

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

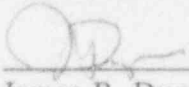
Report No. 030-00883/94-001
030-06991/94-001
030-00356/94-001
030-22083/94-001
070-00343/94-001

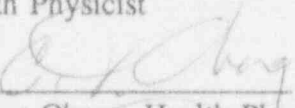
Docket Nos. 030-00883
030-06991
030-00356
030-22083
070-00343


License Nos.	<u>29-05218-28</u>	Priority	<u>2</u>	Category	<u>FIA</u>
	<u>29-05218-29</u>		<u>3</u>		<u>(NA)</u>
	<u>29-05218-30</u>		<u>3</u>		<u>(NA)</u>
	<u>29-05218-31</u>		<u>3</u>		<u>E</u>
	<u>SNM-314</u>		<u>2</u>		<u>A</u>

Program Codes: 01100
03800
03800
03510
22110

Licensee: Rutgers, The State University of New Jersey
Radiation and Environmental Health and Safety
Building 4127 - Livingston Campus
New Brunswick, New Jersey 08903-5077

Inspectors:  3/5/94
James P. Dwyer, Senior Health Physicist date

 3/4/94
C. Thor Oberg, Health Physicist date

Approved by:  3/5/94
for Mohamed M. Shanbaky, Chief Research and Development Section date

Inspection Summary: Routine, unannounced safety inspection conducted from January 31 through February 7, 1994, (Combined Inspection Report Nos. 030-00883/94-001, 030-06991/94-001, 030-00356/94-001, 030-22083/94-001, and 070-00343/94-001).

Areas Inspected: Licensee action on previous violations; organization; scope of program; internal audits; training; facilities and equipment; materials and inventories; receipt and transfer of licensed materials; area surveys; personnel radiation protection - external and internal; radioactive effluents and waste disposal; posting and labeling; and independent measurements.

Results: No radiation safety issues or items of noncompliance were identified during this inspection.

DETAILS

1. Persons Contacted

- * Richard M. Norman, Vice President for Administration and Associate Treasurer
- * Michael C. Quinlan, CIH, Director of Radiation and Environmental Health and Safety, and Radiation Safety Officer
- * Deborah A. Silva, University Health Physicist
- * Sylvia Wittenberg, Associate Director of Operations
- * Martin Costello, Manager, Hazardous Waste
- Ira Schneider, Health/Safety Specialist
- Tom Block, Health/Safety Specialist
- Rosemarie Kulp, Health/Safety Specialist
- Lori Kaufman, Health/Safety Specialist
- Sandy Hayes, Research Associate
- Ming Shu Huang, Research Associate
- Li Feng Good, Research Associate
- Shu Chum Teng, Research Associate
- Carol Lafiandra, Survey Technician
- David Denhardt, Authorized User
- Susan Rittling, Authorized User
- Monica Driscoll, Authorized User
- Robin Lints, Research Associate
- Gerry Berkowitz, Ph.D., Authorized User
- Ian Creese, Authorized User
- Lee Feong, Research Associate
- Steve Radecki, Research Associate
- Janet Gould, Research Associate
- Dunne Fong, Authorized User

* Those present at the exit interview

2. Licensee Action on Previous Violations

(Closed) Violation A., NRC Inspection No. 91-001.

Failure to secure licensed material against unauthorized removal from an unrestricted area, and failure to maintain licensed material under the constant surveillance and immediate control of the licensee. Several incidents were identified.

All licensed materials were observed to be secured against unauthorized removal or were under the constant surveillance and immediate control of the licensee.

(Closed) Violation A., NRC Inspection No. 92-001.

Failure to maintain licensed material in an unrestricted area secured against unauthorized removal. A physical inventory determined that sealed sources were missing. The sources were located subsequent to the inspection.

All licensed materials were observed to be secured against unauthorized removal or were under the constant surveillance and immediate control of the licensee.

(Closed) Violation B., NRC Inspection No. 92-001.

Individuals working in an area where licensed materials were used or stored were not instructed in accordance with the requirements of 10 CFR 19.12.

No deficiencies with the licensee's training program were identified.

(Closed) Violation C., NRC Inspection No. 92-001.

Failure to evaluate and assign radiation doses to individuals who lost their personnel dosimetry badges.

The inspectors determined that the licensee performs an evaluation and assigns radiation doses to individuals whose dosimetry badges are not returned for processing.

3. Organization

The Rutgers Environmental Health and Safety (REHS) Department manages the University Radiation Safety program under the administration of the Director. The Director of REHS, who is also the Radiation Safety Officer (RSO), reports to the Vice President for Administration. The REHS director stated that he spends from 25% to 50% of his time on radiation safety issues. The REHS Department is comprised of two "branches," the Operations Branch and the Program Branch.

The Operations Branch is split into two service groups, Technical Services and Environmental Services. The Technical Services Section is comprised of eight Health/Safety Specialists (HSS) and one Radiation Safety Technician. These individuals stated that they spend from 25% to 50% of their time on radiation safety issues, the remainder of their time is spent on biosafety, Occupational Safety and Health Administration (OSHA) issues, etc. These individuals perform laboratory audits and deliver packages. The Environmental Services Section is composed of a manager, two HSS, and a Health and Safety Technician. They are responsible for radwaste and effluents as well as chemical wastes and other hazardous wastes.

The Program Branch is composed of four professional individuals who devote full time to their specific field; radiation protection, environmental protection, safety engineering, and biosafety. They communicate frequently with the Operations Branch personnel both verbally and, when they need a specific task accomplished (a special survey, cleanup a spill, etc.), through written action memoranda.

The radiation protection professional is the University Health Physicist (HP). The University HP reviews the radiation control and safety programs and the work performed by the HSS. The University HP occasionally accompanies the HSS when they conduct their audits.

The REHS staff reviews and approves Authorized Users (AU) who are permitted to use licensed material for a period of two years before renewing their authorization. REHS reports its actions to the RSC for their review. The RSC meets annually. The licensee is working to reduce the amount of radioactive material, authorized by each permit, to realistic usage limits.

No violations or safety concerns were identified.

4. Scope of Program

The licensee possesses a Broad Scope License, an Irradiator License, a Special Nuclear Material License, and two Possession Only licenses for sealed sources. The licensee maintains facilities for about 120 AU on the Busch Campus, the Camden Campus, the Cook Campus, and the Newark Campus. The licensee is authorized to perform two field studies which, according to REHS personnel, were completed years ago. Inspections were conducted of numerous lab facilities at the Busch, Cook, and Newark Campuses. The labs inspected were those assigned to some 26 AUs. The inspection included the REHS building facilities and the "Gamma Greenhouse" radwaste storage facility.

No violations or safety concerns were identified.

5. Internal Audits

The HSS are responsible for conducting periodic audits of each of the AU's facilities. The HSS strive to perform these audits quarterly but have not always been successful. Since the arrival of the present University HP the audits have become more frequent and more complete than in the past. The HSS also pick up waste and conduct other safety audits (biosafety, OSHA, etc.) in the labs. Consequently, HSS personnel spend a great deal of time in laboratories which is not reflected by the official audits. At all times, the HSS are instructed to observe and document any infractions of the licensee's rules and regulations.

The University HP reviews the results of the radiation safety audits and responds to any other concerns raised by the HSS staff. The University HP can request special actions (increased audit frequency, change the number and type of surveys, etc.) as may be necessary for increased radiological control. The requested increased action is communicated both verbally and in writing.

The University HP and the RSO issue a Notice of Violation (NOV) when violations are identified. The most common violations are contamination surveys not conducted by lab personnel; evidence of smoking, eating, drinking, etc. in the labs; and some unauthorized locations of use and minor security problems. In lab facilities controlled by 26 AUs, the inspectors found no evidence of repeat violations. Personnel in these labs were well aware of the problems with compliance. The audits, as currently conducted, appear to be effectively improving compliance.

Prior to the arrival of the new University HP in 1993, NOV's were apparently not always transmitted to the AU. It appeared to the inspectors that the licensee has made notable progress in correcting this problem.

Within the past year, the licensee established a new enforcement policy. The enforcement policy includes the following: For the first violation, the NOV is presented to the AU; for the second violation, NOV's are presented to the AU and the Department Chairperson; and after the third violation, the AU is required to appear before the RSC to explain why violations have continued. The RSC decides the course of action to be taken, including possible revocation of the AU's authorization to use licensed materials. The licensee was unclear regarding what constituted repeat violations (the repeat of the same violation or two audits where violations were identified) and how long violations remain on the books for enforcement purposes. The licensee acknowledges that this enforcement policy is still being developed.

Since the new enforcement policy was established, two AUs have received three violations. Letters were sent requiring the AUs to meet with the RSC. These meetings did not take place because of scheduling problems. However, the REHS staff was directed to act for the RSC in handling the issues. In both cases, the RSO and the University HP met with the AUs and explained the University's position relative to the noncompliance. The inspectors visited both of the lab facilities involved in these violations. The lab personnel were cooperative and no repeat violations were identified.

No violations or safety concerns were identified.

6. Training

The licensee stated that the AUs are primarily responsible for providing laboratory staff with safety training related to each staff member's specific job function. In addition, each month, REHS provides a Radiation Safety Training class lasting 2-3 hours which provides more general information. New workers are required to take the first available REHS training session. Radiation workers are also required to receive retraining every 2 years. No radiation workers were identified who had not received the required training. Interviews conducted with dozens of radiation workers identified no deficiencies in the licensee's training program.

The inspectors reviewed the training records for individuals using the Gammator 50B irradiator, containing a nominal 260 curie cesium-137 (Cs-137) sealed source, authorized by License No. 29-05218-31. The inspectors determined that training was provided to the individuals using the device as well as the REHS staff responsible for the radiation safety and control of the irradiator.

Training on the new 10 CFR Part 20 regulations has been conducted for the REHS staff by the RSO and the University HP. They are including this training in the routine monthly training provided for all other Rutgers University personnel.

No violations or safety concerns were identified.

7. Facilities and Equipment

The inspectors noted that security in the laboratories appeared to be excellent. The inspectors were initially concerned about security at the Gamma Greenhouse waste storage facility. The gate in the fence around the facility berm was open wide enough for a small child to enter. This opening was apparently the result of ice forming at the gate from the recent snow, rain, and freezing weather conditions. The licensee immediately repaired this problem to the inspectors' satisfaction. One of the doors to the Gamma Greenhouse was noted to be unlocked. While this didn't pose a security problem due to the presence of the fence and berm, the inspectors noted that the door was equipped with a lock and that there was no reason not to keep it locked. When the inspectors mentioned this, the licensee immediately locked the door and chained it shut.

Survey instruments present in the lab facilities inspected were all operational. The inspectors checked the instruments for response to radiation and noted that they were all functional. The meters were generally out of calibration according to the attached calibration stickers. However, because these meters are used for qualitative purposes and not to comply with 10 CFR Part 20 for quantitative measurements, the licensee was not cited. The REHS maintains survey instruments to be used for quantitative

measurements. Records reviewed by the inspectors confirmed that these instruments are calibrated at six month intervals. The inspectors noted that the system employed to track survey instrument calibration needs some refinement with respect to the clarification of instrument status.

No violations or safety concerns were identified.

8. Materials and Inventories

The inspectors reviewed the licensee's sealed source inventory record and noted that the licensee possessed two sealed sources containing a total of 1,500 millicuries (mCi) of samarium-151 (Sm-151). The inspectors also noted that the possession of this material was limited by the license to a maximum of 1 curie (Ci). The licensee stated that until recently, they were unaware that the sources contained Sm-151. The sources were originally labeled by the source manufacturers as containing europium-151 (Eu-151), a stable nuclide. The licensee recognized that the sources contained Sm-151 (half-life = 97 years), metastable Eu-151 (Eu-151m) (half-life = 60 microseconds), and Eu-151. Eu-151m and Eu-151 are the radioactive and stable daughters of Sm-151. Because of the extremely short half-life of Eu-151m, the licensee realized that this source could only be obtained from the long-lived parent, Sm-151. In December 1993, the licensee submitted an amendment request to increase the license possession limit. They requested that the possession limit be changed to read "not to exceed 5 curies per radionuclide and 50 curies total". Subsequent to telephone discussions between the university HP and one of the inspectors, the decision was made by the inspectors not to cite the licensee for this self-identified problem.

With the exception of the aforementioned Sm-151 problem, licensed materials possessed by the licensee were within the limits authorized by their licenses.

The licensee requires that a quarterly inventory of radioactive materials (RAM) possessed by each AU be submitted to the REHS staff. The inspectors reviewed the inventory maintained by the REHS dated January 31, 1994, and identified numerous AUs who appeared to have more RAM in their possession, or in their possession plus what they had on order, than was authorized by their permit. The REHS personnel stated that this inventory was not used to control the use of RAM. When a package of licensed material, ordered by an AU, is received, before it is delivered to the AU, the REHS staff verifies that the AU's possession limit will not be exceeded by the addition of this material. The REHS staff has been working on this inventory system to make it more accurate and accountable but to date they have had little or no success. The licensee believes that RAM is not promptly deleted from the inventory when it is disposed of as radwaste. They also believe that material is not promptly removed from the "On Order" tabulation of the inventory after the material has been received and added to the total. The licensee said that the inventories maintained by

the AUs are more accurate than those maintained by the REHS staff. The inspector reviewed the inventories of 26 AUs and, for the most part, found great discrepancies between the REHS inventory and the lab inventory. The inspectors noted that in every case, the REHS inventory was greater than the lab inventory so the errors were on the conservative side. The licensee promised to continue working to upgrade this inventory system. In addition, they stated that they are trying to perform some independent verifications of what the AUs say they possess.

The licensee conducts physical inventories of the sealed sources in their possession. These inventories are conducted every six months at the same time that leak testing is done. If the sources are in storage, they are not leak tested but, as was noted by the inspectors, the sources are still inventoried.

No violations or safety concerns were identified.

9. Receipt and Transfer of Licensed Materials

All purchase orders for RAM are approved and signed by the RSO. All orders are received at the REHS office and lab facilities. REHS personnel perform both ambient radiation and removable contamination surveys of each package. The unopened packages are delivered to the AUs by the HSS staff. The AUs are responsible for wiping the inside of each package and maintaining copies of their package receipts and the surveys. This documentation is an HSS audit item for which no violations were noted.

External transfers of RAM are processed through the RSO or University HP, and the REHS offices. With the exception of radwaste shipments, transfers of licensed materials are minimal. Before transfers of RAM are made to other licensees, REHS verifies that the transferee's license authorizes the material by obtaining a copy of the recipient's license. Internal transfers between AUs are controlled through the REHS office.

No violations or safety concerns were identified.

10. Area Surveys

The licensee requires each AU to conduct monthly surveys for removable contamination. The inspectors determined that the AUs were almost always complying with this requirement. When an AU fails to do so, REHS will cite the AU and issue an NOV. AUs also said that they would perform surveys of their work areas and their person after completing an experiment. The inspectors observed that survey meters were turned on and close at hand to the researchers during their use of RAM. In some buildings on the Busch Campus, the facility operators hired an

individual to do all of the required monthly surveys. The inspectors determined that this individual is knowledgeable and properly equipped to conduct these surveys. The individual also carried a Geiger-Mueller (GM) survey instrument to use when searching for radioactive contamination.

REHS personnel conduct an annual wipe survey of all areas using RAM.

No violations or safety concerns were identified.

11. Personnel Radiation Protection - External and Internal

External

When requested by individuals, the licensee provides personnel dosimetry monitoring devices to anyone working with, or in the vicinity of, RAM. In these cases, the devices are provided even though it is not necessary or required.

The licensee's personnel dosimetry program utilizes thermoluminescent dosimeter (TLD) badges that are exchanged and processed quarterly by their vendor. The vendor is a participant in the National Voluntary Laboratory Accreditation Program (NVLAP). The highest total exposure levels determined for 1992, in millirems (mRem), were; 50 deep and 60 shallow for whole body doses, and 350 for extremity exposures. The third quarter results for 1993 were not yet available. The results reviewed for the available 1993 data indicated that no quarterly limits had been exceeded.

For individuals who lost their personal dosimeter badge, the licensee performs an evaluation of their radiation exposure. This is usually based on their exposure history. The results of the evaluation are submitted to the licensee's dosimetry vendor to enter into the individual's dose record.

Internal

The inspectors found that the licensee was in compliance with the requirements of their thyroid monitoring, bioassay program for iodine-125 (I-125) uptake. The licensed program requires that bioassays be performed within 72 hours of an iodination or possible intake of I-125. The bioassay measurement system efficiency is checked each month by measuring an iodine-129 (mock I-125) standard source placed in a thyroid neck phantom. The present efficiency for thyroid measurements was calculated to be 3.52% for I-125. By purchase orders submitted for radioiodine and the subsequent receipt of the material, the REHS staff knows when iodinations will occur. The radioiodine is usually held at the REHS facilities until the iodinations are to be performed. When the iodimators pick up the I-125 from the REHS to do the

iodination, they also receive a small, calibrated, air pump and filter system which they place in the iodination hood. With this filter system in operation during the iodination, the licensee collects an air sample for the evaluation of any I-125 releases.

No elevated I-125 bioassays results or effluents were noted.

Because of the minimal amounts of licensed materials used, no other bioassay studies are required for uptake calculations.

No violations or safety concerns were identified.

12. Radioactive Effluents and Waste Disposal

No I-125 effluents have been released to the atmosphere as determined by air monitoring conducted in hoods during iodinations. The minimal amounts of other radionuclides used has not warranted effluent air sampling.

Since September 1993, no liquid RAM has been released to the sanitary sewerage system by disposal to sinks in the lab facilities. The REHS personnel collect and hold liquid waste for decay in storage (DIS) and for controlled releases, as non-radioactive material, to the sanitary sewerage system via one central sink. The inspectors found no unauthorized sink disposals.

Radwaste is processed at the Gamma Greenhouse waste storage area within the restricted/fenced area. Currently the licensee is consolidating, packaging, and shipping all solid radwaste off-site for disposal by licensed burial. The licensee is compacting as much of the solid lab radwaste as possible. They are interested in initiating a DIS program for the disposition of solid radwaste. The inspectors were concerned that flammable waste (small quantities of ether observed in the area) is normally stored with RAM waste in the Greenhouse. The licensee said that the presence of the ether was a mistake and that these types of waste are not stored with the radwaste. The flammable materials were immediately removed. The inspectors were also concerned regarding several 55 gallon drums containing free-standing liquid radioactive waste that was frozen and causing extreme bulging of the drums. These drums were outside the Greenhouse but under cover of a roof. The licensee said that this was an anomaly due to the recent extremely cold temperatures. The licensee also pointed out that the drums were sitting on plastic safety pallets constructed to contain any leakage.

Exempt quantities of C-14 and H-3 in animal carcasses are also being shipped off-site to Barnwell. The licensee informed the inspectors that the REHS personnel can't get anyone to incinerate the carcasses once they advise the vendors that the carcasses contain minor amounts of RAM.

Before being shut out of the low level waste site when it closes, the licensee is attempting to dispose of numerous old sealed sources that they are holding in storage in the Gamma Greenhouse.

Mixed wastes, infrequently generated at the University, are staged in a fire protected, metal storage shed. This waste will be held until adequate and proper disposal is authorized.

The inspectors noted that the licensee was building a new waste processing facility adjacent to the Greenhouse location. In addition, an interim storage facility had been proposed and designed. Risk assessments studies have been completed for both of these facilities.

No violations or safety concerns were identified.

13. Posting and Labeling

The inspectors noted that the laboratories inspected were properly posted. Areas in which licensed materials were used and stored were also posted and labeled as required.

The berm inside the fenced restricted area around the Gamma Greenhouse was still posted as a High Radiation Area and Radiation Area. This is no longer necessary and the licensee said that they would remove these postings.

No violations or safety concerns were identified.

14. Independent Measurements

The inspectors used a Ludlum 14C survey instrument (SN 9657, calibrated October 1, 1993) equipped with an end window GM probe to detect and measure radiation levels from gross contamination in laboratories and storage areas. No abnormal radiation levels were found. Using a Ludlum Model 9 ion chamber (SN 27849, calibrated November 6, 1993) the inspectors also measured the ambient radiation levels in and around the Gamma Greenhouse. No significant dose levels were identified.

No violations or safety concerns were identified.

15. Exit Interview

An exit interview was held with those individuals identified in Section I of this report. The scope and findings of the inspection were discussed. The inspectors informed the licensee's representatives that, compared to previous inspection findings, the licensed programs show a definite improvement in compliance with the conditions of their licenses and with radiological controls. Further, that this improvement appears to be due to the emphasis placed on an effective auditing program conducted by the HSS under the REHS Director and the University HP. This has resulted in an increase in responsiveness and concern for improvement by the Authorized Users and their workers.

The licensee stated that their intent is to continually improve their licensed programs.

Dr. Mohamed M. Shanbaky discussed the licensee's response to the NRC's requirement to submit a signed "Statement of Intent" as backing for a decommissioning funding plan. The statement submitted was signed by an authorized representative of the University. However, because Rutgers is a State University, the statement of intent must be signed by a state official with the authority to spend money for the state. The licensee's Vice President for Administration stated that he would obtain the appropriate authorization from the state.