U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Combined Report Nos.	030-05222/92-001 030-10957/92-001 030-10750/92-001
Docket Nos.	030-05222 030-10957 030-10750
License Nos.	29-00139-02 29-00139-03MA, 29-00139-04MD
Licensee:	E.R. Squibb and Sons, Inc. One Squibb Drive P.O. Box 191 New Brunswick, New Jersey 08903-0193
Facility:	Bristol-Myers Squibb Company
Inspection at:	One Squibb Drive, North Brunswick, New Jersey, Route 206 and Provinceline Road, Lawrenceville, New Jersey, 905 Herrontown Road, Princeton, New Jersey, and 200 Headquarters Drive, Skillman, New Jersey
Inspection Conducted:	October 26 through 28, 1992

Inspectors:

Charles Amato, Health Physicist — 12-1-92 date

James M. Bondick, Health Physicist — 12-1-92 date

Duncan White, Health Physicist — 12/1/92 date

Approved by: Francis M. Costello 12/2/92

Francis M. Costello, Chief
Industrial Applications Section

date

Inspection Summary: Routine unannounced safety inspection conducted from October 26 through 28, 1992 (Combined Reports Nos. 030-05222/92-001, 030-10957/92-001, and 030-10750/92-001).

Areas Inspected: Organization and scope of activities; incidents; radiation safety committee; licensee audits; training and instruction to employees; radiation protection procedures; receipt and transfer of material; surveys; personnel protection - external; personnel protection - internal; effluent monitoring; inventory; waste disposal; transportation; emergency contingency plan; and distribution licenses.

Results: Two violations were identified: failure to perform surveys in areas where licensed material is used (Section 7) and failure of the Health Physics Office to maintain and evaluate results of thyroid bioassays (Section 11)

DETAILS

1. Persons Contacted

* H. Bauer - Vice President of Manufacturing Operations
* M. Vala - Health Physics Scientist
* L. Gaines - Health Physics Supervisor
* J. Gresh - Director of Quality Assurance Services
* D. Balkunow - Radiation Safety Officer
* C.J. Stajura - Health Physics Supervisor
* J.R. Owens - Health Physics Scientist
* G. Thompson - Director of Radiodiagnostic Operations

G. Gideon - Health Physics Technician, North Brunswick
L. Callan - Associate Director of Regulatory Operations, Squibb Diagnostic
B. Swanson - Director, Princeton House
W. Scott - Senior Vice President, Exploratory and Drug Discovery Research
R. Czajkowski - Health Physics Technician, Lawrenceville
J. Frankowski - Distribution Manager
D. Ball - Security Manager, North Brunswick
B. Rottner - Fire Protection Manager, North Brunswick
K. Sosnowski - Radiodiagnostic Manufacturing Manager

Various authorized users, laboratory and manufactoring personnel

W. Czaszar - Radiation Physicist, New Jersey Department of Environmental Protection and Energy (NJDEPE)
S. Boykewich - Radiation Physicist, NJDEPE

* indicates those present during the exit interview

2. Organization and Scope of Activities

The licensee manufactures and distributes iodine-131 (I-131) for diagnostic and therapeutic uses in Building 124 in its North Brunswick facility. In addition to I-131, the licensee also manufactures and distributes other radiopharmaceuticals under a license issued by the State of New Jersey. The licensee receives two shipments of I-131 a week each containing approximately 30 curies. Quality control, quality assurance, packaging and distribution as well as research and development activities are conducted at the North Brunswick facility. The manufacturing facility is supported by approximately 50 personnel. The current scope of research and development at North Brunswick is 20 laboratories in three buildings, including the licensee's two iodination facilities. The licensee is authorized to distribute reagent kits under NRC license No. 29-00139-03MA and distribute radiopharmaceuticals to persons licensed under 10 CFR 35, or equivalent Agreement State licenses under NRC license No. 29-00139-04MD. The licensee's two other distribution licenses, 29-00139-06E and 29-00139-07G, were terminated since the last NRC inspection. The

licensee is authorized to conduct research and development activities at their facilities in Lawrenceville, Skillman, Princeton and Plainsboro, New Jersey. The Skillman facility is part of the ConvaTech group within the Bristol-Myers Squibb Company and currently has two research and development laboratories. The Princeton facility is part of the licensee's association with the Medical Center at Princeton and consists of two laboratories. The Lawrenceville facility is Bristol-Myers Squibb's largest research and development facility with approximately 170 laboratories, 275 authorized users and 400 badged personnel. No iodinations are currently performed at this facility, but three iodination laboratories are planned, one of which is close to completion. According to the licensee representatives, approximately 800 millicuries of tritium and four curies of other isotopes are used monthly. The licensee also indicated that research and development activities are planned to expand at both North Brunswick and Lawrenceville. No licensed material is currently used at Plainsboro.

The Radiation Safety Officer (RSO) heads the Health Physics Department, and reports directly to the Director of Quality Assurance Services. The office is administratively separated from the manufacturing and research and development activities. Since the last NRC inspection, one health physics supervisor left the company, but the licensee has hired three health physicists to the staff to increase the staffing level in the Health Physics Office by two. The RSO is supported by two health physics supervisors, one each for the North Brunswick and Lawrenceville facilities. In addition to the supervisor, a health physics and three technicians support licensed activities at the Lawrenceville facility. The licensee's records to demonstrate compliance with NRC regulations are maintained in North Brunswick.

No safety concerns were identified.

3. Incidents

The licensee maintains a deviation log to document incidents that occur during the routine use of licensed materials. The log also serves to document the corrective action taken by the Health Physics Office. A review of these records by the inspectors noted that a majority of the incidents in the log were spills or the contamination of individuals identified during routine monitoring. The inspectors did note one incident which involved the contamination and thyroid uptake of personnel from 60 millicuries of I-131 in two vials which were placed in the wrong area of Building 122. Although four individuals received measurable uptakes of iodine in their thyroid, the levels were below the licensee's action level (20 nanocuries). The inspectors noted that the Health Physics Office took prompt and appropriate action to remove contamination and the individuals involved as well as corrective action to prevent a repeat of a similar occurance.

No safety concerns were identified.

4. Radiation Safety Committee

The licensee's Radiation Safety Committee currently consists of eleven members from both manufacturing and the research and development groups within the company. The RSO stated that the RSC has become more oriented toward the licensee's research and development activities since the merger of Squibb with Bristol-Myers and the subsequently reorganization of the company. During 1992, the RSC met on a monthly basis. Prior to 1992, the RSC met at least on a quarterly basis as required. The inspectors reviewed the meeting minutes from October 1991 to September 1992 and noted that the minutes emphasized policy items such as radioactive waste storage, more than routine items such as personnel monitoring, training survey results, and incidents. The inspectors noted that the RSC minutes did not include a discussion of the incident described in Section 3 of this report. The licensee's representatives agreed that whenever significant follow-up actions are taken, e.g., an intake in which individuals require thyroid counting or reoccuring contamination in work areas, the item will be reviewed by the RSC and recorded in the minutes.

No violations were identified.

5. Licensee Audits

An external audit is conducted annually by an outside health physics consultant. The most recent outside audit was conducted on March 19 and 20, and April 1, 28 and 29, 1992. The findings of the audit were reported to management and discussed with the RSC. The 1992 audit identified five significant findings: termination reports for personnel monitoring to individuals; posting requirements in 10 CFR 19; evaluation of radiation levels in Room 190, Building 124; unauthorized personnel using radioactive material; and unsecured and uncontrolled licensed material in Building 124's shipping and receiving area. The inspectors concluded that the licensee took effective corrective action concerning these items based on observations during the inspection and review of appropriate records.

No safety concerns were identified.

6. Training and Instruction to Employees

New employees are required to receive a radiation safety orientation prior to working with licensed material or entering a restricted area. The initial orientation lecture lasts approximately 1.5 to 2 hours. The inspectors reviewed the training outline and noted that topics included safety procedures, emergency procedures, ordering of licensed material, waste handling and disposal and the protection of the woman and her fetus during pregnancy. The licensee also provides refresher training for different groups of workers on an annual basis. The inspectors noted the names of individuals

using licensed material during the course of the inspection and confirm that they had been provided training within the last year.

The inspectors interviewed a number of workers during the course of the inspection and found that they were apparently knowledgeable about the safe use of radioactive materials. During the course of the inspectors' review of the Lawrenceville facility, a researcher told one of the inspectors that some materials users initially felt that the level of radiation safety was too restrictive for a research and development laboratory. Subsequent discussions with the radiation safety personnel revealed that this issue was bought before the RSC. The RSC supported the level of radiation safety implemented by the Health Physics Office.

No safety concerns were identified.

7. Radiation Protection Procedures

Principal radioactive materials users complete a radioactive materials authorization request that describes the work that will be performed, the location of use, the isotopes and quantities to be used, and other personnel working under the authorization. The Radiation Safety Office reviews the authorizations to ensure that all essential safety equipment is available in the laboratory. In cases involving the potential for significant exposure to radioactive materials (e.g. iodinations), the Health Physics Office will assist the researcher to ensure proper radiological practices are followed. All authorizations are approved by the RSC. Authorizations for less than 10 millicuries of licensed material may be approved by the RSO until the next meeting of the RSC where a final decision is made by the RSC. The inspectors reviewed a sampling of the authorization requests to confirm that the applications were complete and the RSC approved them prior to work commencing.

The inspectors toured the manufacturing facility (Building 124) in North Brunswick, accompanied a health physics technician conducting routine monitoring, observed and interviewed personnel and made independent measurements. The interlock system for the iodine processing cell in Room 175 was tested and found to operate as designed. Area monitors are located throughout the manufacturing facility which alarm locally and at a control panel located at the health physics office at the entrance to the restricted area. The alarms accuate at 50 and 100 mR/hr and requires manual resetting. The inspector noted two areas posted as high radiation areas. Both areas were properly controlled as required by 10 CFR 20.203(c)(2)(iii). The inspectors noted that housekeeping in Building 124 was good. The facility was sufficiently posted and the restricted area adequately secured.

The inspectors also toured a number of research and development laboratories at the North Brunswick facility. While the inspectors were in Room 207A of Building 80/84, one of the inspectors from the State of New Jersey picked up contamination on

the bottom of his shoe prior to leaving the room. Measurements by the licensee of the shoe were 1000 counts per minute or approximately 5000 disintegration per minute. The shoe was decontaminated immediately after the contamination was identified. At the time of the inspection, an authorized user was performing an iodination using approximately 0.3 millicuries of Iodine-125. The laboratory was not occupied by the user at the time of contamination incident since the procedure was in an incubation step. The laboratory was properly secured to prevent unauthorized personnel from entering the area.

The inspectors toured over 50 research laboratories in Skillman, Princeton and Lawrenceville, observed and interviewed personnel and made independent measurements. An adequate amount of currently calibrated surveying and monitoring equipment was noted by the inspectors as well as shielding and hoods. The inspectors noted during discussions with personnel and the health physics staff that the monitoring of work areas where radioactive material is used are performed during and after each use of licensed material.

During an interview with the authorized user in Room F1.4812, the user stated that she and her assistant used carbon-14 and tritium in rat studies on the average of four times a week. The user further stated that no radiological monitoring was performed after licensed material was used. The room was monitored, however, on a monthly basis by the Health Physics Office.

The licensee's general laboratory procedures for using radioactive material require monitoring before, during and after each use of radioactive material. Failure to survey areas in which licensed materials are used is a violation of Condition 23 of License No. 29-00139-02.

8. Receipt and Transfer of Material

Incoming licensed material in North Brunswick is received at Building 124 and at the Module G shipping and receiving dock at Lawrenceville. Surveys are conducted by the health physics staff within the time frames required by 10 CFR 20.205. Shipments are received only during regular work hours. Once packages are surveyed, the material is transferred to the production area for manufacturing or picked by the authorized user for research and development material.

Shipments of licensed material are predominately radiopharmaceuticals from North Brunswick. Radiopharmaceuticals are shipped to customers via a shipping company in South Plainfield. The distribution manager estimates that approximately 20 to 30 packages of licensed material are shipped each day. The licensee maintains a computer tracking of their customer to ensure that they authorized for the material and the license is current or in timely renewal. Hard copies of customer licensees are

also maintained. The inspectors verified compliance with 10 CFR 30.41 by comparing a sampling of purchase order to current copies of the customers' licenses.

The licensee uses a courier service to transport licensed material between sites. For example, labeled compounds prepared in the iodination laboratory at North Brunswick are shipped to Lawrenceville by this method.

No safety concerns were identified.

9. Surveys

The Health Physics Office conduct monthly surveys and audits of research and development laboratories. In addition to the radiological monitoring, the licensee's Health Physics Office also makes observations concerning overall laboratory practices as they relate to radiation safety. The inspectors reviewed a memorandum from the Health Physics Office to the various supervisors at the Lawrenceville facility regarding the findings of the monthly audits. The inspectors also reviewed selected records of surveys performed by the Health Physics Office for all locations. The inspectors noted that the issuance of the memoranda elicit prompt follow-up by the authorized user and their supervisors.

Monitoring in the manufacturing facility in North Brunswick includes exchanges of air samples three times a week and radiation surveys and surveys for removable contamination weekly. Rooms with high potential for contamination, such as Room 175, are survey for contamination and radiation on a daily basis. Hoods and glove boxes used for handling radioactive materials are checked monthly. The inspectors reviewed the surveys records, which are maintained in a weekly format, for the manufacturing facility and found that the records appeared to be complete. The perimeter to the manufacturing facility is surveyed on a monthly basis.

No safety concerns were identified.

10. Personnel Protection - External

The inspectors reviewed personnel monitoring records for selected individuals for the period October 1991 to September 1992. Individuals working in manufacturing and distribution wear whole body and extremity dosimeters exchanged on a weekly basis. Other personnel are on a monthly exchange frequency. The maximum extremity dose for a one week time period was 3260 millirem and the maximum extremity dose in a calendar quarter was 8719 millirem. The maximum whole body dose noted by the inspectors was 40 millirem in a week. Research and development personnel normally receive monthly doses less than 10 millirem.

No safety concerns were identified.

11. Personnel Protection - Internal

The licensee uses air samplers containing activated charcoal throughout the manufacturing facility and in the laboratories designated for iodinations. The samplers are exchanged three times a week and analyzed in a well counter. The inspectors reviewed select records of the results of air sampling performed through these facilities and noted that the maximum concentration was well within the limits of 10 CFR 20.103 and 20.106.

Personnel working in manufacturing are screened weekly for iodine uptake in the thyroid. Research and development personnel performing iodinations are required to have a thyroid scan performed before the procedure is performed and one or two days after the completion of the iodination. The licensee has two counting facilities for thyroid scans in North Brunswick located in Buildings 124 and 80/84 and appropriate instrumentation in Room H2625 at Lawrenceville. Personnel are required to monitor their thyroids at the required frequency and record the results on their log sheet kept near the instrument. The health physics staff periodically reviews the logs to ensure personnel are performing the bioassay at the required frequency and evaluate the data to ensure individuals do not exceed the licensee's action threshold of 20 nanocuries. A review of a selection of the bioassay records indicated that only one individual reach the 20 nanocurie threshold. The individual's thyroid burden peaked at 20 nanocuries and decreased the next day.

During the course of touring the Lawrenceville facility, the inspector interviewed an authorized user who routinely performs iodinations in North Brunswick and uses the labeled compound in his Lawrenceville laboratory. The authorized user told the inspector that he performs a thyroid scan at the required frequency and records the results on the log sheet that he keeps in his possession. The authorized user produced the log sheet with his thyroid assay results for examination by the inspector. A representative from the Health Physics Office told the inspector that they were unsuccessful in obtaining a copy of the results from the individual. The Health Physics Office is required to evaluate and keep all thyroid assay records.

Failure of the Health Physics Office to maintain a copy of thyroid assay records and the consequent failure to evaluate these records is a violation of Condition 23 of License No. 29-00139-02.

12. Effluent Monitoring

The North Brunswick facility discharges liquid effluent into the sanitary sewers from storage tanks which collect waste water from Building 124. The licensee has four underground storage tank with a capacity of 10,000 gallons each. The licensee discharged 0.13 microcuries (uCi) of I-125 and 0.22 uCi of I-131 in 81,655 gallons of

water in 1991. In 1992, the licensee has discharged 0.19 uCi of I-125 and 0.37 uCi of I-131 in 48,020 gallons through September. The concentrations discharged to the sanitary sewers prior to dilution from other facilities are in compliance with 10 CFR 20.303 and amount to less than 1% of the limit for discharge to sanitary sewers.

Airborne contaminates in Building 124 are handled by one of two filtration banks which consist of a roughing filter, HEPA filter and a charcoal bed to trap iodine released during manufacturing. Air samples are routinely taken by the licensee to measure the efficiency of the filtration bank. The inspectors reviewed a selection of records which indicate that challenged filters will remove greater than 99% of the iodine. The effluent is released to the atmosphere to the atmosphere at a velocity of 75,000 cubic feet per minute. Isokentic samplers located in the stack sample the effluent and pass it through a filter and then a charcoal canister that are continuously monitored for beta and gamma radiation, respectively. The filter and canister are changed daily and analyzed.

During the tour of the effluent monitoring system, the inspectors noted that the stack monitor used rubber hoses to connect the detector channel in series. The sample line for the isokentic sampler in the stack to the monitor consisted of steel tubing. The inspectors asked the licensee if the rubber tubing interacted with the iodine that could influence the air sampling results. The licensee's representatives agreed to investigate the influence of the rubber hoses on the stack monitor's sampling efficiency.

The continuous monitors read out on a control panel located at the health physics technician's office located at entrance to the restricted area for the manufacturing facility. The monitors read out in counts per minute (cpm). The audible alarm is set at 300 cpm. The inspectors noted that normal readings for the stack monitor is approximately 25 cpm for the beta detector and 150 cpm for the gamma detector. The licensee told the inspectors that once the alarm exceeds the alarm set point of 300 cpm, the alarm can only be turned off at the panel. Notification of health physics after hours is accomplished by phone call from security who routinely enters the unrestricted portions of the building and would hear the alarm. The licensee also told the inspectors that the readings from the stack monitor are not recorded. The licensee's representatives stated that they would evaluate the installation of a recording device for the stack monitor.

The inspectors reviewed a selection of records maintained by the licensee to demonstrate compliance with 10 CFR 20.106(a) for airborne effluent from Building 124. The inspector noted during 1991, the licensee released 11.97 millicuries (mCi) of I-131 to atmosphere that was 0.1% of the concentration limit for effluent to unrestricted areas. For the first nine months of 1992, the licensee released 7.90 mCi of I-131.

The inspectors also reviewed the air handling systems used for laboratories equipped

with iodination hoods. The air handling system for an operational iodination laboratory in Building 80/84 in North Brunswick was examined. The air handling system for one of the iodination laboratories in Lawrenceville was also examined by the inspectors. The filtration system is similar to the system in Building 124, at North Brunswick with the three step filtering process. The Lawrenceville facility was still under construction and not operational.

No violations were identified.

13. Inventory

The licensee maintains a weekly inventory of material used for manufacturing radiopharmaceuticals. The inspectors reviewed the inventory records for 1992. For I-131, the inventory is typically maintained at approximately 40-45 curies but the quantity ranged up to 55 curies. The quantity of chromium-51 maintained in North Brunswick ranges from 250 to 600 millicuries a week.

Licensed material used in research and development are inventoried on a monthly and are based on receipts and the carry-over from the previous month. Every six months, a physical inventory is performed and the inventory is adjusted. The last physical inventory was performed in June 1992. The inspectors reviewed the inventory records for each of the four facilities.

No safety concerns were identified.

14. Waste Disposal

Radioacive waste is collected, repackaged and stored at each facility. The licensee uses a licensed radioactive waste broker to pick up the packed waste at each facility. The North Brunswick facility currently uses a separate building (Building 122) for repackaging and storing waste. At the time of the inspection, the building was being painted and most materials were removed. According to the RSO, this building is locked unless authorized individuals are present. Due to the possible presence of high radiation areas in this building, access control is maintained to meet 10 CFR 20.203(c)(2)(iii).

The licensee's radioactive waste packaging and storage area in the basement of Module F at Lawrenceville requires the services of a full time health physics technician. Waste is brought to this facility by each laboratory were the technician transfers the waste into the proper container for disposal. The waste is accompanied by a form that outlines the quantity and type of radioactive material present. The area is equipped with an air handling system and properly calibrated survey instrument was available. Waste generated at the licensee's Skillman facility is stored

in a locked cage area in the shipping and receiving area. The inspector determined that the radiation levels in the unrestricted area were within regulatory limits and that the area was properly secured and posted.

The inspectors reviewed a selection of the disposal records for all facilities. The records were found to be complete.

No safety concerns were identified.

15. Transportation

The inspectors reviewed a selection of the licensee's shipping records. The shipping papers prepared by the licensee were found to contain the appropriate information as required in 49 CFR 172 subpart C. Packages are monitored in the distribution portion of the manufacturing facility utilizing two ion chambers. The transport index listed on the shipping paper is calculated but is compared to actual measurements prior to shipment. The inspectors also examined shipping containers in the distribution area used to ship radiopharmaceuticals. The packaging appeared to meet Department of Transportation requirements.

No safety concerns were identified.

16. Emergency Contingency Plan

The licensee is required to have an emergency plan for the New Brunswick facility due to the presence and use of more than 10 curies of I-131 in the manufacturing facility with the potential for an offsite dose of greater than 5 rems to the thyroid. The inspectors reviewed the facility's Radiological Contingency Plan (RCP) against the criteria outlined in 10 CFR 30.32(i)(3). The inspectors concluded that the licensee's RCP meets the NRC requirements, but noted areas in which the RCP could be improved. The licensee's representatives agreed to exercise the RCP at an Emergency Action Level of Site Area Emergency to initiate off-site radiological monitoring, dose calculations and assessment. Prior to this exercise, the licensee's representatives agreed to take action in the following areas to support an exercise:

a. The RCP and the licensee's Crisis Management Plan (CMP) will cross reference each other and the RCP should be integrated into the CMP.
b. The licensee will sign a formal agreement with at least one area hospital to receive contaminated personnel in the event of radiological accident.
c. Air and water sampling for both on-site and off-site locations including dose calculations based on sample analysis will be added to the RCP and accompanied by the appropriate training.

d. Train additional personnel to ensure sufficient personnel are qualified for senior managerial Crisis Management position and to ensure relief in the event of a prolonged accident.

No safety concerns were identified.

17. Distribution Licenses

Radiopharmaceuticals and reagent kits are manufactured and distributed from the licensee's North Brunswick facility. The distribution licenses are managed by Squibb Diagnostic in Princeton, New Jersey. The licensee currently manufactures three radiopharmaceuticals using I-131 and one with Cr-51 under the -04MD license. The licensee indicated that the market for these products is decreasing. Six reagent kits are distributed by the licensee under their -03MA license, five of which are manufactured by the licensee. One product, Techeplex, is made by Amersham and distributed by the licensee. The inspectors reviewed the distribution figures for the last two years.

No safety concerns were identified.

18. Exit Interview

The inspection findings were discussed with the licensee representatives identified in Section 1 of this report on October 28, 1992.