



Mount Vernon
Nazarene College

May 2, 1985

Ms. Evelyn R. Matson
Materials Licensing Section
United States Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

RE: Control No. 78553

Dear Ms. Matson:

Thank you for your thorough review of our March 12, 1985 application for a byproduct material license. I shall respond to your twelve queries in the order cited by you in your letter of April 19.

1. My training and experience with radioisotopes is summarized in Appendix A. I received inservice radiation safety courses and on-the-job training both at my graduate institution and also in my postdoctoral affiliation. I recently completed a hands-on laboratory course in which both Sanger and Maxam/Gilbert DNA sequencing techniques were used. In this course, each participant used [32-P] nucleotides in the same manner, and in similar amounts, as we propose to do in our license application.
2. The 25-hour hands-on course in DNA sequencing, described above and in Appendix A, provided both classroom training and laboratory experience in the use of [32-P] nucleotides.
3. Appendix B summarizes my duties as Radiation Safety Officer.
4. Appendix C is a revised outline of the training to be given to individuals before they work with radioactive materials. I have cited a recent textbook which is now available to workers in our laboratory.
5. The radiation safety classes will be taught by myself. My training and experience have been summarized in Appendix A.
6. Appendix D summarizes the instructions which will be given to non-research personnel. The instructions will be repeated at the beginning of each fall semester since any staff changes usually occur at that time.
7. TLD finger badges will be worn underneath plastic gloves whenever a new delivery of radioactive material is being opened and whenever [32-P] compounds are withdrawn from the stock bottle. The badges will be supplied and evaluated by ICN Pharmaceuticals, Inc.
- 8-10. Appendix E is the revised protocol for radiation surveys to be performed by the Radiation Safety Officer. This protocol supplants page 2 of our original application document.

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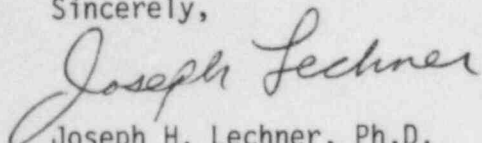
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11. Appendix F summarizes the procedures to be followed in ordering radioactive materials.
12. Appendix G contains the protocol which will be used for inspecting and opening shipments of radioactive materials.

I trust that this information will be satisfactorily to answer the concerns raised in your letter. Please feel free to call me collect at (614) 397-1244, ext. 398, if you require any additional information.

Thank you for your assistance with our license application.

Sincerely,

A handwritten signature in cursive script that reads "Joseph Lechner". The signature is written in dark ink and is positioned above the printed name and title.

Joseph H. Lechner, Ph.D.
Associate Professor of Chemistry

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TRAINING AND EXPERIENCE OF DR. JOSEPH LECHNER

1. I attended a radiation safety course which was conducted by the Radiation Protection Office at The University of Iowa College of Medicine in 1973-1974. This was an in-service, non-credit course of ten hours duration. Roughly half of the lectures dealt with radiation protection principles and practice; the remainder covered biological effects of radiation.
2. I served as a teaching assistant for The University of Iowa's experimental biochemistry course in fall of 1973. My responsibilities were to write laboratory exercises, prepare the reagents and supervise student experimental work. I was directly responsible for experiments in which students learned measurements of beta emitters by liquid scintillation counting, and then used LSC to determine the binding constant of radiolabeled ATP to hemoglobin.
3. I attended an in-service radiation safety course taught by the radiation safety officer at Northwestern University Medical School in 1978.
4. As a postdoctoral fellow at Northwestern University Dental School, I participated in two research projects from 1978 - 1980. The first project was to radiolabel collagen crosslinks using tritiated sodium borohydride, then purify labeled polypeptide fragments resulting from cyanogen bromide cleavage of the labeled collagen. The second project was to isolate and characterize doubly labeled collagen - phosphophoryn conjugates from incisor teeth of rats who had received injected doses of tritiated proline and tritiated serine (total 1.6 millicurie per animal). The results of the latter study were published in J. Biol. Chem., 258: 1450 - 1455 (1983).
5. In February 1985 I attended a 25 hour workshop sponsored by Bethesda Research Laboratories and given at The University of Miami. This course provided hands - on training in the use of [32-P] labeled nucleotides in DNA sequencing, and included instruction on handling and disposal of [32-P] labeled materials. We were provided a stock solution containing one millicurie of [32-P] ATP. Each of the enzyme catalyzed reactions used in DNA sequencing requires 20 - 30 microcuries of [32-P]. The procedures taught at the Workshop were virtually identical to the protocols which we plan to use in the project covered by our byproduct license application.

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DUTIES OF THE RADIATION SAFETY OFFICER

1. To supervise the use of radioactive materials by authorized personnel.
2. To ensure that unauthorized or untrained personnel do not use radioactive materials.
3. To ensure that all users of radioactive materials wear monitoring equipment, and to maintain exposure records for each user.
4. To secure radioactive materials against unauthorized removal.
5. To perform routine inspections of all areas where radioactive materials are used or stored.
6. To provide adequate safety warnings to users as well as non-users of radioactive materials.
7. To ensure that the terms and conditions of the license are met.
8. To maintain inventory records of radioactive materials, as well as other required records.
9. To immediately halt any activity judged to be a threat to health, safety or the environment.
10. To immediately halt any activity which violates NRC regulations or which violates the conditions of the license.

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TRAINING FOR RADIOISOTOPE USERS

1. Reference text: Jacob Shapiro, RADIATION PROTECTION: A Guide for Scientists and Physicians, Second Edition, Harvard University Press, 1981.
2. Topics taught in General Chemistry courses
 1. Nature of subatomic particles
 2. Stable and unstable nuclei
 3. Modes of radioactive decay
 4. Properties of ionizing radiation
 5. Rate of nuclear decay
3. Topics covered in Radiation Safety training course
 1. Radiation and human health
 1. Biological effects of radiation
 2. Health problems associated with radiation
 3. Safe exposure limits
 2. Detection of ionizing radiation
 1. Film badges
 2. Geiger-Mueller counters
 3. Autoradiography
 4. Liquid scintillation counters
 3. Precautions to minimize radiation exposure
 1. Restricted vs. nonrestricted areas
 2. Protective clothing and equipment
 3. Safe laboratory techniques for handling radioisotopes
 4. Disposal of radioactive materials
 5. Radiation surveys
 4. Responsibilities of radioisotope users
 1. Applicable NRC regulations
 2. Conditions requiring report to supervisor
 3. Emergency procedures
 4. Personal exposure history

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INSTRUCTIONS FOR NON-RESEARCH EMPLOYEES

1. FACULTY, TEACHING ASSISTANTS AND SECRETARIES

1. Health hazards of radiation
2. Basic precautions against exposure to radiation
3. Avoid unnecessary exposure to restricted areas
4. No eating, drinking or smoking in restricted areas
5. No food, beverage, tobacco or cosmetics stored in restricted areas
6. Tap water from restricted sinks not to be used for drinking
7. Deliveries of radioactive materials must be directed to RH 229 during normal working hours, or to Security at all other times

2. PURCHASING, RECEIVING, AND POSTAL EMPLOYEES

1. Health hazards of radiation
2. Basic precautions against exposure to radiation
3. Deliveries of radioactive materials must be directed to RH 229 during normal working hours, or to Security at all other times

3. HOUSEKEEPING EMPLOYEES

1. Health hazards of radiation
2. Basic precautions against exposure to radiation
3. Radioactive waste containers not to be emptied as trash
4. No materials other than trash in conventional wastebaskets to be removed from restricted areas without consulting Radiation Safety Officer
5. No procedures other than emptying of nonradioactive trash or sweeping floor to be performed without consulting Radiation Safety Officer
6. Restricted areas (RH 229, FA 226 and FA 109) must be locked when unattended

4. SECURITY EMPLOYEES

1. Health hazards of radiation
2. Basic precautions against exposure to radiation
3. Instructions for after hours delivery of radioactive materials (Appendix F)
4. Restricted areas (RH 229, FA 226 and FA 109) must be locked when unattended

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RADIATION SURVEY PROGRAM

1. RADIATION LABORATORY (RH 229)

1. Bench tops, sink areas, fume hood, refrigerator and floors are to be scanned with Ludlum survey meter monthly and after each experiment using [32-P].
2. Wipe tests of bench tops, sink areas including faucet handles, fume hood surfaces including faucet handles, refrigerator surfaces including handles, and entry doorknobs are to be taken monthly and after each experiment using [32-P].
3. The results of the surveys and wipe tests are to be recorded in the radiation survey log book.
4. Any area in which 2200 dpm/100 cm² or greater are found shall be decontaminated as directed in item 8.c of Appendix II, Instructions to Personnel.

2. RADIOACTIVE WASTE STORAGE AREA (FA 226)

1. Bench tops, sink area, storage cabinets and exterior of solid waste barrels are to be scanned with Ludlum survey meter monthly.
2. Wipe tests of bench tops, sink area including faucet handles, cabinets including door handles, and entry door knob are to be taken monthly.
3. The results of the surveys and wipe tests are to be recorded in the radiation survey log book.
4. Any area in which 2200 dpm/100 cm² or greater are found shall be decontaminated as directed in item 3.c of Appendix II, Instructions to Personnel.

3. DEEP FREEZE STORAGE AREA (FA 109)

1. Exterior of freezer, and floor areas surrounding freezer are to be scanned with Ludlum survey meter monthly.
2. Wipe tests of freezer exterior, door handle and entry door knobs are to be taken monthly.

3. The results of the surveys and wipe tests are to be recorded in the radiation survey log book.
4. Any area in which 2200 dpm/100 cm² or greater are found shall be decontaminated as directed in item 8.c of Appendix II, Instructions to Personnel.

4. NON-RESTRICTED AREAS

1. Wall, door and floor surfaces in the following areas will be scanned with Ludlum survey meter monthly:
 1. Office suite adjoining radiation lab (RH 230).
 2. Chemistry stockroom (RH 228).
 3. Corridors leading from RH 229 to FA 226 and from RH 229 to FA 109.
2. Wipe tests of doorknobs and uncarpeted floors in above areas will be taken monthly.
3. The results of the surveys and wipe tests are to be recorded in the radiation survey log book.
4. Any area in which 220 dpm/100 cm² or greater are found shall be decontaminated as directed in item 8.c of Appendix II, Instructions to Personnel.

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ORDERING AND RECEIVING OF RADIOACTIVE MATERIAL

1. All orders for radioactive material will be initiated by the Radiation Safety Officer, who will verify that the type and quantity of material ordered are authorized by the license. An entry in the radioactive materials inventory log will be begun at the time the order is placed. This precaution will ensure that possession limits will not be exceeded when the order is delivered.
2. Orders will be submitted to the purchasing department using the standard requisition form supplied by the college. Written copies of the requisition will be retained by the radiation safety officer and by the purchasing department. The requisition will identify the isotope, compound, radioactivity level, and vendor.
3. The purchasing department will issue a written purchase order to the vendor. The purchase order will identify the isotope, compound and radioactivity level, and it will specify that the materials are to be delivered directly to Regents Hall room 229. Both the Radiation Safety Officer and the purchasing department will maintain copies of the purchase order.
4. Employees of the mail room, purchasing department, receiving room, and departmental secretaries will be instructed not to accept radioactive shipments in their respective areas, but to direct the carrier to Regents Hall room 229.
5. Laboratory personnel will be instructed to notify the radiation safety officer promptly upon arrival of shipments.
6. Shipments which arrive during off-duty hours will be accepted by the security office, following the procedure outlined below.
 1. Any package containing radioactive material which arrives between 5:00 p.m. and 8:00 a.m. or on weekends shall be signed for by the security guard on duty.
 2. Before the carrier leaves, the security officer shall visually inspect the parcel for signs of damage or leakage.
 3. If the parcel is wet or appears to be damaged, the carrier must be asked to remain at the Security office. Contact the Radiation Safety Officer, Dr. Joseph Lechner, at (614) 397-1244 ext. 398 (office) or (614) 694-1320 (home) IMMEDIATELY. The carrier must remain until the Radiation Safety Officer has ascertained that driver and vehicle are free of contamination.
 4. If the parcel does not appear to be damaged, the security officer on duty shall take it IMMEDIATELY to Regents Hall room 229. Unlock the door, leave the parcel on the laboratory bench to the left of the door, and relock the door. Notify the Radiation Safety Officer of the delivery at the earliest possible opportunity.

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PROCEDURES FOR CHECKING INCOMING PACKAGES

1. Incoming parcels containing radioactive material will be delivered ONLY to Regents Hall room 229. Employees of the mail room, purchasing, receiving, and departmental secretaries have been instructed not to accept delivery of radioactive shipments in their areas.
2. Parcels containing radioactive material will be opened ONLY in Regents Hall room 229 and by personnel who have been trained in the safe handling of radioactive materials. The following precautions will be followed when opening parcels:
 1. Wear film badge, laboratory coat, finger badge and plastic gloves during the procedure.
 2. Visually inspect package for damage or leakage. Notify the Radiation Safety Officer immediately if the package appears to be leaking.
 3. Monitor with a survey meter at a distance of 1 meter from package and record. Notify the Radiation Safety Officer immediately if activity of 10 mR/hr or greater is detected.
 4. Monitor with a survey meter at the surface of the parcel and record. Notify the Radiation Safety Officer immediately if activity of 200 mR/hr or greater is detected.
 5. Open outer package and remove packing slip.
 6. Open inner package and verify that the labeled contents agree with the packing slip and with the purchase requisition.
 7. Inspect the final source container for breakage, leakage, or discoloration of packing material.
 8. Wipe external surface of final source container and count the wipe using a survey meter.
 9. Place final source container in an appropriately labeled airtight plastic outer container and store in approved refrigerator or freezer.
 10. Monitor the original parcel and packing materials for radioactivity. If contaminated, dispose of in radioactive waste containers. If uncontaminated, obliterate radiation labels and discard in regular trash.
3. Shipments will be recorded in the log book of radioactive materials, using a facsimile of the Radioactive Shipment Receipt Report as it appears in Appendix F of NRC Regulatory Guide 10.8. The radiation safety officer will verify that possession limits have not been exceeded.