Bemidji State University BEMIDJI, MINNESOTA 56601

DIVISION OF SCIENCE & MATHEMATICS
218-755-2920

September 27, 1985

U.S. Nuclear Regulatory Commission
Region III
Materials Licensing Section
799 Roosevelt Road
Glen Ellyn, IL 60137

ATTN: Evelyn R. Matson

Re: CONTROL NUMBER 78201 (Renewal of license # 22-07944-01)

This correspondance addresses the concerns outlined in your letter of June 20, 1985. Dr. Alice L. Lindgren will continue as Radiation Safety Officer. We wish to operate our program as outlined in the license application dated March 5, 1979 with amendments as outlined in the following attached items:

A list of current personnel who will be using and supervising the use of radioisotopes.

Changes in isotopes usage.

Facilities and procedures for the Pu-Be Source.

Procedures for the handling of animals treated with radioactive material.

Monitoring equipment and methods.

Emergency procedures.

Procedure for Ordering and Receiving Radioactive Material.

Sincerely,

Alice L. Lindgren

Alice L. Lindgren, Ph.D.
Professor of Biology

RECEIVED
SEP 30 1985
REGION III

Amendments to application for license #22-07944-01

PERSONNEL, TRAINING AND EXPERIENCE

Alice L. Lindgren, Radiation Protection Officer

Training:

B.A. Augsburg College, 1958, Biology
M.S. University of Minnesota, 1961, Cell Biology
Ph.D. University of Iowa, 1970, Radiation Biology

Applicable Courses:

Introductory Radiation Biology	4 sem. hrs.	Univ. Iowa,	1965
Physics of Radiobiology I, II	8 " "	" "	1967-68
Mammalian Radiobiology	4 " "	" "	1969
Cellular Radiobiology	4 " "	" "	1968
Radioisotopes in Research	4 " "	" "	1967
Research in Radiobiology	12 " "	" "	1969-70
Workshop on Scintillation Counting, Argonne Nat'l Lab			1972

Experience:

Thirteen years of teaching radioisotopes at Bemidji State University
Teaching Introductory Radiation Biology Laboratory, 1969-70, Univ. Ia.
Visiting Assistant Professor of Radiobiology, Univ. Ia., 1975
Teaching Introductory Radiation Biology Lecture, Research
Visiting Professor of Radiology, Univ. of Iowa, 1984-85
Conducting research in radiobiology

Gary W. Evans, User

Training:

B.S. Eastern Montana State College, 1962
Ph.D. University of North Dakota, 1970, Biochemistry

Applicable Courses:

Radioisotopes 4 sem. hrs. Univ. of North Dakota, 1968

Experience:

Thirteen years of research using radioisotopes with U.S.D.A. Human Nutrition Laboratory.
Thirteen years as Radiation Research Officer at the U.S.D.A. Human Nutrition Laboratory
Contribution of a chapter to the text, General Processes of Radiotracer Localization, C.R.C. Press, edited by L.J. Anghileri and L.G. Colombetti

Amendments to application for license #22-07944-01

PERSONAL, TRAINING AND EXPERIENCE, Continued

Fu-Hsian Chang, User

Training:

B.S. National Chung-Hsing University, Agricultural Chemistry Taiwan, 1970.
M.S. North Texas State University, Biology, 1974.
Ph.D. University of California Soil Microbiology, Davis, CA., 1979

Applicable Courses:

Nuclear Physics (covered Radiation Biology) 4 semesters North Texas State University, 1972.
Biophysics and Physiology (included Radioisotopes) 4 semester hrs. North Texas State University, 1973.

Experience:

Two years as research assistant in Radiation Biology, 1972-1974, North Texas State University
Two years of research using radioisotopes in Environmental Microbiology at Cornell University, 1979-1981.
One year of research using radioisotopes in Microbial biodegradation at Bemidji State University, 1984 - 1985.

Gerald H. Morine, User

Training:

B.S. (Chem), University of Minnesota, Minneapolis, 1967, Chemistry
Ph.D., University of Wisconsin, Madison, 1975, Physical Chemistry

Applicable Courses: None

Experience:

Taught Szilard-Chalmers experiment as part of physical chemistry lab for 2 years, as graduate student. This experiment includes chemical processing of radioactive iodine.
Four years almost daily use of 1000 Curie Cobalt-60 source for doctoral research. Resulted in 3 papers on radiation chemistry of organic compounds. Duties included dosimetry, monitoring isotope storage for leakage, and group's actinide and tritium waste removal.
Chemical lab experience with hazardous chemicals. One year's experience each with organophosphorous compounds, organomercury compounds, and carcinogenic polycyclic aromatic hydrocarbons.

Amendments to application for license # 22-07944-01

LICENSED MATERIAL (Changes in)

Isotope	Presently Licensed Quantity	Requested Quantity	Explanation
^{14}C	1 mCi	3 mCi	An additional user, Dr. F. Chang, utilizes ^{14}C-labeled biochemicals for research. More than one labeled compound is used, and there are difficulties in purchasing less than 1 mCi in some instances.
^{3}H	1 mCi	3mCi	Dr. A. Lindgren is currently involved with research that may require that up to 3 mCi be on hand.
^{60}Co sealed source	30 mCi	0 mCi	We no longer possess this set of civil defense slugs.

Amendments to Application for License # 22-07944-01

DESCRIPTION OF FACILITIES AND PROCEDURES FOR THE Pu-Be SOURCE

The Pu-Be neutron source will be kept and used under the supervision of Dr. Gerald Morine.

Description of facilities

The Pu-Be source is housed in a VISIFLEX Model 1100-S Neutron Howitzer (Reactor Experiments, Inc.) within the Isotopes Laboratory of the Science Building. The tank is made of 3/8 inch plexiglass and sits on a heavy duty cart. It is filled with 80 gallons of distilled water. The vertical central tube receives the source holder. At the bottom of the tube there is a support tube upon which the source holder rests when the source is in the storage position. The upper part of the source holder is a solid plexiglass rod which is threaded to take the lower part that is in the form of a cup to accommodate a source of 1.02 inches or less in diameter. The cup is screwed against a rubber ring to provide a water-tight seal. The cup attached to the rod is inserted into a vertical central source tube. There are two beam ports. Plastic fillers will be kept in the ports except when it is necessary to remove them for an experiment. The source will be stored when not in use in the X "storage" position of the 1100-S VISIFLUX neutron howitzer. When the unit is not in use a cover will be locked onto the tank. This cover cannot be locked properly unless the source is in the storage position. The key is kept in the locked metal locker within which are kept all of the unsealed sources, except for biochemicals needing refrigeration or freezing.

A standard warning sign is posted on the instrument. An additional warning sign is posted on the instrument, reading as follows:

"Should the water level in this tank fall below 3" of the top of the tank, contact immediately one of the persons listed below. This instrument contains dangerous radioactive material that must be shielded by the water". If no answer, refill tank with cool tap water and notify those listed below.

Dr. Gerald Morine
Office: 755-2792 or 2920

Dr. Gary Evans
Office: 755-2798 or 2920
Home: 243-2251

Dr. Alice Lindgren
Office: 755-2798 or 2920
Home: 751-8567

Amendments to Application for License # 22-07944-01

FACILITIES AND PROCEDURES FOR THE Pu-Be SOURCE continued

Procedures

1. The neutron source is leak tested semi-annually utilizing the following procedure:
   a. Remove cover.
   b. Using the source holder rod (18" long) remove the source from the howitzer, maintaining the source as far from the body as possible.
   c. Using a vice to hold the cup containing the source, remove the rod from the source cup; then using the source handling tool, rotate the source against a filter pad.
   d. Replace the source in the cup; replace the cup on the handling rod; return the source to the howitzer.
   e. Replace the howitzer cover and lock it.
   f. Place the filter pad inside a Bendix Model 1050 radioassay electroscope and determine the alpha activity. (Note: The electroscope must first be calibrated with an alpha reference source (Po 210)
   g. Record results of all leak tests in the log book which must include the following entries:
      1) Drift rate in scale divisions per minute (background)
      2) Calibration calculations.
      3) Conversion of leak test results to microcuries.
   h. If more than 0.005 microcuries of removable contamination is detected, evaluate personnel and area for possible contamination and package the source in a leakproof container with proper shielding for shipment to the manufacturer (Monsanto Research Corporation, Miamisburg, Ohio)

2. The neutron source is used in the education of undergraduates and graduates taking the radioisotope and physical chemistry courses. The experiments for which it is utilized include activation analysis and radioactive decay of daughter products. For these experiments the source is elevated to the port position. Samples are activated in the position of the paraffin plug or else may be activated by being lowered into the water close to the position of the source.

3. The following neutron radiation levels were obtained utilizing the Neutron Survey Meter (Texas Nuclear, Model 2673).

Position	Reading ($N/cm^2/sec$)
Surface of Howitzer directly opposite source	15
Beam port with source in locked position below port, parraffin plug removed	15
Beam port with source elevated to port position, paraffin plug in port	15
Beam port with source elevated to port position, paraffin plug removed	75

4. A copy of the last entry in the log book is attached.

SAMPLE LOG BOOK ENTRY

9/20/85

Electroscope 000779

Background 8 3:14 pm
11 4:14
3 SD/60 MIN

Wipe test 25. at 1:41 pm
30 at 3:07
5 SD per 87 min

P_0 source 30-90 in 32 sec.

Background rate = 0.0505D/min

Wipe test rate = 5/87 = .057 SD/min

Corrected for background = .007 SD/min

Po source $\frac{60 \text{ S.D}}{32/60 \text{ min}}$ = 112 S.D./min

7-72 → 9-85 is 4800 days

$A/A_0 = e^{-\frac{.693}{138} \times 4800} = e^{-24.1} = 3 \times 10^{-11}$

$.1\ \mu Ci \times 3 \times 10^{-11} = 3 \times 10^{-12}\ \mu Ci$

$\frac{112 \text{ S.D/min}}{3 \times 10^{-12}\ \mu Ci} = 3.8 \times 10^{13} \text{ S.D./min/}\mu Ci$

$\frac{.007 \text{ SD/min}}{3.8 \times 10^{13} \text{ SD./min/}\mu Ci} = 2 \times 10^{-16}\ \mu Ci$

BH Mowie

Amendments in application for license # 22-07944-01

HANDLING OF ANIMALS TREATED WITH RADIOACTIVE MATERIAL

All animals treated with radioactive material will be kept in molded plastic cages that are labeled with radioactive warning tape. Bedding from such labeled cages will be emptied into double plastic garbage bags and labeled with warning tape for storage and shipment.

Upon the completion of an experiment, animal carcasses will be stored in plastic labeled bags in the freezer until disposal. Cages will be decontaminated with an appropriate decontamination agent (i.e., Isoclean).

Amendments to application for license #22-07944-01

MONITORING EQUIPMENT AND METHODS

Equipment	Manufacturer	Range of Detection	Sources Monitored	Calibration Methods
Thin end-window GM portable monitor with audio intensity speaker	RPI Model 900E	0-2,000 cps	^{14}C, ^{32}P ^{35}S, ^{131}I, ^{45}Ca	Not calibrated
NaI (32 mm) portable scintillation detector with audio intensity speaker	RPI Model 900-544A	0-2,000 cps	^{125}I	Not calibrated
NaI (2½") scintillation detector with probe or well	Nuclear Chicago	$1-10^5$ cpm	^{59}Fe, ^{60}Co, ^{51}Cr	Not calibrated
Liquid Scintillation detector	Beckman LS100	$1-10^5$ cpm	^{3}H	Not calibrated
Neutron Survey Meter	Texas Nuclear 2673	5-25000 $N/cm^2/sec$	neutrons	Checked with 1 curie plutonium-beryllium source
Electroscope	Bendix	0.01-60 mR/hr	alpha	Calibrated with NEC 0.1 uCi alpha source (Po-210) dated 7/72 and corrected for elapsed time semi-annually.
Cutie Pie Survey Meter	Laird Atomic 04416	$1-10^5$ mR/hr	alpha beta gamma	Calibrated by Nuclear Instrument Company annually

Amendments to application for license # 22-07944-01

MONITORING EQUIPMENT AND METHODS, **Continued**

Monitoring Procedures

Upon the completion of a laboratory exercise or an experiment where unsealed radioisotopes are utilized, the laboratory work area will be monitored appropriately for the isotope utilized (i.e., ^{3}H contamination will be detected by a wipe test with a wetted glass fiber filter to be counted in the LS-100). An entry in the monitoring log book will be made and signed by the person doing the monitoring. When the laboratory is not being used for isotope work, it will not be monitored.

Any detectable contamination (counts above background level) will be eliminated by scrubbing with paper towels wetted with an appropriate decontamination agent (i.e., Isoclean) followed by rinsings until counts return to background levels. All contaminated paper towels will be put into plastic bags for disposal and marked with a radioactive warning label.

Amendments in application for license 22-07944-01

DESCRIPTION OF EMERGENCY PROCEDURES

The following notice is posted in the radioisotopes laboratory and called to the attention of personnel who work in the laboratory.

Emergency Procedures: In case of accidental spills, the following procedures are to be instituted:

1. Wash affected parts of skin (including eyes) with copious amounts of water immediately. Continue eye washing with copious amounts of physiological saline (0.9% NaCl) Except for the eyes, scrub affected portions of the body with isoclean.

2. Leave all contaminated clothing, including shoes, in the laboratory and mark with radioactive tape.

3. Cover with absorbent pad and mark any spills on benches or furniture or floors.

4. Contact one of the following persons as soon as possible:

   Dr. A.L. Lindgren, Radiation Safety Officer
   Office: 755-2798 or 2920
   Home: 751-8567

   Dr. G.W. Evans
   Office: 755-2923 or 2920
   Home: 243-2251

   Dr. F. Chang
   Office: 755-2910 or 2920
   Home: 759-1344

   Dr. G. Morine
   Office: 755-2792 or 2920

Amendments to Application for License # 22-07944-01

PROCEDURE FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. All orders for radioactive material will be processed by the secretary in charge. A copy of the order will be sent to the RSO.

2. All radioactive material will be delivered to the radioisotopes laboratory and the appropriate person notified.

3. Written record will be entered in the log book when radioactive material is opened or stored. All isotope receipts must be numbered in accordance with the log book procedure.

4. Appropriate entries regarding storage location use, and disposal must be made and signed.