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UNION CARBIDE

UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS
P. O. BOX 8361, SOUTH CHARLESTON, W. VA. 25303

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U.S. NUCLEAR REG COMMISSION NMSS MAIL SECTION

Reference File Number: 7915970
Date: July 30, 1979

U. S. Nuclear Regulatory Commission
License Management Branch
Division of Fuel Cycle and Material Safety
Washington, DC 20555

Attn: Mr. Paul R. Guinn

Gentlemen:

Re: Mail Control No. 98815

This is in response to your letter of May 25, 1979. This letter contains the additional information that you requested.

1. Kinds and quantities of licensed material.

   We will specify licensed material as suggested. Please change items 6(a) and 6(b) on NRC Form 313I to read:

Any byproduct material (excluding alpha emitters) with Atomic Numbers 1-83 inclusive.	any	not to exceed 1 curie per radionuclide and 2 curies total except: Carbon-14 - 2 curies.

2. Use of licensed material at temporary jobsights. This request was included so as to facilitate any future applications of radioisotope tracing. Currently, there is no specific use planned beyond the boundaries of the Technical Center. Therefore, please change Item 5 to read:

   Technical Center
   Kanawha Turnpike
   South Charleston, WV 25303

3. Research and Development. A general description of the activities to be conducted at the Technical Center with unencapsulated isotopes is included in Attachment No. 1

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4. Licensed Material. The maximum amount of krypton-85 that we wish to possess at any one time is 5 millicuries.

5. Designation of Individual Users. Chapter XII of the enclosed Technical Center Radiological Control Manual has been updated to include a more detailed description of the training sessions given at this location. Section 2 outlines training for personnel using unencapsulated isotopes in the research laboratory. Filed in Supp. Folder

   Individuals are selected for work assignments with unencapsulated isotopes by their supervisors. Once selected, they undergo a one-day training session and must pass a written examination. A copy of this test is enclosed for your review (Attachment 2).

   Once the test is passed, the employee may begin to work with radioisotopes under direct supervision. It is the responsibility of the supervisor to demonstrate all proper techniques. Once the supervisor feels the employee understands all radiological hazards and can perform the work safely, written notice is given to the RPO and unsupervised work may commence.

   Section 5 of Chapter XII describes briefly the training that is supplied to janitors, service personnel, and millwrights if they have a need to enter a restricted area. This training is given orally.

6. Bioassays. Currently, all applications of unencapsulated radioisotopes utilize only carbon-14. The maximum amount of carbon-14 to be used in a test at any given time will not exceed 50 millicuries. Operations that involve scraping of radioactive samples that may render the carbon-14 airborne are done in a glove box. Under these conditions, I do not feel that a bioassay program is necessary at the present time.

   If, however, experiments are proposed using tritium, iodine, or other isotopes with greater radiotoxicity than carbon-14, it would have to be put forth for approval by the Radioactive Materials Committee. The Committee reviews requests with respect to the necessity of bioassays. If it was determined that a bioassay program was necessary, either a program would be initiated, or a commercial service would be used.

7. Radiation Protection Program. Chapter V of the Technical Center Radiological Control Manual has been revised to include more detail of our radiation protection program. Allowable radiation and contamination levels, frequency of surveys, and air sampling are contained in this chapter.

If any further information is required for review of our application, please contact me at (304) 747-4918.

Sincerely,

Fred P. Straccia

F. P. Straccia
Technical Center Alternate
Radiation Protection Officer

FPS/ld

Attachments

cc: Mr. J. H. Brubaker
Mr. R. D. Stief/Mr. D. L. Garrison

UC 149-2

Attachment One

UNION CARBIDE INTERNAL CORRESPONDENCE 2270

AGRICULTURAL PRODUCTS COMPANY • P. O. BOX 8361, SOUTH CHARLESTON, WEST VIRGINIA 25303

To (Name) F. P. Straccia

Division

Location 740/2309

Date June 27, 1979

Originating Dept. Research and Development

Subject Use of Unencapsulated Radioisotopes in Biological Research

Copy to R. H. Bailey
E. L. Chancey
P. R. College
C. S. Feung
G. C. Holsing
K. A. Mede
K. P. Sheets

Dear Mr. Straccia:

A continuing project which will involve the use of carbon-14, tritium, phosphorus-32, and sulfur-35 in the metabolism and residues of pesticides in biological systems is described below.

Scope:

In the past few years, radioisotopes have been indispensable tools for generating information required by the Environmental Protection Agency and the United States Department of Agriculture for registration of pesticidal chemicals. Radio-tagging of chemicals provides the best method for studying their metabolic fate and rates of residue dissipation in various biological media. Radiochemical techniques are rapid, accurate, sensitive and provide a total accounting of the residue dissipated by physical loss and biotransformations. Furthermore, it is often necessary to rely solely on radioassay of residues of pesticide metabolites when other suitable analytical methods are not available and to validate newly developed methods. Recently, the utilization of radioisotopes has been extended to product service projects to establish a thorough knowledge of the performance and mode of action of UCC pesticides. Such information is needed for optimal marketing of the products. The personnel involved in the use of radiochemicals in this program are highly skilled in various phases of the operation and are aware of the potential hazard of radiation and of the proper disposal procedures. Safe handling during the work-up is mandatory since the immediate as well as the long-term potential hazard of the chemicals per se could exceed that of the radiation exposure.

Areas in Which Radioisotopes Will Be Used

The use of radiolabeled materials will be confined to specified laboratories which are accessible to monitoring equipment. These are classified and described as follows:

I. Building 740:

Rooms 4311, 4312, and 4316 - Metabolism studies utilizing radioactivity not to exceed 10 mCi.

Rooms 4313, 4314, and 4315 - Low level of radioactivity (<1.0 mCi) used. These rooms are mainly used for counting of radioactivity, chromatography of the metabolites and other analytical purposes.

II. Building 741 and the Adjoining Greenhouse and Storage Room:

Dosing, holding of treated plants, and storage of various biological samples will be conducted in these areas. The amounts of radioactivity in all tests at any given time will not exceed 50 mCi.

Procedures

Plants, soil, small animals and other such biological systems will be treated with radiolabeled pesticides by surface application, incorporation, and injection of solutions containing predetermined amounts of the radioisotopes. At preselected intervals, the treated samples will be analyzed for residues and metabolites by radiometric methods. A typical analysis involves extraction of the residues with a proper solvent, fractionation of the recovered materials into organosoluble and water-soluble metabolites, separation of the metabolites by thin-layer and/or column chromatography and quantitation by liquid scintillation counting. In a few cases, the metabolites, after purification by the conventional analytical methods, will be subjected to gas-liquid chromatography, infrared and mass spectral analyses. In these instances, where analytical operations are involved, the total radioactivity per sample will not exceed 1 mc and proper supervision will be provided during handling and clean-up.

Material Balance

An accurate record of the receipt and use of radioactive materials will be maintained. In each test, the amount of radioactivity applied to a given biological system, the amount found in each sample, and the amount lost will be carefully measured. At the end of each test a total material balance is normally calculated.

Safety Considerations and Waste Disposal

Research personnel will follow NRC regulations prescribing safe handling of radioactive materials and observe the usual precautions to protect others from the hazard of radiation. More specific measures involve the following in equal importance:

1. No radioactive wastes will be flushed to the sewer, and all evaporation operations will be carried out in, or vented to, the hood.

2. Liberation of radioactivity to the atmosphere will be minimal, and will be well below the NRC prescribed limits.

3. All glassware and equipment are to be decontaminated following use, accidental spills cleaned promptly, and periodic wipe tests and air samples taken by our industrial hygienist.

4. Treating and holding the plants are to be conducted in a greenhouse equipped with automatic temperature and air exhaust fans which provide one air change per minute when conditions call for cooling.

5. Uncontrolled losses of radioactivity are to be kept minimal by bottom watering the plants and by holding the pots in leak-proof pans to trap leachate from soil.

6. Appropriate warning signs will be posted.

7. All radioactive wastes will be accumulated in 55-gallon drums for later disposal by an authorized disposal agency.

8. A yearly summary of the various portions of the program will be presented to the Radioactive Materials Committee.

Personnel

The following personnel will be involved in the above described program. Shown below is the educational background and research experience of each of the personnel.

Andrawes, Nathan R.

MS [redacted] Auburn University, Auburn, Alabama. Thesis: Metabolism of Phosphorus-32 Labeled Pesticides.

PhD [redacted] Texas A and M University, College Station, Texas. Dissertation: Metabolism of Carbon-14 and Sulfur-35 Labeled Pesticides.

One year (1967) with The U.S. Public Health Pesticide Residue Laboratories (now a branch of The Environmental Protection Agency).

Twelve years (1967-1979) with Union Carbide Corporation in conducting and supervising research on the metabolism and residues of pesticides.

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Bailey, R. H.

Approximately 22 years laboratory technician experience as shown below:

Period	Program
5-1957 to 7-1961	DYNEL
7-1961 to 5-1962	Polyethylene
5-1962 to 7-1964	Rocket Propellent
7-1964 to 2-1966	Analytical
2-1966 to 8-1967	Elastomers
8-1967 to 5-1968	Ag. Chem., Organic
5-1968 to 4-1969	Synthesis and Process Development
4-1969 to 10-1971	Synthesis and Metabolism
10-1971 to 3-1973	Coal Analysis
3-1973 to present	Metabolism

Chancey, Edsel L.

BS Biology [redacted] - Morris Harvey College.

1960 to present - employed by Union Carbide as shown below.

1960-62 - Pilot Plant Operator

1962-65 - Laboratory Technician in Organic Synthesis Lab.

1965 to present - Research and Development Biologist.

The first three years of this period were involved in Plant Pathology Research and in the last four years, have conducted research on the metabolism and residues of radiolabeled pesticides in various biological systems.

College, Phillip R.

BS Biology [redacted] - West Virginia State College

1975-present - employed by Union Carbide as a laboratory technician in the Metabolism and Residue Labs.

During the four years of employment, conducted research on the metabolism of TEMIK, LARVIN, aldoxycarb, and carbaryl using radio-labeled materials.

Feung, C. S.

MS [redacted] - National Taiwan University, Plant Taxonomy/Ecology

MS [redacted] - University of Tennessee, Plant Physiology/Biochemistry

PhD [redacted] - University of Tennessee, Thesis - Metabolic Studies with Isolation Carpel Tissue of Jackbean, Canavalia ensiformis (L.) DC.

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PhD [redacted] - Penn. State University, Studies on the metabolism of 2,4-Dichlorophenoxy-acetic acid in plant tissue cultures; sugar translocation in plants; and isolation and characterization of corn starch granules.

Four year (1975 to present) with Union Carbide Corp. in conducting and supervising research on the metabolism and residues of pesticides.

Mede, K. A.

BS [redacted] Pharmacy - Univ. of Illinois College of Pharmacy.

PhD [redacted] Medicinal Chemistry - Univ. of Illinois at the Medical Center. Synthesis and Biological testing of α-oximino-γ-butyrolactones

1973-75 Research associate in Biological Chemistry, Univ. of Illinois College of Medicine. Development of an analysis of mucopolysaccharides for uronic acid content (utilized ^{14}C tagged compounds).

1975-77 Post-doctoral appointee, Argonne National Laboratory Development of an analysis to determine bile acids in plasma using GC/MS

1977-present Union Carbide Agricultural Products Co. Development of instrumental methods of analysis for pesticide residues.

Sheets, K. P.

BS Chemistry, [redacted] - West Virginia State College

Twenty-eight years laboratory technician experience, UCC as follows:

1951-1967 Organic Synthesis

1967-1970 Residue Analysis -(SEVIN) carbaryl, (TEMIK) aldicarb, and (sulfocarb) aldicarb sulfone.

1970-1978 Application, metabolism studies and synthesis work with radioactive compounds - carbaryl, aldicarb and aldicarb sulfone.

1978-present Residue analysis - LARVIN

Nathan R. Andrawes
Nathan R. Andrawes

NRA:csa

(b)(6)

RADIATION SAFETY FOR UNENCAPSULATED ISOTOPES

Examination

Directions: Read the statement and all possible answers. Circle the letter that corresponds to the correct answer. There is only one correct answer per question. Good luck!

1. Alpha particles

   a) do not travel very far in air
   b) travel at the speed of light
   c) are stopped by a piece of paper
   d) a and b only
   e) a and c only

2. Beta particles

   a) have less charge and mass than alpha particles, therefore, they travel farther
   b) are identical to electrons
   c) are emitted from C-14
   d) all of the above
   e) a and c only

3. Gamma radiation

   a) consists of charged particles
   b) travels at the speed of light
   c) is very penetrating
   d) a and c only
   e) b and c only

4. 10 millicuries of carbon-14 equals

   a) 0.01 microcuries of carbon-14
   b) 0.001 curies of carbon-14
   c) 1000 microcuries of carbon-14
   d) 10,000 microcuries of carbon-14
   e) 100 microcuries of carbon-14

5. If you have 100 microcuries of isotope-X (half-life = 5 hours) now, how much will you have in 10 hours?

   a) 50 millicuries
   b) 0 millicuries
   c) 20 millicuries
   d) 25 millicuries
   e) 33.3 millicuries

6. The half-life of C-14 is:

   a) 57 years
   b) 570 years
   c) 5700 years
   d) 57,000 years

7. The net result of the interaction of radiation with matter is the production of ion pairs.

   a) true
   b) false

8. Natural background radiation results in an estimated dose equivalent of about:

   a) 50 rem/year
   b) 125 millirem/year
   c) 5 millirem/hour
   d) 5 millirem/year

9. The first noticeable clinical symptoms of radiation damage occurs at an approximate dose of:

   a) 5 millirem
   b) 5 rem
   c) 50 rem
   d) 500 rem
   e) 1000 rem

10. Which is true about the biological effects of C-14?

   a) presents slight external hazard but critical internal hazard
   b) presents slight internal hazard but critical external hazard
   c) most C-14 accumulates in the body fat
   d) a and c only
   e) b and c only

11. The maximum energy of C-14 beta particles is:

   a) 0.156 MeV
   b) 1.02 MeV
   c) 45 KeV
   d) 0.045 MeV
   e) none of the above

12. C-14 surface contamination is hazardous because:

   a) contamination can spread to one's hands, with the result being possible ingestion of radioactive material
   b) the external dose rate will result in a whole body dose greater than Technical Center's guidelines
   c) the C-14 may become airborn, resulting in the inhalation of radioactive material
   d) all of the above
   e) a and c only

13. The maximum allowable level of surface contamination in an unencapsulated radioisotope lab (restricted area) is:

   a) 5000 dpm/m^2
   b) 500 dpm/m^2
   c) 5000 dpm/100 cm^2
   d) 500 dpm/100 cm^2
   e) none detectable

14. The maximum allowable level of surface contamination for unrestricted areas, skin, and personal clothing is:

   a) 5000 dpm/m^2
   b) 500 dpm/m^2
   c) 5000 dpm/100 cm^2
   d) 500 dpm/100 cm^2
   e) none detectable

15. The critical organ for carbon-14 is:

   a) spleen
   b) lung
   c) kidney
   d) body fat
   e) liver

16. If a spill of radioactive material occurs:

   a) evacuate the area immediately
   b) contain the spill with absorbant material and call for Technical Center Radiation Protection personnel
   c) try to handle it yourself
   d) rope off the area and label with appropriate signs
   e) b and d only

17. Liquid radioactive waste may be disposed of

   a) with solid waste
   b) in the sink
   c) in liquid waste receptacles only
   d) a and c only
   e) b and c only

18. All carbon-14 must be stored in a locked container when not under direct observation.

   a) true
   b) false

19. The NRC regulations on intentional medical exposure for medical diagnosis or treatment

   a) limit the yearly exposure to 5 rems
   b) do not limit the internal dose but limit the exposure to external radiation to 5 rems per year
   c) do not limit the exposure in any way
   d) none of the above

20. Unencapsulated C-14 use is licensed by

   a) U. S. Department of Transportion
   b) West Virginia Department of Health
   c) U. S. Nuclear Regulatory Commission
   d) a and c only
   e) b and c only