HERCULES

Hercules Incorporated
Research Center
Wilmington, DE 19894
(302) 995-3000
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July 27, 1984

U. S. Nuclear Regulatory Commission, Region I
ATTN: Chief, Nuclear Materials Section B
Nuclear Materials and Safeguards Branch
631 Park Avenue
King of Prussia, PA 19406

RENEWAL OF NRC LICENSE NO.07-00222-02

This letter requests renewal of Hercules Incorporated NRC License No. 07-00222-02 which expires on August 31, 1984. The terms and conditions of the current license are defined in the application filed on February 28, 1979, and in letters (1) to J. M. Brown from A. Z. Conner and R. R. Kohler, June 13, 1979, and (2) to B. H. Grier from A. Z. Conner and A. S. Hirwe, November 19, 1979. Since our present license and the above documents continue to adequately describe overall current programs and future needs, we have decided to follow the simplified renewal procedure described in the recent NRC Notice of Expiration, dated June 4, 1984. Thus we wish to continue to operate under our current License in a manner described in the above documents, with a few minor changes. These changes, which are attached, are numbered to coincide with the various Sections in the petition. Upon approval, we will continue to operate in accordance with these documents and applicable NRC regulations and license conditions.

The application fee of $460.00 is enclosed. For any additional information, please contact: A. Z. Conner, Chairman, Radiological Safety Committee, Telephone No. (302) 995-3205 or A. S. Hirwe, Radiation Protection Officer, Telephone No. (302) 995-3247.

Yours very truly,

R. R. Kohler
Purchasing Supervisor
Office Division

A. S. Hirwe
Radiation Protection Officer
Analytical Division

RECEIVED BY LFMB
Date. 8/6/84
Log. Aug -6 I
By. Jacques
Orig. To.
Action Compl 8/8/84

Applicant.
Check No. 085-26762
Amount, Fee Category $460. 3m
Type of Fee. renewal
Date Check Rec'd. 8.6.84
Received By. Jacques

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8. LICENSE MATERIAL

Line No.	Element and Mass Number	Chemical and/or Physical form	Name of Manufacturer and Model Number (If Sealed Source)	Maximum No. of Millicuries and/or Sealed Sources and Maximum activity per source which will be possessed at any one time
1	Carbon - 14	Any		400 millicuries
2	Chlorine - 36	Any		10 millicuries
3	Sulphur - 35	Any		50 millicuries
4	Hydrogen - 3	Any		20 curies
5	Phosphorous - 32	Any		60 millicuries
6	Chlorine - 36	Sealed Source	Nuclear Science and Engineering Corp. Custom Sources	30 microcuries
7	Promethium - 147	Sealed Source	Nuclear Chicago Corp. Model RG-31P	25 millicuries (License Limit)
8A	Nickel - 63	Sealed Source	Hewlett Packard Model 5713A	Not to exceed 15 millicuries each
8B	Nickel - 63	Sealed Source	Hewlett Packard Model 5713A	Not to exceed 15 millicuries each
8C	Nickel - 63	Sealed Source	Varian M3700	Not to exceed 8 millicuries each
	Nickel - 63	Sealed Source	listed above	License Limit 50 millicuries

9. STORAGE OF SEALED SOURCES

Line No.	Container and/or Device in which each Sealed Source will be Stored or Used	Name of Manufacturer	Model Number
1	#6, Source Housing	Nuclear Science and Engineering Corp. Custom Sources	not available
2	#7, Source Housing	Nuclear Chicago Corp.	RG-31P
3	#8A, Source Housing	Hewlett Packard	Model 18713A
4	#8B, Source Housing	Hewlett Packard	Model 18713A
5	#8C, Source Housing	Varian	Model 02-001972-00

SEALED SOURCES DELETED

Element and Mass Number	Name of Manufacturer and Model Number	Quantity Millicuries	Shipped to
Nickel - 63	Tracor Model 220	15.0	Tracor Analytical for disposal
Nickel - 63	Hewlett Packard Model 7620	2.0	Hewlett Packard for disposal
Iron - 55	Princeton Gamma Tech Chemical Analyzer PGT Model NER-460B	50.0	Returned to PGT

10. RADIATION DETECTION INSTRUMENTS

Line No.	Type of Instrument	Manufacturers Name	Model No.	Number Available	Radiation Detected	Sensitivity Range
1	Geiger-Mueller survey meter	Texas Nuclear Div. Ramsey Engineering Co.	2650	1	α, β, γ of low & medium energy	0.1 to 100 milliroentgens per hour
2	Gas-filled proportional counter Large area (100 cm^2) contamination monitor	Berthold	LB 1210B	1	β, γ of low energy	detection limit ^{14}C - 5 x 10^{-6} microcuries/cm^2

11. CALIBRATION OF INSTRUMENT LISTED IN ITEM 10

Calibrated by service company:

University of Delaware,
Office of Safety Coordination
Newark, DE

Calibrated every six months.

13. FACILITIES AND EQUIPMENT

A. Counting Room - houses Packard Liquid Scintillation Spectrometer - Model 460C and Model 3320 used for radioactivity measurements. An explosion proof refrigerator is housed in this room where most of the radiochemicals are stored.

B. Low Level Room - houses Packard Radiochromatogram scanner model 7201. The laboratory has a hood for handling radioactive material, but only low level work is done in this room.

C. High Level Laboratory - All the tracer work involving millicurie levels of radioactivity is done here. This laboratory has two hoods; one is used for synthesis and the handling of materials and the other is used for carrying out low level work.

The vast majority of our work is done in this laboratory. The laboratory has provisions for storing chemicals in a locked cabinet. A Packard Tricarb Sample Oxidizer Model 360B is also in this laboratory. Two pairs of long handled tongs are available for remote handling of materials, if necessary. Only beta emitting materials are used in the tracer work. Materials are stored in thick walled containers and monitored for radiation when working with millicurie levels of radioactivity.

14. Waste Disposal

Teledyne Isotopes, Westwood, N. J.

K. S. Processing Co., Marcus Hook, PA

15. RADIATION PROTECTION PROGRAM

1. All projects involving the use of radiochemicals are reviewed by the Radiological Safety Committee, Mr. A. Z. Conner, Chairman, prior to any laboratory work being done. A detailed letter (A. S. Hirwe and A. Z. Conner to Technical Personnel, June 1, 1977) is attached which discusses established procedures at the Research Center. This letter details the extensive safety review which all proposed radiochemical experiments must undergo before they can be carried out at the Research Center, and demonstrates Hercules' corporate concern for safety in laboratory research.

   All training for projects involving radiochemicals is given by A. S. Hirwe, who is in charge of the radiochemistry section. A resume of her training and experience is attached. In addition, Mr. A. E. Croes, a technician, assists in the radiochemical work and has had over 25 years experience.

   All radiochemical projects are supervised by A. S. Hirwe. Other personnel who are authorized by the Radiological Safety Committee to carry out work with labeled materials (usually synthesis of a compound) are technical people and, in most cases, have had training in radiochemical work at the college level. Nevertheless, these individuals are given additional on-the-job training as follows:

   a) The proposed project is reviewed by A. S. Hirwe. Proper means of handling radiochemicals and possible radiation levels are discussed. Safety practices regarding protection and contamination are emphasized. Emergency procedures are discussed.

   b) Cold runs are made using unlabeled chemicals.

   c) The proposed procedure is reviewed by the Radiological Safety Committee. Upon approval the project is started.

   d) The labeled run is made under the supervision of A. S. Hirwe. The training discussions are informal and usually involve the technical person assigned to the project. Such discussions last 1-2 hours and most often involve one such meeting plus additional discussions during the actual work. Only the individual concerned with the particular project is involved in the discussion. Reference material such as reports from the National Council on Radiation Protection and Measurements, National Bureau of Standards, Radiological Health Handbook, International Commission on Radiation Units and Measurements, General Motors Training Program, Rules and Regulations of NRC and various reference books on radiation protection are made available.

2. Our bioassay program has included urine analysis by liquid scintillation counting during studies with labeled materials containing ^{3}H or ^{36}Cl. Weekly tests are made when using these isotopes. To date, no radioactivity has been detected. We consider 5 counts per minute above background on a 3.0 ml sample as being significant.

   Since the vast majority of our work is with ^{14}C, bioassay tests on the breath are to be a part of our test program and are carried out before and after the completion of the project. Radiation levels will be calculated from the counts obtained by liquid scintillation counting of the absorber solution. If positive results are obtained, the individual will be taken off the project. If the calculated radiation level exceeds or approaches NRC limits, then further tests will be made. Secondly, checks will be made to locate the source of contamination.

3. Our survey program involves making wipe tests as outlined below. Wipe tests are made after any preparation or use of a material containing moderate levels (millicurie levels) of radioactivity. If the work period for a project involving the use of radioactive materials lasts for more than a month, then wipe tests are made at least once a month until the completion of the work. The wipe test consists of rubbing a $100 cm^2$ area with an ethanol-wet, 4.5 cm Whatman #50 filter paper and counting any radioactivity present in the paper by means of a liquid scintillation spectrometer.

   A survey meter is used to monitor the reaction environment during any and all steps involved in the preparation of radioactive materials. Wipe tests will be made monthly in working areas where tracer studies are being carried out. Six month tests are made on hoods, sinks, bench tops, and balances located in the tracer laboratory, but not used routinely.

   One hundred counts/minute ($5 \times 10^{-5} \mu Ci$) above background for 100 cm^2 is considered to be an acceptable level using liquid scintillation counting. If the count is higher than this, the area is thoroughly cleaned with solvents and cleanser and then rechecked. Records are kept in permanent record books.

   Sealed sources are tested every six months (as required by NRC) according to tests provided by the supplier of the source and permanent records are kept. Attached is a testing procedure provided by one of our suppliers; this test is typical of tests provided by other suppliers. We do our own counting of test papers and the tests are performed by a technician who has had 25 years experience in radiochemical work.

4. Radioisotope authorized user safe laboratory practices and a list of "Hot" Laboratory Rules are attached.

HERCULES RESEARCH CENTER

RADIOISOTOPE AUTHORIZED USER
SAFE LABORATORY PRACTICES

DO - Report any unsafe conditions to Radiation Safety Officer.

DO - Comply with Federal and Research Center rules and regulations regarding radioactive material.

DO - Use radioactive material in approved locations.

DO - Wear protective gloves, lab coats, and respiratory protection (if required).

DO - Label containers indicating nuclide(s), amount(s) and date(s).

DO - Minimize the time, maximize the distance, and use shielding when using radioactive material.

DO - Wear personnel dosimeters as instructed.

DO - Cover all work areas with absorbent paper.

DO - Use a hood or glove box if atmospheric distribution is expected.

DO - Conduct trial runs with non-radioactive material. Work out problems in experimental protocol.

DO - Check work areas for contamination daily when radionuclides are used.

DO - Maintain good housekeeping practices.

DO - Know the hazards associated with the radionuclides you are using.

DO - Report all spills, accidents, loss and thefts of radioactive material to the permit supervisor and the Radiation Safety Officer.

DO - Label contaminated equipment and avoid cross contamination.

DO - Use auxiliary containers and trays lined with absorbent paper.

DO - Maintain security of radionuclides in use and storage.

DO - Keep exposures as low as reasonably achievable.

DO - Dispose of radioactive waste in proper containers. Expedite waste removal from the lab.

DO - Survey hands, shoes, body and clothing for radioactivity and remove any contamination before leaving laboratory.

HERCULES RESEARCH CENTER

RADIOISOTOPE AUTHORIZED USER
SAFE LABORATORY PRACTICES

DON'T - Work with radionuclides if there are open cuts or abrasions on the body.

DON'T - Pipet by mouth any radioactive solution.

DON'T - Dispose of radioactive material via the sanitary sewer system or via regular trash.

DON'T - Eat, drink, smoke, prepare food, store food and/or apply cosmetics in any laboratory where radioactive material is used or stored.

DON'T - Store food and beverages in the same refrigerator or freezer as radioactive material.

DON'T - Place notebooks, pens or pencils, or other such items in the work area. All items placed in the work area are considered contaminated.

"HOT" LABORATORY RULES

1. No person is to enter "hot" laboratory unless he has a reason to be there.

2. Laboratory coats usually worn in the "cold" laboratory shall be removed before entering the "hot" laboratory.

3. All persons working in the "hot" laboratory must wear a laboratory coat, such coat to be kept and worn in "hot" laboratory only. Gloves must be worn when handling labeled material.

4. Each person is to monitor bench top, apparatus, and material with which he is working before and after completion of the work.

5. Before leaving "hot" laboratory, hands must be scrupulously cleaned.

6. No work is to be done on bench tops unless absorbent paper is first laid down. Absorbent paper is to be changed every two (2) weeks.

7. When work is completed, each person is to individually clean and/or dispose of contaminated material.

8. Activity is to be disposed of in waste jars kept in hood, and special containers for paper towels, etc.

9. The "hot" laboratory is to be monitored after completion of each project or at least once every six months.

10. All radioactive materials are to be kept locked. The License Representative is responsible for all materials.

11. All labeled material entering or leaving the "hot" laboratory - shipping, for use in "cold" laboratory, or for any other reason - must be dated and entered in the laboratory log book.

12. There will be Positively No Smoking or Eating in the "hot" laboratory at any time.

16. TRAINING AND RETRAINING OF PERSONNEL

1. As a part of training and retraining of technical and non-technical personnel, who may and have used radionuclides, a radiochemistry workshop was presented by Stuart W. Kline, Associate Director of Safety, University of Delaware, November, 1983.

2. ACS Audio-Course by Gregory Choppin and Patricia Baisden was given in June, 1984.

HERCULES RADIOLOGICAL SAFETY COMMITTEE MEMBERS

A. Z. Conner - Chairman

A. S. Hirwe - Radiation Protection Officer

*H. W. Stumpf - Manager, Safety Division
Hercules Research Center
Management Representative

*J. J. Ford - Member-at-Large

R. R. Kohler - Purchasing and Licensing

*Training and experience of the new committee members is attached.

JOHN J. FORD, M.S.

Senior Research Chemist
Member-at-Large - Radiological Safety Committee

Pertinent Training and Experience

1. Over 30 years experience in the practice of analytical chemistry with emphasis on the development and application of procedures for the detection of trace levels of toxic organic compounds. Laboratory experience with the use of radiolabeled compounds (^{14}C and ^{3}H) to solve problems in metabolic and environmental chemistry. Longtime involvement with electron capture gas chromatography using detectors having either tritium or ^{63}Ni sources. Knowledgeable in the handling and use of toxic and hazardous substances, particularly solvents, pesticides, and known carcinogens.

2. Group Leader and Project Leader of the Pesticide Residue Laboratory. Responsible for the design, implementation and execution of research programs required to generate data for submission to the Environmental Protection Agency (EPA).

3. Related Instruction

   (a) Radiochemistry Workshop (Radiation Safety)

   Taught by Stuart W. Kline, Associate Director for Safety and Radiological Safety Officer, University of Delaware.

   (b) Radiochemistry by Gregory Choppin and Patricia Baisden, Florida State University, ACS Audio Course.

HENRY W. STUMPF, B.S., CHEMICAL ENGINEERING
MANAGER, SAFETY DIVISION
HERCULES INCORPORATED, RESEARCH CENTER

MANAGEMENT REPRESENTATIVE AND MEMBER OF THE RADIOLOGICAL SAFETY COMMITTEE

Pertinent Training and Experience

1. Member of Safety Engineers Club of Delaware.

2. Safety Supervisor, Research Center Safety Division 4/76 - 2/82.

3. Manager, Research Center Safety Division 2/82 - present.
   Responsible for general and chemical safety programs at the Research Center.

4. Attended a seminar series on radiation safety presented by Stuart W. Kline, Associate Director of Safety, University of Delaware - November, 1983.

5. Member of the Research Center Radiological Safety Committee February 1982 - present.