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Form AEC-313 (5-58)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved. Budget Bureau No. 38-R027.4.

INSTRUCTIONS.–Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail three copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545. Attention: Isotopes Branch, Division of Licensing and Regulation. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

Dr. Charles J. Kensler
Arthur D. Little, Inc.
30 Memorial Drive
Cambridge, Massachusetts 02142

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

30 Memorial Drive, Cambridge, Mass.

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Life Sciences Division

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

Renewal of license number 20-1489-4 (E65)

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

C. J. Kensler, Vice President
Life Sciences Division

Paul E. Baronowsky, Biochemist
Robert F. Shepard

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

Paul E. Baronowsky

6. (a) BYPRODUCT MATERIAL. *(Elements and mass numbs. of each.)*

Hydrogen 3
Carbon 14
Phosphorus 32
Sulfur 35
Calcium 45

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

Hydrogen 3	(any)	80 millicuries
Carbon 14	(any)	5 millicuries
Phosphorus 32	(any)	5 millicuries
Sulfur 35	(any)	5 millicuries
Calcium 45	(any)	5 millicuries

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

To study the metabolic fate of cancer chemotherapeutic agents in various species of animals.

To study basic metabolic processes of normal and neoplastic cells.

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(Continued on reverse side)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection	C. J. Kensler Cornell Univ. Med. College	1 year	(Yes) No	Yes (No)
b. Radioactivity measurement standardization and monitoring techniques and instruments	Cornell Univ. Med. College	1 year	(Yes) No	Yes (No)
c. Mathematics and calculations basic to the use and measurement of radioactivity	Cornell Univ. Med. College	1 year	(Yes) No	Yes (No)
d. Biological effects of radiation	Cornell Univ. Med. College	1 year	(Yes) No	Yes (No)

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
C^{14}	1 millicurie	C. J. Kensler Cornell Univ. Med. College	4 years	metabolic studies

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm^2)	USE (Monitoring, surveying, measuring)
See attached sheet					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

C^{14} as $BaC^{14}O_3$ - yearly

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

The service will be obtained from Controls for Radiation, Incorporated

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. (Circle answer) (Yes) No See attached sheet

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source. See attached sheet

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See attached sheet

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

RECEIVED APR 23 1965 U.S. ATOMIC ENERGY COMMISSION REGION 1 MAIL & RECORDS SECTION

Date April 21, 1965

Applicant named in item 1

By: C. J. Kensler

Charles J. Kensler, Vice President
Arthur D. Little, Inc.

Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

GPO 874-149

8, 9 - Dr. Robert Shepard has had no prior relevant experience with radio-isotopes. Dr. Charles K. Levy will serve as a consultant to Dr. Shepard on the use of radio-isotopes.

8, 9 - Experience and Training of Dr. Charles K. Levy

a. Attended a course in Radiation Biology given by the staff of Oak Ridge National Laboratory at Duke University.

b. Was a member and sometime Chairman of the Radiation Safety and Isotopes Committee, Worcester Foundation for Experimental Biology, 1958-1962.

c. Has been Chairman of the Radio-isotopes Committee, Biology Department, Boston University, 1962-present.

d. Will be Assistant Professor of Radiology, Boston University Medical School, starting in September, 1965.

10. Radiation Detection Instruments

TYPE	Number	Radiation	Sensitivity Range	Thickness	Use
Anton CDV-700 Survey Meter	1	β, γ	0.1 mr/hr		Monitoring
Nuclear Chicago C110B Automatic sample changer, C111B printing timer and D47 gas flow detector	1	β, γ			Measuring
Nuclear Chicago 186A Scaler	1	β, γ			Measuring
C100B strip feeder Nuclear Chicago, 1620 rate meter and geiger tube detector	1	β, γ			Measuring
Cary Model 32 Electrometer and Flow Detector	1	β			Measuring, monitoring

13. Facilities and Equipment

General Description: The floor is covered with linoleum tile. The laboratory benches in the area where labeled material will be used are steel construction and the laboratory bench tops are of stainless steel. The fume hood is a five foot standard by-pass hood vented through an absolute filter system (Cambridge Filter Corp.) and is equipped with external controls and a stainless steel working surface.

The primary storage facility is a locked steel box which is kept in the fume hood. Dilutions of labeled material and working solutions are kept in a freezer reserved for only labeled compounds.

14. Radiation Protection Program

Monthly film badge assays for all persons in area. Monthly wipe tests of benches and surfaces where labeled materials are used.

15. Waste Disposal

Allied-Crossroads Nuclear Corp., Dorchester, Mass.

8. Training and Experience of Paul E. Baronowsky

Type of Training	Where Trained	Duration of Training	On the Job	Formal Course
a. Principles and practices of radiation protection	Harvard University	5 years	Yes	No
	Arthur D.Little, Inc.	1 year	Yes	No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Harvard University	5 years	Yes	No
	Arthur D.Little, Inc.	1 year	Yes	No
c. Mathematics and calculations basic to the use and measurement of radioactivity	Harvard University	5 years	Yes	No
	Arthur D. Little, Inc.	1 year	Yes	No
d. Biological effects of radiation	Harvard University	5 years	Yes	No
	Arthur D.Little, Inc.	1 year	Yes	No

9. Experience with Radiation - Paul E. Baronowsky

Isotope	Max.Amount	Where Experience Was Gained	Duration of Experience	Type of Use
C^{14}	1 mC	Harvard University	5 years	Chemical synthesis and metabolic studies
	0.5 mC	Arthur D. Little, Inc.	1 year	Metabolic studies
H^3	1 C	Harvard University	5 years	Metabolic studies
P^{32}	1 mC	Harvard University	5 years	Chemical syntheses and enzymatic reactions
	1 mC	Arthur D.Little, Inc.	1 year	Metabolic studies