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College of Tropical Agriculture and Human Resources  
Department of Food Science and Human Nutrition  
1920 Edmondson Road • Honolulu, Hawaii 96822  
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REGIONAL

October 22, 1985

Mr. R. D. Thomas, Chief  
Ms Beth A. Riedlinger, Health Physicist (Lic.)  
U. S. Nuclear Regulatory Commission  
Region V  
1450 Maria Lane, Suite 210  
Walnut Creek, CA 94596

RE: Control No. 70205  
Hawaii Research Irradiator

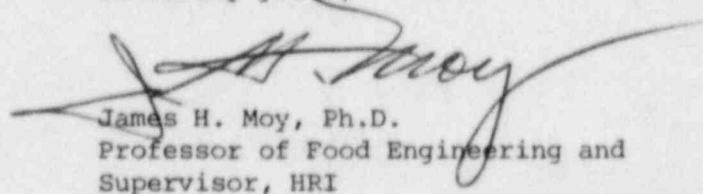
Dear Mr. Thomas and Ms Riedlinger:

Referring to our recent communications and my letter of September 25, 1985, we have revised the training program for the researcher-operators of the Hawaii Research Irradiator (HRI) in accordance to Item 8 of the second proposed revision to Regulatory Guide 10.9 of NRI. These are shown on page 6 of the Administrative Procedures, and Item 8 of the Attachment to Application for Material License, NRC Form 313, Second Revision 10/18/85.

Mr. Thomas J. Bauer, Radiation Safety Officer of our university, has indicated that he offers a didactic training session of a 4-hour duration 3 to 4 times a year. This will be part of the 8-hr training available to our researcher-operators. The balance of the 8-hr training sessions will be offered by me and Dr. Edison W. Putman. I will also conduct the 4-hr on-the-job training for all the authorized researcher-operators.

Three copies of the revision are enclosed for your review. We hope these will be satisfactory as part of the requirements for our license.

Sincerely yours,

  
James H. Moy, Ph.D.  
Professor of Food Engineering and  
Supervisor, HRI

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JHM:tn

cc: Dr. C.T.K. Ching  
Dr. E.W. Putman  
Mr. T.J. Bauer

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## ADMINISTRATIVE PROCEDURES

## HAWAII RESEARCH IRRADIATOR

Amendment No. 2 to Supplemental Information, Licensing Requirement for Gamma Irradiator for University of Hawaii (Ref.: Item H).

SUPERVISORS

The Hawaii Research Irradiator (HRI) is under the direct supervision of Dr. James H. Moy and Dr. Edison W. Putman, as recorded in the NRC Operational License held by the University of Hawaii. Entry to and use of the facility may be made only by personnel authorized by the two supervisors.

AUTHORIZATION OF OPERATORS

Authorization for use of the Hawaii Research Irradiator will be given only to selected personnel cleared by the supervisors. Authorization will be made only under the following circumstances:

1. All operators must be employees of the University of Hawaii or of the United States Department of Agriculture or of an agency of the State of Hawaii, or of a laboratory in the State of Hawaii.
2. Operators must complete training sessions under the supervisors, and show satisfactory knowledge of radiation principles, radiation protection, and radiation health physics. Training sessions will cover thoroughly the design of the facility, radiation monitoring equipment, and standard operating procedures. Each operator shall receive 8 hrs of didactic training (including classroom instruction) and 4 hrs on-the-job training.
3. All operators will be expected to be thoroughly familiar with Standard Operating Procedures (SOP) of the facility, and to adhere strictly to them.
4. Authorization for use of HRI will be suspended in cases of any departure from SOP, or in case of resignation or retirement of the employee.

IMPLEMENTATION OF STANDARD OPERATING PROCEDURES, HRI

1. A list of all personnel authorized to use the HRI, including supervisors, will be kept posted at all times on the door of the facility, and copies filed with the Principal Investigator, Dr. James H. Moy and the Director of Research, Dr. Howard P. McKaughan.
2. Keys to the HRI facility will be issued only to supervisors, made available upon request only to authorized operators, and returned promptly to supervisors following use.
3. Operators will adhere strictly to SOP regulations, entering the facility only with approval of supervisors, logging in and monitoring the area prior to entry as specified in SOP.
4. Operators will be responsible for reporting immediately to super-

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Application for Material License  
NRC Form 313  
(Attachment)

University of Hawaii  
Honolulu, Hawaii  
1st Rev. 7/19/85  
2nd Rev. 10/18/85

5. Radioactive Material:

- a. Cobalt-60
- b. Sealed Sources (Brookhaven Natl Lab. MKI standard strip sources and/or sources as per BNL Drawing ME 188-135-3C).
- c. 45,000 curies total

6. Purposes:

To be used in a modified Brookhaven National Laboratory designed Mark IV research food irradiator to determine biological and chemical effects of gamma-radiation for purposes of food preservation, insect sterilization, mutant induction in plants, soil sterilization, cell response to gamma-radiation, and simulation of radiation effect in outer space.

7. Radiation Safety - Individual Responsible For:

James H. Moy, Professor of Food Engineering, U. of Hawaii

- B.S. & M.S. Chem. Engineering, U. of Wisconsin-Madison, 1957 & 1958.  
University courses in Radiation Chemistry; Transport Process, Nuclear Engineering; graduate courses in Kinetics and Catalysis. Material and Energy Balance, Advanced Thermodynamics, Advanced Fluid Mechanics.
- Ph.D. Food Science, Rutgers University-New Brunswick, 1965.  
Radiation Biology, and Radiation Preservation of Food (part of Food Preservation).
- Project Leader & P.I. Food Irrad. Proj. (AEC-sponsored), U. of Hawaii (AEC-sponsored) 1965-72.
- Dosimetry Workshop, U.S. Army Natick Lab., 5 days, 1968.
- Supervisor, Hawaii Research Irradiator (HRI) 1968-present
- Proj. P.I. Fruit Irrad. Proj. (State Calif-sponsored) 1980-83.

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Edison W. Putman, Assoc. Professor of Plant Physiology, U. of Hawaii

- B.A. 1942, Ph.D. Plant Physiology, UC Berkeley, 1952  
Course in Atomic Physics, Nuclear Chemistry, and Health Physics
- Asst. Res. Biochemist, U.C. Berkeley, 1952-59  
Used  $^{14}\text{C}$ ,  $^{32}\text{P}$  and  $^{60}\text{Co}$  for research.
- Assoc. Professor Plant Physiology, U. of Hawaii 1959-present  
Used  $^{14}\text{C}$ ,  $^{32}\text{P}$ ,  $^{45}\text{Ca}$ ,  $^{35}\text{S}$  for research.
- Chairman, U. Haw. Radiological Activities Committee 1964-69.
- Co-Supervisor, HRI, 1978-present.
- Radiation Safety, UC-Berkeley, 1947.  
Courses in Radiation Protection, Radiation Instrumentation,  
Radiation Biology and Radiation Physics.

The University of Hawaii also has a Radiation Safety Office which would render assistance and guidance when needed. The Radiation Safety Officer is Thomas J. Bauer.

#### 8. Training of Operators:

As indicated under Administrative Procedure, page 6 of the Standard Operational Procedure (SOP) of the Hawaii Research Irradiator (HRI), the following training program for authorized operators of HRI is outlined:

- (a) Each operator of the HRI facility shall receive a minimum of 8 hrs of didactic training in the following topics. These topics can be covered either through: (1) classroom instructions offered as a, or part of a, university course, or (2) workshop-type course sponsored and offered by an international, a federal or a state agency, or (3) didactic training at the University of Hawaii at Manoa by personnel of the University Radiation Safety Office, and supervisors of the Hawaii Research Irradiator, or, (4) a combination of the above thereof.

The eight (8) hours of didactic training will be divided among the following topics, each of 2-hr duration:

- Principles and fundamentals of radiation safety and good safety practices in the use of radioactive materials;
- Radioactivity measurement, standardization, monitoring techniques, the use of radiation detection instruments, and mathematics and calculations basic to the use and measurement of radioactivity;
- Biological and chemical effects of ionizing radiation;
- Design and operation of the Hawaii Research Irradiator (HRI).

- (b) At the end of the training program, each trainee/operator will be given an examination of 25 questions or more to test the understanding and knowledge of the individuals pertaining to all aspects of the above-indicated topics. On a maximum scale of 100, a passing scale will be 70. Individuals who are deficient in some of the areas will be required to do some additional homework and participate in a small group discussion with the supervisors.
- (c) On-the-job training shall consist of a minimum of 4 hours in the actual operation and use of the irradiator conducted by the supervisors.
- (d) Course instructors:  
  
James H. Moy, Ph.D. Professor of Food Engineering, U. of Hawaii  
Edison W. Putman, Ph.D. Assoc. Professor of Plant Physiology, U. of Hawaii  
Thomas J. Bauer, Radiation Safety Officer, U. of Hawaii
- (e) Records of training of each authorized operator will be maintained at the facility of HRI.

#### 9. Facilities and Equipment:

The Hawaii Research Irradiator (HRI) is a Co-60 irradiator of the BNL Mark IV design completed in January, 1965 with an initial activity of 30,000 Ci. The 100 Co-60 Strips are kept under 11 1/2 ft of deionized, refrigerated (58°F) water with 50 strips to a plaque.

The central chamber, measured 22 1/2" L x 7 1/4" W x 22" H, receives samples to be irradiated with a water-tight cover. Dose rates of the source are measured with the Fricke dosimetry procedure and are mapped according to the geometry of the chamber. Also available are three (3) 6" and five (5) 3" wet tubes but these are seldom used.

The source has been upgraded twice since 1965. In July, 1968, it was upgraded to 19,500 Ci. In January, 1978, it was upgraded to 42,500 Ci. Each time an outside radiation contractor performed the job. As of May 20, 1985, the source strength was 16,473 Ci by normal decay.

Besides the irradiator, equipment include: two monitor-detectors, one calibrated, portable survey meter capable of measuring up to 500 milliroentgen per hour, an ion-exchange system, a refrigeration system, water level alarm, conductivity meter, air-conditioner, exhaust fan, and audio-visual alarm outside the building.

#### 10. Radiation Safety Program

As described in the Standard Operational Procedure (attached)

p. 1 Operational Hazards and Control

p. 2 Direct Radiation Control

p. 2-3 Contamination Control

p. 3 Emergency Action

p. 4 Facility Operation, Weekly Test



p. 8-9 Leak Test Procedure

11. Waste Management

There is no radioactive waste to be disposed of.

In 1968 and 1978, low activity strips were returned to ERDA & DOE receiving depots in Nevada and Washington.

12. Experimental Irradiated Food:

Irradiated food samples prepared for experimental study such as for conducting taste test will be distributed in accordance with FDA regulations.

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