

MATERIALS 12 FOOD IRRADIATION

Vol. 3

Vol. 3 Correspondence beginning with 1-4-63 to 5-31-66

~~Vol. 2 Correspondence beginning with 6-1-63 to~~

*For subse serial material
see: Subtype 9. Food Irradiation*

	Date	To	From	Class.	Proj. No.	To	From	Class
1	6-11-64	Vitro Eng. Co.	Savannah River, Georgia	vee				
2	9-25-64	American Nuclear Corp.		et				
3	1-25-65	Preservation of Food for the	Polaris Fleet	et				
4	3-4-65	AEC 719/39	Radiation Pasteurization	vee				
5	3-12-65	Hawaiian Food Irradiation		et				
6	4-30-65	Waste Mgt. Study		vee				
7	5-28-65	AEC 719/40	Foods Program	vee				
8	6-30-65	Joint Study by U.A.	& Canada	et				
9	7-8-65	AEC 719/41		et				

1-11-65
5 31

*John F. Kennedy
with initials
John M.*

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AEC 719/48

June 27, 1966

COPY NO. 18

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

ADDENDUM TO AEC 719/47 -
STATUS REPORT ON RADIATION PRESERVATION OF FOOD PROGRAM

Note by the Secretary

The General Manager has requested that the attached memorandum of June 24, 1966 by the Director, Division of Isotopes Development, with attachment, be circulated for consideration by the Commission in conjunction with AEC 719/47 at the Information Meeting scheduled for June 27, 1966.

W. B. McCool

Secretary

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6/27/66

UNITED STATES GOVERNMENT

Memorandum

TO : R. E. Hollingsworth, General Manager
THRU : S. G. English, Assistant General Manager
for Research and Development
FROM : E. B. Fowler, Director
Division of Isotopes Development

DATE: June 24, 1966

SUBJECT: STATUS REPORT OF AEC RADIATION PRESERVATION OF FOOD PROGRAM

In accordance with your request, supplemental information to that provided with my memorandum of June 14, 1966, has been prepared on problem areas associated with the research and development program on radiation pasteurization of food. This report should be made an addendum to AEC 719/47.

Attachment:
Report on Food Program

- 2 -



SUPPLEMENTAL INFORMATION ON PRODUCT STATUS AND PROBLEM AREAS
IN THE RADIATION PRESERVATION OF FOODS PROGRAM

Four major problem areas are associated with the AEC's program on radiation pasteurization of fresh food products and the commercialization of this technology. These are:

- I. Technical
- II. Legal
- III. Economic
- IV. Consumer acceptability

A discussion of each of these problem areas follows:

I. Technical

A. Food Product Quality

Maintenance of a high quality, near-fresh food product is the objective of radiation pasteurization. Quality characteristics include the following: flavor and odor, texture, color, and nutritional value.

Flavor and Odor

Adverse flavor and odor changes do not appear to be a problem with radiation pasteurized foods.

Alteration of the flavor and odor of foods by radiation processing depends upon the specific food product and the radiation dose used.

As contrasted to radiation sterilized foods, adverse flavor and odor changes have not been observed in food

products processed using recommended pasteurizing doses of radiation. (In some cases, food flavors are enhanced, as has been found with papayas). Expert taste panelists routinely score radiation pasteurized foods high. Good results have been obtained in large-scale test acceptability studies with military personnel at Fort Lee, Virginia, fed radiation pasteurized fish and fruit.

Color

Adverse color change does not appear to be a problem with radiation pasteurized foods.

Results of work to date, show no significant change in the color of foods under study. In the case of certain fresh fruits, such as nectarine and pineapple, an intensification of color has been observed. This is not judged to be a disadvantage from the standpoint of acceptability and may actually lead to the market value.

Texture

Adverse texture changes are observed in some fruits which, unless solved, will prevent their processing with radiation.

Some fresh fruits such as peaches, nectarines, grapes, pears and sweet cherries processed with pasteurizing doses of radiation show tissue damage which results in oversoftening and subsequent susceptibility of these fruits to faster spoilage.

Results of preliminary studies indicate that radiation doses required for pasteurization treatment can be sharply reduced (from 250,000 rad to 75,000 rad) by a combination radiation-heat process. More detailed work is now in progress to establish the efficacy of the combination process with selected fresh fruits.

Results indicate that sweet cherries dipped in calcium chloride prior to irradiation do not show the severe change in texture usually seen in this species. Apparently, the calcium chloride exerts a protective effect on the structural component, calcium pectate.

Marine products under study show no adverse textural changes using pasteurizing doses of radiation.

Extensive studies have now been completed which show that a high standard of textural quality is maintained in marine products processed with radiation pasteurizing doses, and, accordingly, textural change does not present a problem.

Nutritional Value

The nutritional value of radiation pasteurized foods is maintained at an acceptable level.

Radiation processed foods, like other processed food products, lose some of their initial nutritive quality. Comprehensive studies completed to date, including animal

feeding tests, indicate that the nutritive value of radiation pasteurized foods is maintained at a fully satisfactory level.

Radiation can cause some destruction of certain vitamins; however, the degree of destruction is judged not to be significant.

B. Genetic Effect.

Extensive feeding tests with animals have not shown any gross genetic effects.

Literature reports have suggested possible mutagenic and/or cytotoxic effects attributable to the effect of radiation on certain biochemical materials. These effects have been observed only in single plant cells and insects. More detailed studies will be conducted involving in vivo experiments with animals fed irradiated foods, under the guidance of an ad hoc committee established by the AEC. The Commission has been briefed by Dr. Dunham and his staff on this specific problem.

C. Public Health Hazard

Residual bacteria in irradiated marine products do not appear to constitute a public health hazard.

Continuing detailed studies are being carried out to establish fully that a public health hazard does not exist with marine products processed with radiation due to the existence of the toxin-producing bacteria, Clostridium botulinum, Type E. Toxin produced by this bacteria in

certain foods improperly handled is a cause of food poisoning. Presently available laboratory data indicate that irradiated marine products are no more susceptible to this food poisoning effect than non-irradiated marine products.

The outlook for successful management of any possible public health hazard due to Cl. Botulinum in marine products processed with pasteurizing doses of radiation appears favorable; however, this problem has not been completely characterized to date, and if not solved satisfactorily, would seriously affect any possible commercial use of radiation processing of marine products.

D. Process Development

Full demonstration of the process on a near-commercial scale will be achieved after completion of facilities now under construction.

Major pilot facilities, the Marine Products Development Irradiator, Grain Products Irradiator, Mobile Irradiator, and Hawaiian Development Irradiator are either operating or under construction and will yield the required information.

II. Legal

Commercialization will not take place until a sufficient number of food clearances have been issued.

FDA approval of the process has been obtained for only a few specific food products, as noted in AEC 719/47, dated

June 22, 1966. Approval for additional food products is required if commercialization of radiation processing of foods is to be achieved.

AEC schedules call for the submittal of a number of petitions to FDA within the next three-year period. FDA reluctance to approve petitions already submitted is attributed to its lack of familiarity with the technical aspects of the radiation process. The effect of this is an excessive time required by FDA to issue regulations and an escalation of requirements placed on AEC to demonstrate efficacy.

III. Economics

The economic relationship of costs versus benefits for radiation pasteurized food is as yet not sufficiently well defined.

Reasonably reliable estimates are available of radiation pasteurization costs, and activities in progress will provide increasingly accurate information. Data available on the economic value of benefits conferred by radiation pasteurization, however, are only qualitative at best at this time. The difficulty in quantifying benefits derives from the fact that they are an aggregate of individual benefits at numerous points throughout the production-distribution chain. The characteristics of this complex marketing system itself often are only vaguely defined, even for conventional products, so that

economic projections necessarily become in large part matters of judgment rather than the consequence of rigorous analysis. The net effect of these circumstances is to present an obstacle to investment analysis by industry, and consequently to its determination as to whether to undertake radiation pasteurization of foods. A detailed professional cost-benefit analysis will be completed in October 1966, which should contribute toward alleviation of this problem.

IV. Consumer Acceptability

There is a consensus among the food industry that there will be significant consumer resistance to consumption of radiation pasteurized foods.

It should be noted that the actual existence of such consumer resistance in fact has not been substantiated. Its presumed existence reflects personal opinion and not demonstrated fact. Nevertheless, it is necessary that these industrial fears be overcome if they are not well founded or that the education of the public be undertaken if they are. The previously referenced cost-benefit analysis includes a consumer attitude survey, and thus will help clarify this problem.

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June 22, 1966

AEC 719/47

COPY NO. 19

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

STATUS REPORT ON RADIATION PRESERVATION OF FOOD PROGRAM

Note by the Secretary

The General Manager has requested that the attached memorandum of June 14, 1966 from the Director of Isotopes Development, with attachments, be circulated for consideration by the Commission at an early Information Meeting.

W. B. McCool

Secretary

DISTRIBUTION

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UNITED STATES GOVERNMENT

Memorandum

TO R. E. Hollingsworth, General Manager
THRU *for* S. G. English, Assistant General Manager
for Research and Development
FROM E. E. Fowler, Director *J. E. MacArthur*
Division of Isotopes Development

DATE: June 14, 1966

SUBJECT: STATUS REPORT OF AEC RADIATION PRESERVATION OF FOOD PROGRAM

I am attaching the subject report for review by the Commissioners prior to their meeting with Food and Drug Administration officials on June 30, 1966. Both Dr. Dunham and I are prepared to provide additional detail as may be required in further preparation for the meeting.

A proposed agenda for the meeting is also attached.

Attachments:

1. Proposed Agenda
2. Status Report



Proposed Agenda
USAEC-USFDA Meeting
June 30, 1966

Item

I. AEC Program

- A. Program purpose and expected benefits
- B. Separation of development from safety responsibilities
- C. Program Elements
- D. Foods under Study
- E. Progress to Date

II. FDA Clearance Procedures

- A. Advantages to AEC Program of FDA technical evaluations
- B. Items of AEC concern
 1. Time required for FDA final action on irradiated food petitions
 2. Escalation of FDA requirements to include areas beyond wholesomeness and safety, e.g., economics, need, consumer attitudes
 3. Labeling requirements
 4. Requirement to demonstrate "efficacy" (What exactly is meant? How is this shown?)
 5. Availability to FDA of scientific disciplines specific to radiation physics as relevant to food preservation.

III. General Discussion

- A. AEC Interest
- B. FDA Viewpoints

CURRENT STATUS OF THE AEC
RADIATION PRESERVATION OF FOODS PROGRAM

I. GENERAL

A. Program Administration

The program is jointly carried out by the Division of Isotopes Development and Division of Biology and Medicine with responsibilities as follows:

DID: Technological Development

Irradiation Facility Design, Construction and Operation

Economic Projections

Processor and Consumer Education

Liaison with Industry

DEM: Product Wholesomeness and Public Health aspects (i.e. wholesomeness, nutritional adequacy and microbiological safety).

B. Program Elements

1. Product Development - Selection of products for testing; determination of optimum processing and irradiation conditions.
2. Process Development - Integration of irradiation into the overall process of harvest, pre- and post-irradiation handling, and distribution, to attain optimum results. Translation of laboratory results to semi-commercial processing conditions is included, as is the development of commercial interest and public acceptance. FDA clearances are requested and obtained within this category.

3. **Product Wholesomeness and Public Health Aspects - Determinations of availability and quality of protein and losses of essential amino-acids and vitamins. Sub-acute and chronic toxicity animal feeding studies are conducted on irradiated foods to assure their safety for consumption. Possible long term genetic effects of irradiated food consumption are being studied. Potential microbial pathogens have been subjected to intensive investigation.**
4. **Irradiation Facilities - Developing and making available suitable irradiation sources and facilities to support the program from research through pilot plant operations.**

C. Foods Under Study

Food items currently being investigated include:

Fruits & Vegetables

Marine Products & Others

Strawberries	Tomatoes	Halibut	Crab
Sweet Cherries	Bananas	Codfish	Shrimp
Pears	Papayas	Sole	Oysters
Plums	Mangoes	Flounder	Hake
Prunes	Pineapples	Pollock	Fresh water fish
Peaches	Figs	Ocean Perch	Chicken
Apricots	Onions	Clams	
Nectarines	Potatoes		
Apples	Wheat & Wheat Products		
Oranges			

D. Regulations Governing Human Use of Radiation Processed Foods

1. U. S. Food and Drug Administration (FDA)

The Food Additives Amendment of 1958 (PL 85-929, approved September 6, 1958) classifies radiation as a food additive, and prohibits its use in food processing unless by exception. Exemptions are granted by FDA after review and approval of petitions for exception of specific foods under prescribed conditions.

Five specific sections and areas are thoroughly discussed in each petition. These include:

Section A: Name of the food additive and all pertinent information concerning it.

Section B: Statement of the conditions of the proposed use of such additive including all directions, recommendations, and suggestions proposed for the use of such additive, and including specimens of its proposed labeling.

Section C: All relevant data bearing on the physical or other technical effect such additive is intended to produce and the quantity of such additive required to produce such effect.

Section D: Practicable analytical methods.

Section E: Full reports of investigations made with respect to the safety for use of such additive, including full information as to the methods and controls used in conducting such investigations.

Our procedure is to coordinate a protocol with FDA for the conduct of studies to fulfill the above requirements, accomplish the research, then formulate and submit a detailed petition requesting clearance. A schedule of previous food petitioning actions is included in Table I.

2. U. S. Department of Agriculture

The Poultry Division, USDA, has clearance responsibilities concerning poultry in interstate commerce. The Poultry Products Inspection Act (21 U.S.C. 451 as amended) provides for compulsory inspection of poultry products during processing and distribution, to insure accurate grading and freedom of the product of disease and pathological conditions.

Concurrent with FDA review, USDA would review an identical copy of the petition for clearance of radiation as a food additive to poultry, focusing attention on aspects other than irradiation.

3. Problem Areas

There is no question as to FDA's important role in assuring the safety and nutritional adequacy of all food additives. We regard clearances by FDA as a necessity for consumer acceptance and as a desirable review of our own work. Our problem areas with FDA relate to the following, which derive from the fact that irradiation has been singled out from other food additives for extreme surveillance:

- a. An extreme amount of time is taken by FDA to evaluate irradiated food petitions. We currently must allow an average of one year

to 18 months for final action, and this has not been sufficient in at least one case (oranges). More conventional petitions normally require a year or less for processing.

- b. FDA persistently challenges the efficacy of each process, including need, probable economics, and capability to provide adequate radiation facilities. This requires demonstrated near-commercial scale shipments to prove out laboratory findings.
- c. Possible adverse consumer acceptance attitudes influence FDA actions, whereas we feel this point is irrelevant to their considerations.
- d. We have attempted for several years to persuade FDA to be definitive on general labeling requirements for irradiated foods. This area is still unresolved. A recently proposed FDA regulation would have required wheat and wheat products to bear the label, "Treated with ionizing radiation - do not treat again." This action was vigorously opposed on several grounds, and the issue is not resolved. This proposed label is comparable to a hypothetical situation with chemical additives, which might read "Treated with toxic chemicals - do not treat again." Such labeling is not required in these cases.
- e. FDA is still in a "learning" process about irradiation. Hence the protocols and requirements agreed upon in coordination meetings are often escalated a year or two later upon completion of research, when FDA suggests other areas for research and clarification. Thus we have been in a position of meeting escalated requirements for each new petition.

f. There has been a definite lack of understanding of basic physics in the FDA staff. This has led to undue confusion in areas of radiation sources and dosimetry, the equivalence of x-rays, electrons, and gamma rays, and the subject of induced radioactivity. As an example, 5 Mev x-rays are generally approved as a radiation source for the processing of foods. Yet sodium-24 with a 2.75 Mev gamma ray, will not be accepted until actual irradiation tests on foods are made. Limitations are set by induced radioactivity considerations.

II. PROGRAM FUNDING

Long range DID and DBM plans include funding of the food irradiation program through FY 1972, with funding estimated totals as follows:

Through FY 1966	\$ 9,280,000
Through FY 1967 (proposed BCB cutoff)	11,810,000
Through FY 1972 if extended	24,810,000

Table II is a detailed account of cost estimates. FY 68-72 estimates assume extension of the program into certain public health aspects and cooperative U. S. industry and international programs. The extended program would maximize the benefits of irradiation in both the U. S. and abroad.

III. PROGRAM STATUS

A. Product Development

1. Fish: Results of work on some 16 species of marine products continue to be very favorable. Fish with a normal refrigerated

shelf-life of 7-10 days can be stored for 7-14 days longer, and still maintain highly desirable characteristics of taste, color, odor and quality. Table III summarizes product status.

2. Fruits: Research results continue to offer an optimistic outlook for many - but not all - fruit products. Strawberries, bananas, pink or ripe tomatoes, and several tropical fruits presently head the list of most promising products. An increasing understanding of the radiation biochemistry, pathology, and physiology of products indicates that continued and perhaps even more rapid progress toward development may be expected. The extreme complexities encountered with various fruits indicate that radiation can only be applied on a very selective basis. Nevertheless, significant effects such as reduction in spoilage, extension of shelf-life, sprout inhibition, and delay of maturation are feasible. Table IV summarizes fruit product status.

B. Wholesomeness and Public Health Aspects

Chronic, two-year toxicity studies on three species of animals fed irradiated soft-shelled clams will be completed by December 1967. Long term studies of the feeding of low-dose irradiated bananas are presently being negotiated, with completion expected by December 1968. Biological evaluations of protein quality of irradiated chicken are in progress, and studies have been completed on a number of marine products (Table V).

Results from wholesomeness and toxicity feeding programs conducted to date have demonstrated no evidence of untoward biological effects on animals or impairment of nutritional quality.

Microbiological studies have been concentrated predominately on Clostridium botulinum, Types E and F. The germination, outgrowth, and toxin production capabilities of these organisms are being investigated in great depth because of their public health importance. A number of foods have been subjected to sub-acute toxicity studies (Table VI). Surveys are now being made to determine the natural incidence of these organisms in U. S. coastal areas in order to assess the potential hazard thereof.

C. Process Development

For both fish and fruit products, laboratory technology is now being translated into semi-production or pilot plant operations. Large scale testing is confirming the technical feasibility of commercial processing, and is drawing the interest of processors. Petition preparation is continuing, with schedules included in Tables III and IV.

D. Irradiation Facilities

A major effort has been devoted to the development and provision of a family of irradiation facilities (Table VII) to support all phases of food irradiation research. Twelve irradiators are now in operation or nearing completion. Included are four for on-site research, four for scaled up laboratory research, and four large scale semi-commercial capacity plants.

IV. PROBLEM AREAS

A. Technical Questions

1. Fruits

- a. Uncontrollable variables such as climatic conditions, soils, and short harvest periods prevent year-around research on any particular fruit. A program extended to cover additional harvest seasons would offer the opportunity for further fruit research.
- b. Whereas irradiation alone is sometimes detrimental to fruits, combination treatments (e.g., hot water dip and irradiation) are sometimes quite effective. We have only recently begun to investigate this approach.
- c. The extreme biological and botanical complexity of fruits has also delayed more rapid advances. However, we feel that most technological aspects can be solved with continued adequate efforts.

2. Wholesomeness

- a. Some microbiologists feel that radiation processing may produce bacterial mutants having greater virulence and/or increased radio-resistance. Research contracts designed to assess this possibility are presently being negotiated.
- b. The inoculation of massive numbers of Clostridium botulinum, Type E, spores into marine products, followed by irradiation and proper storage under refrigeration, has indicated no

unmanageable health safety hazard. However, some concern has been expressed that "proper" storage temperatures and handling conditions may not always be attained in commercial channels. Although this reservation unquestionably applies to other methods of food processing equally as well, data now accumulating on inoculated pack studies will be carefully assessed in light of practical considerations.

- c. As a result of recent publications, attention has again been focused on possible cytotoxic and genetic consequences of consuming irradiated foods, particularly those of high sugar content. While AEC and Army studies have been negative in this regard, the literature reports conflicting results, especially when lower forms of life and cells in tissue culture systems have been the test models. A continuing awareness of this aspect is being maintained. An ad hoc committee was recently convened for the purpose of advising the AEC with respect to potential genetic hazards of irradiated foods and to recommend techniques by which definitive data on mammals could be obtained.

3. Irradiators

Completion schedules for the larger irradiators will permit a minimum time for pilot plant or semi-commercial processing and evaluation, assuming a FY 1967 program phaseout.

B. Bureau of the Budget

1. BOB has exhibited a persistent disenchantment with the food irradiation program. They have given notification that FY 67 is the terminal year for the program, unless AEC can provide convincing evidence of future potential benefits. A cost-benefit analysis on selected promising foods is currently in progress, at BOB's suggestion. Results of the study will be used by BOB to re-evaluate their present position, and make a final determination of program extension or termination. The study will be completed in October 1966.
2. Uncertainties in program funding after FY 67 are inhibiting full progress, especially in areas of longer-term studies.

C. Industrial Participation and Commercialization

We are encouraged, but not fully satisfied, by current industry interest and participation in program development. Commercialization is directly dependent on (1) a wider base of FDA clearances; (2) a clarification of irradiation economics; and (3) consumer acceptance of radiation processing. Present unavailability of definitive information in these particular areas precludes an evaluation in specific terms of the prospects for commercialization, and represent areas of present and proposed efforts.

V. CONCLUSION

The USABC research and development work continues to show increasing promise for commercialization. Commercial interest will be directly dependent upon progress made in obtaining clearances of radiation

processed foods from FDA. While important problems remain to be solved, there exists no evidence which would preclude their solution and the subsequent acceptance of food pasteurization.

TABLE I

REGULATIONS AND PETITIONS ON RADIATION PRESERVATION OF FOODS

PRODUCT	PETITIONER	SOURCE	DOSE	FDA PETITION			FDA REGULATION			REMARKS
				FILING DATE	REF. VOL.	F.R. PAGE	ISSUE DATE	REF. VOL.	F.R. PAGE	
Bacon	U.S.Army	Co-60	4.5-5.6 Mrad	8-17-62	28	8214	2-8-63	28	1465	
Bacon	Gen.Electric	5 Mev. electron	4.5-5.6 Mrad	6-5-63	28	5537	8-30-63	28	9526	
Bacon	U.S.Army	10 Mev. electron	4.5-5.6 Mrad	8-23-63	28	9329	4-21-65	30	5631	
Bacon	AEC	Cs-137	4.5-5.6 Mrad	12-18-63	28	13797	4-1-64	29	4672	
Bacon	Radiation Dynamics	x-rays from 5 Mev. elec.	4.5-5.6 Mrad	7-23-64	29	9910	12-19-64	29	18056	
Wheat, Wheat Products	Brownell, et al.	Co-60	.02-.05 Mrad	10-4-62	28	1465	8-21-63	28	9208	
Wheat, Wheat Products	High Voltage Engr. Corp.	5 Mev. electron	.02-.05 Mrad	12-18-63	28	13797	-	-	-	Pending
Wheat, Wheat Products	AEC	Cs-137	.02-.05 Mrad	9-1-64	29	12481	10-10-64	29	14027	
White Potato	AEC	Cs-137	.005-.01 Mrad	-	-	-	-	-	-	Pending
White Potato	U.S.Army	Co-60, Cs-137	.005-.01 Mrad	1-30-65	30	1013	-	-	-	Pending
White Potato	U.S.Army	Co-60	.005-.01 Mrad	6-6-63	28	5588	7-8-64	29	9329	
Strawberry	AEC	Co-60, Cs-137	.1-.25 Mrad	5-11-66	31	7256	-	-	-	

PRODUCT	PETITIONER	SOURCE	DOSE	FDA PETITION			FDA REGULATION		
				FILING DATE	REF., F.R. VOL. PAGE	ISSUE DATE	REF., F.R. VOL. PAGE		
Citrus (oranges, lemons, grapefruit)	AEC/U.S.Army	Co-60, Cs-137	.075-.2 Mrad	12-26-63	28 13797	-	-	-	
Citrus (oranges)	AEC/U.S.Army	Co-60, Cs-137	.075-.3 Mrad	-	-	-	-	-	
Marine Products (Haddock, pollock, ocean perch, cod, flounder, and sole)	AEC/U.S.Army	Co-60, Cs-137 10 Mev.elec. 5 Mev. x-rays	.1-.2 Mrad	9-15-65	30 11801	-	-	-	
Packaging Materials	AEC	2.2 Mev gamma energy	1 Mrad or less	2-8-64	29 11651	8-14-64	30	11651	
<u>Packaging Materials Amendments:</u>									
Cellophane, Saran-coated	AEC	as above	1 Mrad	2-18-65	30 9216	6-11-65	30	7599	
Nylon	AEC	as above	1 Mrad	9-8-65	30 11400	-	-	-	
Polyester, Saran-coated	AEC	as above	1 Mrad	7-30-65	30 9551	-	-	-	
Polypropylene, Saran-coated	AEC	as above	1 Mrad	7-30-65	30 9551	-	-	-	
Six Films	U.S.Army	as above*	6 Mrad	7-21-65	30 9216	-	-	-	
Parchment Paper	U.S.Army	as above*	6 Mrad	1-15-65	30 547	3-12-65	30	3354	

*Plus x-rays from 5 Mev electrons

TABLE II
RADIATION PRESERVATION OF FOODS PROGRAM
BUDGETARY STATUS AND PLANNING
INCEPTION THROUGH FY 72

	Costs	Budget	Program Plan				
	Thru FY 66	FY 67	FY 68	FY 69	FY 70	FY 71	FY 72
<u>Isotopes Development Program</u>							
Operating Expenses	\$4.8	\$1.7	\$2.0	\$2.0	\$1.8	\$1.7	\$1.2
Facilities and Equipment	2.2	0.3	0.7	0.7	0.5	0.2	0.2
<u>Biology and Medicine Program</u>							
Operating Expenses	2.3	0.5	0.5	0.5	0.4	0.4	0.2
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	\$9.3	\$2.5	\$3.2	\$3.2	\$2.7	\$2.3	\$1.6

TABLE III
MARINE PRODUCTS STATUS
(Shelf life extension)

Product	State of technology	Technological outlook ¹	State of wholesomeness (toxicity)	Expected wholesomeness completion (fiscal year)	Microbiology	Petition submitted date ² - (fiscal year)
Haddock ³	Advanced	Excellent	Near completion	1965	1965	1966
Codfish ³	Relatively new	Good	Completed	-	do	1966
Sole ³	Advanced	Excellent	do	-	do	1966
Flounder ³	do	do	do	-	do	1966
Pollock ³	do	do	do	-	do	1966
Ocean perch ³	do	Good	do	-	do	1966
Clams	do	do	Beginning	1967	In progress	1968
Crab	do	Excellent	In progress	1966	do	1968
Shrimp	do	Good	Near completion	1965	do	1968
Oysters	New	do	Some work needed	1967	do	1969
Halibut	Advanced	Excellent	Near completion	1966	do	1967
Hake	New	Good	Will extrapolate	1966	do	1967
Fresh water fish	do	do	Not initiated	1968	Beginning	1970
Chicken	do	Excellent	Some work needed	1966	do	1969

Legend:

1. Microbiological aspects not considered.
2. Approval normally requires 12-18 months and additional work may be required by FDA during this period.
3. Items in marine products petition.

TABLE IV
PRODUCT STATUS
Fruits and Vegetables

Product	Desired end point	State of Technology	Technological outlook ¹	State of Wholesomeness	Completion of wholesomeness (fiscal year)	Petition submission date ² (clearance expected 12 to 18 months later) (fiscal year)
Strawberries	RS, SLE	Advanced	Excellent	Near completion	1966	1966
Sweet cherries	RS	Relatively new	Fair	Do	1966	1967
Pears	RS, DM	Advanced	Poor	Do	1966	(?)
Plums	RS	New	Fair	Do	1966	(?)
Prunes	RS	Do	Good	Do	1966	1967
Peaches	RS	Advanced	Uncertain ⁵	Completed	----	(?)
Apricots	RS	New	Poor	Near completion	1966	1967
Nectarines	RS	Advanced	Good	Completed	----	1967
Apples	DIS	New	Fair	Near completion	1966	(?)
Oranges	RS	Advanced	Good	Completed	----	(³)
Lemons	RS	Dropped	Poor	-----	----	----
Grapes	RS	Do	Do	-----	----	----
Tomatoes (ripe)	RS, DM	New	Fair	Not initiated	(?)	(?)
Bananas ⁶	DM	Do	Excellent	Do	1968	1969
Papayas	DIS, SLE	Relatively new	Do	Do	1967	1969
Mangoes	DIS	Do	Do	Do	1967	1969
Pineapples	DIS	New	Good	Partly completed	(?)	(?)
Figs	DIS	Do	Do	Not initiated	1967	1969
Onions	SI	Near completion	Do	Near completion	1966	1967
Potatoes	SI	Completed	Do	Completed	----	(⁴)
Wheat and wheat products	DIS	Do	Excellent	Do	----	(⁴)

Legend:

RS=Reduced spoilage.
SLE=Storage life extension.
SI=Sprout inhibition.
DIS=Disinfestation.
DM=Delayed maturation.

¹Economic aspects not considered.

²Approval normally requires 12 to 18 months, and may require additional work during that period.

³Pending FDA action.

⁴FDA approval.

⁵Improving due to promising combination treatment with heat.

⁶Main variety studied to date (Gros Michel variety).

Table V**Biological Evaluations of Protein Quality^a**

Food	Dose (krad)	Current Status
Haddock	0/200/400	Completed
Flounder	0/300/600	Completed
Crab	0/200/400	Completed
Shrimp	0/150/300	Completed
Soft-shell clams	0/400/800	Completed
Chicken	0/400/800	In progress

^a Biological evaluation of protein quality, Official Methods of Analysis of the Association of Official Agricultural Chemists, 9th Ed., (1960) 680-618.

Table VI
Short Term, Subacute Toxicity Studies^a

Food	Dose (krad)	Experimental Animals	Status
Strawberries	0/300	Rat and Dog	Completed
Apples	0/200	Rat and Dog	Completed
Pears	0/400	Rat and Dog	Completed
Sweet cherries	0/500	Rat and Dog	Completed
Apricots	0/400	Rat and Dog	Completed
Prune plums	0/400	Rat and Dog	Completed
Onions	0/25	Rat and Dog	Completed

^a All diets contained 35% (of total dietary solids) of the experimental food, with exception of onions, which were fed at a level of 10% to dogs.

TABLE VII

IRRADIATORS SUPPORTING THE AEC FOOD IRRADIATION PROGRAM

<u>TYPE</u>	<u>DESCRIPTION</u>	<u>LOCATION</u>	<u>PURPOSE</u>	<u>REMARKS</u>
a. Research Irradiators (4 total)	35,000 curie ⁶⁰ Co source; capacity of 75 lbs/hr at 1 megarad dose, underwater irradiation in closed containers	MIT, University of Florida University of Washington, University of California	Immediate research support at the research site	All in operation
b. Marine Products Development Irradiator (MPDI)	250,000 curie ⁶⁰ Co source; capacity 1000 lb/hr at 0.5 Mrad; 4 pass quadrant irradiator	USDI Laboratory Gloucester, Mass.	Semi-commercial seafood irradiation testing; cooperative industry programs	Operable in early 1965
c. Mobile Gamma Irradiator (MGI)	Truck-mounted, 60 ton unit; 100,000 curie ⁶⁰ Co; capacity 1000 lb/hr at 0.2 Mrad	West Coast (California initially)	Wide-scale demonstration of feasibility of fruit irradiation; economic determinations. Industry participation invited.	Operable in June 1966
d. Grain Products Irradiator	30,000 curie ⁶⁰ Co source; capacity 5000 lb/hr bulk grain or 2800 lb/hr packaged product at 25,000 rad dose	USDA Labs Savannah, Georgia	Bulk or packaged product disinfection. Industry participation invited.	Operable in June 1966
e. On-Ship Irradiator	30,000 curie ⁶⁰ Co source; transportable 17 ton unit, capacity at 150 lb/hr at 0.1 Mrad	USDI, Gloucester, Mass. USDA, Seattle, Wash. Louisiana	Placement on fishing vessels for immediate irradiation after catch.	Two units operable
f. Portable Irradiator	Under design. To be a ¹³⁷ Cs source of 150,000 curies; portable, trailer mounted unit of about 18 tons.	On-site at industry locations	Demonstration unit for use by interested food processors.	Completion scheduled for October 1966
g. Hawaii Development Irradiator	250,000 curie ⁶⁰ Co source; with capacity of 4,000 lb/hr at doses of 100,000 rad.	Honolulu, Hawaii	Semi-commercial irradiation of tropical fruits; economic determinations; test marketing in cooperation with industry.	Completion scheduled for January 1967

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Material 12
Food Irradiation

OFFICE OF THE CHAIRMAN

June 13, 1966

Dear Dr. Goddard:

This will confirm the invitation made through your secretary, Mrs. Sink, by my assistant, Julius H. Rubin, for you to meet with the Commission on June 30. We plan to have a luncheon meeting at 12:30 at our office located on the eleventh floor of the Matomic Building, 1717 "H" Street, N.W.

We are primarily interested in a general discussion of our Food Irradiation Program. A copy of a letter on this subject which I recently received from Congressman Price was sent to your office on June 9.

Please feel free to have one or two members of your staff accompany you to this meeting if you so desire.

Sincerely,

(Signed) Glenn T. Seaborg

Glenn T. Seaborg

Dr. James Goddard
Commissioner
Food and Drug Administration
330 Independence Avenue, S.W.
Washington, D. C. 20201

*Reg at hq. w/Steering
Group 9/10 5/24*

copy filed - O.M. 7. ... Radiation ... Devel.

6-13-66

Memo 12-7101

Immunization
Reference & Reproduction Branch

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OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

UNITED STATES GOVERNMENT

Memorandum

TO : File
FROM : *W. B. McCool*
W. B. McCool, Secretary

DATE: June 8, 1966

SUBJECT: CONGRESSMAN PRICE'S JUNE 2 LETTER RE FOOD IRRADIATION PROGRAM

SECY: JCH

1. At Information Meeting 592 on June 6, 1966, the Commissioners noted Congressman Price's June 2 letter and the Chairman requested information on the proposed luncheon with the Food and Drug Administration representatives. (See Secretary's May 31, 1966 memorandum to Mr. Fowler.) The Commission also requested preparation of an early reply to Congressman Price.

2. It is our understanding the Division of Isotopes Development is taking the required action.

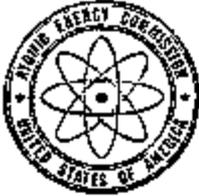
- cc:
- Commissioners
 - General Manager
 - Deputy General Manager
 - Assistant General Manager
 - Exec. Asst. to Gen. Mgr.
 - Asst. Gen. Mgr. for R&D
 - General Counsel
 - Dir., Isotopes Development
 - Dir., Biology & Medicine
 - Dir., Congr. Relations
 - Controller

*Copy filed:
O.M-6*



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6-8-66



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20543

*Nutritionals
Food Association*

JUN 7 1966

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

John A. Hall/tot

THROUGH GENERAL MANAGER

SUBJECT: U.S. OFFER TO HOST FAO/IAEA TRAINING SEMINAR ON FOOD
IRRADIATION TECHNOLOGY AND TECHNIQUES IN 1967 AT
MICHIGAN STATE UNIVERSITY

The Joint FAO/IAEA Division of Atomic Energy in Agriculture plans to sponsor in 1967 a Training Seminar on Food Irradiation Technology and Techniques, and has inquired whether or not we would be interested in sharing the costs and holding the Seminar in the United States. The Seminar would be designed to develop technologists proficient in handling various phases of food irradiation technology. Member States would be invited to nominate candidates for the Seminar, and from these the Agency would select the most promising 20 for participation in the course.

Following discussions with appropriate staff members of the Divisions of Biology and Medicine and Isotopes Development, it has been concluded that the proposed Seminar would satisfy a bona fide need for the indoctrination and training of personnel in the food irradiation field from a number of countries, and would be particularly valuable for persons from the less developed countries, where such opportunities are non-existent. Moreover, it could serve to foster a mature understanding of the prospects and limitations of food irradiation, which we believe would be highly desirable. Students trained at the Seminar could also serve as a nucleus for further training of a similar nature and facilitate the subsequent dissemination of technical information in the field in their respective countries.

6-7-66

The Department of Food Science of Michigan State University is interested in arranging for and conducting this Seminar for the IAEA, under the direction of Professor Walter Urbain. The Department of Food Science will have completed a new building by the fall of this year which would be available for the course, and among its facilities will be a 50,000 curie cobalt-60 source. Housing and meals for students can be arranged in University facilities, and similar arrangements can be made for lecturers in a campus-located University-operated lodging and eating facility.

The Seminar is projected for a period of five or six weeks, the exact period to be determined by further detailed planning. While no specific dates have been selected, Michigan State University is prepared to arrange for it to be held sometime between June 15 and August 31, 1967. It is proposed that lecturers for the Seminar be drawn from: (1) academic institutions, e.g., MSU, MIT and the University of California (Davis); (2) Government agencies, e.g., AEC (DEM and DID), USDA, NBS, and the U.S. Army Natick Laboratories; and (3) private industry, e.g., Swift and Co., Vitro Engineering Corp. and High Voltage Engineering Corp. Two field trips are proposed, one to the University of Michigan Phoenix Project and the other to two modern food processing plants, i.e., Gerber Products Co. and Kellogg Co. or General Foods Corp.

The total estimated budget for the Seminar is \$33,500, broken down as follows:

1. Staff and special lecturers	\$ 7,840
2. Cost for trainees' expenses, transportation, subsistence, and insurance	24,750
3. Equipment and books	560
4. Contingencies	350
TOTAL	<u>\$33,500</u>

The Joint FAO/IAEA Division of Atomic Energy in Agriculture has budgeted \$15,000 of its own funds for the Seminar and has requested that the U.S. contribute the balance of \$18,500. We anticipate that the U.S. share of the financing will be provided by the Department of State from funds expected to be made available for providing contributions-in-kind to the Agency (which include contributions for seminars and symposia held

in the U.S.). This would be subject, of course, to the appropriation of funds, as well as the U.S. pledge of voluntary contributions for the Agency's 1967 Operational Program which is expected to be made during the next General Conference.

The preliminary arrangements for this Seminar have been coordinated through an ad hoc working group with the Departments of State, Agriculture, Commerce, Army, and the U.S. Army Natick Laboratories, all of which concur in the desirability of extending an offer to the IAEA to have the course in the U.S. at Michigan State University. Also, since we must anticipate the possibility that trainees from Soviet-bloc countries may be nominated to attend the Seminar, as in all IAEA sponsored meetings, we have discussed the proposal with the Divisions of Security and Intelligence, who interpose no objections to our extending such an offer to the Agency. In this connection, we should point out that we shall have an opportunity to review the Agency's proposed nominees and alternates before final selections are made, and it will be made clear at that time that our acceptance of nominees does not constitute approval of the issuance of visas for them to enter the U.S., since the latter will be handled separately by the Department of State in accordance with their normal policy.

In light of the foregoing, we plan to extend an offer through the Department of State to the IAEA to have the Seminar at Michigan State University next year as discussed above, subject to the appropriation of funds and the U.S. pledge at the next General Conference.

Signed by
Abraham S. Friedman

Myron B. Kretzer, Director
Division of International Affairs

cc: GM (2)
Kull, Executive Asst. to GM
AGMIA
Secretariat (2)
OGC
Whitehair, DEM
Shea, DID
Reichardt, I
Palazzolo, S
Abrahams, DIA

June 7, 1966

ATOMIC ENERGY COMMISSION

INFORMATION ITEM

FOOD IRRADIATION PROGRAM

Note by the Secretary

The General Manager has requested that the attached memorandum of June 3, 1966 by the Director of Industrial Participation, with attachments, be circulated for the information of the Commission.

W. B. McCool

Secretary

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Isotopes Development	17



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

JUN 3 1966

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER BAMEY
COMMISSIONER TAPP

THROUGH THE GENERAL MANAGER

SUBJECT: FOOD IRRADIATION PROGRAM

At the Commission Meeting on Tuesday, May 24, 1966, in a discussion on the food irradiation program, the efforts that have been made to attract people to work in our Division of Isotopes Development were mentioned. During the discussion, specific mention was made that an effort had been made to obtain Dr. Walter H. Urbain.

I thought it might be helpful for you to have the attached speech and information on Dr. Urbain. This is a speech he gave on an American Nuclear Society Panel in Washington last fall. I was very much impressed by Dr. Urbain.

Ernest B. Tamm
Ernest B. Tamm, Director
Division of Industrial
Participation

Attachments:
Dr. Urbain's Speech
Brochure

MICHIGAN STATE UNIVERSITY EAST LANSING 48823

COLLEGE OF AGRICULTURE - DEPARTMENT OF FOOD SCIENCE

December 6, 1965

Mr. Ernest B. Tremmel, Director
Division of Industrial Participation
United States Atomic Energy Commission
Washington, D. C. 20545

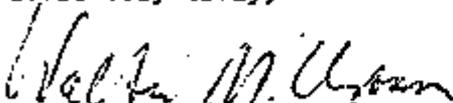
Dear Mr. Tremmel:

Thank you for your letter of November 30 regarding the Nuclear News Panel Discussion on the Future of the Nuclear Industry. I am very glad to have a copy of your 1965 report on the Nuclear Industry.

Enclosed you will find a copy of my presentation on food irradiation at the panel.

I would like to add that I was very happy that the occasion gave me an opportunity to meet you. As you may know, I have been working with the Division of Isotopes Development in connection with the commercialization of food irradiation. This activity takes me to Germantown about once a month. I usually meet with Gene Fowler, Kevin Shea, and George Dietz. Perhaps on one of these occasions we shall be able to spend a few minutes together.

Yours very truly,


Walter M. Urbain, Professor
Food Science

Enc.

COMMERCIALIZATION OF RADIATION PRESERVATION OF FOODS

Walter M. Urbain
Department of Food Science
Michigan State University, East Lansing

I. Current Status

1. Research Findings

Research on radiation preservation of foods started about 1945 and has been virtually continuous since that date. Since 1953 the principal effort in the U.S.A. has been carried out with government support. The current government program is being conducted by the Atomic Energy Commission and the Army. A summary of the research findings to date is as follows:

Ionizing radiation destroys spoilage microorganisms and thereby accomplishes or aids the preservation of foods. The amount of radiation needed to kill is different for different organisms. Non-spore forms generally require smaller amounts than do spores. Of the spore formers, the most radiation resistant is Clostridium botulinum. While there has been some controversy on the dose requirement to destroy this organism, the presently established figure for irradiation of non-acid low salt foods is 4.5 megarad. Since a lesser amount of radiation is needed to kill other organisms, treatment of a food with 4.5 megarad produces a sterile product. Non-spore forming organisms usually require less than a megarad.

Radiation in relatively small amounts (ca. 100,000 rad.) can be used to kill a percentage of the organisms present. Through this reduction in microbial population, the normal life of the product can be extended. Such products, however, do not have the indefinite life of sterile products. Sterilized products, if properly packaged so as to prevent recontamination, will keep indefinitely. Products such as meats containing natural enzymes require inactivation of enzymes in addition. Ionizing radiation can assist food preservation in other ways:

- a. Destruction of insects
- b. Destruction of parasites
- c. Inhibition of sprouting
- d. Destruction of a specific microorganism associated with a health problem (e.g., Salmonellae).

In addition, ionizing radiation can soften certain vegetables in a manner as to shorten the time for reconstitution when dehydrated.

Radiation can cause undesired effects in foods. Such effects vary with the food in question. They may be grouped as follows:

- a. Flavor changes. Many foods develop a characteristic "irradiated" flavor, generally considered undesirable.

- b. Color changes. Since any new color is abnormal, it is considered undesirable.
- c. Texture changes. Usually there is a softening or tenderization of the food. In some instances this may be undesirable.
- d. Functional properties. Some foods, such as flour or eggs, are ingredients in composite foods and as such perform specific functions which may be impaired by radiation.

Of these undesired changes, the most significant are the flavor changes. The magnitude of all these changes is dose-dependent. For some foods a light radiation treatment such as in pasteurization or sprout inhibition, may occasion no noticeable change. On the other hand, sterilizing doses tend to induce some change in practically all foods.

Control of irradiation conditions sometimes can reduce the undesired effects. In particular, the amount of "irradiated" flavor can be reduced by lowering the temperature during irradiation. Best results in meats have been obtained at liquid nitrogen temperatures.

Consumer acceptance of some foods has been tested, particularly that of sterilized products. The Army and others have found a number of irradiated foods to have adequate acceptance.

Extensive work has been done to determine if irradiation affects the wholesomeness of foods. This work is essentially

completed, and no evidence has been found to suggest any health hazard results from the consumption of irradiated foods. This finding is based on results obtained largely by using cobalt-60 gamma radiation. Other studies have tentatively set a limit of 10,000,000 electron volts for electron beams. Energies above this limit can lead to induced radioactivity. In order to be considered safe for use, radiation cannot induce measurable radioactivity in the food irradiated. A secondary phase of the proof of wholesomeness of irradiated foods involves demonstration that the dose used in the case of sterilized products does in fact produce products free of microbiological hazard, specifically that such foods under suitable storage conditions will not develop the toxin of Clostridium botulinum.

The recently discovered wide distribution of type B Clostridium botulinum bacteria in marine and other water locations may pose a microbiological problem for pasteurized sea food products. Since radiation at pasteurizing levels does not destroy the spores of this microorganism and since growth can occur at temperatures as low as 36° F., there is need to evaluate the effect of extended product life on the total microbiological picture. Recent findings in this area by workers at the Massachusetts Institute of Technology indicate that irradiated fish present no greater hazard from type B C. botulinum than do unirradiated fish.

The Food and Drug Administration has given approval for the irradiation of:

- a. Bacon (sterilization)
- b. Wheat and wheat products (insect disinfection)
- c. White potatoes (sprout inhibition)
- d. Certain packaging materials.

In addition, the U. S. Department of Agriculture, Meat Inspection Division, has approved the irradiation of bacon. Specific types and amounts of radiation are covered in the regulations governing these uses.

2. Facilities

At the present time there are a number of government-owned irradiation facilities in existence which have been built for experimental processing of foods. These are:

- a. U. S. Army Natick Laboratory irradiator
- b. Marine Products Development Irradiator
- c. Four research irradiators

A number of other government-owned research units are under construction. Other privately owned facilities are available for radiation research.

The research facilities available today or soon to become available through the present Atomic Energy Commission program, in some instances provide adequate capacities not only for research but for small scale production with low dose

requirements. No facility with adequate capacity and suitable characteristics exists for similar small scale production of sterilized foods.

As is known, there are several choices of radiation sources available, some isotopic and some machine. Considerable work has been done in determining the suitability of these various sources, and while there are apparent technical "pros and cons" with respect to each, at this time there is no clear cut determination of which kind of source is best. The most significant fact resulting from the work completed is that sources of adequate capacity can be obtained to permit food irradiation on a commercial scale.

II. Principal Problem Areas

1. Food Product

a. Flavor

The existence or importance of a problem with flavor depends on the product in question and the amount of radiation involved. To a large degree, but not entirely, serious flavor problems involve only sterilized foods. Here, too, there is considerable variation in the magnitude of the problem. While certain measures help to reduce the undesired flavor, they are subject to criticism because they are either insufficiently adequate or they are expensive. Consequently, there is need to find better

ways to solve the flavor problem. For example, in the case of sterilized foods, reduction of the dose requirements would cause less irradiation flavor development.

b. Color

This effect varies with the product and amount of radiation employed. Where a color change leads to an abnormal appearance, it is likely to be considered undesirable. There seems to be no solution available at this time.

c. Texture

Again we are dealing with a change which varies with the product and the amount of radiation employed. In most products this is not a large problem. In some, unless solved, it will prevent application of the process. In certain cases the resultant softening is a benefit.

d. Functional properties.

This is a problem limited only to certain products. It appears to be one of secondary significance.

e. Enzyme inactivation

The only known effective method for enzyme inactivation is heat. This results in cooked products, which in some cases, are less desirable. Meat having been heated for enzyme inactivity, for example, is apt to have a warmed over flavor. When, after having been sterilized by

radiation, it is again heated prior to consumption. There is urgent need for a better method for enzyme inactivation.

f. Nutritional losses

Irradiated foods like other processed foods suffer a loss of some of their initial nutritive quality. Such losses, if not too severe, are ordinarily accepted as unavoidable, and are considered to be tolerable in view of the advantage gained through the processing. Radiation can cause some destruction of certain vitamins, and there is some concern by at least one group that certain radiation-induced losses are not insignificant. If their view holds, then there is a problem in this area for certain foods.

2. Processing

Processing problems in a large measure relate to the lack of experience in operating the process under commercial conditions. Process reliability and efficiency are yet to be worked out. Costs are available only as estimates. In some applications costs could be a serious problem. In general where dose requirements are high, as in sterilized foods, capital costs to provide adequate capacity may be excessive in terms of usual commercial experience. Cost reduction is clearly an area for attention. Most helpful immediately would be estimates on which could be placed a high degree of confidence. The selection of the type of radiation source remains an open

area. To a large degree this selection will be determined by economic factors, presently not well defined. The direct use of electron beam generators in some applications will be governed by the allowable energy of the electron. The possible use of X-rays appears to include problems both technical and economic. Isotopes present problems of availability and cost.

It seems probable that as need develops, source problems will be resolved, but the existence of these problems may be a difficulty in the early phases of commercialization.

Other requirements for a processing facility seem sufficiently orthodox as to not be considered as major problems. One exception to this might be some problems associated with obtaining and maintaining liquid nitrogen temperatures during irradiation, should this be necessary. Problems here are both technical and economic.

3. Packaging

Products treated with less than a sterilizing dose probably have no packaging requirements different from conventional.

For sterilized products only rigid metal containers are suitable at present. Glass containers suffer from a radiation-induced color change. Flexible films do not meet performance requirements fully, but do show promise for the future.

Because of this, additional work on flexible package development is needed.

4. Legal

No commercialization can take place until the process is legally approved. The approval of the process by appropriate governmental regulatory agencies has been obtained for only a few products, as noted previously. Approval for additional foods is needed. This lack of approval is a major, if not principal, hold-up in the commercialization of irradiation. There is urgent need to speed up the schedule now being followed.

5. Marketing

The key question to commercialization is the suitability of irradiated foods. If the irradiated food is a new food in the sense that it is not now marketed in the manner which irradiation permits, then all the questions and problems associated with the marketing of any new food item apply for the irradiated product. In addition, there is an important unknown in the consumer reaction to the use of radiation in the processing of a food.

If the irradiated food is identical with the unirradiated product, except perhaps for a difference such as extended life, then the marketing problems are not those of a new product. The problem of consumer reaction to an irradiated food probably will exist if government regulations require labeling indicating that radiation has been used.

Whether the product is new or not, the economics of the process will be part of the marketing picture. Costs to the consumer must be in line with the value he receives.

The customary procedure to determine the salability of a product is to test market it. While many details can be varied, test marketing usually involves the production and sale of the product in question, usually in a limited market area. Variables such as unit size, product characteristics, packaging, selling price, etc., are studied. Results are carefully measured and analyzed to determine the best conditions for market acceptance. All this is done in the competitive situation normal to the test market.

Test marketing of appropriate irradiated foods is an important step in commercialization of the process yet to be carried out.

III. Outlook

1. Food product

Before research provided specific information, there was envisaged a very broad application of irradiation. Now it is recognized that not every food can be advantageously irradiated. For a particular food commercial application will be dependent upon a combination of technical factors and marketing value (except in a case in which radiation is used to solve a public health problem and in which technical factors may virtually govern the situation). Since there is

incomplete information with respect to both technical and marketing aspects, efforts to predict which foods will be processed commercially are on uncertain grounds. Possibilities appear to be:

a. Fruits

Bananas (delayed ripening and life extension)

Strawberries (life extension)

Mangoes (insect disinfection)

Papayas (insect disinfection)

b. Vegetables

Potatoes (sprout inhibition)

Dehydrated carrots, potatoes, onions, and cabbage (to facilitate rehydration)

c. Sea food

Fish

Haddock (life extension)

Codfish " "

Sole " "

Flounder " "

Pollock " "

Ocean perch " "

Halibut " "

Hake " "

Shrimp " "

Oysters (life extension)

Crab " "

Clams " "

d. Meats

Pork (sterilized-shelf stable)

Beef " "

Ham " "

Pork sausage " "

Chicken (sterilized-shelf stable)

(pasteurized-life extension)

e. Eggs

Frozen (Salmonella control)

f. Animal feeds

Animal protein meals (Salmonella control)

2. General

Continued research can be expected to solve many of the problems listed. Optimism can be held for the legal clearance for the process as applied to specific foods. Costs for at least the low dose applications can be expected to be within reach of what can be afforded. Sterilizing treatments seem to involve problems of cost, stemming largely from high capital costs. Based on quality considerations, consumer acceptance of certain irradiated foods, both sterilized and pasteurized, seems adequate. Commercial value appears likely

for certain products benefiting with life extension and may be based on spoilage reduction, extended marketing period or enlarged market area possibilities. Sterilized products, principally meats, offer improved quality and added convenience. Radiation sources are available but need further consideration as to cost and type.

In the overall, the status is such that when legal barriers are removed through suitable specific product clearances and with the availability of suitable facilities, the first step of commercialization, namely test marketing, can take place.

1. Although irradiation has no effect upon everyone's inhibitions, can it commercially be a substitute for refrigeration in a shipment and short-term storage of fresh meat?

Radiation can accomplish a reduction in the microbial population of fresh meat and thereby effect an extension of product life. This extension is largely dependent upon maintenance of normal handling conditions including refrigeration. To do without refrigeration would be impractical because:

- a. Unless the radiation treatment sterilizes the meat, spoilage organisms should grow out and any initial gain would soon be lost.
- b. Other changes not particularly related to microbial growth would occur which cause deterioration of the meat. These include discoloration of the lean, drip loss, which would be at least unsightly, and changes in fat due to relatively high temperatures.

Because of these effects the use of radiation for short-term preservation of fresh meat without refrigeration appears unlikely.

2. Are there any physical changes present in irradiation of white potatoes?

We must recognize that a potato is a living organism. When we irradiate it to inhibit sprouting, we may interfere with other biological processes of the living organism. It has been found that there is a minimum dose requirement to inhibit sprouting. It has also been found that too much radiation can destroy the mechanism for healing bruises. Fortunately, it has been possible to select a level of radiation which accomplishes the sprout inhibition but does not impair the healing function. Unless such care is exercised, irradiation of potatoes actually can damage the potato and shorten its storage life. It has been found that not all varieties of potatoes respond in the same way. By paying attention to such critical factors, it is possible to irradiate potatoes and to obtain only the desired effect of sprout inhibition.

3. What are possibilities of utilizing or modifying present facilities at National Reactor Testing Station in potato processing? (Since NRTS is located in heart of potato-producing region.)

The National Reactor Testing Station facility used some years ago involved spent fuel rods. These were sources of both gamma radiation and neutrons. Since neutrons are capable of inducing radioactivity in a food, their use is now prohibited. It seems unlikely, therefore, that this facility will be of value in potato processing.

4. Are there technical or economical reasons now known for preferring cobalt irradiations to accelerator produced irradiation for meat sterilization?

In most food applications the requirement exists for the radiation to penetrate appreciable depth of a food. Gamma radiation, such as is obtained with cobalt-60 sources, provides good penetration and on this basis is quite well suited for food applications. The penetration of electron beams depends upon the energy of the electrons. Approximately one inch of unit density material can be penetrated by five million volt electrons. Presently there is a limitation on the allowable energy of an electron beam of ten million volts. This limit is set by the recognition that higher energies may induce radioactivity. The precise cut-off point is not known at this time, but it is agreed that ten million electron volt electrons are safe. With irradiation from two sides, one can obtain penetration of four inches with ten million electron volt electrons. For some applications this may not be sufficient. And under these circumstances x-rays or gamma-rays would be required.

It is generally considered that electron beams are the cheapest form of ionizing radiation, and where technical factors allow their use they probably would be the first choice. As is known, electron beams can be converted to x-rays by impinging the electrons on a metal target. This conversion is not very efficient and its efficiency is dependent upon the energy of the electrons. Here too there is an accepted upper limit for energy, namely five million electron volts. Some claims have been made for x-rays generated in this fashion having lower costs than gamma-rays from isotopic sources such as cobalt-60. Further information is needed in the entire area of costs.

5. To what extent is the correlation between temperature at which meat is irradiated and flavor (or customer acceptance) known?

The lower the temperature, the less irradiated flavor is developed. For some meats such as beef it is necessary to go to very low temperatures to observe this effect. Best results with beef have been obtained at liquid nitrogen temperatures.

6. What are the three foods approved for irradiation?

The three foods approved by the Federal Food and Drug Administration for irradiation are bacon, wheat and wheat products, and potatoes. The approvals for these products specify particular conditions as to type of radiation, dosage, etc.

Water - Gas Irradiation

G. L. Dunham, Director
Division of Biology and Medicine

JUN 6 1966

E. E. Fowler, Director
Division of Isotope Development

**RECOMMENDED MEETING WITH FDA RE EXPEDITING
FOOD IRRADIATION PERMITTING**

The Advisory Committee on Isotopes and Radiation Development met last on March 3-4, 1966, and submitted its formal report to the Commission on April 1, 1966. A number of recommendations in this report relate to the AEC radiation preservation of foods program.

On May 24, 1966, the Commission met with the Steering Group of the Advisory Committee to discuss the specific recommendations of its report. Prior to this meeting, the Commission was provided a status report by staff on action taken or planned on the Committee's recommendations. A copy of this report is attached. Your attention is directed to paragraph B. 2., on pages 4-5. As the attached memorandum from the Secretary states, the Commission has recommended an early luncheon meeting between representatives of the Commission and of the FDA to review the AEC food program with specific reference to progress and problems in obtaining clearances. Reference is also made to the question of adequate staffing for the food program.

In light of the above, I have suggested to Spoff English that we meet soon for a preliminary discussion of the above recommendation. I will check with your and Spoff's offices about a time for the meeting.

Attachment:

Status Report on AICRD Recommendations 5/17/66
Cy Memo McCool to Fowler, 5/31/66

cc: S. G. English, AICRD
W. B. McCool, Secretary ✓

DISTRIBUTION
DIV. OF ISOTOPES DEVELOPMENT
U.S. ATOMIC ENERGY COMMISSION

JUN 5 1966

PM
4:56

DID:R&EAB

DID:D

JLBLOM:mkw

EEFowler

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6-5-66

CHEV BELFIELD, CALIF.
CHAIRMAN
MELVIN PRICE, ILL.
WAYNE M. ARNONE, CALIF.
THOMAS G. MOHR, N. MEX.
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WILLIAM M. MCCALLUM, OHIO
JOHN Y. CONWAY, EXECUTIVE DIRECTOR

Materials *Food* *Irradiation*
Congress of the United States
JOINT COMMITTEE ON ATOMIC ENERGY

JOHN G. PASTORE, R.I.
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CARL V. CORTIS, MISS.

June 2, 1966

Honorable Glenn T. Seaborg
Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

BT 6/4/66

Dear Dr. Seaborg:

As you know, the Atomic Energy Commission's research and development program is exceedingly broad in scope and includes a wide range of projects extending from those vital to the common defense and security of this country, to those which might be described as incidental benefits deriving from peaceful uses of atomic energy. With such a broad program involving many scientific disciplines, it is understandably difficult for the Commissioners to find the time to give detailed attention to what might be described as major development projects; let alone time for close study and management of the smaller programs.

I am writing because of a continuing interest that I have had in the AEC's Food Irradiation Program, a program which is small in terms of funds and scientific manpower in relation to many other Commission efforts. I believe, however, that this program has far-reaching significance in terms of the benefits which it holds out for mankind. We are living in a time when world food supplies are inadequate to meet the demands of the present population. Predictions for the future envision even a more dismal picture than the present one. A large fraction of the world's food supplies is continuously being lost through bacterial spoilage as the result of improper or inadequate refrigeration. In addition, large quantities of vital grain products are ruined by insect infestation.

Radiation processing of food has demonstrated its capability to sterilize, pasteurize, and disinfect food products effectively. A great deal of scientific data concerning this program have been

6-2-66

gathered, and for the most part they are favorable. As an example of a feasible application of radiation processing to a food product, it has been demonstrated that radiation treatment of poultry and poultry products is an effective means of preventing the spread of salmonella infection. The significance of preventing the spread of this infection was highlighted by President Johnson in the January 1966 Economic Report of the President as follows:

"Foodborne diseases are being increasingly recognized as a leading cause of acute sickness in this country and probably account for more illness than all other environmental elements combined. Salmonellosis--the most serious such disease--now is much more widespread than it was 15 years ago because of inadequate controls in new methods of food production and processing."

As you know, to date, the Food and Drug Administration has approved for general consumption only irradiated bacon, grain products, and potatoes. Other petitions for irradiated foods have been before the FDA for some time, and an increasing number are in preparation for submission in the near future.

As I have already indicated I have taken a personal interest in the Food Irradiation Program throughout the years, and a similar concern has been displayed by other members of the Joint Committee. I am disappointed that I have not seen evidence of an equally strong interest in this program on the part of the Commission. In my opinion, if you as Chairman of the AEC, were to display such an interest this would have a salutary impact, particularly with respect to encouraging the prompt, as well as thorough, review of petitions submitted for radiation processed foods.

I was very pleased -- and I am sure that you were too -- to see the invigorating effect on the Food Irradiation Program that resulted from the Food and Drug Administration's approval, in the spring of 1963, of irradiated bacon for consumption by the general public. I am growing concerned that we may have lost the momentum which resulted from this approval, and the subsequent favorable action

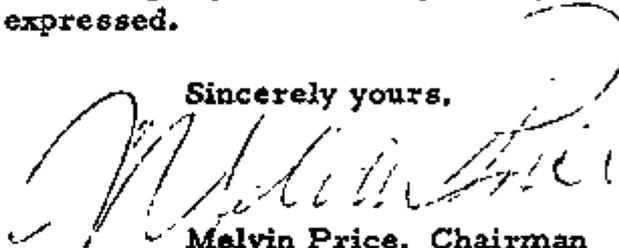
Honorable Glenn T. Seaborg

3

on grain products and potatoes. Accordingly, I urge that you devote special attention to the needs of this program in order to help assure that the pace of progress, as measured by FDA clearance of specific petitions, be commensurate with the rate of accumulation of scientific data in this new and promising field.

I would appreciate receiving any comments you may have on the views which I have expressed.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Melvin Price". The signature is written in dark ink and is positioned above the typed name.

Melvin Price, Chairman
Subcommittee on Research,
Development and Radiation

Industrial Participation
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OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

UNITED STATES GOVERNMENT

Memorandum

Reference & Reproduction Branch

Copy - Germantown

TO : E. Eugene Fowler, Director
Division of Isotopes Development

DATE: May 11, 1966

FROM : W. B. McCool, Secretary *Original signed W. B. McCool*

SUBJECT: DISCUSSIONS WITH AIF ON RADIATION APPLICATION DEMONSTRATION PROGRAM

SECY:GF

1. At the Meeting with Members of the Atomic Industrial Forum on May 5, 1966, it was noted that a request for proposals would be distributed within several months for industrial participation in the construction of a meat sterilization facility under joint contract with the AEC and DOD.

2. The General Manager has directed you to take the required action.

cc:

Commissioners
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for R&D
Asst. Gen. Mgr. for Operations
Director, Construction
Director, Contracts
Director, Industrial Participation
General Counsel

*copy filed.
CIM-7. AIF*



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5-11-66

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Materials-12
Food Production
Reference & Reproduction Branch

UNITED STATES GOVERNMENT

Copy - Germantown

Memorandum

TO : File

DATE: May 6, 1966

SIGNED

FROM : W. B. McCool, Secretary
W. L. Woodard

SUBJECT: AEC 1201/11 - STATUS REPORT ON FOOD PASTEURIZATION PROGRAM STUDY

SECY:JCH

1. At Information Meeting 582 on May 5, 1966, the Commissioners requested a re-ordering of the alternatives listed on pages 3 and 4 of AEC 1201/11.

2. It is our understanding the Division of Operations Analysis and Forecasting is taking the required action.

cc:

- Commissioners
- General Manager
- Deputy General Manager
- Exec. Asst. to Gen. Mgr.
- Asst. Gen. Mgr. for Admin.
- Asst. Gen. Mgr. for Plans & Prod.
- Asst. Gen. Mgr. for R&D
- Asst. to Gen. Mgr.
- General Counsel
- Dir., Ind. Participation
- Dir., Inspection
- Dir., Isotopes Dev.
- Dir., Operations Analysis & Forecasting
- Controller

Copied:
15 AF-2
168

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5-6-66

DATE: 5-4-66

[REDACTED]

INDEX: MATERIALS 12- Food Irradiation

TO:

FROM:

SUMMARY: AEC 1201/11. STATUS REPORT ON FOOD PASTEURIZATION PROGRAM STUDY.
Status report on study for BoB on "Food pasteurization Program".

FILED: BAF 2- 1968

INDEXER:

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: SP R.A.P.M. 6-30-99 DOB/NACD

THIS PAGE ONLY

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

5-4-66



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

*Step 7
Materials 12
Food Products*

FEB 25 1966

Dear Dr. Bergmann:

I am sure you know by now that we have reached agreement with representatives of your Embassy on a contract for cooperation in the food irradiation project we discussed last September in Israel and we expect to sign the contract as soon as approval is received from Israel for an Embassy representative to sign on behalf of your country.

I am most happy that we shall have this opportunity to share our efforts on a project which can make an important contribution to the advancement of food preservation technology. You may be assured that this work will have my continuing interest and support.

I look forward with anticipation to reviewing the reports which your scientists will prepare on the results of the experiment and trust that we shall be able to continue to expand our cooperative activities.

Sincerely yours,

J. E. Ramey

James E. Ramey
Commissioner

cc: Chairman (2)
Commissioner Palfrey
Commissioner Ramey
Commissioner Tapp
General Manager
AGNIA
Secretariat (2)
CFC
HED
H. Biles, Paris Office

Dr. Ernst D. Bergmann, Chairman
Israeli Atomic Energy Commission
P. O. Box 7057, Hakiryat
Tel Aviv, Israel

7750

Office IA-2 Israel

7-25-66

*Materials ID
JAN 25 1966
Food Irradiation*

JAN 25 1966

Dear Mr. Ullman:

Thank you for your letter of January 6, 1966, regarding your interest in Oregon State University as a possible site for the proposed Pilot Plant Meat Irradiator.

The Atomic Energy Commission has been asked by the Department of the Army to give financial and technical assistance in the construction of the irradiator as a step toward establishing a commercial capability for supplying the Army and other Armed Services with radiation-sterilized meats. The process for preserving meats with radiation is under development at the Army Natick Laboratories in Natick, Massachusetts.

The approach being taken is to contact the food processing industry of the United States in depth to determine the extent to which individual companies or groups of companies might be willing to participate financially in the construction and operation of the pilot plant; there is no intention at this time to construct the pilot plant solely with Government funds. Consequently, no consideration is being given to universities as potential sites for the plant, unless a commercial organization investing private funds should determine that a university site would offer significant advantages over more conventional industrial sites. To our knowledge, this has not been the case, since such factors as proximity to meat packing plants, refrigerated warehouses, and transportation centers must be considered.

The technical staff of the Atomic Energy Commission is well acquainted with the pioneering work of Dr. H. W. Schultz, and he is looked upon as one of the experts in the field of radiation preservation of foods. We understand that he is now performing contract research of this nature for the Army Natick Laboratories.

OFFICE ▶						
SERNAME ▶						
DATE ▶						

1-25-66

Honorable Al Ullman

-2-

If you would like any further information on this subject, we will be glad to furnish it.

Cordially,

John T. Seaberg]

Chairman

Honorable Al Ullman
House of Representatives

OFFICE ▶						
SURNAME ▶						
DATE ▶						



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

*Chapman
Nathaniel
Food Irradiation*

JAN 24 1966

Mr. John T. Conway
Executive Director
Joint Committee on Atomic Energy
Congress of the United States

Dear Mr. Conway:

Reference is made to your letter of January 3, 1966, concerning news reports relating to Dr. F. C. Steward's article entitled "Direct and Indirect Effects of Radiation on Plant Cells: Their Relation to Growth and Growth Induction," which appeared in the November 27, 1965, issue of Nature.

The Atomic Energy Commission is cognizant of this work and previous literature in similar and related areas, and has supported research studies in such areas for the past several years. The results reported by Holsten, Sugii and Steward demonstrate a marked inhibitory effect on cell division of carrot cells grown on irradiated media or media supplemented with irradiated sugar solutions when high radiation doses are used (0.5 - 4.0 megarads). At lower doses (0.02 - 0.5 megarads) there appears to be a stimulatory effect on cell division. In addition to these results, the paper reported, although no quantitative data were presented, that chromosome aberrations are produced in both meiotic and mitotic cells of plants raised on media supplemented with irradiated sucrose, and that gene mutations, produced in *Drosophila* raised on media containing irradiated sucrose, were increased. The evidence for the increase in mutations can be considered to be suggestive of an effect, but more information would be necessary before definite conclusions could be made as to whether the effect was real. Evidence of a similar nature has been reported previously by others on each of these biological effects, and although the subject article adds to the body of similar existing information, it does not effect in any significant way our current understanding of the phenomena.

It is our belief that any compounds produced when carbohydrates are irradiated should be considered in the light of two possible long-term biological effects; one possible effect is that such products might be carcinogenic, while the second possibility is that such compounds could be mutagenic. The vast amount of toxicity evaluation work conducted under the U. S. Army Surgeon General's Office auspices on 21 major classes of radiation sterilized foods has provided convincing evidence

*Info 7/16/66
1/24/66
Food Irradiation*

1-24-66

that no carcinogenic effects are present in animals fed high level radiation sterilized food over four generations. Currently, additional toxicity studies are being conducted under AEC auspices using protocols approved by the Food and Drug Administration. The possibility of genetic change resulting from ingestion of irradiated carbohydrates, however, must still be considered.

In this connection, the findings to date on tissue or cell culture systems demonstrate that these compounds can be toxic to these systems and can induce chromosome aberrations in them. Reports as to the mutagenicity of products from irradiated food which contains sucrose as measured in *Neurospora* have been published. At the present time, this evidence is controversial. There is evidence reported from work supported by the Atomic Energy Commission that there is a mutagenic effect in *Drosophila* but, on the other hand, there are other published reports which indicate that there is no such effect.

Regardless of the question of the mutagenic effects of these compounds in *Drosophila*, it is our considered judgment that the present evidence cannot be construed to mean that compounds produced by irradiation of carbohydrates would necessarily behave in a mutagenic manner when fed to mammals or man. Our reasons for this belief are as follows: (1) The availability to mammalian germ cells of possibly mutagenic substances produced in irradiated foods and ingested in the diet of mammals would be greatly reduced relative to the concentration available to microorganisms and cells in culture or to germ cells of *Drosophila* larvae. (2) Such compounds may be rendered ineffective from a mutagenic standpoint by the enzymatic degradation processes to which they would be subjected prior to leaving the gastro-intestinal tract or to the detoxification processes normally present in mammalian systems. (3) It is known that heat treatment of sugars, as might be used in food processing, produces many of the same substances that irradiation yields. Nevertheless, work supported by AEC is now in progress to investigate further the mutational and genetic consequences of irradiated sugars. Experimentation along these lines using mammalian systems will begin shortly at Oak Ridge.

None reports which have implied that these findings indicate a potential health hazard to mammals and man are indeed unfortunate. While the referenced article has been found to be of scientific interest, we see nothing in the findings which would suggest a need to modify the current Food Irradiation Program.

cc: Chairman (2) ✓
 Congressional (2)
 ACMRD
 BMB
 BNA

GM
 DGM
 DID
 DFI

Sincerely yours,
 (Signed) Dwight A. Ink
 Assistant
 General Manager

BMB:JSKirby-Smith/Ink/tf 1/24/66

*Material 12
JAN 17 1966
Food Irradiation*

JAN 17 1966

Mr. John T. Conway
Executive Director
Joint Committee on Atomic Energy
Congress of the United States

Dear Mr. Conway:

This is to inform you that the Commission is entering into a research contract with the Austrian Study Company for Atomic Energy under which the Commission will supply 50,000 curies of Cobalt-60 for use in a study of the irradiation preservation of fruits and fruit juices. The Study Company will, in turn, provide the Commission with all information developed in the project which is being carried out at the Austrian Nuclear Research Center, Seibersdorf, Austria.

The Cobalt-60, which the Commission is supplying to the Study Company without cost, has been employed for several years in other AEC work and requires re-encapsulation before it can be used further. The re-encapsulation cost, estimated at approximately \$18,000, and the cost of shipping the material to the Seibersdorf Laboratory will be borne by the Study Company. The Commission is also planning to assign a technical representative to the project. The Commission anticipates that the results of the information obtained from the project will be of substantial and direct interest to AEC's program on the preservation of food by irradiation.

We would be pleased to answer any questions you may have.

cc: AGMIA
GM
Secretariat (2)
OGC
OCR (2)
OCM
European Br., DIA
M. Kratzer, DIA
DIA JCAE File

Sincerely yours,

Original signed by
John A. Hall

John A. Hall
Assistant General Manager
for International Activities

CONCUR:
OGC

OFFICE ▶	DIA:HIR	AGMIA	OCR			
SURNAME ▶	MKratzer:8w	JHall				
DATE ▶	1/10/66					

1-17-66

Materials - → Head Area
Food Area



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

~~TOP SECRET~~

January 8, 1966

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

THROUGH GENERAL MANAGER

for SUBJECT: PENDING CONTRACTUAL MATTERS (REPORT NO. 132): COST-BENEFIT ANALYSIS OF THE AEC'S RADIATION PRESERVATION OF FOOD PROGRAM; STATUS OF THE WOOD-PLASTIC DEMONSTRATION PROJECT; AND STATUS OF THE DEMONSTRATION MEAT IRRADIATOR.

In his two memorandums to me of December 23, 1965, summarizing Information Meeting 545 on December 22, 1965, Mr. McCool requested that the Commission be provided with a current estimate of costs for conducting a cost-benefit analysis of the food irradiation program, and status reports on the Wood-Plastic Demonstration Project and cooperative Demonstration Meat Irradiator.

Our initial estimated cost of proposed work for the cost-benefit study was \$150,000. At the Commission's suggestion, the scope of work was limited to consideration of three product categories rather than eight, and our cost estimate was revised accordingly to approximately \$100,000.

Following acknowledgement of my memorandum of November 24, 1965 to the Commission, relating the reduced scope and cost estimates, requests for proposals were solicited on December 13, 1965 following appropriate selection board procedures. Bids received by December 30, 1965 range as follows:

aEC 719/42

99-61-1-1966

\$ 87,500
90,570
98,100
137,075
143,300
148,000

The present scope is less extensive than that requested by the BOB, which initially recommended that six to ten product categories be studied. Our impression is that the reduction in scope of the study will be acceptable to the BOB since it results in a lower expenditure of funds, although it is realized that a less comprehensive evaluation will be obtained.

Irrespective of the number of food categories included, certain basic procedures remain to be developed and objectives evaluated in the study. These include:

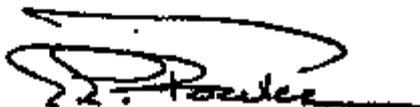
- a. Evaluating present and projected commercial marketing patterns and trends of consumption for fresh marine products and fruits.
- b. Evaluating the impact which radiation processed foods may be expected to have on marketing and distribution practices and consumer demand.
- c. Examining projected costs of R & D for both government and private industry in bringing food irradiation to the point of commercialization.
- d. Determining probable irradiation processing costs.
- e. Estimating the effect of an AEC phaseout prior to commercialization on private industry efforts and on related programs such as the Department of Army's radiation sterilization of food program, and food irradiation programs in other countries.
- f. Determining industry plans for commercializing food irradiation and evaluating consumer acceptance of radiation processed foods.

Our current estimate of three man-years of effort (or \$100,000) to complete this study has not changed significantly. The responses of bidders verify this cost estimate.

It is believed that a further reduction in scope would result in a dilution of effort and the performance of a superficial study which would fall short of completing the study objectives. In light of a prime purpose of the cost-benefit analysis -- namely to affirm to the BOB that further support of the food irradiation program is warranted -- I recommend that our current proposed expenditure of approximately \$100,000 be allowed. During the course of negotiation of the contract, positive efforts will be made to reduce the cost of the work to the lowest possible level consistent with the conduct of a meaningful study.

Regarding wood plastic combinations, we have forwarded to the General Manager for transmittal to the Commission a staff paper entitled, "Cooperative AEC - Industry Isotopes and Radiation Development Program." This paper includes a discussion of the status of the wood plastics project and recommends that AEC solicit expressions from industry concerning private plans for construction of facilities for production of these materials and the need for AEC assistance in this regard. Upon receipt and evaluation of these expressions, an appropriate course of action would be recommended to the Commission.

With respect to the commercial demonstration meat irradiator, an industry meeting was held on September 24, 1965, which was sponsored by the Department of Commerce with participation by the Department of Defense and the Atomic Energy Commission. The purpose of the meeting was to solicit the meat industry's interest in a cooperative arrangement for the construction and operation of such a facility. As a consequence of the meeting, 39 organizations expressed interest. A task force, with representation from the three aforementioned agencies, will visit these organizations over the next 60-90 days. Subsequently, the task force will make recommendations concerning a formal solicitation of proposals from industry.



E. E. Fowler, Director
Division of Isotopes Development

Memo to Food Irradiation
~~OFFICIAL USE ONLY~~

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

UNITED STATES GOVERNMENT

Memorandum

Copy - Germantown

Reference & Reproduction Branch

TO :

File

DATE: January 14, 1966

FROM :

W. B. McCool, *WBM*
Secretary

SUBJECT:

BRIEFING ON FOOD IRRADIATION

SECY:ICB

1. On January 4, 1966, in Room A-410, Germantown, Maryland, at 4:25 p.m., staff of the Division of Biology & Medicine briefed the Commission on the experiments on food irradiation, the results of which are relevant to the article by Dr. Steward in Nature magazine. The article had been discussed at Information Meeting 546 on December 29. (See also the General Manager's December 29 memorandum).

2. Attached is a summary of Biology & Medicine's comments at the January 4 briefing. Following these comments, the Commission noted staff would prepare an appropriate response to the Joint Committee's inquiry on the Nature article. We have been informed this response has been prepared and is currently in review.

3. A complete attendance list at the briefing is also attached.

Attachments:

As noted above

cc:

Commissioners
General Manager

*Copy filed
0-11-6
Luppo*



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1-14-66

UNITED STATES GOVERNMENT

Memorandum

TO : Irvin C. Bupp, Jr.
Office of the Secretary

FROM : *Charles W. Edington*
Charles W. Edington, Assistant Chief, Biology Branch
Division of Biology and Medicine

DATE: January 10, 1966

SUBJECT: SUMMARY OF COMMENTS MADE AT COMMISSIONER'S MEETING ON JANUARY 4, 1966

BMB:CWE

It is our belief that any compound produced in irradiated carbohydrates should be considered in light of two possible long term biological effects; one possible effect is that such products might be carcinogenic, while the second possibility is that such compounds could be mutagenic. The vast amount of toxicity evaluation work conducted under the U. S. Army SGO auspices on 21 major classes of radiation sterilized foods has provided convincing evidence that no carcinogenic effects in animals fed high level radiation sterilized food over four generations are present. The possibility of genetic damage, however, must be considered. The findings to date on tissue or cell culture systems demonstrate unequivocally that these compounds are toxic and do induce chromosome aberrations. Reports as to the mutagenicity of products from irradiated food which contain sucrose as measured in *Drosophila* have been published. At the present time, this evidence is controversial. There is excellent evidence reported that there is a mutagenic effect, but on the other hand, there are published reports which indicate that there is no such effect.

It is our considered judgement that the present evidence cannot be construed to mean that breakdown products of irradiated carbohydrates would behave in a carcinogenic or mutagenic manner when fed to mammals or man. It is our opinion that such compounds may be rendered ineffective from a carcinogenic or mutagenic standpoint by the enzymatic degradation processes to which they would be subjected prior to leaving the gastro-intestinal tract or to the detoxification processes in the liver. Investigations are in progress or will be initiated to better understand the effects of these products of radiolysis of carbohydrates.



ATTENDANCE
BRIEFING ON FOOD IRRADIATION

Commissioners

Glenn T. Seaborg, Chairman
James T. Ramey
John G. Palfrey
Gerald F. Tape

General Manager

R. E. Hollingsworth

Secretary

W. B. McCool

Staff

William C. Bartels
Edward J. Bloch
Irvin C. Bupp
James W. Gulpepper
Enzi DeRenzia
Charles L. Dumban
Charles W. Edington
Spofford G. English
E. Eugene Fowler
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F. T. Hobbs
John C. Hoyle
Dwight A. Ink
Antionette Joseph
George M. Kavanagh

Norman P. Klug
Hugh Leenhouts
Egnauld Muller
Robert O'Neill
John Reich
Robert W. Ritzmann
Julius H. Rubin
Kelvin G. Shea
James F. Smith
Franklin Tobey
John R. Totter
Ernest B. Trammel
Capt. Leo A. Whitehair
William L. Woodard
James R. Yore

Materials & Irradiation 10

Congress of the United States
House of Representatives
Washington, D.C. 20515
January 6, 1966

Mr. Glenn T. Seaborg, Chairman
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Chairman:

I have read with considerable interest the proceedings of Industry-Government Conference on Pilot Plan Meat Irradiator which was held on September 24, 1965. If a workable means to preserve meat by radiation could be developed within a range of economic feasibility it would no doubt represent a revolutionary step forward in the meat processing industry.

Oregon State University has pioneered research on the use of radiation as a preservative for meat under the direction of Dr. H. W. Schultz of the Food Science and Technology Department. In my opinion this outstanding institution and staff through its prior work in this area should be given serious consideration as a possible site for the location of the pilot plant which is to be financed by the Commission. I would appreciate receiving from you at the earliest possible date the criteria which will govern the site selection as well as detailed instructions regarding procedures to be followed by officials from institutions who may wish to apply for participation in the research project.

Sincerely,

Al Ullman
Al Ullman, M. C.

AU:lg

eg filed 0-7-66

1-6-66

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*Materials 12 -
Food Irradiation*

OPTIONAL FORM NO. 10
MAY 1962 EDITION
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UNITED STATES GOVERNMENT

Memorandum

TO : R. E. Hollingsworth, General Manager

DATE: January 4, 1966
Approved: *R. E. Hollingsworth*

FROM : W. B. McCool, Secretary *W. B. McCool*

Date: R. E. H.
1/5/66

SUBJECT: CHECKLIST OF BRIEFING ON FOOD IRRADIATION, TUESDAY, JANUARY 4, 1966, 4:25 P.M., ROOM A-410, GERMANTOWN, MARYLAND

SECY: ICB

The Commission noted staff would prepare an appropriate response to the Joint Committee's inquiry. (BGM)

cc:
Commissioners

*copy files:
Com-6 - Dringler*



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1-4-66

Materials 12 Food Irradiation
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MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-107

UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: January 4, 1966

FROM : W. B. McCool, Secretary *WBM*

SUBJECT: AEC 719/45 - PROPOSED PARTICIPATION IN INTERNATIONAL FOOD IRRADIATION PROGRAM

SECY: JCH

1. At Information Meeting 546 on December 29, 1965, the Commissioners approved the General Manager's recommendation to authorize negotiation and execution of a research contract with the Austrian SGAE, as described in Mr. Kratzer's December 21 memorandum, for AEC participation in the International Food Irradiation Project at Seibersdorf, Austria.

2. It is our understanding the Division of International Affairs is taking the required action.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for IA
Asst. Gen. Mgr. for Research & Dev.
General Counsel
Director, Biology & Medicine
Director, Isotopes Development
Director, Congr. Relations
Director, IA
Controller



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DATE:

INDEX: Materials 12 Food Irradiation

O&M 6 Briefings

TO:

FROM:

SUMMARY: AEC 688/18 - REPORT OF TELECON WITH DR. F.C. STEWARD RE
FOOD IRRADIATION

FILED: I&P 6

INDEXER: date of paper: 1-4-65

REMARKS:

CONFIRMED TO BE UNCLASSIFIED

DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: SP 6.1 P.M. 4:30-99 D05NN-323

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U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

104-60

*Matter 12. Food
Mutations*

~~12-29-65~~
G7

December 29, 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: CORNELL UNIVERSITY ARTICLE ON FOOD IRRADIATION

Dr. F. C. Steward and associates at Cornell University have observed that irradiation of sucrose-containing solutions and media results in the formation of chemical compounds which cause cultures of plant cells to exhibit abnormal mitotic figures upon cell division, an effect commonly associated with damage to the genetic apparatus of cells. This observation has been extrapolated so as to question whether certain irradiated food products rich in carbohydrates might induce similar responses in the tissues of persons consuming those radiation-preserved foods. These products of the radiolysis of sugars, probably sucrose, have not yet been identified.

On the other hand, carefully controlled feeding tests in several species of animals have failed to show evidence of harm although the animals received high levels of the irradiated materials in their diets, (up to 35% of dry solids), for up to four successive generations. These and related data in the judgment of the Food and Drug Administration and expert committees of food technologists, both in the United States and abroad, have had sufficient merit to warrant release of the tested foods for public consumption (bacon, wheat, wheat products, and potatoes).

It is not clear whether the conclusions from Dr. Steward's experiments on cell cultures of plants and on fruit flies have a relation to the situation where irradiated foods are fed to mammals and man.

This general question of toxicity induced in culture media (the basic food material for bacteria, cell cultures and for fruit fly larvae) has been under investigation for more than ten years; Dr. Steward's observations, first reported in August 1965, have therefore simply served to highlight the question in the press.

The authoritative judgments on all such matters reside with the Food and Drug Administration, in that it sets the conditions for acceptability of new food products and determines when those conditions have been met.

12-29-65
JF

On the other hand, the Atomic Energy Commission and the Office of the Surgeon General of the Army accept responsibility for carrying out thorough investigations which will insure that the irradiated foods being developed are not harmful to the consumer. All investigations of acceptability including protocols for the feeding studies, have been closely coordinated with the Food and Drug Administration and will continue so.

Attached is a statement which the Division of Public Information is using in response to news media inquiries.

WJ General Manager

Attachment
Responses to Press Inquiries

CC: GM
DGM ✓
AGM
EAGM
AGIRD
BSM
DPI
DID

RESPONSES TO PRESS INQUIRIES

We are aware of the work at Cornell in which researchers studied the growth of carrot cells in irradiated coconut milk, and also experimented with fruit flies. The AEC has conducted related and pertinent research in these same areas for more than 10 years. The Cornell studies are limited to effects on plant cells and fruit flies, and the findings to date should not be extrapolated to mammals and man.

The AEC and the Department of Defense have conducted extensive studies on irradiated foods for about 15 years. Research has included the feeding of animals on irradiated foods over several generations, with no observed ill effects. We recognize the usefulness of continuing research on possible effects on individual cells, and are continuing to support such research.

The Food and Drug Administration has cleared for human consumption three foods -- bacon, potatoes, and wheat and wheat products. As noted above, this clearance was granted only after exhaustive animal feeding tests over several generations. (If asked, the following may be used: Although FDA clearance has been granted, no irradiated foods now are being sold in the United States. We understand the military services are conducting some test feeding programs.)

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*Materials - 12
Food Irradiation*

UNITED STATES GOVERNMENT

Memorandum

Reference & Reproduction Branch

TO : **File:** Original signed
W. B. McCool

FROM : **W. B. McCool, Secretary**

SUBJECT: **PENDING CONTRACTUAL MATTERS REPORT NO. 132**
SECY: ICB

DATE: **December 23, 1965**

1. At Information Meeting 545 on December 22, 1965, the Commissioners considered Pending Contractual Matters Report No. 132 and had no objection.

2. Commissioner Ramey requested a report on the proposed contract with RCA for development of a 600° centrifuge heat pipe and a proposed contract for a cost benefit analysis of the food program.

3. It is our understanding the Divisions of Isotopes Development and Space Nuclear Systems are taking the required action.

- cc:
- Chairman
- Commissioner Ramey
- Asst. Gen. Mgr. for Operations
- Asst. Gen. Mgr. for Reactors
- Asst. Gen. Mgr. for Research & Dev.
- General Counsel
- Director, Isotopes Development
- Director, Space Nuclear Systems
- Director, Contracts
- Director, Congr. Relations
- Controller

*Copy filed;
Contracts 7-1*

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13-2-65

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*Materials 12
Food Irradiation*

UNITED STATES GOVERNMENT

Memorandum

Reference & Reproduction Branch

TO : File

DATE: December 23, 1965

FROM : W. B. McCool, Secretary *W.B.M.*

SUBJECT: DEMONSTRATION FACILITIES FOR NOVANWOOD AND FOOD IRRADIATION
SECY: ICB

1. At Information Meeting 545 on December 22, 1965, Commissioner Ramey requested a report on progress regarding demonstration facilities for Novanwood and Food Irradiation.

2. It is our understanding the Division of Isotopes Development is taking the required action.

cc:

- Chairman
- Commissioner Ramey
- General Manager
- Deputy General Manager
- Asst. General Manager
- Exec. Asst. to Gen. Mgr.
- Asst. Gen. Mgr. for Research & Dev.
- General Counsel
- Director, Congr. Relations
- Director, Isotopes Development
- Controller

*Copied:
R.B.L. - T. Ward & Associates*

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12-23-65

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*Octopus 9
Food Irradiation
Material-12
Food Irradiation*

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AEC 719/45

December 23, 1965

COPY NO. 23

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

PROPOSED PARTICIPATION IN INTERNATIONAL
FOOD IRRADIATION PROGRAM

Note by the Secretary

The Executive Assistant to the General Manager has requested that the attached memorandum of December 21, 1965 from the Director, Division of International Affairs, be circulated for consideration by the Commission at an early Information Meeting.

W. B. McCool

Secretary

AEC
719
45

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International Affairs	19 - 21
	- 1 -

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12-23-65

UNITED STATES GOVERNMENT

Memorandum

TO : R. E. Hollingsworth, General Manager
(TERU) J. A. Hall, AGHA

DATE: DEC 21 1965

FROM : Myron B. Kratzer, Director
Division of International Affairs

SUBJECT: PROPOSED PARTICIPATION IN INTERNATIONAL FOOD IRRADIATION PROGRAM

The staff is presently completing arrangements to establish participation by the AEC in the International Food Irradiation Project at Seibersdorf, Austria. This six-year program, which is a joint international activity of the ENEA, the IAEA, and the Austrian Studiengesellschaft fur Atomenergie (SGAE), deals with the use of fruit and fruit juices as model systems for fundamental research in the acquisition of basic knowledge of broad application in food irradiation.

The Divisions of Biology and Medicine and Isotopes Development, which have actively assisted in the establishment of this program by providing information and guidance, consider it desirable for AEC to participate in the Project since they expect that it will produce information of direct interest to AEC programs. As is customary in joint international undertakings of the ENEA, member or associate member countries participate in programs by the assignment of technical personnel and/or financial or in-kind contributions. For example, as a basis for the AEC's participation in the Halden Boiling Water Project, another ENEA joint activity, the AEC contributed three tons of heavy water and has assigned technical personnel. (Approved by you after consideration at Information Meeting 408, August 21, 1964.)

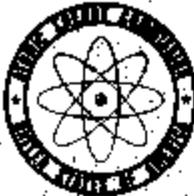
Accordingly, as a basis for participation in the Seibersdorf Program, the Division of Biology and Medicine is prepared, within its budget, to assign an Animal Histopathologist to the Project for one year commencing in early 1966. The Division of Isotopes Development has available an amount of Cobalt-60 (approximately 50,000 curies from three used sources) which it proposes to contribute to the Project for use in the irradiation program. Expenses of approximately \$20,500 involved in the reencapsulation of the Cobalt-60 source, including shipment to the Seibersdorf Project, will be borne by the Austrian Government.

I would propose, with your approval, to negotiate and execute a research contract with the SGAE which will provide that the AEC receive all information developed within the program. In addition, it will contain patent provisions which are similar to other of our

international cooperative arrangements under which both parties acquire reciprocal rights in the field of atomic energy as to inventions resulting from the program.

APPROVED:

General Manager



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

DEC 17 1965

Mr. John T. Conroy
Executive Director
Joint Committee on Atomic Energy
Congress of the United States

Dear Mr. Conroy:

The Government of Israel has recently proposed a cooperative program in Israel which would involve the irradiation of oranges, poultry, tropical fruits, dates and reusable surgical supplies, and the evaluation of the irradiated products. The United States participation in this program would involve the loan to Israel, for a period of approximately one year, of a portable irradiator containing a 30-50,000 curie Cobalt-60 source. The AEC presently has two such irradiators, with a third to be completed by March 1, 1966 and a fourth one scheduled for procurement in the near future.

The Israeli participation would involve the operation of the U. S. irradiator, together with their own radiation source located at the Nahal Soreq laboratory of the Israeli AEC in a program of irradiation and evaluation of articles such as those indicated above. After completion of irradiation, each product would be subjected to testing and evaluation by the Israeli AEC. Israel will pay all costs for transportation of the source to and from Israel. The program would begin March 1, 1966 in time to permit experimental work on a portion of the 1966 orange crop in Israel.

Based on a total cost of approximately \$35,000 and a source life of five years, the value of AEC's financial participation in the project will be about \$7,000. The estimated cost to Israel of the proposed irradiation program is a minimum of \$107,000 and would include such costs as manpower for research and services, transportation and travel expenses, management and office services, and laboratory depreciation and interest.

Def. Div. 540

by filed SA-5 Israel

12-17-65

*Materials - 12 - Food Irradiation
7-1-65
7-1-65*

The Commission believes that this cooperative activity has special significance in that the Israelis would test market the irradiated products to the public in Israel. This should provide significant information on the public acceptability of irradiated foods. Accordingly, we are responding affirmatively to the Israeli proposal and will conclude a research and development contract with them under which the portable irradiator and its Cobalt-60 source would be loaned to Israel for a period of one year.

We would be pleased to provide you with any further information you may wish on this activity.

Sincerely yours,

John H. J. V.
General Manager

- cc: General Manager
- ASMA
- Secretariat (2) ←
- OSC
- CEL (2)
- OCM
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7-8-65 8:10 AM*

UNITED STATES GOVERNMENT

Memorandum

Reference & Reproduction Branch

TO : File

DATE: December 15, 1965

FROM : W. B. McCool, Secretary *WBM*

SUBJECT: COOPERATIVE IRRADIATION PROJECT WITH ISRAEL

SECY:JCH

1. At Information Meeting 540 on December 13, 1965, the Commissioners approved the General Manager's recommendation to enter into a research and development contract with Israel for a cooperative irradiation program under which the U.S. would loan a portable irradiator and its Co-60 source. Details regarding this proposed contract are contained in Mr. Kratzer's December 10, 1965 memorandum.

2. The Commissioners noted the letter to the Israelis is to include a reference to Commissioner Ramey's discussion with them of this project.

3. It is our understanding the Division of International Affairs is taking the required action.

- cc:
- Chairman
- Commissioner Ramey
- General Manager
- Deputy General Manager
- Asst. General Manager
- Exec. Asst. to Gen. Mgr.
- Asst. Gen. Mgr. for IA
- Asst. Gen. Mgr. for R&D
- General Counsel
- Director, IA
- Director, Isotopes Development
- Director, Congressional Relations
- Controller

*By filed:
14-5 Israel*

12-15-65



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Materials - Food Irradiation

DEC 10 1965

**MEMORANDUM FOR CHAIRMAN SHERWOOD
COMMISSIONER PALFREY
COMMISSIONER RABETZ
COMMISSIONER TAPPE**

THROUGH GENERAL MANAGER (Signed) John V. Vuciguerra for

SUBJECT: COOPERATIVE IRRADIATION PROJECT WITH ISRAEL

The Embassy of Israel has proposed to the USAEC that we enter into a cooperative irradiation program utilizing one of the three USAEC portable irradiators. The Israeli Atomic Energy Commission is interested in the use of irradiation processing as a means of preserving and improving the quality of a wide variety of foods and other products. In an already extensive program conducted by the Israeli AEC, studies have been initiated in irradiation treatment in the belief that this process may offer a new and important means of stimulating economic growth in Israel. Among the products of primary interest which would be irradiated and evaluated are oranges, poultry, tropical fruits, dates, and reusable surgical supplies. The Israelis have informed us that after completion of irradiation each product would be subjected to testing and evaluation as appropriate and a complete description of each experiment and its results would then be furnished to the USAEC. The Israelis have proposed that this cooperative irradiation program begin March 1, 1966, in time to permit experimental work on a portion of the 1966 orange crop in Israel and to extend for a period of about one year.

The USAEC presently has two portable irradiators and a third is to be completed by March 1, 1966. In order to assure that industry in the United States has the first opportunity to utilize the irradiators in their programs, however, it will become necessary to procure a fourth irradiator, which would release the third irradiator to Israel specifically for this project. Funds for a fourth irradiator are already available for this purpose and the irradiator would in all probability be required in the near future in any event.

of field PA. 5 Israel

12-10-65

Each of the irradiators costs about \$27,000 and the sources, including encapsulation, cost \$6,000 (at AEC fixed costs). Accordingly, the value of AEC's financial participation in this project will be about \$6,000 based on a life of five years, and based on a loan of the irradiator and source to the Israelis for a period of one year. We would expect it to be returned to the U.S. for use in our domestic program or possibly for use in other countries where the results of its use are in our programmatic interest. Argentina has already expressed a firm desire to use the irradiator in the course of our recent discussions with Admiral Quibilliat, and we expect that several other countries would be equally responsive if offered the opportunity to borrow the irradiator. Additional irradiators may eventually be required to meet the foreign demand.

The estimated cost to Israel of the proposed irradiation program is a minimum of \$167,000 and would include such costs as manpower for research and services, transportation and travel expenses, management and office services, and laboratory depreciation and interest.

The Division of Isotopes Development has informed us that they would be highly interested in such a cooperative activity and that it has special appeal in that the Israelis have offered to test-market the irradiated products to the public in Israel. This has a great deal of appeal to the Division of Isotopes Development since it should help to gain public acceptance and FDA approval for irradiated foods for consumption more readily in the U.S. Accordingly, we propose to respond affirmatively to the Israelis' request and to enter into a research and development contract with them under which the portable irradiator and its Co-60 source would be loaned to them.

Myron B. Krutzer, Director
Division of International Affairs

cc: GH
AGHA
Secretariat (2)
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COMMUNICATIONS
OFFICE OF THE DEPUTY
DIRECTOR OF THE
BUREAU OF INTERNATIONAL AFFAIRS

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Food Irradiation

UNITED STATES GOVERNMENT

Reference & Reproduction Branch

Memorandum

de

TO : File

DATE: December 9, 1965

FROM : W. B. McCool, Secretary 

SUBJECT: AEC 719/43 - SUMMARY REPORT ON VISIT TO STATE OF HAWAII AND
AEC 719/44 - SUPPLEMENT TO AEC 719/43

SECY: JCH

1. At Information Meeting 539 on December 8, 1965, the Commissioners approved the draft Memorandum of Understanding regarding the management and use of the Hawaiian Development Irradiator (HDI), as attached to Mr. Fowler's December 2, 1965 memorandum, circulated as AEC 719/43.

2. It is our understanding the Division of Isotopes Development is taking the required action.

- cc:
- Chairman
- General Manager
- Deputy General Manager
- Asst. General Manager
- Exec. Asst. to Gen. Mgr.
- Asst. Gen. Mgr. for Admin.
- Asst. Gen. Mgr. for R&D
- General Counsel
- Director, Congr. Relations
- Director, Isotopes Development
- Director, Public Information

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December 7, 1965

AEC 719/44

COPY NO. 22

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

SUPPLEMENT TO AEC 719/43

Note by the Secretary

The General Manager has requested that the attached memorandum of December 6, 1965, from the Acting Director, Division of Isotopes Development, be circulated for Commission consideration at the Information Meeting on Wednesday, December 8, 1965.

W. B. McCool

Secretary

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11-7-65

UNITED STATES GOVERNMENT

Memorandum

TO : John V. Vinciguerra, Executive Assistant to
the General Manager
Office of the General Manager

FROM : E. E. Fowler, Acting Director
Division of Isotopes Development

SUBJECT: DESCRIPTION OF HAWAIIAN DEVELOPMENT IRRADIATOR (HDI)

DATE: DEC 6 1965

We are proceeding with detailed engineering design of the HDI through our contractor, NUMEC. The AEC portion of the project is to design and construct the irradiation cell and product conveyors, and to provide the source and source handling system, at a cost of approximately \$350,000. Approximately 225,000 curies of cobalt-60 are required to permit the desired throughput of 4,000 pounds per hour of papaya at a dose of 75,000 rad. Other products requiring doses in the range of 20,000 rad to several hundred thousand rad can also be accommodated.

The State of Hawaii has appropriated \$180,000 to design and construct supporting laboratories, pre- and post-irradiation refrigerated storage areas, and general processing areas. The total building area is about 10,000 square feet, of which 1,700 square feet are for the irradiation cell.

The HDI will be located on the Fort Armstrong site in Honolulu. This site, belonging to the State Department of Agriculture, is projected to be a Food Transportation Center to aid in the dissemination and shipping of Hawaiian produce.

The HDI is expected to be operational in January, 1967.



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AEC 719/43

December 2, 1965

COPY NO. 58

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

SUMMARY REPORT ON VISIT TO STATE OF HAWAII

Note by the Secretary

The General Manager has requested that the attached memorandum of December 2, 1965 from the Acting Director, Division of Isotopes Development, with attachments, be circulated for Commission consideration at an early Information Meeting.

W. B. McCool

Secretary

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AEC
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43

12.2.65



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

DEC 2 1965

MEMORANDUM FOR CHAIRMAN SEABORG ←
COMMISSIONER PALFREY
COMMISSIONER RAMBY
COMMISSIONER TAFE

fa
THROUGH GENERAL MANAGER *J. W. Black*

SUBJECT: SUMMARY REPORT ON VISIT TO STATE OF HAWAII

I wish to inform the Commission of my recent visit to the State of Hawaii to meet with Governor John A. Burns and other State and Federal officials. The purpose of the visit was to secure agreement on the agency or institution within the State to be given operating responsibility for the Hawaiian Development Irradiator (HDI), a pilot-scale unit designed for processing tropical fruits. A list of those State and Federal officials is attached.

This is being brought to the attention of the Commission because of a competition which developed between the University of Hawaii and the State Department of Agriculture for management responsibility of HDI and because of the political interest in this matter. Governor Burns, Senator Daniel K. Inouye and Congressman Spark Matsunaga, all, have directly intervened in this situation.

As the Commission knows, we initiated a research and development program in 1964 with the University of Hawaii to establish technology for radiation processing of tropical fruits, including disinfection. Included in the original program plan were a first phase research irradiator and a second phase pilot irradiator (HDI), designed for large-scale shipping, storage and marketing tests. Planning for HDI also included its use in cooperative programs with the food industry in Hawaii. The original plan provided that the University of Hawaii would have management responsibility for HDI.

During the course of our budget planning for HDI, the University of Hawaii was requested to obtain State funds for construction of the building to house the irradiator in order that the project could be instituted as a cooperative venture. An agreement was reached and Governor Burns requested the State legislature to appropriate \$180,000 for the building, which was approved. The State contribution compares to the \$350,000 budgeted by the AEC for the irradiator and associated equipment.

At the request of Congressman Matsunaga, I met in Washington on November 2 with Dr. Kenneth K. Otagaki, Director, State Department of Agriculture, to discuss the HDI. At the meeting, Dr. Otagaki informed us for the first time that the \$180,000 appropriation had been placed in the Department of Agriculture's budget rather than in the University of Hawaii's. Dr. Otagaki's understanding was that the money had been placed in the Department's budget because of Governor Burns' interest in having Agriculture become involved in the management of HDI. (Note: On July 8, 1965, we communicated with Dr. Robert W. Hiatt, Vice President, University of Hawaii, to inform him that Nuclear Materials and Equipment Corporation had been selected by AEC as its contractor to design, construct and test operate the HDI. At that time, we also requested Dr. Hiatt to reconfirm that the University would be the state institution responsible for operation of the facility. This responsibility was acknowledged by Dr. Hiatt in his reply dated July 30, 1965.)

Dr. Otagaki, and subsequently Congressman Matsunaga, urged that I meet personally with Governor Burns to discuss our plans for the facility and to receive his personal views on management of the HDI, which I agreed to do.

On November 8 and 9, I held discussions in Hawaii with a number of State, University and Federal officials interested in the HDI project, in preparation for the scheduled meeting with Governor Burns on November 10. These included:

1. Preliminary meetings were held on November 8 with Lieutenant Governor William Richardson and Mr. William Norwood, Administrative Director to Governor Burns. Both Lieutenant Governor Richardson and Mr. Norwood stated that it was Governor Burns' wish that the State Department of Agriculture have the responsibility for operation of the facility because of the eventual commercial potential of this new food processing method.

2. At a separate meeting on November 8 with Vice President Hiatt, University of Hawaii, he stated that Governor Burns was undecided on the question of responsibility for management of HDI and that it was he (Vice President Hiatt) who had suggested to the Governor that I be invited to Hawaii to resolve the question.
3. A meeting was also held on November 8 with Dr. Loren Steiner, Chief of the Hawaii Fruit Fly Laboratory, U. S. Department of Agriculture, concerning the Department's interest in using HDI to support their work on disinfection. Dr. Steiner saw no problem in their use of HDI under either University or State Department of Agriculture management.
4. On November 9, a meeting was held at the Executive Offices with Mr. Norwood, President Thomas H. Hamilton, University of Hawaii and Mr. George G. Raymond, Deputy Director, State Department of Agriculture. At the meeting I stated that we continued to feel the University should be given the responsibility for start-up of the facility and its operation for the first two years. The reasons for this position were:
 - a. Priority use of the facility over the first two years would have to be for large-scale storage, distribution and laboratory testing in support of the research and development program.
 - b. The University has available the technical and scientific support necessary for conduct of the test program. The resources of the Department of Agriculture are less clear in this regard. Much of the Department's effort is directed to regulatory functions as opposed to research and development activities.
 - c. Assuming satisfactory progress of the research and development effort over the first two years of operation of HDI, the program would then phase toward commercial development. At that point, management responsibility for HDI could more logically be assumed by the State Department of Agriculture.
 - d. At this meeting, the point was made that if there existed outstanding reasons within the State Government why management of the HDI should start initially with the State Department of Agriculture, these obviously would be considered seriously.

On November 10, I met with Governor Burns at which time he expressed his interest in the Department of Agriculture being given responsibility for operation of HDI and asked AEC's favorable consideration of his request. He cited the following reasons:

1. Within the State of Hawaii, the Department of Agriculture has the primary responsibility for developing the agricultural economy of the State.
2. The HDI, while not immediately, would ultimately have value in commercial development efforts including work with private growers in the State.
3. A desire to reshape the State Department of Agriculture by developing "in-house" capability to do more of its own research and development as opposed to being almost totally dependent upon the University of Hawaii and the U. S. Department of Agriculture for such work. Governor Burns looks upon the radiation processing of foods program as a good starter in this direction.
4. Governor Burns stated that he had to watch the University closely because "They are empire builders."

It was agreed with Governor Burns that we would proceed with the State Department of Agriculture as operator of HDI wherein:

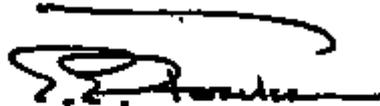
1. The Department would obtain needed, additional technical staff to provide for operation of the facility.
2. The University of Hawaii would continue to have research and development responsibility for the radiation processing of foods program including conduct of large-scale storage, distribution and associated testing activities.
3. The University of Hawaii would have first priority on the use of the HDI during the first two years of its operational availability.
4. A formal Memorandum of Understanding would be prepared and executed specifying responsibility of all parties.

Governor Burns was in agreement with all of the foregoing conditions. I offered to prepare a draft of the Memorandum of Understanding which would then be submitted to him for review and

comment, or concurrence. The draft memorandum has been prepared, concurred in by General Counsel and the Division of Contracts, and is attached for the Commission's review. It will be submitted to Governor Burns following your review.

Prior to my leaving for Hawaii, Senator Inouye directed three letters to the Division concerning the HDI; copies of which are attached.

I am also attaching a copy of a newspaper story which appeared in the Honolulu Star-Bulletin prior to my arrival in Hawaii, and a copy of a press release issued from Governor Burns' office on November 18, regarding the Hawaii Development Irradiator.



E. E. Fowler, Acting Director
Division of Isotopes Development

Attachments:

1. List of State and Federal Officials Visited
2. Draft Memorandum of Understanding
3. Ltr., Senator Inouye to E. E. Fowler, dtd. 10/13/65
4. Ltr., Senator Inouye to E. E. Fowler, dtd. 10/23/65
5. Ltr., Senator Inouye to E. E. Fowler, dtd. 10/29/65
6. Newspaper Clipping
7. Press Release

LIST OF STATE AND FEDERAL OFFICIALS VISITED

Congressman Spark Matsunaga

Governor John A. Burns

Lieutenant Governor William Richardson

Mr. William R. Norwood, Administrative Director to the Governor

Mr. Ochura Sukemo, House of Representatives, State of Hawaii,
Committee on Agriculture.

Mr. George G. Raymond, Deputy Director, State Department of Agriculture

Dr. Loren F. Steiner, Chief, Hawaii Fruit Fly Laboratory, U. S.
Department of Agriculture, Honolulu, Hawaii

Dr. Thomas H. Hamilton, President, University of Hawaii

Dr. Robert W. Hiatt, Vice President, University of Hawaii

Dr. G. Peairs Wilson, Dean of Tropical Agriculture, University of
Hawaii

Dr. Edward Ross, Head, Food Science and Technology Department,
University of Hawaii

Mr. Sunao Kido, Deputy Chairman, Department of Land and Natural
Resources

Honorable John A. Burns
Governor of Hawaii
Honolulu, Hawaii

Dear Governor Burns:

May I first convey my appreciation to you and to the many State officials in Hawaii for helping to make my recent visit both fruitful and pleasant.

As agreed, we have formulated a draft "Memorandum of Understanding" which is enclosed for review by the several parties concerned with the ultimate operation of the Hawaiian Demonstration Irradiator (HDI) and the related research and development program. I have attempted to set forth the broad guidelines which we feel would best serve the radiation preservation of foods program, while leaving specific details of administration for your determination.

During the course of my discussions with Mr. Raymond and others, the subject of cost sharing for facility operation was reviewed, and my feelings toward the desirability of such a cooperative effort were expressed. Specific terms of such an arrangement will be formulated during our contract negotiations with the State Department of Agriculture.

I wish to request that when the draft Memorandum has been reviewed and comments developed or general concurrences obtained, that we meet with your designee here in Washington to prepare the final form of the Memorandum. At that time, we will also go over the details of planning and scheduling for construction and operation of the HDI. I would hope this could be done without undue delay, since we have already begun certain phases of detailed design for the HDI, and undue protraction of our discussions will serve only to defer the completion date of the irradiator. If you have comments and recommendations for modification of the draft memorandum, we would appreciate receiving these before the arrival of your representative so that we may have the opportunity of studying them with care.

Again, please accept my thanks for your taking time out of a busy schedule to meet with me, and for the many courtesies which I received during my stay.

Sincerely yours,

E. E. Fowler, Acting Director
Division of Isotopes Development

Enclosure:
Draft Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

RESPONSIBILITIES FOR THE MANAGEMENT AND USE OF THE
HAWAIIAN DEVELOPMENT IRRADIATOR (HDI)

I. PARTIES

Parties to this Memorandum of Understanding are the United States Atomic Energy Commission (hereafter referred to as AEC), as represented by its Division of Isotopes Development, and the State of Hawaii (hereafter referred to as the State), as represented by its Department of Agriculture, and the University of Hawaii.

II. PURPOSE

The purpose of this agreement is to set forth the principal features of a definitive contract or contracts by the parties hereto which it is expected will subsequently be negotiated. Notwithstanding any other provision hereof, if the parties do not enter into a definitive implementing contract or contracts, for any reason, this Memorandum of Understanding shall have no force or effect. The contemplated cooperative arrangement will be for the construction, operation and use of an Hawaiian Development Irradiator facility (hereafter referred to as HDI). The demonstration period, following completion of construction of HDI, is expected to be three years.

III. TITLE

Title to the irradiator proper, including its radiation source and any other appurtenances furnished by the AEC, will be in the AEC; the definitive contract may provide for a subsequent vesting of title in the State. Title to the site and the building which houses the irradiator, plus other equipment furnished by the State, shall be in the State.

IV. ASSIGNMENT OF RESPONSIBILITIES

A. Construction Phase of HDI

Detailed design for the HDI is scheduled to begin in November, 1965, with completion of the facility planned in January, 1967. To assure coordination and a smooth construction project, the parties agree to the following:

1. The Fort Armstrong site in Honolulu is designated as the construction site for the HDI. This site shall be provided by the State.

2. The AEC and its contractor (Nuclear Materials and Equipment Corporation) shall begin immediate coordination with the State. The State shall facilitate any required cooperative efforts by the State's Department of Agriculture, Department of Economics and General Sciences, and Department of Land and Natural Resources, regarding land allocation, design, installation, construction and sub-contractor work, and other activities.

Management of construction of the irradiator proper shall be vested in the AEC, with appropriate delegation of technical responsibility to its construction contractors through the terms of its contract with the latter. Management of construction of the building housing the irradiator shall be vested in the State, and may be delegated as necessary to its construction contractor. Interface problems which cannot be resolved by the contractors shall be referred to the parties to this agreement for resolution. It is expected that construction of the HDI will be completed by January, 1967.

B. Supervision and Operation of HDI

1. Management Responsibility of HDI

Upon completion of construction of the HDI, management responsibility for its operation shall be vested in the State Department of Agriculture, subject to appropriate rights of approval by AEC. Functions including responsibility for overall facility operation, scheduling, and maintenance shall rest with a facility supervisor appointed by the State Department of Agriculture. The supervisor, in turn, shall be assisted by an individual capable of performing health physics functions and conducting dosimetry measurements. After several weeks of training under the HDI supervisor, the assistant may, subject to licensing authority, assume responsibility for facility operation for short periods of time during the supervisor's absence for leave, sickness, or other reasons.

2. Training of Supervisor and Health Physicist

Responsibility for hiring and training the supervisor and health physicist shall lie with the State Department of Agriculture. A suggested adequate training program for each position is attached as Appendix 1 and 2.

3. Licensing Responsibility for HDI

The HDI falls within the category of requiring an AEC license for possession and use of By-product Material, as specified by Title 10, Part 30, Code of Federal Regulations. Preparation of a license application, securing an AEC By-product Materials License, and operating the nuclear portion of the facility under conditions specified by the license shall be the responsibility of the State Department of Agriculture.

4. Other Personnel

It is anticipated that probably two additional personnel, such as laborers, will be required to assist in product loading and unloading during normal facility operation. Securing these personnel shall be a responsibility of the State Department of Agriculture.

5. Funding for Facility Personnel and Operations

The parties deem it highly beneficial to the accomplishment of the purpose of this arrangement for the State Department of Agriculture to contribute a reasonable portion of the operating costs. The definitive contract or contracts will cover this feature, and will provide for AEC's contribution toward the operation, maintenance and use of the HDI during the contract term, presently expected to be three years following the completion of construction of the HDI; AEC's obligation to fund for the operation, maintenance and use of the HDI will nevertheless be on an approximately annual basis due to budgetary limitations.

C. Use of the HDI

The cooperative project will include research, development, and a demonstration program of a radiation facility for: (a) large scale storage and acceptability tests undertaken by the University of Hawaii, and (b) large scale test marketing studies by the State Department of Agriculture and cooperative marketing studies jointly between the Department of Agriculture and the tropical fruit industry.

It is expected that priority for use will be as follows:

1. Upon the operational availability of the HDI, the University of Hawaii shall have first priority for use of the facility to perform these functions required by its separate research and development contract with the AEC. The large scale tests to be carried out by the University are expected to require up to 24

months from the date of operational availability of the HDI and are not expected to involve more than 10% of the available operating time.

2. Following satisfactory completion of the large scale testing by the University of Hawaii, the State Department of Agriculture shall have first priority for use of the HDI for purposes of the project, and the University shall receive second priority for its requirements.

3. Other Users

Aside from the above assigned priorities, other agencies and users shall be accommodated as scheduling permits, pursuant to guidelines or specific terms agreed to by AEC and the State.

D. Conduct of the Food Irradiation Research Program

1. Applied research and development

This phase of the program shall continue to be vested with the University of Hawaii under its present contract with the AEC. Development phases shall include the determination of radiation parameters, and the conduct of large scale shipping, storage and distribution tests.

2. Possible Commercialization Aspects

Concurrently with the later phases of large scale testing, it is expected that the State Department of Agriculture will initiate and conduct a vigorous program, consonant with the required approvals of Federal agencies having jurisdiction, including AEC in its regulatory capacity, toward the beneficial commercialization of radiation processed tropical fruits and other products.

FOR THE UNITED STATES ATOMIC ENERGY COMMISSION:

TITLE: ACTING DIRECTOR, DIVISION OF
ISOTOPES DEVELOPMENT

DATE: _____

FOR THE STATE OF HAWAII:

TITLE: STATE DEPARTMENT OF
AGRICULTURE DIRECTOR

DATE: _____

FOR THE UNIVERSITY OF HAWAII:

TITLE: _____

DATE: _____

Appendix I

PROPOSED TRAINING FOR HDI SUPERVISOR

Desirable Prerequisites for Individual: College graduate, degree and training in one of physical sciences, some experience or background in radiation applications.

<u>COURSE</u>	<u>TIME</u>	<u>TUITION</u>	<u>PER DIEM (\$16/Day)</u>	<u>ESTIMATED TRAVEL</u>
1. ORINS: Basic Course in Use of Radioisotopes in Research	4 weeks	\$200	\$ 500	\$ 550
2. BNL: On-the-Job Training (OJT)	3 weeks	-0-	350	
3. Army Radiation Laboratory (OJT) Natick, Massachusetts, or Marine Products Development Irradiator (OJT), Gloucester	3 weeks	-0-	350	550
	TOTALS	<u>\$200</u>	<u>\$1,200</u>	<u>\$1,100</u>
			ESTIMATED GRAND TOTAL	<u>\$2,500</u>

REMARKS: Course 1 is a formal course given at the Oak Ridge Institute for Nuclear Studies. It consists of lectures, laboratories and demonstrations in nuclear theory, radio-chemistry, radiation chemistry, radiological safety, interaction of radiation with matter, isotope dilution, activation analysis, and instrumentation.

Courses 2 and 3 provide on-the-job-training at operating radiation centers or facilities. Dosimetry, health physics, and practical aspects of facility operations have proved especially valuable to past participants.

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Appendix I

Appendix 2

HDL HEALTH PHYSICIST

A number of universities offer comprehensive health physics courses to both graduates and undergraduates. Any of three alternatives are available to select a health physicist.

Desirable prerequisites: College graduate, physical science background, completion of a health physics program.

Alternative #1: Correspond with any of the following universities and ask for responders to a job offer:

University of Rochester

University of Kansas

University of Chicago

University of Michigan

University of California

University of Pittsburg

Vanderbilt University

Alternative #2: Consult a professional placement organization.

One suggestion is:

Dr. Robert G. Gallagher, President
Applied Health Physics, Inc.
2986 Industrial Boulevard
Bethel Park, Pennsylvania 15102

(Dr. Gallagher also teaches in the University of Pittsburg health physics program.)

Alternative #3: Contact the Placement Bureau of the American Health
Physics Society, as follows:

Mr. Clifford J. Konnerth, Chairman
Placement Bureau
Health Physics Society
Union Carbide Corporation
P. O. Box 324
Tuxedo, New York 10987

STUART STIMMINGTON, MD.
HENRY M. JACKSON, WASH.
SAM J. ERVIN, JR., N.C.
HOWARD W. CANADY, NEV.
ROBERT C. BYRD, W. VA.
STEPHEN M. YOUNG, OHIO
DANIEL K. INOUE, HAWAII
THOMAS J. HEINTZHE, N.J.
DANIEL S. BREWSTER, MD.

JACK MILLER, IOWA
JOHN S. TOWER,

United States Senate

COMMITTEE ON ARMED SERVICES

WILLIAM H. GARDNER, CHIEF OF STAFF
CHARLES B. HINSHAW, CHIEF CLERK

October 13, 1965

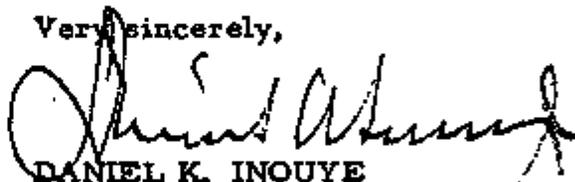
Mr. Eugene E. Fowler
Acting Director, Division of
Isotopes Development
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Fowler:

I have been advised that Dr. Harold C. Garber of NUMEC Corporation of Apollo, Pennsylvania, recently submitted to your office a report on the site evaluation of the Hawaii Food Irradiator Project.

If your rules will permit, may I be furnished with a copy of this report.

Very sincerely,



DANIEL K. INOUE
United States Senator

FRANK M. JACKSON, WASH.
GEO. J. BRUN, JR., N.C.
HOWARD W. CANNON, ILL.
ROBERT G. BYRD, W. VA.
STEPHEN M. YOUNG, OHIO
DANIEL K. INOUE, HAWAII
THOMAS J. HEFFNER, N.M.
SAMUEL A. BENTLEY, MD.

JEAN MILLER, IOWA
JOHN S. TUNNEY, TENN.

United States Senate

COMMITTEE ON ARMED SERVICES

October 23, 1965

WILLIAM H. SANDS, CHIEF OF STAFF
CHARLES E. KINSON, CHIEF CLERK

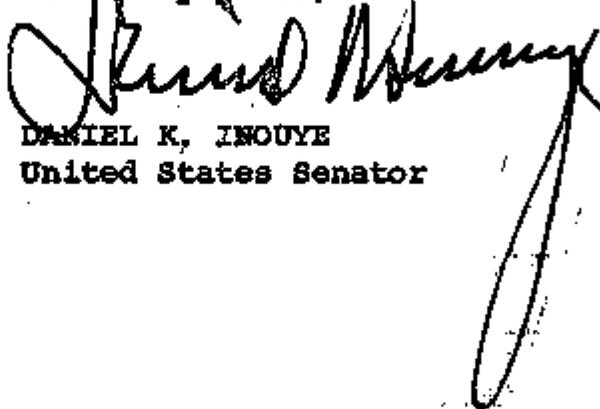
Mr. E. E. Fowler
Acting Director
Division of Isotopes Development
Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Fowler:

Thank you for sending me a copy of the site evaluations for the Hawaiian Demonstration Irradiator.

The Fort Armstrong site appears to be a good choice. I am hopeful that you will soon receive word of the formal designation of a site by the State Department of Agriculture officials.

Sincerely yours,



DANIEL K. INOUE
United States Senator

JOHN STENNIS, MISS.
HARRY FLOOD, NIND. VA.
STUART SYDNOR, MO.
HENRY M. JACKSON, WASH.
SAM J. ERVIN, JR., N.C.
HOWARD W. CANNON, ILL.
ROBERT C. BYRD, W. VA.
STEPHEN M. YOUNG, OHIO
DANIEL K. INOUE, HAWAII
THOMAS J. MCINTYRE, N.J.
DANIEL B. CRUYTER, MD.

LEVERETT SALTONSTALL, MASS.
MARGARET CHASE SMITH, MAINE
B. ROY THURMOND, S.
JACK MILLER, IOWA
JOHN G. YERGEN, TEX.

United States Senate

COMMITTEE ON ARMED SERVICES

October 29, 1965

WILLIAM H. DARDEN, CHIEF OF STAFF
CHARLES E. HANCOCK, CHIEF CLERK

Mr. E. E. Fowler
Acting Director
Division of Isotopes Development
Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Fowler:

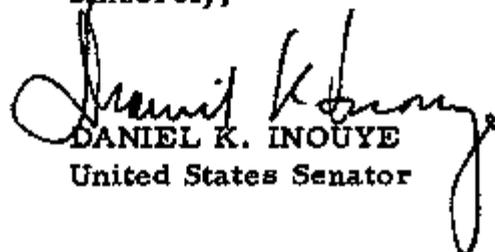
I am most pleased to learn that your project in Hawaii relating to irradiation on shelf life and disinfestation of fruits and vegetables is progressing according to schedule.

Several weeks ago I had the opportunity of discussing this matter with some of the officials of the State of Hawaii. It was the general feeling that the contracting party in Hawaii should be the Department of Agriculture of the State of Hawaii and not the University of Hawaii. It appears that by legislative action and by executive concurrence, \$200,000 was appropriated to be spent for this project through the Department of Agriculture. Furthermore, it appears that 90 percent of the activities of this project will involve demonstrations and the remaining 10 percent on research. Based on this, it is felt that the proper agency to handle this would be the Department of Agriculture.

I have been authorized by our Governor, John A. Burns, to advise you that he concurs with the proposition that the contracting agency be the State of Hawaii, Department of Agriculture.

May I have your views?

Sincerely,


DANIEL K. INOUE
United States Senator

For research on preventing food spoilage

Parley set for State

By HELEN ALTONN

State officials will meet next week with an Atomic Energy Commission director to plan the first of several steps aimed at greatly expanding Hawaii's fruit exports.

The conferences with Dr. Eugene Fowler, head of the A.E.C.'s Division of Isotopes, will concern a large irradiation plant to be built here.

The University of Hawaii has been doing research the past year with an irradiator to see how well atomic radiation treatments prevent spoilage of foods and plants.

Robert W. Hiatt, vice-president for academic af-

fairs, said the new irradiator "will be a good deal larger version of the one we have on campus.

"It will be large enough to simulate production runs. I think we will be able to put a crate of papayas in it, instead of only a few pieces of fruit."

But he said the new irradiator is not intended to be a regular commercial operation: "It is still a research developmental machine."

The next step would be to get a facility which would handle transport-type containers, he said.

"If the economics work out with the new irradiator, we will be in a position to recommend installation of commercial-size units at appropriate places."

Preliminary work with the small campus irradiator

irradiation plant

has been "extremely promising," he said, "particularly with papayas."

State officials are looking to irradiation devices as a means of opening up new markets for the Hawaii industry.

They envision a multi-million-dollar growth in mango and papaya shipments over the next few years, just with the present university project.

Fowler is due here either Friday or Monday.

He will meet with Acting Governor William S. Richardson; George Raymond, acting State agriculture director; Dr. Thomas H. Hamilton, University president; Hiatt and other officials.

Raymond said the Nuclear Materials and Equip-

ment Corporation of Apollo, Pennsylvania, has been awarded the A.E.C. contract to design the plant.

Congress appropriated \$350,000 for the project in 1964 and the last State Legislature provided \$180,000 to house the facility.

Four sites have been mentioned: The Fort Armstrong food distribution area, Honolulu Airport, the Manoa Campus, and Hilo.

Fowler's visit is expected to help pinpoint the plant location.

"He is also coming out to talk with us about what A.E.C. expects us to do," Hiatt said. "This has never been quite clear."

Hiatt estimates that it will take about a year to design and construct the facility.

FOR THE PRESS
From the Executive Chambers
Iolani Palace

November 18, 1965

Governor John A. Burns today announced the selection of Fort Armstrong as the site for a \$350,000 nuclear irradiator to be used for research and for pilot commercial experiments with Isle produce.

The irradiator will be put at Fort Armstrong as part of a new food distribution center to be developed on the State's waterfront property in Honolulu Harbor.

Selection of the Armstrong site was based largely on a study of alternative locations by Harold J. Garber, director of advanced projects for the Nuclear Materials and Equipment Corporation of Pennsylvania.

Garber's detailed analysis of several possible locations favored Armstrong by a wide margin. Other locations considered included the inter-island airline maintenance area and the overseas airlines maintenance area at the Honolulu International Airport.

Factors in Armstrong's favor were the proximity to shipping facilities and the various agencies that will be involved in the operation and use of the irradiator.

The Governor said the facility, to be known as the Hawaii Development Irradiator, will be managed by the State Department of Agriculture, but research and development studies to determine the economic potential of the irradiation process will be conducted by the University of Hawaii's College of Tropical Agriculture, under a joint use agreement which is presently being worked out with the AEC.

Dr. Eugene E. Fowler, acting director of the AEC's Division of Isotopes Development, met with Governor Burns, University of Hawaii and Department of Agriculture representatives last week to discuss details of the management arrangement for the HDI.

The Governor said that for the first two years following completion of the facility it will be used primarily for research and development studies under the direction of the University.

It is expected, however, that the research will involve treatment and processing of fairly substantial amounts of fruits and vegetables for test marketing.

The AEC has allocated \$350,000 for construction of the irradiator, with the understanding the State is to provide a site and a building for the unit. The 1965 session of the Legislature appropriated \$180,000 to the Department of Agriculture for the building, which is to be located on State land in the Armstrong area. The precise location and area requirements are to be worked out in conjunction with the food center plans.

The irradiator is expected to be completed and ready for use by January, 1967.

The University presently has a smaller pilot cobalt irradiator with which the College of Tropical Agriculture has been testing effect of irradiation on various fruits and vegetables. Results have been encouraging, especially so in treatment of papayas to prolong shelf life.

It is hoped that with the larger facility and after a two-year period of concentrated research using larger quantities of produce, results will substantially enhance Hawaii's export crop potential.

Governor Burns said he is grateful for the AEC's generous interest and cooperation and is confident the Department of Agriculture and the University can make advantageous use of the irradiator.

He noted also that it will add a major resource to Hawaii's expanding capacity for research and development in the Pacific area.

-30-

Materials - Food Irradiation

NOV 24 1955

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAFE

THROUGH GENERAL MANAGER

SUBJECT: COST-BENEFIT ANALYSIS OF THE RADIATION PASTEURIZATION OF FOODS PROGRAM

In its meeting AEC 715/42 on the above subject, the Commission recommended that the proposed program be reduced, both in scope and estimated cost. The initial estimated cost was \$150,000.

The number of product categories in the proposed scope has been reduced from eight to three. However, since the depth of the study requires exploration of areas such as marketing techniques applicable to classes of product, the reduction in the number of products does not incur a linear reduction in cost. We will attempt to keep the cost of the study below \$100,000.

We plan to proceed immediately with the reduced scope of work, even though the value of the overall study may be somewhat reduced. We have discussed the reduced scope in detail with the Bureau of the Budget, and have incorporated their suggested changes and recommendations.

RECEIVED
OFFICE OF THE SECRETARY
ATOMIC ENERGY COMMISSION

E. S. Fowler, Acting Director
Division of Isotopes Development

NOV 24 1955

RECEIVED

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11/24/55

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Materials 12

UNITED STATES GOVERNMENT

Memorandum

Reference & Reproduction Branch

TO : File

DATE: November 15, 1965

FROM : W. B. McCool, Secretary 

SUBJECT: AEC 719/42 - COST-BENEFIT ANALYSIS OF THE RADIATION PRESERVATION
OF FOODS PROGRAM

SECY:JCH

1. At Information Meeting 532 on November 10, 1965, the Commissioners reviewed Mr. Fowler's November 8 memorandum and requested a recommendation for a program of reduced scope, including reduction in the estimated cost and in the specific products to be included in the study.

2. It is our understanding the Division of Isotopes Development is taking the required action.

cc:

Chairman

General Manager

Deputy General Manager

Asst. General Manager

Exec. Asst. to Gen. Mgr.

Asst. Gen. Mgr. for Research & Dev.

General Counsel

Director, Biology & Medicine

Director, Industrial Participation

Director, Isotopes Development

Director, Contracts

Controller

~~OFFICIAL USE ONLY~~

11-15-65

Materials
Food Production

NOV 7 1965

MEMORANDUM FOR CHIEF OF BUREAU
COMMISSIONER BALPHE
COMMISSIONER PARK
COMMISSIONER TAPP

THROUGH GENERAL MANAGER DWIGHT A. INE

SUBJECT: TRANSMITTAL OF RECOMMENDATIONS OF THE AIDS ADVISORY
COMMITTEE ON IRRADIATED FOODS (G-TOUR 21-22, 1965)

The semi-annual meeting of the subject committee was held in conjunction with our annual meeting of contractors in the food irradiation program during October 20-22, 1965. After reviewing the program status and hearing comments from each of the DID and HSA contractors, the committee formulated the attached recommendations, which are forwarded to you for your information.

H. E. Foster, Acting Director
Division of Isotopes Development

Attachment:
AIDS Recommendations

CELESTATION
OFFICE OF THE SECRETARY
12 MICHIGAN AVENUE

Info cys: Secretariat (2) 11-20

BID:RAB
JEL:oom
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AGRD
GM
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CELESTATION:sky HEP:oster

11-9-65

OFFICIAL USE ONLY

ABC 719/42

November 9, 1965

COPY NO. 37

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

COST-BENEFIT ANALYSIS OF THE RADIATION
PRESERVATION OF FOODS PROGRAM

Note by the Secretary

The General Manager has requested that the attached memorandum of November 8, 1965, from the Acting Director of Isotopes Development, with attachment, be circulated to the Commission for consideration at the Information Meeting scheduled for Wednesday, November 10, 1965.

W. B. McCool

Secretary

Attachments:

- a. Memo of 11/8/65 fm DIA to Commissioners w/
- b. Proposed Scope of Work

<u>DISTRIBUTION</u>	<u>COPY NO.</u>	<u>DISTRIBUTION</u>	<u>COPY NO.</u>
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Commissioners	2-6, 32-35	Congr. Relations	18
General Manager	7-8	Contracts	19
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Asst. Gen. Mgr.	10	Ind. Participation	21
Exec. Asst. to GM	11-12	Inspection	22
Asst. GM for Operations	13	Isotopes Development	23
Asst. GM for Plans & Prod.	14	Plans & Reports	24
Asst. GM for R&D	15	Public Information	25
General Counsel	16		

ABC
719
42

11-8-65



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

November 8, 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

THROUGH *fu* GENERAL MANAGER *[Signature]*

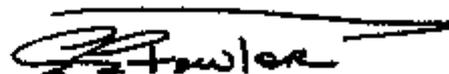
SUBJECT: COST-BENEFIT ANALYSIS OF THE RADIATION PRESERVATION
OF FOODS PROGRAM

In its meeting with Mr. Fred Schuldt of the Bureau of the Budget on August 2, 1965, the Commission agreed to study the feasibility of preparing a cost-benefit analysis of the Radiation Processing of Foods Program, with the objective of having the results of the analysis available at the time of the spring preview of the FY 1968 budget to the BOB.

In conjunction with the Division of Plans and Reports, we have evaluated the status of the food program and have arrived at the conclusion that a comprehensive and meaningful analysis cannot be prepared in this time period. However, we are of the opinion that such a study would be of great value in formulating detailed plans for the future of the program and would provide a basis for determining whether good justification exists for expenditures beyond those currently authorized. We therefore recommend that a study of this type be started even though it will not be completed by the time of the spring preview. To the extent that useful information is available at the time of the preview, it will be made available to the BOB examiner. Because of the extensive nature of the cost-benefit analysis contemplated, it will not be possible to conduct it with AEC staff and the award of a contract to a competent industrial operations analysis and marketing research organization is therefore proposed. We believe that a twelve month effort at an estimated cost of \$150,000 will be required for the study. It will

be our purpose to phase the contract work so that a preliminary assessment can be available five months after the start of the study. We currently estimate this to be around June 1, 1966.

We have prepared a proposed scope of work (Attachment 1) which we feel should be undertaken to accomplish the study. This scope is being discussed informally with the BCB staff and with representatives of the Controller's Office. We will advise you of the outcome of these discussions shortly.



E. E. Fowler, Acting Director
Division of Isotopes Development

Attachment:

1. Proposed Scope of Work

PROPOSED SCOPE OF WORK

Cost-Benefit Analysis of Selected Radiation Pasteurization Foods

I. GENERAL

The AEC is attempting to develop a substantive and credible cost-benefit analysis of selected radiation pasteurized foods. The basic objective is to evaluate and estimate both tangible (e.g., benefits from improved economic efficiency) and intangible effects (e.g., improved public health) likely to accrue through commercialized food irradiation, as a function of the continued budgetary effort required of the AEC to ensure the real beginning of commercialization, and of the costs estimated to be incurred by private industry in establishing and operating the process. A secondary purpose is to minimize dollar costs subject to the mission requirement, and to develop recommendations for the future of the program upon which to base policy decisions.

II. PRODUCTS

Specific products or product areas encompassed in this study include:

1. East coast marine products (fillets of cod, haddock, ocean perch, pollock, flounder and sole) market expansion and shelf-life extension)
2. Crustacean
 - a. Shrimp (varieties from all coasts)
 - b. Crab (West Coast species)
3. Bananas
4. Tropical fruits subject to quarantine restrictions
 - a. Papaya
 - b. Mango
5. Strawberries (reduction in spoilage)
6. Fresh unfrozen chicken (shelf life extension)
7. Frozen Chicken and poultry (salmonella control)
8. Tomatoes (shelf life extension and reduced spoilage)

ASSUMPTIONS

Guidelines and assumptions pertinent to the conduct of this study are outlined below. At the conclusion of Phase I of the study, a reevaluation and recasting of these may be applicable.

Assume

- (a) Food and Drug Administration clearances of the selected product will occur approximately as outlined in Appendix A.
- (b) Benefits and costs will be estimated for the period 1970 through 1980, using 1965 valuations of costs and worth of products.
- (c) For the period of time shown in (b), AEC funding and participation will be assumed to (1) terminate in FY 1968 and (2) continue at a level which would best ensure commercial adaptation of several products at the earliest time. AEC will furnish actual cost data through FY 1966 and projected costs from FY 1966 through FY 1968.

III. SPECIFIC AREAS REQUIRING EVALUATION

A. Non-irradiated product evaluation (fish)

Several areas of standard or non-irradiated food processing and marketing will require clarification and definition. These data will provide a firm base upon which a more realistic evaluation of the radiation process can be determined.

Data to be generated for marine products include:

- (a) Present market demand for fresh fish of specified quality in new and existing markets for various classes of buyers, such as family, restaurant, military or institutional buyers, with projections to the 1970-1980 time period.
- (b) The impact of distribution and handling methods on the quality and demand for fresh fish in various markets as compared with frozen varieties.
- (c) Methods of marketing and handling of fresh product from time of catch through sale to the consumer.
- (d) Variation in costs as a function of supply and demand.
- (e) Quality and shelf life of marine products off-loaded from

fishing vessels.

- (f) Processing costs prior to normal distribution.
- (g) Distribution costs of fresh product.
- (h) Profit margins attached throughout the entire marketing sequence.
- (i) Comparative evaluation of other new fish preservation techniques, if any.

B. Radiation processed marine products

Using the above as a basis, determine

- (a) Quality of landed catch for subject species and throughputs of good quality that would be available to satisfy the requirements of an economic radiation process
- (b) Processing costs with irradiation
- (c) Economies likely to be realized from stabilized supply due to shelf life extension.
- (d) Capital costs of optimal irradiation facilities and related processing costs, for the range of throughputs that are likely to be processed commercially, projected to the 1970-1980 time period.
- (e) Cost and/or public health benefits likely to accrue in the same time frame.

C. Non-irradiated product evaluation (fruits)

- (a) Market demand for fresh fruits in existing markets, and projections to the 1970-1980 time period.
- (b) Marketing and handling methods currently employed.
- (c) Estimated spoilage losses during distribution.
- (d) Processing costs entailed in present marketing procedures.
- (e) Distribution costs in present marketing procedures.
- (f) Comparative evaluation of other new preservation techniques, if any.

D. Radiation Processed Fruits

Using those items in (C) above, determine

- (a) Processing costs with irradiation
- (b) Capital costs of optimal irradiation facilities and related processing costs for the range of throughputs that are likely to be processed commercially, projected to the 1970-1980 time period.
- (c) Economies likely to be realized from reduced spoilage and/or extension of shelf-life during marketing and distribution, in the same time frame.

E. Areas common to both radiation processed fruits or marine products. To achieve an optimum degree of commercialization of radiation processing, determine

- (a) Current industry interest in each specific product.
- (b) Industry appraisals of factors necessary for consumer acceptance
- (c) Consumer attitudes related to acceptance of radiation processed foods.
- (d) Consumer educational programs which may be indicated, and methods, costs, and time to implement.
- (e) Effect on consumer acceptance of labeling irradiated food packages, to include a recommended most acceptable label.
- (f) Probable patterns of commercialization
- (g) Industry evaluation of further government support required to foster commercialization, to include specific actions or projects, projected costs and timing.
- (h) Long range prospects for radiation pasteurization, assuming AEC phaseout prior to commercialization of several products.

F. Probable Effects on other programs

To complete the perspective of the significance of an AEC phaseout prior to commercialization of several products, estimate

- (a) The effect on the Department of the Army's program on

Radiation Sterilization of Foods.

- (b) The effect on food irradiation programs being conducted in other countries.

IV. TIMING

The subject scope of work (Section III) shall be completed within twelve months of contract initiation.

In addition, it is deemed desirable to designate phases and timing of the overall scope, as follows:

Phase I (to be completed within five months after award of contract)

1. Familiarization with food program activities and review of current status, to include review of existing economic studies.
2. Discussions with other government agencies as to the availability and suitability of information pertinent to the study.
3. Collection of existing marketing data from both public and private sources.
4. Preliminary assessment of costs and benefits in the 1970-1980 time period, with delineation of uncertainty factors and problem areas to require special attention, based on an AEC phaseout in FY 1968 or continued effort sufficient to insure commercialization.
5. Presentation of preliminary findings and recommendations to AEC, in both oral and written form.

Phase II (to be completed twelve months after award of contract)

In-depth study as outlined for each specific product.

NOTE:

Appendix B is a list of AEC contractors in food irradiation, government agencies having an interest and knowledge of radiation preservation, and private companies known to have some interest in radiation processing. Contact with these companies or agencies, as well as others of the contractor's choice, would constitute a springboard for accomplishment of the study.



THE ASSISTANT SECRETARY OF COMMERCE
WASHINGTON, D.C. 20230

0077 652

Honorable James T. Ramey
Commissioner
Atomic Energy Commission
Washington, D.C. 20545

Dear Commissioner Ramey:

I wish to express to you the appreciation of the Department of Commerce for the Atomic Energy Commission's participation in the industry-government conference on the establishment of a pilot plant meat irradiator, which was held here on September 24, 1965. Mr. Eugene Fowler made an excellent presentation to the conference covering current developments and future plans with reference to the Atomic Energy Commission's program for food irradiation.

In our opinion, this meeting was highly successful, and accomplished our purpose of stimulating industry interest in the proposed pilot plant. Summary minutes of the conference will be given wide distribution to interested business firms and associations. Also, we plan to continue our discussions with those in attendance with the hope that the proposed facility will materialize.

Sincerely yours,

A. B. Trowbridge
Domestic and International Business

Materials - 12 - Total Amendment
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Res. & Status Br. = 614

UNITED STATES GOVERNMENT

Memorandum

TO : E. Eugene Fowler, Acting Director DATE: August 5, 1965
 Division of Isotopes Development

FROM : F. T. Hobbs, Acting Secretary *Original signed by*
 F. T. Hobbs

SUBJECT: MEETING WITH FRED SCHULDT, BOB, RE FOOD IRRADIATION AND
 WOOD PLASTICS PROGRAMS

SECY:AJ

1. At the Meeting with Fred Schuidt of the BOB, on August 2, 1965, the Commission noted consideration would be given to the feasibility of conducting a cost benefit analysis of the food irradiation program.

2. Commissioner Ramey requested the Advisory Committee on Isotopes and Radiation Development review both the food irradiation and wood plastics programs, and that the results be made available to the BOB.

3. The General Manager has directed you to take the action required by the above decision and request. Copies of all pertinent correspondence should be provided the Office of the Secretary.

- cc:
- Chairman
 - Commissioner Ramey
 - General Manager
 - Deputy General Manager
 - Asst. General Manager
 - Exec. Asst. to Gen. Mgr.
 - Asst. Gen. Mgr. for R&D
 - General Counsel
 - Controller

*copy filed:
 PL 131.7 - Wood Plastic*

~~OFFICIAL USE ONLY~~

8-5-65

Motwings - 12. For Radiation Sec'y of

AUG 5 1965

Mr. John T. Conway
 Executive Director
 Joint Committee on Atomic Energy
 Congress of the United States

Dear Mr. Conway:

This is in reply to your letter of July 23, 1965, with reference to the AEC's budget for the program on radiation processing of foods.

The Commission's advance planning contemplates that this program will continue through FY 1969 with continuation beyond that date subject to later review. This planning is still under review by the Bureau of the Budget.

Our preliminary estimates of the funding required to finance the program for the FY 1967-1969 period are as follows:

	<u>Division of Isotope Development</u>	<u>Division of Biology & Medicine</u>
	<u>(Thousands)</u>	
Operating Costs	\$5,100	\$1,500
Equipment Obligations	1,100	-
Construction Obligations	2,300	-
	<u>\$8,500</u>	<u>\$1,500</u>

It is hoped that the above will satisfy your needs.

Distributions:
 Office of Chairman
 GM
 DCM
 ACM
 AGRD
 OC
 Cong. Liaison
 BSM

Sincerely yours,

General Manager

DID:BA	DID:AD	ACM	DCM	ACRD	GM
7/30/65	7/ 165	7/ 165	7/ 165	7/ 165	7/ 165

*Copy filed
 Sent July 67*

8-5-65

DATE:

INDEX: MATERIAL 12 Food Irradiation

~~SECRET - SECURITY INFORMATION~~

TO:

FROM:

SUMMARY: Meeting with BoB representatives and with the Commission on the food processing and wood-plastic programs included in the FY 1967 Budget Preview

FILED: BUDGET 1967

INDEXER: date 3-5-65

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: 82 E.A. Pahl 6-30-77 DOENN-523
THIS PAGE ONLY

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

8-5-65

UNITED STATES GOVERNMENT

Memorandum

TO : E. Eugene Fowler, Acting Director
Division of Isotopes Development

DATE: August 4, 1965

FROM : F. T. Hobbs, Acting Secretary

Original signed by
F. T. Hobbs

SUBJECT: JCAE REQUEST TO FURNISH AEC BUDGET PLANS FOR FOOD IRRADIATION PROGRAM

SECY:GF

1. At Meeting 2128 on August 2, 1965, the Commission noted the JCAE staff would be informed by letter of the proposed AEC budget plans for the Food Irradiation Program.

2. It is our understanding that the Division of Isotopes Development is taking the required action. Copies of this letter together with other pertinent correspondence should be provided the Office of the Secretary.

- cc:
- Chairman
- General Manager
- Deputy General Manager
- Asst. General Manager
- Exec. Asst. to Gen. Mgr.
- Asst. Gen. Mgr. for R&D
- Controller
- Director, Congressional Relations

*Copy filed:
Bud file 67*

8-4-65

Materials - 12 - Isaac I. Ruderman



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

JUL 27 1965

MEMORANDUM FOR CHAIRMAN BRABER
COMMISSIONER PALINCY
COMMISSIONER RABETZ
COMMISSIONER TATE

THROUGH GENERAL MANAGER

SUBJECT: ECONOMIC EVALUATION OF THE COMMERCIAL POTENTIAL OF
FOOD IRRADIATION

The Director, Bureau of Budget, requested that an evaluation of the commercial potential of radiation pasteurization of food be made available to the Bureau prior to his meeting with the Commission on the fiscal year 1967 preview estimates.

At our request, the Department of Commerce, in close association with the USDA, FDA and AEC, developed the attached estimate, based on the commercialization of selected items in the AEC food irradiation program.

Based on a reference year of 1975, an economic gain in excess of \$100 million annually is projected. The report includes a discussion of the bases for the estimates.

The report has been submitted to the DCB and arrangements made for AEC staff review of it with the Bureau staff. The results of this discussion will be submitted to the Commission prior to its meeting with the Director of the Bureau.

E. E. Fuder, Acting Director
Division of Isotopes Development

Attachment: w/o
As stated above

Copy files
Rec'd July 67

7-27-65

UNCLASSIFIED

July 8, 1965

AEC 719/41

COPY NO. 35

ATOMIC ENERGY COMMISSION

RADIATION PRESERVATION OF FOODS PROGRAM

AEC
719
41

Note by the Secretary

As requested by the Commission at Meeting 2112 on June 2, 1965, when considering AEC 719/40, attached for the information of the Commission is the Work Plan for Radiation Preservation of Foods Program.

W. B. McCool

Secretary

DISTRIBUTION

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10-3-74

UNCLASSIFIED

WORK PLAN
FY 1967-1969

RADIATION PRESERVATION OF FOODS PROGRAM

TABLE I
RADIATION PROCESSING OF FOODS
Budgetary Summary
(Thousands of Dollars)

	FY1967	FY1968	FY1969	Total
<u>Division of Isotopes Development</u>				
Operating				
Preservation Factors (1)	625	425	320	1370
Acceptability (2)	630	745	820	2195
Source & Facility Studies (3)	210	150	120	480
Facility Operating Cost (4)	235	380	440	1055
Research Irradiators	30	30	30	
Marine Products Development Irradiator	50	50	50	
Mobile Gamma Irradiator	50	50	50	
Bulk Grain Irradiator	30	30	30	
Hawaiian Fruit Irradiator	25(a)	50	50	
Meat Irradiator	0	40(a)	80	
On-Ship Irradiators	50	50	50	
Cooperative Programs	0	80	100	
Total	<u>1700</u>	<u>1700</u>	<u>1700</u>	<u>5100</u>
(a) One half year's operation				
Equipment (5)	300	400	400	1100
Construction - Meat Irradiator	3750*			3750
Cooperative Programs		<u>500**</u>	<u>500**</u>	<u>1000</u>
Total DLD	<u>5750</u>	<u>2600</u>	<u>2600</u>	<u>10,950</u>
<u>Division of Biology & Medicine</u>				
Operating				
Food Chemistry (6)	100	100	100	300
Wholesomeness & Toxicity (7)	150	150	100	400
Microbiology (8)	250	250	300	800
Total B&M	<u>500</u>	<u>500</u>	<u>500</u>	<u>1500</u>
Total AEC Program	6250	3100	3100	12,450

* Meat Irradiator for U.S. Army, based on preliminary discussions with Army personnel. AEC to budget for and construct irradiator. Irradiator to be operated by private industry. Construction budget figure represents full plant cost; actual cost to Government is expected to be reduced by amount of cooperative private investment.

** Maximum AEC contribution to cooperative construction projects; may be reduced if private investment covers greater proportion of construction costs.

Definitions

1. Preservation Factors

Involves laboratory research to determine, with respect to each food item, the optimum radiation dose which provides shelf-life extension without adversely affecting the quality of the food item, the extent of shelf-life extension thereby obtained, the effect of varietal differences and physiological condition of each food item on the foregoing two parameters, the irradiation conditions necessary to achieve the desired result, including dose rate, temperature, atmosphere and dwell time, and the microbiological, biochemical and biological research necessary to understand and overcome any adverse radiation effects.

2. Acceptability Factors

Involves radiation processing of bulk quantities of food items utilizing pilot scale radiation facilities to prove out laboratory research results under practical processing conditions. Wherever possible and pertinent, this will be accomplished through cooperative programs with private industry. Factors to be studied include required storage conditions, effects of shipping and storage on organoleptic qualities, development and testing of suitable packaging materials, and consumer testing through expert and consumer taste panels. It also includes obtaining Food and Drug Administration clearance, economic and marketing analysis and consumer and industry education.

3. Source and Facility Studies

Encompasses study of the characteristics of both radioisotope and machine radiation sources to identify those applicable to food processing, study of optimum radiation source geometry, development

of radiation facility designs to meet required performance specifications, investigation of dosimetry systems suitable for production line use, and facility operating cost analysis.

4. Facility Operating Costs

Includes costs associated with maintaining and processing food items through the various facilities utilized in the program, but does not include the research and development conducted on these items.

5. Equipment

Includes cost for replenishment of radiation sources in use, modifications found to be necessary in the various sources and facilities, and normal contractor equipment requirements.

6. Food Chemistry

These studies are being conducted to determine the qualitative and quantitative effects of irradiation on naturally occurring tissue substrates which can affect flavor and texture. More definitive investigations are concerned with characterization of the changes observed in terms of chemical, biochemical and physiological parameters.

7. Wholesomeness and Toxicity

These studies are conducted in accordance with Food and Drug Administration requirements to assure the safety and nutritional adequacy of the chronic and/or subacute feeding of low dose irradiated foods to various species of laboratory animals.

8. Microbiology

Under this section are performed those investigations designed to assess the effects of irradiation on food inhabiting fungi, bacteria and molds. Particularly emphasized are studies of microorganisms of potential public health significance such as clostridium botulinum, type E. Determinations are made of population reduction, inhibition, outgrowth and toxin production under a variety of conditions and in various media. Ecological surveys are conducted to establish the prevalence and distribution of potentially hazardous organisms.

TABLE II
CLASSIFICATION OF FOODS IN THE AEC RADIATION
 PRESERVATION OF FOODS PROGRAM

	Major Items <u>1/</u>	Related Major Items <u>2/</u>	Items Being Screened <u>3/</u>
Marine Products	Haddock Pacific Crab Shrimp Clams Flounder (sole)	Codfish Pollock Ocean Perch Oysters Halibut Hake	Fresh water fish
Fruit Products	Strawberries Oranges Bananas Mangoes Papayas Tomatoes (ripe)	Nectarines Apricots Peaches	Apples Sweet Cherries Pears Plums Prunes Pineapples Figs
Other			Chicken Onions Potatoes Wheat and wheat products

1/ These products represent the major program emphasis. They are either of the original selection or they are substitutes for original selections that have proven unsatisfactory.

2/ Represents items related taxonomically or otherwise to column 1/ and are an extension of that column representing an efficient utilization of time and personnel at a small increase in cost.

3/ This column represents potential candidates for column 1/ that are being investigated only as time and seasonal availability permits. They constitute a minor exploratory effort as a backup and a fresh source of promising products in case substitutes are required in column 1/.

TABLE III
RESEARCH EMPHASIS ON MAJOR ITEMS BY FISCAL YEAR
(MARINE PRODUCTS)

Product	FY 1966	FY 1967	FY 1968	FY 1969
Haddock	Large scale storage and distribution testing. Wholesomeness completion in FY 65. Petition submission.	Consumer acceptability and test marketing.	Phase out	-----
Pacific Crab	Microbiology. Determination of process parameters. Wholesomeness completion.	Continuation of '66 plus organoleptic studies. Microbiology.	Large scale storage and distribution studies. Petition submission.	Consumer acceptability and test marketing.
Shrimp	Microbiology. Packaging. Wholesomeness completion in FY 65.	Large scale storage and distribution studies. Microbiology.	Consumer acceptability and test marketing. Petition submission.	Phase out
Soft Shell Clams	Two year feeding studies (wholesomeness)	Process parameters. Microbiology. Wholesomeness completion.	Large scale storage and distribution studies. Petition submission.	Consumer acceptability and test marketing.
Flounder (sole)	Large scale storage and distribution testing. Petition submission to Food & Drug Administration.	Consumer acceptability and test marketing.	Phase out	-----

TABLE IV
RESEARCH EMPHASIS ON MAJOR ITEMS BY FISCAL YEAR
(FRUITS)

Product	FY 1966	FY 1967	FY 1968	FY 1969
Strawberries	Completion of product research. Wholesomeness studies.	Large scale storage and distribution testing. Petition submission.	Consumer acceptability and test marketing.	Phase out
Oranges	Large scale storage, shipping and economic study. Petition now pending FDA action.	Phase out	-----	-----
Bananas, Papayas	Determination of irradiation parameters and physiological characteristics.	Completion of wholesomeness studies. Packaging studies. Process characteristic determination.	Large scale storage distribution	Limited consumer acceptability and test marketing. Petition submission.
Tomatoes*	Categorization of varietal and physiological characteristics.	Continuation of FY 66 work.	Completion of wholesomeness studies.	Consumer acceptability and test marketing. Petition submission.

* Decision on initiation of wholesomeness held up pending a clearer understanding of the potentialities of this product.

AEC**UNITED STATES
ATOMIC ENERGY COMMISSION**

WASHINGTON, D.C. 20545

Material 12- Food Irradiation

No. H-157
Tel. 973-3335 or
973-3446

FOR IMMEDIATE RELEASE
(Wednesday, June 30, 1965)

**U.S., CANADA ANNOUNCE JOINT STUDY OF
RADIATION PRESERVATION OF FOOD**

The first U.S.-Canadian research program on radiation preservation of food will get under way this summer when Canadian and U.S. scientists will begin a two-year study on extending the shelf life of chicken by low-dose radiation pasteurization.

The study will be conducted jointly by Atomic Energy of Canada Limited, the U.S. Atomic Energy Commission, and the U.S. Army Materiel Command's Natick (Mass.) Laboratories.

Among areas to be investigated are economic needs and advantages, microbiology, wholesomeness, product development, packaging, and consumer acceptance.

The refrigerated shelf life of freshly killed chickens is from 7 to 10 days under today's marketing conditions. Radiation pasteurization is expected to double this shelf life. The increased time advantage should result in more stable marketing operations and in wider marketing areas for breeders, processors, shippers, and sellers.

Radiation pasteurization of chicken may be accomplished by radiation doses of about 250,000 rads. (A rad is a standard unit of radiation measurement.) The process results in a fresh product in which the naturally occurring bacteria that eventually cause spoilage are reduced in number. The radiation energy is harmless. Unrestricted public consumption of a specific irradiated food item, such as chicken, would have to be approved by both U.S. and Canadian food and drug officials.

(more)

6-30-65

Canadian and U.S. scientists will share the research and development efforts essential for the success and regulatory clearance of the process. The microbiological aspects, a major area of interest, will be studied jointly by MacDonald College of McGill University, Montreal, Canada; the Food Division, U.S. Army Natick Laboratories; and under contract with the Division of Biology and Medicine, U.S. Atomic Energy Commission.

Studies of the public health aspects will include observation of the effects of low levels of radiation upon the life processes of micro-organisms which occur naturally on the raw product. Emphasis will be placed on salmonellae, certain other bacteria which grow at refrigeration temperatures, and bacteria which are able to grow in an oxygen-free environment.

Several flexible plastic materials, already cleared by the Food and Drug Administration for pre-packaging foods for radiation-pasteurization, will be evaluated by Natick Laboratories to select those best suited for use with chicken.

After completion in 1967, data from the joint study will be used in preparing petitions to the authorities of the respective countries for clearance of radiation-pasteurized chicken for unlimited public consumption. The petitions will be presented to the U.S. Food and Drug Administration and Canada's Food and Drug Directorate.

#

(NOTE TO EDITORS AND CORRESPONDENTS: This announcement is also being issued simultaneously by Atomic Energy of Canada Limited in Canada.)

6/30/65



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

JUN 25 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER PALFREY
COMMISSIONER RANNEY
COMMISSIONER TAFE

SUBJECT: ANNOUNCEMENT ON U.S.-CANADIAN RESEARCH ON IRRADIATED
CHICKEN

Attached for your information is a public announcement on joint U.S.-Canadian studies on irradiated chicken. We plan to release the announcement simultaneously here and in Canada on the morning of June 30.

The announcement has the approval of the Acting General Manager. The announcement has been coordinated with the U.S. Army Materiel Command, and Atomic Energy of Canada, Ltd. Information copies are being sent to the Department of State and the Canadian Embassy.

(Signed) Philippe G. Jacques
jr

Duncan Clark, Director
Division of Public Information

Attachment

cc: E. E. Hollingsworth, General Manager

S. G. Eglish, ASGL
H. C. Brown, ASGL
C. L. Dumas, DVM (Attn: Lab Welfare)
E. E. Fowler, DED (Attn: J. L. Smith)
Dale Carter, DSI
Miller Wilson, AMT Liaison Off., ASGL
Russell Price, Gen. Secy.
J. J. Parker, ASG
W. P. McCool, SECY ←
Joe Hanson, USA

7/17/65 - 4

STATEMENT BY JAMES T. RAMEY
COMMISSIONER, ATOMIC ENERGY COMMISSION
ON NATIONAL RADIATION PRESERVATION OF FOODS PROGRAM
BEFORE THE JOINT COMMITTEE ON ATOMIC ENERGY

JUNE 9, 1965

6-11-65

STATEMENT BY JAMES T. RAMEY
COMMISSIONER, ATOMIC ENERGY COMMISSION
ON NATIONAL RADIATION PRESERVATION OF FOODS PROGRAM
BEFORE THE JOINT COMMITTEE ON ATOMIC ENERGY

JUNE 9, 1965

Mr. Chairman, I would like to begin by saying that it is a privilege for the Commission once again to report to you on the accomplishments, status and plans of the AEC's Radiation Processing of Foods Program. Accompanying me at these hearings are Mr. Robert E. Hollingsworth, General Manager, Dr. George M. Kavanagh, Deputy Assistant General Manager for Research and Development, Mr. E. E. Fowler, Acting Director of the Division of Isotopes Development, and Dr. Charles L. Dunham, Director of the Division of Biology and Medicine, along with other members of the staff. Additionally, Dr. Samuel A. Goldblith, Massachusetts Institute of Technology; Dr. Herman Kraybill, Department of Health, Education and Welfare; Dr. Edward Maxie, University of California, Davis; Mr. Joseph Slavin, Bureau of Commercial Fisheries at Gloucester, Massachusetts; and Mr. Edgar A. Taylor, Department of Agriculture, distinguished members of the scientific community who work in this field, are present and will make statements on selected aspects of the AEC program. Most of these gentlemen are well known to this Committee through their previous appearances before you.

To recall some history this Committee will remember from testimony received at the January 1960 hearings that the Department of the Army held essentially complete responsibility

for governmental work on radiation preservation of foods during the 1955-1960 time period. During the course of those hearings, the results of a study of the national radiation preservation of foods program by the Interdepartmental Committee on Radiation Preservation of Foods were presented. The Interdepartmental Committee recommended realignment of the national program so that the Department of the Army would be responsible for the radiation sterilization of foods, because of its potential for providing better field rations for military personnel. The Interdepartmental Committee report further recommended that the Atomic Energy Commission assume over-all management and budgetary responsibility for a new civilian program on low-dose radiation preservation of perishable foods for extension of marketing life. This was judged to be the most immediate commercial application of the technology. The AEC was proposed for this role because:

"(1) . . . much of the food process development work required involves radiation source technology and radiation engineering, and (2) the radiation-processed foods program would be a principal facet of the Nation's atoms-for-peace program."

As Executive Director of the Joint Committee at that time, I recall specifically the encouragement which the Committee gave to the Commission to assume this new responsibility. In recommending the over-all management role for the AEC, the Interdepartmental Committee recognized that the new civilian program would be carried out by the Commission in concert with

other government departments having a historic responsibility for foods and their safety.

At the continuation of the JCAE hearings in March 1960, Commissioner John F. Floberg announced that the AEC had approved a low-dose radiation-processed foods program. He stated that the objectives of the program were to conduct research on a relatively few foods and to bring them to the point of technical and practical feasibility, including establishment of their wholesomeness and safety. It was further indicated that the Commission would proceed with its program as rapidly as was consistent with the state-of-the-art and requirements for sound scientific research.

In Commissioner Floberg's testimony, he outlined the bases on which the AEC decided to assume responsibility for the low-dose program, which were that the process would:

1. Contribute to civilian food distribution objectives of making food available in as nearly fresh condition as possible, minimizing processing effects on quality, and balancing supply with demand.

2. Have important economic value in the United States, by extending markets for perishable foods.

3. Provide leadership to other countries in improving food distribution techniques, and in increasing the variety and quality of available food products.

At the 1962 JCAE hearings on the AEC and Army Food Irradiation Programs, Chairman Seaborg reiterated the intention of the Commission to administer, as vigorously as scientifically prudent, a program in low-dose radiation processing of perishable foods, encompassing the establishment of technical and marketing feasibility and safety clearances by the Food and Drug Administration.

I can say that the bases for establishment of the program are still valid, and that the original objectives are being met, although perhaps not exactly in the way set forth initially. Certainly, the program has not been free of technical and other problems - some of which were delineated at the 1962 JCAE hearings. I want to state also that the progress which has been made reflects the strong support which the program has always received from this Committee.

To elaborate on our progress to date, five species each of seafood and fruits were selected for initial study, based on preliminary evidence that they would be most amenable to radiation treatment, and that improvement in their shelf life would constitute a true economic advantage. The seafoods have proved to be a wise choice, since all continue to be favorable prospects for commercial radiation treatment. Of the fruits, two - peaches and grapes - have not fared so well, and grapes have been dropped from further consideration in the program. In accordance with the plan presented to the Committee in 1960, we have also conducted screening studies of selected fruit and

fishery products to determine other foods showing promise for radiation processing.

The program has been expanded beyond that originally contemplated in two areas which showed economic promise, and in which there was substantial commercial interest, domestically and abroad. The two new fields were the inhibition of sprouting in tubers and the disinfestation of grain, cereal products, and certain fruits. Work in these areas has been brought to the attention of the Committee and your staff.

Progress has now reached the point where program emphasis is now changing to undertake activities designed to foster early commercialization of this technology. Principal among these efforts will be cooperative projects with private industry, involving large-scale shipping, storage, and marketing tests, and construction and operation of needed pilot facilities. A phase concerned with consumer acceptance is also envisioned as a necessary part of the commercialization effort.

In view of the time required to accomplish the foregoing and to resolve the technical problems remaining, we and our advisors in Government, science, and industry have been led to the conclusion that the program must be carried at an intensive level through FY 1969. If, by then, it is clear that commercialization has been effectively realized, AEC involvement will diminish rapidly in successive years. Of course, this forecast is tempered by recognition of the complexities involved in working with foods, and we intend to re-evaluate our position periodically.

I should now like to summarize several major aspects of the program. Subsequent testimony will expand upon these points.

In essence, the past three years have seen the program move from a laboratory-scale research effort to one of development, as we acquired the facilities and experience needed to translate our research into process technology. For example, it was only in March of this year that the Marine Products Development Irradiator, the AEC's first pilot plant facility, became operational at Gloucester, Massachusetts. Incidentally I am happy to recognize the important part played by Congressman William Bates and other members of the Committee in making this facility a reality. There were no significant delays in constructing this facility, but it is a fact of life that the time required to budget for, design, and construct such a plant amounts to approximately 2 years. The irradiator was designed and built with the concept that it would serve as a model for much larger commercial plants ultimately to be constructed and that it would permit accumulation of information on a scale sufficiently large to further define process conditions and economics. We have invited the fisheries industry to join with us in the utilization of the Marine Products Development Irradiator.

I know that this Committee had occasion to hold one of its hearings on the food program at Natick in May of 1963, a few months after the Radiation Laboratory there became operational.

I would now like to take this opportunity to extend an invitation to the Committee to visit the Gloucester facility, so that you can see for yourselves how freshly caught seafood is preserved with radiation. I think that I can assure you of a productive visit and in particular, a good luncheon.

Six other irradiators intended for a wide variety of field usage are now in various stages of construction, and we - and the food processing industry - are learning more with each successive project as to how to build increasingly efficient radiation facilities for food preservation. You will recall that research work is carried out with small irradiators located at the various laboratory sites. Four such devices have been built and installed previously under AEC auspices. Three other similar irradiators have been built by universities and have received Commission support through the provision of radiation sources.

Perhaps more important than the facilities are the accomplishments of our research investigators. These are so extensive that I will not attempt to cover these comprehensively at this time but will only touch upon the more significant aspects. Other witnesses will provide full details.

As the Committee knows, Food and Drug Administration approval of radiation processed foods for general public consumption is a prerequisite for introduction of these foods into our economy. It is particularly encouraging to observe that of 21 petitions for such clearance already submitted to FDA, by

AEC, the Department of Army, and others, 13 have been approved and the remainder are pending. The success experienced in this regard to date, indicates that if the necessary research leading to the submittal of the several other petitions now under consideration can be completed, equally good FDA reaction may be anticipated. FDA approvals achieved during the past year have given increasing confidence to the food processing industry that the technology will find commercial acceptance.

The outlook for commercial radiation pasteurization of fisheries products is particularly good. Current research and development results on the preservation of a variety of fish, clams, shrimp, and crabs indicate that products completely acceptable to the consumer can be furnished, with refrigerated shelf life extensions ranging from one week to several weeks. If brought to fruition, radiation preservation of seafoods will open new markets for the fisheries industry in the interior of the country not now benefited by a supply of fresh fish and will increase the proportion of the catch which finally reaches the consumer in wholesome condition.

Several varieties of fruit also show significant promise of technical and commercial feasibility for radiation preservation. Strawberries in particular continue to be one of the best fruits, with spoilage losses due to mold formation reduced from 25 percent to 5 percent in normal commercial shipping channels. Recent work on bananas strongly indicates that if this fruit is treated with only a very modest dose of radiation while in the

very green stage, ripening can be delayed for exceptionally long periods of time. In fact, ripening can be induced in the irradiated bananas at almost any desired point by subjecting them to a harmless secondary treatment with ethylene gas. The resultant decrease in spoilage losses that now occur in marketing bananas could have real economic significance.

A field closely related to the preservation of fruits is the disinfection of fruits, grains, and cereal products by radiation treatment. Here, nominal radiation doses are effective in sterilizing insects and thus preventing their propagation in harvested, stored, or packaged agricultural products. The Department of Agriculture's interest in this regard will be demonstrated by a later witness, but I would like to note that tropical fruits such as papayas, mangoes, and pineapples can be disinfested by radiation more effectively in most cases than by any other means, and that grains and processed cereal products are equally amenable to this treatment.

The use of radiation to inhibit sprouting during storage of white potatoes, onions, and other tubers, has been demonstrated conclusively to be effective. However, the economics of the process in terms of comparison to other sprout inhibition techniques are still in doubt, pending larger scale storage tests. Such comparative tests are planned for the near future, and will be conducted by a commercial organization with nominal AEC support. In Canada and Russia, where different economic parameters are in effect, full-scale commercial irradiation of potatoes to inhibit sprouting is being carried out.

Turning now to the problems that we have encountered, we find that two major difficulties have appeared which have consumed more time and money to resolve than we anticipated. The first of these concerns the potential hazards of the microorganism Clostridium botulinum, Type E. The identification of this organism as the causative agent in some food poisoning outbreaks involving the consumption of marine products prompted us to intensify investigations to determine whether or not a hazard exists with low dose radiation treated seafoods. The research program was expanded to include studies to assess the natural incidence and distribution of the microorganism, those conditions favorable to its growth and toxin production, and the changes in these characteristics resulting from radiation processing and subsequent storage and handling. Doctor Goldblith will have more to say on this subject.

The second problem has occurred in studies related to fruit preservation. Here it has been found that the efficacy of the radiation preservation process cannot be extrapolated from one species to another or even from one variety to another within the same species. Also, it is observed that the degree of ripening prior to irradiation is critical in determining whether radiation will be beneficial or not. These effects have necessitated taking a more deliberate approach to the radiation preservation of fruits than was originally thought necessary. Dr. Maxie will provide further information in this regard.

Another measure of progress being made is the degree of commercial interest in the process. During the past year, this interest has increased markedly. Several things are responsible for this. Perhaps the most significant is the confidence given industry, as I have indicated earlier, by Food and Drug Administration approval of selected radiation processed foods for unlimited human consumption. It is our impression that private food companies have, over the past few years, essentially adopted a "wait-and-see" attitude. This has not been because of a lack of interest in this new food processing method, but a general uncertainty associated with the clearance question. Additionally, the continued good technical results coming out of our research and development work have contributed importantly to this confidence, not to mention the availability of operational radiation processing facilities of various types.

Many companies have discussed their plans with us, particularly over the past year. While these discussions, in many cases, were on a proprietary basis, the general statement can be made that there are approximately 20 major food companies conducting in-house experiments with private funds and an equivalent number that have expressed a desire to enter into cost-sharing agreements with us.

We have already taken several steps to accelerate participation of the food industry in the program. For example, response to the Commission's recent public invitation to the fisheries industry to participate with us in the use of the

Marine Products Development Irradiator at Gloucester has been very encouraging. A dozen companies have formally expressed an interest in engaging, on a cooperative basis, in shipping, storage, and laboratory evaluation tests of radiation-processed fish fillets and other seafoods. In these tests, the radiation pasteurized foods will be subject to normal commercial handling conditions which are a necessary extension of laboratory findings and are requisite to commercialization.

I would also like to identify that we have been having discussions with the Department of the Army about the requirements for a large-scale radiation facility designed specifically for processing of meats. We are hopeful that sufficient interest can be developed within industry to build such a plant with private funds, provided the Armed Services will guarantee to purchase a portion of the through-put of the plant over a period of several years. I understand that General Lotz intends to address himself to this question during the course of his testimony. Under such a cooperative arrangement, the AEC would furnish the radiation source if required. This venture, if successful, would result in one or more private facilities being built rather than requiring the Government to build such a facility. This would also provide a specific demonstration by industry of its intent to commercialize radiation processing of foods and would represent a major step forward. During the course of the next several months, we and the Department of the Army will consider specifically the issuance of a public invitation to industry to obtain proposals for such a facility.

Recognizing that only two years still remained to carry out the program as originally conceived, and taking into account the problems discussed earlier, the AEC requested the American Institute of Biological Sciences' advisory committee on radiation preservation of foods to evaluate the current status and future needs of the program late in 1964. The Committee has applied itself to this task, and has concluded that the program should be extended at least through 1971, based on the unpredictable delays that have been encountered in performing the research and because of the previous lack of availability of pilot-sized irradiators. More recently, the Interdepartmental Committee on Radiation Preservation of Foods met to consider the AIBS Committee report and to perform its own evaluation. It concurred in the findings. The Commission has reviewed the reports of these groups and the internal analysis of the program prepared by the staff which is reflected in our testimony today, as I have stated earlier, and has concluded that there is sufficient merit to the accomplishments already made and to the prognosis for the future to plan for continuation of the program through the next several years.

The planned extension will encompass product development on those food items which show the greatest promise of ultimate commercialization, and the necessary comprehensive wholesomeness tests required to obtain FDA clearance of these products. Parallel studies of marketing and economic factors will be carried to completion in conjunction with the Department of the

Army and the several other agencies which contribute so significantly to the over-all effort. On an ever-increasing basis, the cooperation and involvement of industry will be solicited to conduct shipping, storage, and consumer acceptance tests, and we anticipate substantial private financial contributions to facilities and programs as well.

To accomplish this mission, we now estimate that maximum AEC resources of the order of \$6.6 million for operating costs, \$1.1 million for equipment and \$4.8 million for construction of facilities will be required in the FY 1967-1969 time period. These amounts will be reduced to the extent that private financial participation is obtained. For comparison, total AEC expenditures from inception through FY 1966 for operating costs, equipment and construction are estimated to be \$9.7 million. A fiscal analysis is provided with my prepared remarks. The additional funds are believed to be reasonable in terms of the value to the public. While this value cannot be quantitated in precise terms, it is evident that reduction in food spoilage, stabilization of market supply and demand, extension of markets, and availability of fresh foods in areas where they are not presently obtainable will result in substantial economic advantage.

As a concluding part of my testimony, I wish to recognize specifically the invaluable contributions of other Government departments to the AEC program. Through the years, we have maintained exceptionally close coordination with the Department

of the Army concerning our respective programs. It is extremely pleasing to be able to tell this Committee that our working relationships, which have been on a day-to-day basis throughout the course of the entire program, have been outstanding. We feel quite strongly that the excellent rapport we have achieved has had great influence in bringing both programs to their present state of success. There is every reason to believe this relationship will continue as both the Army and AEC begin to concentrate their combined efforts toward actual commercialization of radiation processing of foods.

This concludes my statement and I will now call upon Mr. Fowler to continue with the testimony and to introduce other witnesses.

June 4, 1965

List of Appendices

Appendix 1 - Fiscal Analysis

APPENDIX 1

RADIATION PROCESSING OF FOODS
 Budgetary Summary
 (Thousands of Dollars)

	<u>Actual</u>						<u>Estimated Budget</u>		<u>FY 1967-1969</u>	<u>Total Estimated Program Costs</u>
	<u>FY-60</u>	<u>FY-61</u>	<u>FY-62</u>	<u>FY-63</u>	<u>FY-64</u>	<u>FY-65</u>	<u>FY-66</u>	<u>Cumulative through FY-1966</u>	<u>Extension</u>	
<u>Division of Isotopes Development</u>										
Operating Costs	74	179	314	683	987	1,170	1,700	5,107	5,100	10,207
Equipment obligations	162	168	20	79	668	375	100	1,572	1,100	2,672
Construction obligations	-	-	-	600	-	-	-	600	4,750	5,350
	<u>236</u>	<u>347</u>	<u>334</u>	<u>1,362</u>	<u>1,655</u>	<u>1,545</u>	<u>1,800</u>	<u>7,279</u>	<u>10,950</u>	<u>18,229</u>
<u>Division of Biology and Medicine</u>										
Operating Costs	-	82	182	391	453	600	700	2,408	1,500	3,908
Total ABC Program	<u>236</u>	<u>429</u>	<u>516</u>	<u>1,753</u>	<u>2,108</u>	<u>2,145</u>	<u>2,500</u>	<u>9,687</u>	<u>12,450</u>	<u>22,137</u>

Materials - Food Irradiation
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UNITED STATES GOVERNMENT

Memorandum

TO : E. Eugene Fowler, Acting Director
Division of Isotopes Development

FROM : C. L. Dunham, Director
Division of Biology & Medicine
W. B. McCool, Secretary

DATE: June 7, 1965

SUBJECT: AEC 719/40 - AEC RADIATION PRESERVATION OF FOODS PROGRAM

SECT:GF

*Original signed
W. B. McCool*

1. At Meeting 2112 on June 2, 1965, the Commission:
 - a. Approved continuation of the Radiation Preservation of Foods Program through FY 1969, subject to satisfactory preparation of a work plan to be circulated for review by the Commissioners. Emphasis should be placed on those areas promising early meaningful results, and encouraging commercialization, including participation of other Government agencies and, in particular, private industry;
 - b. Noted that the projected funding levels beyond FY 1966 are subject to the annual budgetary reviews;
 - c. Noted the Bureau of the Budget will be notified of AEC's desire to extend the program and request that the BOB review its previous position;
 - d. Noted, subsequent to BOB clearance, the position outlined in AEC 719/40, as revised, will be presented at the JCAE hearings scheduled for June 9-10, 1965; and
 - e. Noted that no public announcement is necessary at this time.

2. The Commission requested circulation of a work plan and of revised testimony for the June 9-10 Hearings. In this connection, Commissioner Ramey requested a report on the research recently conducted by Dr. Harry Mosen on the consumption of irradiated foods by mice.
3. The General Manager has directed you to take the action required by the above decision.

cc:

Chairman	Asst. Gen. Mgr. for R&D
Commissioner Ramey	General Counsel
General Manager	Controller
Deputy General Manager	Director, Public Information
Asst. General Manager	Director, Congressional Relations
Exec. Asst. to Gen. Mgr.	

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6-7-65

Materials - 13

OFFICE OF THE GENERAL MANAGER

To: W. B. McGool

At Commission Meeting 2112, on 6/2, during consideration of AEC 719/40 - "AEC Radiation Preservation of Foods Program", Commissioner Ramsey requested a report on research conducted by Dr. Harry Mousen on the consumption of irradiated foods by mice.

Attached is a note from Gene Fowler to Commissioner Ramsey, in response to this request, and is forwarded for your records to close out this action.

Attachment:
Memo, dated 6/8/65

CMK
C. S. King, Management Assistant
Office of the General Manager
6/16/65

GPO 203227

59-837-168-65

Handwritten signature

JUN 8 1965

INTERNAL NOTE

TO : Commissioner James T. Ramey
SUBJECT: HEART DEFECTS IN RATS FED RADIATION PROCESSED FOODS

You have inquired about the outcome of the question raised at the 1960 JCHN hearings on radiation preservation of foods, concerning the incidence of heart defects in rats which had been fed a diet of irradiated foods. Harry Mouson, Ph. D., Assistant Professor of Anatomy, University of Illinois, was the witness at the time.

Dr. Mouson was recalled to testify on this subject at the 1962 hearings, and he stated that when he attempted to repeat a part of his experiments, he was unable to obtain the same results that he had achieved previously. Dr. Mouson stated that another laboratory (Pittsborough General Hospital, Denver, Colorado) also failed to obtain heart lesions in mice fed irradiated foods, although the work had not been completed. He stated further that he induced heart lesions in mice by feeding them either irradiated milk or nonirradiated milk, as long as milk constituted the principal item of diet.

Dr. Warren Keybill of the U.S. Public Health Service also testified at the 1962 hearings. He stated that the cause of heart lesions in mice fed irradiated foods had not been conclusively established, other than that a diet of canned or heat-treated milk will produce the lesions in small percentages of mice. He proposed that a dietary stress associated with a genetic factor was the cause. He cited several other laboratories which had observed lesion formation with diets completely unrelated to irradiated foods.

Dr. Mouson's reference to uncompleted work at Denver alluded to research being conducted on 4,473 test mice by Lt. Col. Samuel W. Thompson, II, DVM, U.S. Army Medical Research and Nutrition Laboratory, Pittsborough General Hospital, Denver, Colorado, whose work

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completed about September 1963. There were no recognizable heart lesions of the Monson type, although over 50 percent of the mice, both experimental and controls, exhibited other lesions of varied types. Dr. Thompson stated that these observations suggested "genetic predisposition in certain strains of the mice towards left auricular weakness." Furthermore, he stated, "the observations of left auricular dilation in Cb mice fed irradiated diets is a matter for speculation, since the induction of lesions following the administration of this type of diet cannot be reproduced."

The term "is a matter for speculation" in the above quotation is the conservative scientist's way of leaving open a scientific matter which could not be conclusively disproven. That is, Dr. Thompson could report only on his own findings and could not be the judge of Dr. Monson's research, since there might have been some unknown factor in Dr. Monson's experiments which was not duplicated in Dr. Thompson's work.

The consensus of those familiar with this problem is that:

- (1) The effect seen by Dr. Monson could not be conclusively repeated by others.
- (2) Several foods cause congenital heart defects in mice, and the effect is probably a dietary stress in conjunction with a hereditary factor.
- (3) If irradiated foods produce heart lesions in mice, the incidence is too low to be of concern and should be no cause for alarm, since many other diet staples produce this effect and no one is proposing that humans avoid eating these foods.

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MA

E. E. Fowler, Acting Director
Division of Isotopes Development

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JLBLOOM:eam EEFOWLER



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

*Materials-12
Food Irradiation*

May 25, 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: JCAE FOOD IRRADIATION HEARINGS

We have been informed by the staff of the JCAE that the Committee plans to hold open hearings on the food irradiation program on June 9 and 10. Purpose will be to review status of program, accomplishments and plans for the future.

In addition to hearing from the AEC they plan to have witnesses from the Department of the Army and private industry. Preparation of the Commission's testimony is underway by Mr. Fowler. In this connection he plans to meet with the staff of the Joint Committee Wednesday afternoon in order to discuss the scope of the hearings, outside witnesses, and other related matters. A copy of the draft statement will be circulated for review and comment in the next several days.

The hearings will be chaired by Representative Melvin Price before his Subcommittee on Research, Development and Radiation and are planned for 10 a.m. and 2 p.m. each of the two days.

Original signed by R. D. O'Neill
John J. Burke, Director
Congressional Relations

cc: GM
DGM
AGM
ACIRD
OGC
OC
B&M
DID
Secretariat



not filed O-M-T. JCAE

5-26-65

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May 28, 1965

AEC 719/40

COPY NO. 49

ATOMIC ENERGY COMMISSION

AEC RADIATION PRESERVATION OF FOODS PROGRAM

Note by the Secretary

The General Manager has requested that the attached report by the Acting Director of Isotopes Development and Director of Biology and Medicine be circulated for consideration by the Commission at an early date.

W. B. McCool
Secretary

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ATOMIC ENERGY COMMISSION

AEC RADIATION PRESERVATION OF FOODS PROGRAM

Report to the General Manager by the
Acting Director, Division of Isotopes Development
and Director, Division of Ecology and Medicine

THE PROBLEM

1. To consider extension of the AEC Radiation Preservation of Foods Program beyond the presently scheduled termination date of FY 1968.

2. To establish an AEC position regarding program extension prior to the Joint Committee on Atomic Energy hearings on this subject which are presently planned for June 9-10, 1965.

BACKGROUND AND SUMMARY

3. In testimony presented to the JCAE on March 31, 1960, the AEC agreed to "...conduct the basic research necessary for advancing low-dose radiation processing of foods to the point of technical and practical feasibility." The appropriate excerpt from the testimony is attached as Appendix "A". It was then estimated that this goal probably could be met in five years beginning in FY 1961, at a cost of \$5 million.

4. Research was initiated in FY 1961. In mid-FY 1962, the AEC was advised by the BOB that funds for the program were being eliminated from the FY 1963 budget. The JCAE held further hearings on the National Radiation Processing of Foods Program in May 1962, and the Congress reinstated the program in the FY 1963 budget. These funds did not become available to AEC until mid-FY 1963. In this interim, limited funds from other Division of Isotopes Development and Division of Biology and

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Medicine programs were diverted to the food program to maintain some continuity. The net effect of the Budget Bureau's action was to delay program development by at least one year.

5. During the Bureau's review of the Division of Isotopes Development's FY 1966 budget request for the food program, they emphasized the desirability for its effective termination in FY 1967. However, no written guidance to this effect has been received from the BOB. Subsequently, AEC budget requests and plans have been made on the assumption of program conclusion in FY 1967, with incremental funding in FY 1968 to provide for orderly termination.

6. In view of the fact that approximately two years of effective research and development time remain under current program planning, the American Institute of Biological Sciences Advisory Committee on Radiation Preservation of Foods, which serves the AEC, was requested to review fully the program status. The Committee was specifically requested to assess AEC accomplishments to date with reference to the previously noted 5-year plan and the need, if any, to extend the program beyond FY 1968. The major conclusion of the Committee, which met March 18-19, 1965, was:

"Based on extensive review of the over-all program, the important scientific accomplishments to date, and the research currently underway, the Committee concludes that the Irradiation Preservation of Foods Program of the Atomic Energy Commission needs to be continued beyond FY 1968. Important factors involved in this conclusion relate to difficulties in projecting an exact timetable of research results when the program was initiated in 1960. Additional time will be needed to achieve the original program objectives, because: (1) of the unexpected research emphasis needed to clarify the possible public health significance of Clostridium botulium, Type E, in marine products; (2) the significance of the physiological maturity of fruits as related to the response of these foods to irradiation treatment was not recognized until 1964;

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(3) of the lack of availability of sufficient numbers of pilot size irradiators for commercial testing up to the present time. These factors have delayed the successful prosecution of petitions through USFDA."

7. The petitions referred to in paragraph 6 above are the means by which the results of wholesomeness and microbiological studies of specific radiation processed foods are presented to the Food and Drug Administration in accordance with a previously agreed upon research plan or "protocol." FDA performs an exhaustive review of the data, and, if the results demonstrate that the food in question is safe for human consumption, a regulation clearing the food is issued. The AIBS Committee's reference to prosecution of petitions through FDA was based on the fact that, subsequent to inception of the AEC program, the FDA's requirements for information prior to approval of petitions were expanded to include much more detailed microbiological studies on fisheries products, evaluations of market acceptance and economics, and in some cases demonstrations of need for this new food preservation process.

8. The Committee concluded that FY 1971 was the earliest probable target date wherein current AEC program objectives would be effectively realized, based on evidence to date and subject, once again, to the uncertainties of predicting, on a precise timetable, successful development of required technology. The Divisions of Biology and Medicine and Isotopes Development concur in the need to extend the AEC Radiation Preservation of Foods Program through FY 1971. The full report of the AIBS Committee is attached as Appendix "B".

9. The current status and level of accomplishment of the AEC Radiation Preservation of Foods Program can be assessed in terms

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of progress with the types and varieties of fruits, vegetables, and seafood that have been studied and of the status of petitions to the Food and Drug Administration for clearance of these foods for general public consumption. In summary, approximately 20 types of fruits and vegetables and 15 varieties of seafoods are in various stages of research. A comprehensive petition for approval of various types of plastic wrappings in contact with radiation processed foods has been approved by FDA. Other packaging material petitions are under FDA evaluation. A petition has been submitted by AEC to FDA for oranges, and ones involving strawberries and fish fillets are scheduled for the near future. Previously, petitions submitted by others for the radiation processing of wheat and wheat products, bacon, and potatoes had been approved by FDA. A more detailed analysis of this phase of the AEC program is attached as Appendix "C".

10. During the course of the program to date, it became apparent that the initial objective of studying a few species of fruits and fish only was somewhat unrealistic in that there could be no a priori assumption that the species selected would prove to be amenable to radiation treatment. Therefore, the base of research was extended to cover a large number of species. Furthermore, varietal differences within a given species were found to be significant in ascertaining whether the species could or could not be treated effectively with radiation. As a consequence of these factors, a greater effort than had been originally contemplated proved to be necessary. Additional justification for extending the number of products studied has been realized from the consideration that optimum economic use of a food irradiation facility and of attendant research manpower can be obtained only if enough varieties of foods are included in the

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program to overcome lapses in the availability of many foods because of their seasonal nature of harvest. It should be noted also that the original objective of the program has been extended to include studies of insect disinfestation and sprout inhibition in cereals, cereal products, and vegetables, because there is a distinct economic advantage to be gained from such processes and because there was substantial commercial interest in them. Cost to the AEC for the research aspects of this work has been minimal because of the availability of radiation facilities and trained manpower which have been accumulated for the major portion of the program. The results have been promising enough to warrant further investment in equipment for commercializing these processes.

11. Development of irradiators designed for the handling of food has proceeded concurrently with the research. Initial program emphasis was on developing and procuring research irradiators required for basic technological studies. Because of restrictions imposed by time and money, and the state of radiation engineering, it was not until March 1965 that the AEC's first continuous process semi-commercial-scale food irradiator became operational (the Marine Products Development Irradiator sited at Gloucester, Massachusetts). Five other irradiators, described in Appendix "D", are in various stages of design or construction. Large-scale storage, distribution, and consumer acceptance tests cannot be performed adequately until these irradiators are in service. Several years of operation will be required to accumulate data necessary to satisfy technical, economic, and wholesomeness consideration.

12. If approval is given for program extension, we will pursue product development on those items which now or will in the near

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future show promise of commercialization. In many cases, results obtained from research either underway or completed on one product can be extrapolated to others under consideration, with the net result that several products can be studied with only a modest increase in funds and effort. FDA approval will be requested for those food products which prove to be responsive to radiation, and which show an economic advantage. Most likely, clearances for all items shown in Appendix "C" will not be requested. This extension would emphasize industry-government cooperative ventures by incorporating aspects leading to commercialization. This would involve the use of the process irradiators now in operation or under construction. Commercial food processors will be invited to enter into joint ventures with the AEC to conduct shipping, storage, and consumer acceptance tests on a semi-commercial-scale. In fact, a formal invitation has been issued already to the fisheries industry for cooperative participation in such tests. In some cases, new radiation facilities may be built with private funds for these purposes, with financial assistance from the AEC in the form of providing radiation sources on a loan or rental basis, or sharing the operating costs of the facilities. In a few instances, sharing of the capital costs may be necessary also. Such facilities would not duplicate the functions of the research and development irradiators which have been constructed solely at AEC expense. Any AEC financial support for private participation in the program is covered within the cost projections shown in paragraph 13 below. An essential consideration in program extension is that it will permit completion of wholesomeness studies and subsequent clearance of specific foods by FDA for general public consumption. The dates for submission of petitions shown in Appendix "C" do not

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necessarily mark the end of AEC activity since experience indicates that, more often than not, the FDA, in the course of its considerations, requires additional research data. Projects are also planned for the development of radiation processes for the control of salmonellae in poultry and poultry products. Salmonellosis is considered by the U. S. Public Health Service to be the primary food-borne disease in the United States.

13. Funding at the rate of approximately \$2.1 million per year by the Division of Isotopes Development for process development, and of approximately \$0.5 million per year by the Division of Biology and Medicine for wholesomeness research, is projected beginning in FY 1967 and extending through FY 1971, for a total expenditure of \$16.6 million in this period. For comparison, total AEC funding through FY 1966 is now estimated to be \$9.7 million. (See Appendix "E" for a detailed breakdown of funding history and projections). It is not clear at this time what the exact nature of the AEC's contribution to cooperative projects with the food industry will be. Provision has been made for sharing operating, equipment, and construction costs, as individual cases may warrant. For example, the Army has expressed an informal desire to have the AEC budget for a meat irradiator in FY 1967 which may be built at least partially with private funds. This facility would satisfy Army needs for limited procurement of irradiated meat and would permit evaluation of commercial sterilized or pasteurized meat product production as well.

14. The AEC low-dose program has as a close counterpart the Department of Army's high-dose radiation sterilization program. Each includes the determination of technical feasibility of radiation processing in its respective area. Current Army program planning for its food effort extends through FY 1966. It plans to initiate a new 5-year program with the objectives of fostering commercialization of sterilized meats and other foods, and of making these products standard components of

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military rations. In this respect, it is desirable that the AEC plans be in consonance with those of the Army since the two programs are interdependent. Representatives of the U.S. Army Natick Laboratories have expressed concern that premature termination of the AEC effort in FY 1968 will have adverse effects not only on their own program but also on the present national effort.

15. A number of private organizations representing food, equipment, and irradiator interests, as well as other governmental agencies working with the AEC in the development of low-dose radiation processing, have encouraged the AEC to extend the program until such time that private industry is commercially engaged in actual distribution and sale of radiation processed foods. In their viewpoint, withdrawal prior to this time would be most unfortunate because AEC central leadership now provides the means of maintaining an organized effort. (Appendix "F" lists companies known to be doing private food radiation research and also those who have expressed strong interest in participating in cooperative industry-AEC projects). The Departments of Agriculture, Interior and Commerce are principal advocates of an AEC program extension. Each of these agencies, in addition to the Army, is now investing manpower and funds in their own areas of special interest to advance the program. Their contributions are expected to increase substantially in FY 1967. A premature termination of the program would also have an adverse effect on the many projects of similar nature in other countries which rely heavily on the AEC for technological results and leadership.

16. The role of other Government agencies in the program is coordinated by the Interdepartmental Committee on Radiation

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Preservation of Foods. The AEC representative is the Assistant General Manager for Research and Development. The Committee met in March, 1965, to hear reports on progress, prospects and problems in both the Army and AEC programs. In reviewing the effects of phase-out by either AEC or Army, the Committee concluded that "It is imperative that the Army and AEC maintain their responsibilities in the program at least through 1971 and beyond if necessary." The full text of the summary of the meeting is on file in the Division of Isotopes Development.

17. The prospects for commercialization continue to appear favorable. Recent technological results are substantiating earlier predictions of success for several fruit and fish products. Two economic analyses which have been completed recently under AEC sponsorship are favorable in their outlook, although more critical studies of this kind will be required before a firm assessment of the economic future of the process can be established. Several large food companies are performing internal studies to assess their potential in the field, or have indicated a desire to participate in cooperative pilot ventures (See Appendix "F"). Industry consensus is that commercialization will occur, but only after a sufficient number of FDA clearances have been obtained to form a solid base, and after economic feasibility is more firmly established. Termination of the AEC program in FY 1967 will not provide sufficient time to accomplish these objectives; these areas would be stressed during the extension period.

STAFF JUDGMENTS

18. The Offices of the General Counsel and the Controller concur in the conclusion and recommendation of this paper. The Division of Public Information concurs in recommendation 20e. The Office of Congressional Relations concurs in recommendation 20.d.

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CONCLUSION

19. It is concluded that the AEC Radiation Preservation of Foods Program will not have reached the goal of "Advancing low-dose radiation processing of foods to the point of technical and practical feasibility" by FY 1968.

RECOMMENDATION

20. The General Manager recommends that the Atomic Energy Commission:

- a. Approve continuation of the Radiation Preservation of Foods Program through FY 1971 with emphasis on those aspects which would encourage commercialization, including participation of other Government agencies and, in particular, private industry;
- b. Note that the projected funding levels beyond FY 1966 are subject to the annual budgetary reviews;
- c. Notify the Bureau of the Budget of AEC's desire to extend the program and request that the Bureau review its previous position;
- d. Present, subsequent to BOB clearance, the position outlined in this paper at the JCAE hearings scheduled for June 9-10, 1965; and
- e. Note that no public announcement is necessary at this time.

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APPENDIX "A"

Excerpts from March 31, 1960 JCAE Hearings
on Food Irradiation

"The Commission's program will be directed to the study of low dose radiation processing of perishable foods to extend their shelf life, using radiation doses ranging from a few hundred thousand rad up to one million rad. Initial emphasis will be on fish and fruit.

"The objectives of the program are to:

1. Concentrate on a relatively few low-dose, radiation processed foods so as to achieve success sooner than would be possible if a multitude of food products were studied concurrently.
2. Establish wholesomeness and safety of selected low-dose, radiation processed foods.
3. Proceed as rapidly as possible, consistent with the state of the art and requirements for sound scientific research.
4. The Commission will conduct the basic research necessary for advancing low-dose radiation processing of foods to the point of technical and practical feasibility. Emphasis will be placed on basic studies in food chemistry, microbiology, wholesomeness testing, pre-irradiation and post-irradiation factors of shelf life extension and radiation process technology."

Taken from testimony before the Joint Committee by the Commission on March 31, 1960.

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APPENDIX "B"

RECOMMENDATIONS OF THE AIBS
ADVISORY COMMITTEE ON IRRADIATED FOODS
TO THE
U. S. ATOMIC ENERGY COMMISSION

11TH SEMI-ANNUAL MEETING
MARCH 18-19, 1965

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ADVISORY COMMITTEE MEMBERS

Dr. Bernard S. Schweigert, Michigan State University, Chairman

Dr. Samuel A. Goldblith, Massachusetts Institute of Technology

Dr. Lloyd L. Kasper, University of Michigan

Dr. Herman Kraybill, National Institutes of Health

Dr. Paul S. Larson, Medical College of Virginia

Dr. E. C. Maxie, University of California, Davis

Mr. David H. Rest, Arthur D. Little, Inc.

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OVERALL EVALUATION OF THE IRRADIATION
PRESERVATION OF FOODS PROGRAM

The Committee commends the Division of Biology and Medicine and the Division of Isotopes Development of the U. S. Atomic Energy Commission for the technical excellence of their programs on food irradiation.

Based on extensive review of the overall program, the important scientific accomplishments to date and of research currently underway, the Committee concludes that the Irradiation Preservation of Foods Program of the Atomic Energy Commission needs to be continued beyond FY 1968. Important factors involved in this conclusion relate to difficulties in projecting an exact timetable of research results when the program was initiated in 1960. Additional time will be needed to achieve the original program objectives because: (1) of the unexpected research emphasis needed to clarify the possible public health significance of Clostridium botulinum, Type E in marine products; (2) the significance of the physiological maturity of fruits as related to the response of these foods to irradiation treatment was not recognized until 1964; (3) of lack of availability of sufficient numbers of pilot size irradiators for commercial testing up to the present time. These factors have delayed the successful prosecution of petitions through USFDA.

The Committee considers the continued AEC emphasis to bring a few selected food products to the stage of technical and practical feasibility to be sound. The Committee further considers the plans of other governmental agencies (i.e., U.S.D.A., Bureau of Commercial Fisheries, USDI, Department of Commerce, U. S. Public Health Service) to augment their participation in the years ahead to be most appropriate as commercialization of selected products becomes more imminent. At that time, continuing participation of the AEC in irradiator source design,

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fabrication, dosimetry, etc., in international scientific liaison activities, and as a technical information center for augmenting the transfer of irradiation technology to the food and allied industries will be vital components in bringing this important research and development program to a successful conclusion. While it is not possible to predict the exact number of years of additional research and development effort required, the Committee estimates that continued support will be needed until 1971 or longer.

APPLIED PUBLIC HEALTH ASPECTS OF RADIATION
PROCESSING OF FOOD AND FEEDS

Within recent years considerable attention has been focused upon the control of certain pathogens and parasites which give rise to food-borne diseases of major public health significance. In this instance, for example, salmonellae has been regarded by the U. S. Public Health Service as the nation's primary food-borne disease which is transmitted to man by certain food products (frozen eggs, cake mixes with egg products, chicken, etc.) and to animals through feed stuffs (fishmeal, meat meal, and bone meal). Current practices and technology, usually lacking adequate sanitation, do not insure adequate protection from these agents.

For the last 10 years, scientific investigators have shown that radiation treatment in the dose range from 7,000 rads for parasites up to several hundred thousand (500,000) rad for salmonella destruction could be very effective as preventive health measures in control of these agents. Keen interest has been shown in some countries, including developing countries, for this process. However, in the USA, recognition of the radiation process as an adjunct to our armamentarium for public health control procedures has not reached the commercial applications stage. Operating at these low radiation dose levels, there is no

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adverse effect on quality of food products with the exception of some baked products using egg products, but these minor factors are not that important to preclude commercialization. The economics of the process appear to be quite favorable. In the final step in packaging of product prior to distribution and retail sale, radiation processing would guarantee a product of established safety and break this potential chain for disease transmission.

The AEC should exploit this area of development through pilot studies and demonstration projects. In addition, a concerted effort should be initiated with food processors and animal feed manufacturers to demonstrate to the industry the favorable technical features and the apparent low costs of operation of the process, plus the competitive advantage that the food industry can furnish products which will merit consumer confidence. In terms of the total AEC program, this area of effort should represent a significant percent of development effort. Since this developmental effort embraces national and international interest, this program covers more than the single objective of applied public health aspects relative to promotion of radiation processing as a technology.

CLOSTRIDIUM BOTULINUM, TYPE E

When the AEC radiation pasteurization of foods program was first initiated, about 1960, it was thought that no significant botulinum problem would be involved, since it was anticipated that foods so pasteurized would be safe if kept refrigerated. However, at the first meeting of the advisory committee the existence of then very new research findings on the growth of Clostridium botulinum, Type E at 38°F or above were introduced for consideration. At that time, the food industry was generally unformed and unconcerned about Type E botulism. Nevertheless, the AEC program was modified to investigate Type E botulism as a possible problem. Within a few years, increasing evidence accumulated to point to C. botulinum as a crucial factor

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governing the development of a safe irradiation pasteurized process for fish which was to be stored under refrigeration. A number of people have died in the last couple of years from eating industrially smoked and canned fish. Today, it is absolutely essential that any new processing technique, including radiation pasteurization for preserving fish, poultry, etc, provide adequate protection against the presence of botulinum toxin in the food when it is delivered to the consumer. Indeed, this should further include protection against possible development of Type E. botulinum toxin in the food stored under possibly inadequate conditions while the food is under the consumer's care.

Thus it is evident that, since inception of the AEC food program, Type E botulism poisoning has grown from a curiosity recognized by very few microbiologists, to a major problem in the food industry. The AEC, through its radiation pasteurization of foods program, was one of the first to recognize this problem and to support an important research effort concerning it. This has aided materially in training scientists and food processing experts who are knowledgeable in this subject.

Nevertheless, it is a fact that the potential development of Type E botulism in irradiated fish, poultry, etc., that are stored at usual refrigeration temperature, has materially delayed the development of the AEC radiation pasteurization of foods program. Unfortunately, even today we do not have really adequate knowledge about control of Type E botulism in refrigerated foods. Although much research is in progress, more needs to be done. This lack of knowledge about Type E botulism has also caused concern about the safety of other food preservation techniques such as smoking, heat pasteurization, pickling, salting, etc., as applied to fish and other foods. Within the next five years, with adequate research support by government and industry, Type E botulism problems in foods should become manageable.

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Besides the low growth temperature exhibited by C. botulinum, Type E cultures, it has been observed that irradiation can accelerate development of strains of radiation resistant mutants. This development of mutants has been observed with a number of other bacteria besides C. botulinum. Indeed, mutagenicity could change presently established radiation pasteurization dosages established to control salmonella as well as those to control C. botulinum. It is anticipated that future research will clarify the significance of this mutation question.

MUTAGENICITY IN CHEMICAL SYSTEMS

Although some concern was demonstrated about a year ago on the potential mutagenic effects of radiation treatment of foods, free radical formation and occurrence of mutagens, more recent work in Belgium and in this country has failed to confirm the findings of Swaminathan et. al. in working with irradiated cereal products using Drosophila as the test species. The AEC should continue to follow this research endeavor by geneticists with the view to development of a final report on this area of research.

ANIMAL FEEDING STUDIES

The recent re-structuring of the FDA resulted in the creation of a Division of Toxicology Evaluation. Steps should be taken as soon as possible to review all wholesomeness testing programs, including those believed to be completed, those nearing completion, and those contemplated, with this Division. Failure to do this could result in unexpected additional requirements at the petition submission stage. It appears that action on petition preparation and clearance has already contributed to a lag in the program.

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INDUSTRY-GOVERNMENT PROGRAMS

The attractiveness of any operation, be it in processing, marketing, distribution or other, is measured in industry by the profitability of that operation. Each commercial organization establishes its own minimum limits to the profitability of an operation before it adopts or rejects the operation. Although there are recognized methods of determining profitability, each commercial group establishes and uses its own methods. In any case profitability must take into consideration technical and economic feasibility.

The irradiation preservation of food program has properly been dedicated to the establishment of technical feasibility. Before an economic feasibility investigation can be made a scientific and technical base must be established.

It has been demonstrated, within limitation, that the extension of shelf life of some food items by the use of radiation is technically feasible. In such cases it is now necessary to determine economic feasibility.

In establishing a basis upon which an economic feasibility study can be made, it is necessary to visualize an operation in its entirety.

The radiation source comprises only one segment in a production and distribution line. Raw material must be harvested in the field, caught in the seas or derived by some other means. The raw material must be at least accumulated, prepared and eaten. While the economics of each step is of interest to the operating manager, only the economics of the entire system is meaningful to the board of directors and the stockholder. Each step has to be paid for before any profit can be realized. Each step and its sequence are the steps carried out in different manners for each currently-used method of food preservation.

The techniques and costs of preparing frozen food for the market are different than the techniques and costs of similar operations carried out in canned or thermal

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processing. Dehydration uses techniques and resulting costs that differ from those used in freezing or canning. Indeed, specific methods (dehydration, thermal processing and freezing) use specific pre- and post-preservation techniques. It is also possible that preservation with radiation will require a process line and distribution system different from any line conventionally used.

In order to determine costs and operational problems, studies should be undertaken to establish and evaluate the system or systems required to process irradiated foods.

Since these studies should be directed to profitability, they can best be carried out by profit-oriented organizations - private commercial business firms. These firms will not only be properly motivated, but, by the nature of their enterprise, be knowledgeable in the technology, marketing and active areas of some specific product or products.

Since these commercial organizations are interested in profits, they are not likely to invest money in any studies unless it appears that there is a reasonable prospect for success - that money can be made. It will be necessary to present to those companies information to convince them that the risk is small and that profits can accrue if the studies are positive.

The presentation of this information may best be done by product specialization economists in such organizations as the USDA, USDI and USDC, in conjunction with the AEC food irradiation program personnel. The existence of the several pilot irradiators will allow actual measurements to be made in pilot production facilities. These radiation facilities will be available by 1966-1967. A five year period thereafter of accumulating operating data should allow industry to definitely determine profitability as it exists at that time.

MARINE PRODUCTS

One of the items that was recognized at an early stage in the "low dose" food irradiation program as having a great deal of potential was marine products. This conclusion was arrived at as a result of a feasibility study made in 1960.

To develop this technology, a series of studies were undertaken by the Commission. This involved some of the laboratories of the Bureau of Commercial Fisheries, as well as those of several universities.

These studies represented several areas:

- a) A series of product-oriented research programs and product-development programs. These programs contained the following:
 1. technological aspects
 2. microbiological aspects
 3. feasibility aspects
- b) At early stages, in 1960-1962, as soon as the technological feasibility for selected items was established and as a result of direct liaison with the U. S. Food and Drug Administration, a series of wholesomeness studies were initiated on those marine products which exhibited technological feasibility and offered potential economic advantage.
- c) Early in this program, several outbreaks of botulism, traced to processed marine products, occurred in this country. This led to an augmented level of work on Clostridium botulinum, Type E, including response to radiation, its ecology, and inoculated pack studies, as recommended by the U. S. Food and Drug Administration. These, and other similar unexpected requirements, have resulted in a stretched-out timetable for petition preparation and submission.
- d) The design, construction and development of two types of irradiators, specifically for marine products, was undertaken. One of these, the

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Marine Products Development Irradiator, is specifically designed for large scale activity and for direct use with and by members of the seafood industry. The second is for shipboard use for the extension of storage life by treatment of fish aboard ship soon after catching.

Each of these units has potential utility for other products and other industries.

- e.) As a result of a-d, above, petitions to the Secretary of Health, Education and Welfare to issue regulations for the preservation of specific marine products by ionizing energy are being prepared. However, as indicated below, these petitions are well behind schedule.

A number of products which are deemed to have reached both the technological development and wholesomeness testing stage wherein petitions are under preparation include:

Haddock fillets	Flounder fillets
Codfish fillets	Pollock fillets
Sole fillets	Ocean Perch fillets

It is expected that a petition to the Secretary of Health, Education and Welfare for these products will be in the hands of the Food and Drug Administration sometime in FY 1966.

The determination of the technological feasibility of clams, crab, shrimp, and halibut is at an advanced stage with an excellent outlook in terms of product technology. The wholesomeness testing of shrimp is nearing completion and it is expected that a petition will be filed in FY 66. The wholesomeness testing of both halibut and crab are well underway and it is expected that petitions will be filed in FY 67.

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Clams appear to offer a good technological outlook and potential. However, the extent of wholesomeness testing required is so great that a petition may not be ready for filing until FY 1968.

The preservation of oysters and hake are items that have only recently been undergoing scientific investigation. While appearing to offer excellent promise, they will require a great deal of work in terms of determining optimal dose, product quality, shelf life extension, etc., and petitions for these may not be initiated until FY 1968.

Included in the low dose program of the AEC is another important protein food - chicken, wherein ionising energy offers a promising means of controlling salmonellae organisms, as well as extending fresh storage life. It is difficult to assess the timetable for the work required to obtain sufficient data for submission of petitions for chicken and other poultry items but it is believed that this could well be as late as FY 68 or FY 69.

It should be recognized that the submission of a petition per se is not an a priori assurance that it will be accepted or that, if accepted for filing, a regulation will be issued.

Even after the product is approved by the Food and Drug Administration, there still remains a great deal of research work, coordination, source development and education necessary prior to a specific product and process becoming an industrial reality.

In general, with seafoods, definite end item developments have occurred as a result of this program. Moreover, as with the three Princesses of Serendip, better benefits have occurred in terms of advancing the state of our knowledge in environmental health, vis a vis botulism, in the development of new irradiation results and in the education of a corps of people to handle this new technology.

It should be recognized, however, that any new technology may create new problems as well as solve old ones. Thus, an educational program for the seafood

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industry, the food distribution industry and marketing industry, as well as the consumer, will be an important factor in molding the complete program of utilization of ionizing energy for the substerilization of marine products, and thus realizing its ultimate potential for the consumer.

STATUS OF FRUIT IRRADIATION

Perusal of the scientific literature at the time of the initiation of the AEC low dose food irradiation program revealed an optimism that irradiation would be applicable to many fruits and vegetables. The general outlook was that the principle research needs were a "polishing up" of the techniques with individual commodities. There was little in the literature to indicate that species and varietal variation, or physiological and fruit pathological problems would become limiting in the development of a feasible technology. Based upon the literature at the time, a short term program with emphasis upon a few selected commodities seemed likely to yield a feasible process within the space of a few years.

In retrospect, it is now clear that with the exception of a few papers by USDA personnel and European scientists, the true science of low dose fruit irradiation began with the implementation of the AEC program.

From the research in this program, it is now clear that species and varietal variation in response to radiation stress is a major consideration. Lemons and table grapes - two of the fruits chosen for major emphasis in the initial program outline - have proven too sensitive for a practical technology. With freestone peaches and their related nectarines, variation in response between varieties has proven to be a complex and worrisome problem in reaching a conclusion as to the feasibility with this group.

Another area of perplexity that has been revealed in the fruit irradiation program has been the striking effect of physiological status of the commodity at

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the time of treatment upon its subsequent response. Two examples of this phenomenon are: (1) Tomatoes, in which it has been shown that fruits irradiated in the green state respond very poorly, while those treated in the pink to "table ripe" state show shelf life extensions of 4 to 12 days without severe adverse effects on quality; (2) Bananas, in which doses of 25-35 Krad give a marked inhibition of ripening if treatments are made to fruits that are entirely unripe, while fruits that have started to ripen even slightly show no measurable response to treatment. In bananas, where irradiation inhibits ripening, the fruits may be caused to ripen to excellent quality by standard ethylene treatments, even though they have been held for as much as 18 days longer than unirradiated fruits.

The seasonal nature of many fruit crops, such as peaches and tomatoes, make resolution of any problem very slow. Thus the fruit irradiation program is faced with several unanticipated problems for which solution will require considerable time.

There are several fruit commodities where cautious optimism for a feasible technology is justified. Strawberries, bananas, papayas and mangoes are particularly promising. However, in each of these, clearance by the Food and Drug Administration, commercial test shipments, and extensive demonstrations to the respective industry must still be done.

While certain problems exist in the fruit irradiation program, there is one area where definitive and optimistic results have been obtained. There is no nutritional-ly significant loss in vitamins at doses the fruits will tolerate.

In some fruits, the major factor limiting application of irradiation to fruits is loss in texture of the treated product. Solution of this problem must await considerable time and effort in basic research.

APPENDIX "C"

PRODUCT STATUS

PART I--FRUITS AND VEGETABLES

Product	Desired End Point	State of Technology	Technological Outlook*	State of Wholesomeness	Completion of Wholesomeness	Petition Submission Date** (Clearance expected 12-18 months later)
Strawberries	RS, SLE	Advanced	Excellent	Near Completion	FY 66	FY 66
Sweet Cherries	RS	Rel. New	Fair	Near Completion	FY 66	FY 67
Pears	RS, IM	Advanced	Poor	Near Completion	FY 66	?
Plums	RS	New	Fair	Near Completion	FY 66	?
Prunes	RS	New	Good	Near Completion	FY 66	FY 67
Peaches	RS	Advanced	Uncertain	Completed	-	?
Apricots	RS	New	Poor	Near Completion	FY 66	FY 67
Nectarines	RS	Advanced	Good	Completed	-	FY 67
Apples	DIS	New	Fair	Near Completion	FY 66	?
Oranges	RS	Advanced	Good	Completed	-	Pending FDA Action
Lemons	RS	Dropped	Poor	-	-	-
Grapes	RS	Dropped	Poor	-	-	-
Tomatoes (ripe)	RS, IM	New	Fair	Not Initiated	?	?
Bananas	IM	New	Excellent	Not Initiated	FY 67	FY 69
Papayas	DIS, SLE	Rel. New	Excellent	Not Initiated	FY 67	FY 69
Mangoes	DIS	Rel. New	Excellent	Not Initiated	FY 67	FY 69

FRUITS AND VEGETABLES - Continued

Product	Desired End Point	State of Technology	Technological Outlook*	State of Wholesomeness	Completion of Wholesomeness	Petition Submission Date** (Clearance expected 12-18 months later)
Pineapples	DIS	New	Good	Partly Completed	?	?
Figs	DIS	New	Good	Not Initiated	FY 67	FY 69
Onions	SI	Near Completion	Good	Near Completion	FY 66	FY 67
Potatoes	SI	Completed	Good	Completed	-	FDA Approved
Wheat and Wheat Products	DIS	Completed	Excellent	Completed	-	FDA Approved

Legend:

- RS = Reduced Spoilage
- SLE = Storage Life Extension
- SI = Sprout Inhibition
- DIS = Disinfestation
- DM = Delayed maturation
- * = Economic aspects not considered

** = Approval normally requires 12-18 months, and may require additional work during that period

APPENDIX "C"

PART II--MARINE PRODUCTS, AND OTHER

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Product	Desired End Point	State of Technology	Technological Outlook*	State of Wholesomeness (Toxicity)	Expected Wholesomeness Completion	Microbiology	Petition Submission Date*** (Clearance expected 12-18 months later)
Haddock**	SLE	Advanced	Excellent	Near Completion	FY 65	FY 65	FY 66
Codfish**	SLE	Rel. New	Good	Completed	-	FY 65	FY 66
Sole**	SLE	Advanced	Excellent	Completed	-	FY 65	FY 66
Flounder**	SLE	Advanced	Excellent	Completed	-	FY 65	FY 66
Pollock**	SLE	Advanced	Excellent	Completed	-	FY 65	FY 66
Ocean Perch**	SLE	Advanced	Good	Completed	-	FY 65	FY 66
Clams	SLE	Advanced	Good	Beginning	FY 67	In Progress	FY 68
Crab	SLE	Advanced	Excellent	In Progress	FY 66	In Progress	FY 68
Shrimp	SLE	Advanced	Good	Near Completion	FY 65	In Progress	FY 68
Oysters	SLE	New	Good	Some Work Needed	FY 67	In Progress	FY 69
Halibut	SLE	Advanced	Excellent	Near Completion	FY 66	In Progress	FY 67
Hake	SLE	New	Good	Will Extrapolate	FY 66	In Progress	FY 67
Fresh Water Fish	SLE	New	Good	Not Initiated	FY 68	Beginning	FY 70
Chicken	SLE, SAL	New	Excellent	Some Work Needed	FY 66	Beginning	FY 69

Legend:

SLE = Storage Life extension

SAL = Salmonellae control

* Microbiological Aspects not considered

** Items in Marine Products Petition (scheduled for submission in FY 1966)

*** Approval normally requires 12-18 months and additional work may be required by FDA during this period

APPENDIX "D"IRRADIATOR COMPLETION SCHEDULE

<u>Name and Location</u>	<u>Description</u>	<u>Estimated Time of Operational Availability</u>
1. Grain Products Irradiator Savannah, Ga.	For bulk grain or packaged product disinfestation; 26,000 curie cobalt-60 source; throughput of 5000 pounds per hour bulk, or 2800 pounds per hour of packages	December 1965
2. Mobile Irradiator (Fruits) California	For field processing of fruits; truck mounted; 125,000 curie cobalt-60 source; throughput of 1000 pounds per hour at pasteurizing dose (200,000 rad)	December 1965
3. On-Ship Irradiator (2 units) Gloucester, Mass. LSU, Louisiana Seattle, Washington	For processing on-ship, after catch; 17 ton self-contained unit; 30,000 curie cobalt-60 source; throughput of 150 pounds per hour at sub-pasteurization dose (100,000 rad)	June-July 1965
4. Hawaiian Irradiator Hawaii	For processing of tropical fruits; design has not yet been fixed, but facility will be pilot plant scale	December 1966

APPENDIX "G"

RADIATION PROCESSING OF FOODS
Budgetary Summary
(Thousands of Dollars)

	Actual					Budget		Future Projections					Total
	FY-60	FY-61	FY-62	FY-63	FY-64	FY-65	FY-66	FY-67	FY-68	FY-69	FY-70	FY-71	
<u>Division of Isotopes Development</u>													
Operating	74	179	314	683	987	1,170	1,700	1,700	1,700	1,700	1,400	1,300	12,907
Equipment (obligations)	162	168	20	79	668	375	100	300	400	400	400	250	3,322
Construction	-	-	-	*600	-	-	-	3,750**	500***	500***	-	-	5,350
	<u>236</u>	<u>347</u>	<u>334</u>	<u>1,362</u>	<u>1,655</u>	<u>1,545</u>	<u>1,800</u>	<u>5,750</u>	<u>2,600</u>	<u>2,600</u>	<u>1,800</u>	<u>1,550</u>	<u>21,579</u>
<u>Division of Biology & Medicine</u>													
Operating	-	82	182	391	453	600	700	500	500	500	400	400	4,708
Total AEC Program	<u>236</u>	<u>429</u>	<u>516</u>	<u>1,753</u>	<u>2,108</u>	<u>2,145</u>	<u>2,500</u>	<u>6,250</u>	<u>3,100</u>	<u>3,100</u>	<u>2,200</u>	<u>1,950</u>	<u>26,287</u>

*Authorized - Actual Obligations Incurred Over Three Year Period

**Meat irradiator for U. S. Army, based on preliminary discussions with Army personnel. AEC to budget for and construct irradiator. Irradiator to be operated by private industry. Construction budget figure represents full plant cost; actual cost to Government is expected to be reduced by amount of cooperative private investment.

***Maximum AEC contribution to cooperative construction projects; may be reduced if private investment covers greater proportion of construction costs.

COMMERCIAL INTEREST IN FOOD IRRADIATION
(Proprietary Information in Most Cases)

- I. Private food companies known to be spending their own funds in food irradiation research (others unknown to AEC undoubtedly are doing private studies):

<u>Company</u>	<u>Food Application</u>
1. United Fruit Company	Bananas, shrimp
2. Swift and Company	Sterilized meat products
3. T. J. Lipton Company	Dried soup mixes
4. Hercules Powder Company	Mushrooms
5. Ralston-Purina Company	Disease-free animal feeds
6. Nuclear Technology Corporation	Control of trichina in pork
7. Mobilrad Corporation	Strawberries, potatoes
8. Armour Company	Sterilized meats
9. General Foods	Coffees, other
10. S. L. Casselina Company	Strawberries
11. Gorton's	Fish pasteurization
12. Sucrest Sugar Company	Control of microbial spoilage in molasses
13. Sunkist Corporation	Pasteurized oranges
14. General Mills	Flour product disinfection
15. Quaker Oats Company	Flour product disinfection
16. Newfield Products Company, Ltd.	Potato sprout control
17. Holly Farms, Incorporated	Pasteurization of chicken

- II. Food companies which have expressed interest in AEC-cooperative programs

<u>Company</u>	<u>Food Application</u>
1. Gorton's	Fish pasteurization
2. Swift and Company	Sterilized meat products
3. Pillsbury Company	Sprout control, potatoes
4. Holly Farms, Incorporated	Pasteurization of chicken
5. Potato Chip Institute, Intl.*	Sprout control, potatoes
6. Shrimp Assn. of Americas*	Pasteurized shrimp
7. National Shell-Fisheries Assn.*	Pasteurized shrimp
8. Oyster Institute of North America	Pasteurized oysters
9. O'Donnell-Usen	Pasteurized fish
10. Quincy Cold Storage	Pasteurized fish

* Usually several companies in each association are active in their respective areas.

AEC**UNITED STATES
ATOMIC ENERGY COMMISSION**
WASHINGTON, D.C. 20545*Materials - Food Irradiation*No. H-100
Tel. 973-3335 or
973-3446FOR IMMEDIATE RELEASE
(Wednesday, May 5, 1965)**AEC INVITES INDUSTRY TO JOIN STUDIES
OF PASTEURIZED SEAFOOD**

The Atomic Energy Commission is seeking the cooperation of the seafood industry in carrying out studies of radiation-processed seafood and other marine products.

The Commission's Marine Products Development Irradiator, located at the Gloucester, Massachusetts, Technological Laboratory of the Bureau of Commercial Fisheries, will be used in the prospective industry-government studies. The irradiator is the only one in the world expressly designed for pasteurization of fishery products; it is located at the center of the New England seafood industry. The plant was licensed by the Atomic Energy Commission on March 17, and was fully operational on April 19, 1965.

Representatives of the Commission and the Bureau met recently with key people in the fishing and food processing industries of the New England area to discuss future joint plans for exploring the market feasibility of radiation-processed seafood.

The marine products irradiator will be available to the seafood industry for experimental processing of limited quantities of seafood for shipping, storage and acceptability tests and for evaluation of the product in commercial plant and laboratory facilities. The seafoods will not be made available for commercial use or sale to the public at this time. The information obtained will be helpful in further developing the process for future commercial application.

The pilot plant's radiation chamber contains a 250,000-curie cobalt-60 source which is capable of processing

(more)

5-5-65

seafoods at the rate of a ton an hour. The plant was built by the Atomic Energy Commission and is operated for the AEC by the Bureau of Commercial Fisheries, U.S. Department of the Interior.

Seafoods treated in the irradiator are still fresh, raw, and cold when they emerge from the radiation chamber. Pasteurization -- reduction of bacteria -- is accomplished by radiant energy emitted by the cobalt-60 source. Extensive research has shown that this new, heatless pasteurization process will double or triple the shelf life of ocean-fresh unfrozen seafoods. After they are processed, the fillets are kept at refrigerator temperatures.

Commercial seafood processors and distributors interested in negotiating a cooperative agreement with the AEC should express their desire to participate by communicating with the Director, Division of Isotopes Development, U.S. Atomic Energy Commission, Washington, D.C. 20545.

#

5/5/65

APR 30 1965

Dear Mr. Israel:

Thank you for your letter of April 16 concerning your statewide waste management study which you are carrying out for the State of California.

We are pleased to cooperate with your group in providing information on the Atomic Energy Commission waste management program and its possible impact on present and future nuclear planning for the State of California. I have asked Mr. J. A. Lieberman and Mr. W. G. Seltzer of our Division of Reactor Development and Technology to meet with you at a mutually convenient time. The week of May 3, 1965, or Monday, May 17 are suggested as possibilities but I suggest you contact Mr. Lieberman directly to arrange a firm date.

We appreciate the opportunity of working with you in this phase of our atomic energy activities.

Distribution

CHAIRMAN-2
AGIR
DCM
ADM
GM
R FT.

Sincerely yours,

(Type) Clark Seltzer

Chairman

Mr. J. M. Israel
Waste Management Study
Aerojet-General Corporation
Azusa, California

EUNJ
RDT: NSB
NS
RDT: D
RDT-2

WIRegan
RDT: NSB
4/27/65

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JALieberman
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RDT: D
FJarrotta

RDT: D
MEhaw

ADM

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ADM/DCM

RDT: NSB
WGSeltzer :skt
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4-30-65

APR 29 1965

MEMORANDUM FOR CHAIRMAN SEAFOOD
COMMISSIONER DELZIEU
COMMISSIONER PALFREY
COMMISSIONER RALLY
COMMISSIONER TAPP

SUBJECT: ANNOUNCEMENT OF STUDIES OF IRRADIATED SEAFOOD

Attached is a public announcement, approved by the General Manager, on AEC plans to seek the cooperation of the seafood industry in studying irradiated seafood.

We plan to issue the announcement on Wednesday, May 5. The Bureau of Commercial Fisheries' Technological Laboratory at Charleston plans to distribute a similar announcement at the same time.

Sign:u

Duncan Clark

Duncan Clark, Director
Division of Public Information

Attachment
Announcement

cc: R. E. Hollingsworth, General Manager

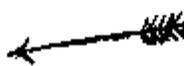
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SEARCHED	INDEXED	SERIALIZED	FILED		

Honorable Melvin Price
Chairman, Subcommittee on
Research, Development and Radiation
Joint Committee on Atomic Energy
Congress of the United States

Dear Mr. Price:

Thank you for your letter of April 5, 1965, concerning our efforts to obtain market survey information in the form of present consumer reaction to the concept of radiation processing of fishery products. Establishment of consumer attitudes is considered essential to the formation of a sound basis for a subsequent educational program. This information would be particularly timely as the Marine Products Development Irradiator is now operational and semi-commercial quantities of fish will be available for large scale consumer testing.

The Atomic Energy Commission and The Bureau of Commercial Fisheries executed an agreement on October 1, 1963, to implement such a program, with AEC reimbursing BCF for the costs involved. As a prerequisite of this work, a proposed questionnaire form directed to a consumer survey was forwarded by the Bureau of Commercial Fisheries on February 24, 1964, to the Bureau of the Budget for approval, as required by the Federal Reports Act, PL 77-85. The Bureau of the Budget informed the Bureau of Commercial Fisheries by letter dated March 30, 1964, that the approval was withheld on the basis that the Government already has the necessary knowledge and skill to inform the public on this new food processing method.

Our staff, in conjunction with the Bureau of Commercial Fisheries and the Inter-departmental Committee on Radiation Preservation of Foods, plans to meet at an early date with the BCB to request reconsideration of its decision on the study. In the meantime, the presently estimated

July 7/19470

4-16-65

Honorable Melvin Price

- 2 -

APP 16 1965

funding of \$40,000 remains available under our agreement with the Bureau of Commercial Fisheries.

If you should need any further information on this matter, please let us know.

Sincerely yours,

General Manager

DID:RAB
KCSHEA:mkw
4/14/65

DID:RAB
JLBloom
4/ /65

OC
4/ /65

DID:AD

AGHD

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DGM

GM

CONG.LIAS.

EEFowler
4/ /65

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4/ /65

4/ /65

4/ /65

UNITED STATES GOVERNMENT

Memorandum

TO : File DATE: April 12, 1965

FROM : W. B. McCool, Secretary *JCH*

SUBJECT: CONGRESSMAN PRICE'S APRIL 5 LETTER RE FOOD IRRADIATION PROGRAM

SECY:JCH

1. At Information Meeting 470 on April 8, 1965, the Chairman requested preparation of a response to Congressman Melvin Price's April 5 letter regarding the Commission's program on radiation processing of food.

2. It is our understanding the Division of Isotopes Development is taking the required action.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for R&D
General Counsel
Controller
Director, Isotopes Development
Director, Congressional Relations

UNITED STATES GOVERNMENT

Memorandum

TO :

FROM :

SUBJECT:

File

DATE: March 12, 1965

W. B. McCool, Secretary *W. B. McCool*

PENDING CONTRACTUAL MATTERS REPORT NO. 91

SECY:JCH

1. At Information Meeting 459 on March 10, 1965, the Commission considered Pending Contractual Matters Report No. 91 and had no objection.

2. Mr. Bloch noted the Systems Study of the Hawaiian Food Irradiator, described on page 1 of the Report, will now be incorporated in a contract for a radiation facility to be located in the vicinity of Honolulu, Hawaii, under a contract selection board established by the Manager, New York Operations Office, as described on page 3 of the Report.

cc:

- Chairman
- Commissioner Ramey
- General Manager
- Deputy General Manager
- Asst. General Manager
- Exec. Asst. to Gen. Mgr.
- General Counsel
- Asst. Gen. Mgr. for R&D
- Asst. Gen. Mgr. for Reactors
- Director, Plans & Reports
- Director, RD&T
- Director, Isotopes Development
- Director, Congressional Relations

Copy of report.

3-12-65

CHET HOLIFIELD, CALIF.
CHAIRMAN
MELVIN PRICE, ILL.
WAYNE H. ASPINALL, COLO.
ALBERT THOMAS, TENN.
THOMAS G. MORRIS, N. MEK.
Clyde HOSMER, CALIF.
WILLIAM H. BATES, MASS.
JOHN B. ANDERSON, N.J.
WILLIAM W. McCULLOUGH, OHIO
JOHN T. CONWAY, EXECUTIVE DIRECTOR

Materials - Isac Inad

JOHN G. ...
VICE CHAIRMAN
RICHARD B. ...
CANTON P. ...
ALBERT BORG, TENN.
HENRY M. ...
BOURKE B. ...
GEORGE D. ...
WALLACE F. ...
CARL T. ...

Congress of the United States

JOINT COMMITTEE ON ATOMIC ENERGY

April 5, 1965

Comm/A
Comm/I

Honorable Glenn T. Seaborg, Chairman
U. S. Atomic Energy Commission
Washington, D. C.

Dear Dr. Seaborg:

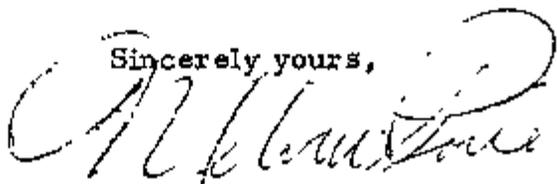
During the Joint Committee's February 10, 1965 authorization hearings, Commission witnesses testified concerning the interest of private industry in applications of radioisotopes, including radiation processing of food.

It was stated that the Commission intended to continue its efforts to establish consumer acceptance of radiation-processed foods. In this connection, it is my understanding that there is need for up-to-date market survey information in order to define the nature of the problem confronting the AEC and industry. In particular, there is a current need for consumer reaction data concerning radiation-processed seafoods. The acquisition of this data would appear highly desirable, if not essential, as a basis for conducting a sound public information program in this field.

I am informed that the necessary funds for the consumer reaction survey have been appropriated but not utilized. I would appreciate it if you would advise me and my subcommittee why this work has not proceeded to date and what action is being taken to complete this project. I would hope that any administrative difficulties which may be delaying approval of this survey will soon be overcome so that the results of the research and development in this field can be properly utilized.

I plan to schedule hearings of the Joint Committee's Subcommittee on Research, Development and Radiation for this session of Congress on radiation processing of food, in order that we may be informed of progress in this field.

Sincerely yours,



Melvin Price, Chairman
Subcommittee on Research,
Development and Radiation

4-5-65

UNCLASSIFIED

AEC 719/39

March 4, 1965

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39

ATOMIC ENERGY COMMISSION

FY 1965 COSTS - RADIATION PASTEURIZATION OF FOODS PROGRAM

Note by the Secretary

The attached memorandum of March 2, 1965 from the Acting Director of Isotopes Development is circulated for the information of the Commission at the request of the Executive Assistant to the General Manager.

W. B. McCool

Secretary

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UNCLASSIFIED

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

March 2, 1965

MEMORANDUM

TO : R. E. Hollingsworth, General Manager

THRU : S. G. English, Assistant General Manager
for Research and Development

FROM : E. E. Fowler, Acting Director
Division of Isotopes Development

SUBJECT: FY 1965 COSTS - RADIATION PASTEURIZATION OF FOODS
PROGRAM

SYMBOL : DID:BA:MEL

Attached are projections of estimated costs for the Radiation Pasteurization of Foods program for FY 1965, reflecting both Division of Isotopes Development and Division of Biology and Medicine sponsored activities.

Concerning the Division of Isotopes Development program, the higher rate of costing to be experienced in the last half of FY 1965, as compared to the first half, is attributed principally to two factors. First, a majority of the larger contracts, including most of those which are on a lump sum basis, come up for renewal late in the fiscal year. These will be completely costed on negotiation. Second, a disproportionately higher rate of costing in the second half of the fiscal year is involved for certain interagency agreements, because of (a) increases in levels authorized upon renewal of the agreements during the second quarter, and (b) some mid-year lag in recording costs for these, since the agencies involved do not normally report costs on a completely current basis, except at the end of the fiscal year.

Attachments:
Analyses of FY 1965 Costs for the
Food Program for DID and DBM

UNCLASSIFIED

Division of Isotopes Development
Radiation Pasteurization of Foods
Analysis of FY 1965 Costs

1. FY 1965 available cost ceiling		\$1,170,000
2. Costs thru December 31, 1964		
a. Onsite Project	\$ 65,346	
b. Lump sum contracts	-0-	
c. Cost reimbursement contracts	<u>144,541</u>	<u>209,887</u>
	uncoated as of 12/31/64	960,213
3. Estimated costs 1/1/65 - 6/30/65		
a. Onsite project	96,654	
b. Lump sum contracts authorized and projected	490,000	
c. Existing cost-type contracts	303,000	
d. New cost-type contracts under review to be approved	<u>9,000</u>	<u>896,654</u>
	Balance	\$ 63,459 *

*This cost balance is expected to be diminished through the initiation of new contract work, now being planned, in the next few months. Full utilization is not possible, however, because available obligational authority is not adequate to bring the total costs closer than about \$25,000 to the cost ceiling.

February 26, 1965

UNCLASSIFIED

Division of Biology and Medicine
Radiation Pasteurization of Foods
Analysis of FY 1965 Costs

1. FY 1965 available cost ceiling		\$ 600,000
2. Costs thru December 31, 1964		
a. lump sum	\$ 163,903	
b. cost reimbursable	<u>39,084</u>	<u>202,987</u>
	uncosted as of 12/31/64	397,013
3. Estimated costs - 1/1/65-6/30/65		
a. lump sum contracts authorized and projected	197,768	
b. Existing cost-type contracts for period 1/1/65-6/30/65	86,475	
c. new projects under review to be approved	<u>77,178</u>	<u>361,421</u>
	available to be costed for	\$ 35,592
	additional proposals anticipated to be received and authorized prior to 6/30/65	

February 24, 1965



Material 12. Gene D. ...

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

FEB 10 1965

MEMORANDUM FOR CHAIRMAN SEABORG

for
THROUGH GENERAL MANAGER

Signed:
John V. Vindiguerra

FEB 10 1965

SUBJECT: POTENTIAL OF IRRADIATED FOODS RELATIVE TO
SUSTINENCE PROBLEMS IN NUCLEAR SUBMARINES

This is to advise you of the results of a meeting with Admiral Galantin, Office of Special Projects, Department of the Navy, on January 27, 1965. The purpose of the meeting with Admiral Galantin was to comply with his request for a briefing on the radiation processing of foods program, as identified in the General Manager's memorandum of January 25, 1965. Admiral Galantin had in his company two submarine Commanders who discussed the food requirements of their service.

Admiral Galantin was interested in establishing (1) the immediate benefit of radiation processed foods to the submarine service, and (2) the degree to which the Government's research and development program was specifically recognizing that service's interest.

A brief summary of the radiation processing of foods programs of the AEC and the Department of the Army was presented by Dr. Kevin Shea of this Division. You may know that the Department of the Army acts as a single manager of research and development on foods for the total military establishment.

The following observations can be made as a consequence of discussions during the meeting:

1. The overriding interest in food supplies for the submarine service is space conservation. Dehydrated foods best meet

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FEB 10 1965

this criterion. It was recognized, however, that reduction in spoilage losses attainable with radiation processing would result in actual space savings as compared to conventional food products.

2. A 90-day shelf life for foods aboard submarines is required. It was pointed out that radiation pasteurization could provide various fresh foods with an increased shelf life of from two to six weeks beyond their normal storage period.
3. The use of radiation to control salmonellae in such products as frozen eggs and poultry was discussed, and some interest was expressed in this possibility.
4. With commercialization of radiation processing of foods technology, the Navy will have the opportunity to procure for the submarine service foods such as strawberries, fish, and steak, resulting in a small but important contribution by providing a more varied, morale-building menu.

In conclusion, it can be stated that the Army and the AEC food preservation programs are oriented in a direction which will provide the Navy and other military services with a more diversified and wholesome diet when commercialization of the processes has been achieved. No further action with the Navy is considered necessary at this time.

E. E. Fowler, Acting Director
 Division of Isotopes Development

cc: Commissioner Bunting
 Commissioner Palfrey
 Commissioner Ramey
 Commissioner Tape

bcc: General Manager (2)
 Secretariat (2) - 
 AGMRD

DID:RAB

JLBloom
 2/ /65

Second page retyped 2/9/65 to add last paragraph. bb

OFFICE ▶	DID:RAB	DID:D Acting	AGMRD	AGM	DGM	GM
SURNAME ▶	GKShea:jk:bb	EEFowler				
DATE ▶	2/9/65	2/ /65	2/ /65	2/ /65	2/ /65	2/ /65

Materials - 12

THE NATIONAL BREWING COMPANY
BALTIMORE, MARYLAND

son/A
c/I

ARTHUR E. SACHS
VICE PRESIDENT

January 28, 1965

Dr. Glenn T. Seabord, Chairman
Atomic Energy Commission
Washington, D.C. 20545

Dear Dr. Seabord:

We have been aware that for sometime efforts have been made to develop the use of atomic radiation in food processing to preserve the freshness and flavor of products by sterilization through radiation. We are desirous of trying to develop some use of radiation in the sterilization of a malt beverage product.

We would appreciate your advising us how we might obtain additional specific information from one of your operating divisions with regard to the above. We would also like to know how funds might be obtained for a joint development project of this type.

We will certainly appreciate your cooperation and look forward to hearing from you.

Thank you for your help.

Sincerely,



Arthur E. Sachs

AES:hs

1-28-65

Materials 1/2 - Just Inactivation
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UNITED STATES GOVERNMENT

Memorandum

TO : File DATE: January 23, 1965

FROM : W. B. McCool, *John* Secretary

SUBJECT: PRESERVATION OF FOOD FOR THE POLARIS FLEET

SECY: JCH

1. At Information Meeting 443 on January 22, 1965, the Chairman noted Dr. J. Maxfield's call concerning his discussions with RADM. I. J. Galantin regarding the preservation of food for the Polaris Fleet. The Commissioners noted staff would discuss the proposal with the Department of the Navy.

2. It is our understanding the Division of Isotopes Development is taking the required action.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for R&D
General Counsel
Director, ID

*copy filed:
MR. A-9*

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1 - 25 - 65

Materials - 12 - Food Irradiation

JAN 25 1965

MEMORANDUM FOR CHAIRMAN SEAECORG

SUBJECT: ADMIRAL GALANTIN'S INTEREST IN FOOD IRRADIATION

This is to inform you that arrangements have been made for representatives of the Office of the AGMR&D and the Division of Isotopes Development to meet with Admiral Galantin on Wednesday, January 27, to discuss the Admiral's interest regarding naval use of irradiated food.

Admiral Rickover has been contacted about this and he has no particular interest in the matter.

We shall inform you of the results of the discussion.

Signed:
John V. Vinciguerra
General Manager

JV

c.c.: Commissioner Dunting
Commissioner Palfrey
Commissioner Rancy
Commissioner Tape
Mr. McCool, Secretary (2) ←

c.c.: GM (2)
J. Machurek, DID
AGMR&D

Retyped in Office of EAGM -JVVinciguerra:dhk - 1/25/65

Refer to 1/25/65

OFFICE ▶	OAGMRD	AGMRD	AGM	DGM	GM	
SURNAME ▶	DeRenzis:hk:					
DATE ▶	1/25/65	1/ /65	1/ /65	1/ /65	1/ /65	

1-25-65

c/I

DEC 24 1964

Dear Senator Curtis:

I am pleased to provide you with the information requested in your letter of December 2, 1964, on our research and development activities on radiation processing of food. Rather than go into detail in my letter on the program work, I am enclosing staff reports which discuss its status, including working relationships with other Government departments and private industry, economic considerations, as well as facilities now in use or planned.

With respect to your question about the use of the Hallam facility for food studies, we are currently considering a proposal from the Consumers Public Power District to permit irradiation of products, such as food, using sodium 24 which is produced in the sodium coolant of the reactor as the radiation source. If the proposal is accepted, we will, upon installation of the radiation facility, undertake a limited program to assure that sodium 24 is acceptable as a source of radiation for food processing and then request its formal clearance by the Food and Drug Administration. Availability of the radiation facility at Hallam would, of course, permit the study of other materials, in addition to food, of interest to industry.

As quickly as our consideration of the Consumers Public Power District proposal is completed, we will notify you of our action.

You asked about the interest of private enterprise in radiation processing of foods, and I would like to observe that we are seeing increasing industrial activity at the present time. There are a number of reasons for this. First, the economics of radiation processing of a number of food products appear to be commercially acceptable. Next, the actions of the Food and Drug Administration in approving selected food products for human consumption during the past two years have contributed significantly to the current state of industrial interest. Lastly, of course the continuing promising nature of this developing technology adds further confidence to ultimate commercialization of this new food processing method. A specific measure of the current industrial

12-24-64

OFFICE ▶					
SURNAME ▶					
DATE ▶					

Senator Curtis

- 2 -

interest is that a number of large food companies are engaged in privately supported work on radiation processing of foods such as meats, packaged flour products, and dehydrated soup components.

We will certainly keep you currently informed as developments occur in our radiation processing of foods program.

Sincerely yours,

(Signed) Elson T. Seaberg

Chairman

Honorable Carl F. Curtis
United States Senate

Enclosures:

1. The USAEC Food Irradiation Program, Sept. 27-30, 1964
2. Facilities Supporting Food Research
3. TID 17886
4. WASH 1030

cc: Chairman (2)
 Secretariat (2) *RM*
 Cong. Liaison (2)
 AGMRD
 GM
 OGC

RAB: DID OGC CONG. LIAISON

JLBloom 12/ /64 12/ /64

OFFICE >	DID: RAB	DID: D Acting	AGMRD	AGM	DGM	GM
SURNAME >	GRDietz: bb	EEFowler				
DATE >	12/21/64	12/ /64				

United States Senate

WASHINGTON, D.C.

December 2, 1961

Honorable Glenn T. Seaborg, Chairman
Atomic Energy Commission
Washington, D. C.

Dear Dr. Seaborg:

You will recall our earlier correspondence with respect to the food irradiation program in which both your Commission and the Army have been interested, and specifically my inquiries about the possibility of establishing such an activity at the Hallam, Nebraska, plant as a by-product endeavor.

About a year and one-half ago, I visited the Army facility at Natick, Massachusetts, and was most impressed. It is my recollection that the AEC was at that time about to undertake some experimental work in the food irradiation field in its own facilities. I understand that your Commission does in fact have such facilities experimenting with fruits and fish, but I do not know whether these are entirely AEC projects or in cooperation with other Federal agencies or private enterprise.

If your own work has advanced to the point that you can, I wonder if you would advise me of the progress in the last several months in interesting private enterprise in the commercialization of the irradiation processes, and particularly whether private industry has undertaken any actual developmental work or simply expressed interest in the Federal program.

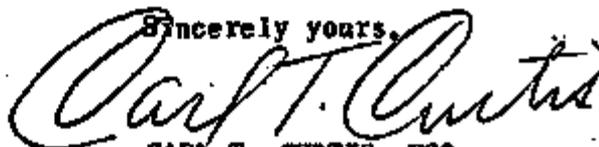
I would like to know also what your experience has been with respect to cost factors involved in the irradiation processes, and whether any significant cost changes have been accomplished which might serve to persuade private industry to enter the field.

You advised me some months ago that the Commission had no plans at that time to undertake such a program at Hallam. I wonder if anything has occurred to alter this conclusion.

I am very interested in the possibilities inherent in this experimental work, and hope you can keep me informed of developments as they occur.

With best personal regards, I remain

Sincerely yours,



CARL T. CURTIS, USS

Im/R
Comm/I
BZ

Matters - 103 *John Seaborg*

JAMES O. EASTLAND, MISS., CHAIRMAN
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ROBERT L. MURPHY, MISS.
KENNETH B. KEATING, N.Y.
HUBERT H. HOFFA, MICH.
FRANK R. RICE, TEX.

United States Senate
COMMITTEE ON THE JUDICIARY

September 15, 1964

1/E
8/21/A-com
DP

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Seaborg:

I enclose a letter from The American Shrimp Cannery Association of Biloxi, Mississippi, relative to the desirability of shrimp research at Pascagoula, Mississippi.

The letter is self-explanatory and I would appreciate hearing from you relative to the prospects for such a laboratory on the Mississippi coast.

With personal regards, I am

Sincerely yours,

James O. Eastland
S. S.

Encl
JOE:L

9-15-64

American Shrimp Cannery Association

P.O. Box ~~10774~~ 487

~~New Orleans, Louisiana~~ Biloxi, Mississippi

September 1, 1964

The Honorable James O. Eastland
U. S. Senate
Washington, D. C.

Dear Senator Eastland:

As you so well know, Shrimp is one of the most important natural resources in Mississippi and the adjoining coastal states, and thousands of jobs depend on finding better ways and methods of conserving Shrimp. While canned Shrimp represents one of the best known ways of Shrimp preservation, the Atomic Energy Commission is now conducting research on the East and West Coasts of the United States towards finding ways to preserve the fish and shellfish of those areas by atomic radiation, so called "irradiation pasteurization".

The U. S. Government has a laboratory in Pascagoula, Mississippi, which laboratory has been in the forefront of Shrimp research. This laboratory, the Pascagoula Technological Laboratory of the Bureau of Commercial Fisheries, is being considered by the Atomic Energy Commission for a contract for the investigation of irradiation pasteurization of Shrimp. These investigations by the Atomic Energy Commission are already being carried out on Atlantic and Pacific fish.

Shrimp represents the fishery resource of by far the greatest dollar value in the U.S. In order to continue our supremacy over competing imported Shrimp, it is very necessary that we employ the most modern methods; it is imperative that - in addition to the Atlantic and the Pacific areas - this investigation be carried on in the Gulf area also.

It would be of the utmost importance to the industry if you could recommend to the Atomic Energy Commission that this cooperative contract for Shrimp research of irradiation pasteurization of Shrimp be issued to the Pascagoula Technological Laboratory of the Bureau of Commercial Fisheries.

For your information, a copy of our letter to the Atomic Energy Commission is attached.

We thank you in advance for the help you will give our industry in this connection and hoping to hear from you favorably in this matter we are,

Very respectfully yours,
AMERICAN SHRIMP CANNERS ASSOCIATION

American Shrimp Cannery Association

P.O. Box ~~3077~~ 487

~~New Orleans, Louisiana~~ Biloxi, Mississippi

September 1, 1964

Mr. Kevin Shea
Division of Isotopes Development
U. S. Atomic Energy Commission
Washington 25, D.C.

Dear Sir:

The Association of Shrimp Cannerys is very vitally interested in investigation of all methods of Shrimp preservation which eventually may be of commercial interest.

It is our understanding the presently irradiation pasteurization experiments are being carried on at different laboratories of the U.S. Fish and Wildlife Service on varieties of fish and seafood of the East and West Coasts.

We are vitally interested in Shrimp, practically all of which, for canning purposes, is caught in the Gulf of Mexico. We understand that the Pascagoula Technological Laboratory of the Bureau of Commercial Fisheries is being considered as the laboratory to conduct irradiation pasteurization experiments on Shrimp.

The object of this letter is to report to you that not only is the Shrimping the most important fishing activity in this area, but also that Shrimp represents a larger dollar value than any other fish or seafood caught in the United States. Thousands of people in Louisiana, Mississippi, Texas, Alabama and Florida make their living out of Shrimp fishing, processing, shipping, etc., and if these industries are to hold their own against the ever increasing foreign competition, we have to be able to do things our foreign competitors cannot do. They can produce Shrimp with considerably cheaper labor; we cannot compete there; the U.S. however, has always been first in technological innovations and that is the only way we will be able to compete with these imports.

Irradiation pasteurization may be one of the answers; it may well be the answer. That is why we are putting our case before the AEC; please help us, please help this, the largest dollar earning fishery in the U.S., the Shrimp industry, by having the foremost scientific laboratory in the area specializing in Shrimp, the Pascagoula Technological Laboratory of the Bureau of Commercial Fisheries, conduct this program at the very earliest time.

AMERICAN SHRIMP CANNERS ASSOCIATION

To: Mr. Kevin Shea

September 1, 1964

Page 2.

If any additional information or details may be useful coming from the industry, please do not hesitate to call on us. We believe that by having this research conducted in Pascagoula on Shrimp, a very important forward step will have been taken.

Respectfully yours,
AMERICAN SHRIMP CANNERS ASSOCIATION

John Mavar, Jr.
President

lc

Materials - 12 Food Irradiation Program



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

SEP 10 1964

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER FALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: PUBLIC ANNOUNCEMENT ON FORTHCOMING DEDICATION OF SEAFOOD IRRADIATOR

Attached for your information is a public announcement which we plan to issue from AEC headquarters in Cambridge, Massachusetts, on the dedication of the Marine Products Development Irradiator, on September 28.

The Joint Committee will be notified in advance.

Signed
Duncan Clark

Duncan Clark, Director
Division of Public Information

Attachment

- cc: E. E. H. [unclear] General Manager
- E. G. Maginn, Room
- J. A. Erlowin, OOR
- E. E. Fowler, Asst. Dir., DID (Attn: G. N. Bissell)
- E. G. Shea, DID
- W. B. McCool, SACT

9-10-64

AEC'S MARINE PRODUCTS DEVELOPMENT IRRADIATOR DEDICATED

The Marine Products Development Irradiator was dedicated today with ceremonies at the Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Massachusetts.

The seafood irradiator was built to demonstrate the feasibility of extending the refrigerated storage life of fresh fishery products. It was constructed as part of the Atomic Energy Commission program on radiation-pasteurization of foods. The facility will be operated for the AEC by the BCF Technological Laboratory, Fish and Wildlife Service, Department of the Interior, under an inter-agency agreement.

Principal speakers at the morning dedication were Governor Radclett Peabody of Massachusetts; Representative William H. Bates of Massachusetts, member of the Congressional Joint Committee on Atomic Energy; Dr. Mary I. Bunting, Member of the Atomic Energy Commission; Dr. Willis M. Hawkins, Assistant Secretary of the Army for Research and Development; and Donald L. McKernan, Director, Bureau of Commercial Fisheries, U.S. Department of the Interior.

Mayor Ralph B. O'Malley of Gloucester and other state and local officials witnessed the ceremony, along with officials of the Bureau of Commercial Fisheries, representatives of the fishing, seafood and allied industries, and scientists who are attending an International Conference on Radiation Preservation of Foods, in Boston, September 28 to 30.

(more)

Irradiated seafood, like that which will be processed by the facility, was served to luncheon guests following the dedication. Guests were served clam chowder made from radiation-processed clams, and broiled radiation-processed haddock, and radiation-processed lobster in lobster salad. Buttered parsley potatoes, green beans, dessert and coffee completed the luncheon.

Construction of the seafood irradiator was begun in late July, 1963. The \$600,000 facility will operate on a near-commercial scale processing marine products at a rate of up to one ton an hour using a 250,000-curie cobalt-60 irradiation source. The source was installed on September 2.

Fresh food successfully pasteurized by radiation does not lose its characteristic appearance, taste, or odor, but does have a longer refrigerated shelf-life. The energy from the gamma rays passes through the food without leaving traces of radioactivity and reduces the number of bacteria and other spoilage-causing organisms which are normally present.

Radiation-treated seafoods such as flounder, haddock, clams, shrimp, and crab can be kept in ocean-fresh condition for over four weeks under normal refrigeration. Research results to date show that this radiation-pasteurization does not affect food wholesomeness or nutritional values.

The architect-engineer for the Marine Products Development Irradiator was Associated Nucleonics, Inc., Garden City, Long Island, N.Y.

RECEIVED
OFFICE OF THE SECRETARY
SEP 10 1963

(NOTE TO EDITORS AND CORRESPONDENTS: This announcement is being made by AEC simultaneously in Washington, D.C., and in the Boston area.)

HALE BOGGS, M.C.
20 DISTRICT, LOUISIANA

DEMOCRATIC WHIP

BARBARA RAYHE
EXECUTIVE SECRETARY

*Materials - Food Irradiation Program*¹⁰

COMMITTEES
WAYS AND MEANS
JOINT ECONOMIC COMMITTEE
CHAIRMAN, SUBCOMMITTEE ON
FOREIGN ECONOMIC POLICY

Congress of the United States
House of Representatives
Washington, D. C.

September 4, 1964

Dr. Glenn T. Seaborg
Chairman
U.S. Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Seaborg:

I understand that the Pascagoula Technological Laboratory is being considered for a contract for the investigation of irradiation pasteurization of shrimp, and I am writing in the hope that favorable consideration may be given this laboratory by your Commission.

The American Shrimp Cannery Association is also very interested in this and in their letter of September 1, addressed to your Division of Isotopes Development, they outlined compelling reasons for awarding the contract to the Pascagoula Technological Laboratory.

I will very much appreciate any consideration that may be given this matter and your good advice.

Sincerely,

Hale Boggs
HALE BOGGS, M.C.

HB:S

FB/A

9-4-64

Mailing - 12 - Food Irradiation



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

AUG 21 1964

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER PALFREY
COMMISSIONER RASKY
COMMISSIONER TAFE

SUBJECT: PUBLIC ANNOUNCEMENT ON FDA APPROVAL OF PACKAGING
MATERIALS FOR USE IN PROGRAM ON RADIATION-
PASTEURIZATION OF FOODS

Attached for your information is a public announcement on clearance, by the Food and Drug Administration, of packaging materials for use in the food radiation-pasteurization program. We plan to distribute the announcement on Tuesday morning, August 25. Harlequin Laboratories will issue a similar text.

The Joint Committee will be notified.

Signed
Duncan Clark

Duncan Clark, Director
Division of Public Information

Attachment

cc: R. E. Hollingsworth, General Manager

S. G. English, AGRD
J. A. Klevins, OCR
E. E. Fowler, Act. Dir., DID
O. M. Bizzelli, DID
Kevin Shea, DID
W. E. McCool, SECY

8-21-64

PACKAGING MATERIALS FOR RADIATION-PROCESSED FOOD
APPROVED BY FDA

Packaging materials for use in the irradiation of processed food products have been cleared by the Food and Drug Administration. The action was taken as a result of a petition submitted to FDA by Hialeah, Ltd., Hialeah, Fla., on behalf of the Atomic Energy Commission.

The packaging materials cleared under the new regulations are nitrocellulose-coated cellophane, glassine paper, wax-coated paperboard, and clear plastic films. The FDA also allows these materials to be subjected to a dose of radiation not to exceed one megard (1,000,000 rads), incident to the use of gamma radiation in the irradiation processing of pre-packaged foods. (A rad is a standard unit of measurement of absorbed radiation.)

Research studies of the packaging materials leading to the presentation and submission of the petition were carried out over the past 18 months by Hialeah, Ltd. under an AEC contract. Samples of the various packaging materials were irradiated while in contact with toxiculating solvents to determine if there would be adverse effects on the stability of the materials. A large number of tests of similar materials were also conducted for exposing the test materials to gamma radiation. Various tests were also conducted on the same packaging materials were also studied for toxicology.

Industry and government representatives, together with other interested parties participating in the program, provided valuable assistance in selecting materials to be tested and in reviewing experimental conditions.

Dr. Frederick O. Marzke, in charge of the marketing research field station for USDA's Agricultural Marketing Service, pointed out that installation of this facility is part of an AEC-USDA cooperative developmental program on ways to control insects in stored grain without use of pesticides. He said that marketing researchers, through use of this technique which eliminates the problem of chemical residues, hope to develop a means of providing an effective treatment of bulk and packaged grain and grain products.

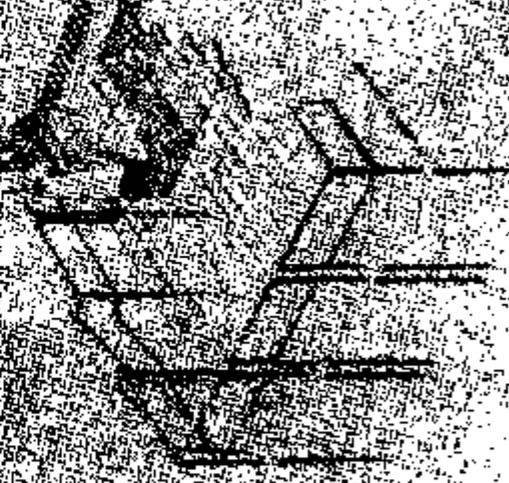
This will be the first facility to be constructed for bulk treatment of grain by irradiation. The pilot-scale grain irradiator has been so designed that its operating principle can be "scaled up" to a size suitable for commercial use. The small-scale irradiator can treat approximately 2-1/2 tons of grain an hour. Commercial models probably would operate at 250 tons an hour, or more.

It is estimated that the pilot-scale facility will be operating in July, 1965. Actual construction will be by a local contractor.

The accompanying figure illustrates operation of the irradiator. Bulk grain to be processed enters the top storage hopper, and is mechanically conveyed into the interior of the facility. A gravity system permits the grain to flow past the shielded cobalt-60 source. Following exposure, the product is conveyed out of the chamber to a storage area. The system is simple and uses standard grain handling techniques. The irradiator also has an excellent capability for processing packaged products.

ATTACHMENT

LIBRARY OF THE BUREAU OF INVESTIGATION





Materials B - Lead Enrich

UNITED STATES
ATOMIC ENERGY COMMISSION

WASHINGTON, D.C. 20545

MAR 5 1964

Dear Senator Jackson:

Reference is made to your letter of February 20, 1964, with the enclosed copy of correspondence from Mr. E. W. Panton, Seattle, concerning his interest in radiation preservation of foods. Mr. Panton's letter has been reviewed. Since the comments primarily concern time requirements necessary for development and clearance of foods processed by use of radiation, our response will be addressed to this point.

As you are aware, the Atomic Energy Commission's low-dose Radiation Pasteurization of Foods Program was organized for purposes of exploring and defining the feasibility of this process for a number of marine products, fruits and vegetables. The economic and technological aspects of each irradiated food item are first ascertained by contract studies. When these studies have assured that a food product is amenable to pasteurization by low-dose radiation and also exhibits strong possibilities for future development, studies on the wholesomeness and public health safety of the irradiated food under question are undertaken. These contract studies include detailed observations in the areas of food chemistry and nutritional adequacy, pathogenic microbiology and toxicity factors. Toxicity research, which is conducted to safeguard the health of the consumer, normally requires two-year animal feeding studies for food processed by any new method. The extent of such investigations is determined by wholesomeness and public health safety requirements outlined by the Food and Drug Administration.

It is our firm conviction that the application of low-level radiation to many food items will prove both feasible and of considerable economic importance in the future. As petitions are submitted to the Food and Drug Administration and clearances of irradiated products for public consumption are obtained, industrial participation will be welcomed.

3-5-64

Honorable Henry M. Jackson - 2 -

Since the Food and Drug Administration is responsible for decisions regarding the ultimate clearance of these food items, we are taking the liberty of forwarding a copy of your letter, with the enclosed correspondence from Mr. Penton, to that Agency for any comments which they may desire to make.

Sincerely yours,

(Signed) Glenn L. Stegert

Chairman

Honorable Henry M. Jackson
United States Senate

Mat-12- Food Production Program

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United States Senate

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

*CM/R
DL 374.10*

JERRY V. VERGLES, STAFF DIRECTOR

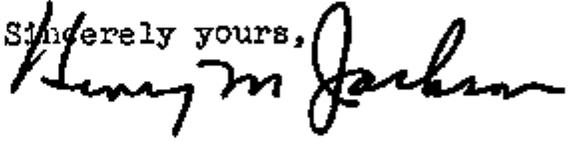
February 20, 1964

Honorable Glenn Seaborg
 Chairman
 Atomic Energy Commission
 Washington, D.C.

My dear Mr. Chairman:

I am enclosing a letter I have received from Mr. E.W. Penton of Seattle in further reference to our correspondence concerning his interest in radiation for sterilization of foods.

I would appreciate your comments on his additional remarks so that I may best answer his letter.

Sincerely yours,


Henry M. Jackson, U.S.S.

HMJ:cs
 enclosure

2-20-64

EDUARDO'S FOODS

Producers of
"ADSORB" FOOD CONCENTRATES
702 West Main Street
Auburn Washington

Seattle, Washington
February 10, 1964

MAILING ADDRESS:
P. O. Box 6691
Seattle 98116

Honorable Henry M. Jackson
United States Senate
Washington, D. C. 20510

Dear Senator Jackson:

I wish to extend my thanks for the promptness, courtesy and thoroughness of your response to my recent inquiry. Copies of this letter go to Honorable Glenn T. Seaborg, Chairman, Atomic Energy Commission and Brig. General Merrill L. Triba, Commanding U. S. Army Natick Laboratories, which will serve to bring every one up to date on the matter.

While our concentrates such as cream sauce, cheese sauce, ala Newburg, ala King, curry, etc., are essentially moisture free - as we make them - they are being added to a variety of products as combinations which are not so stable. These include meat, like chipped beef, poultry, sea foods, such as crab, shrimp, halibut and salmon; vegetables such as peas, lima beans, carrots, etc. Some of these are now being distributed as frozen pack to which the user simply adds water and brings to a boil. Great savings in weight, space and shipping costs are effected.

For instance - take the institutional pack of Milwaukee Chipped Beef with our Cream Sauce Concentrate described in the enclosed instruction sheet. Weighing 6 pounds and occupying less than 100 cubic inches, it makes up to 500 ounces of delicious creamed chipped beef with the addition of water. This is sixty portions of five ounces each. A comparable canned product would occupy about three times the space, weigh about three times as much and cost about twice as much. Now - if this product is pasteurized under low dose radiation it can be handled as a chilled product instead of frozen. If sterilized with higher dosage it would keep a long time without any refrigeration.

So you see our interest is not for our product alone but for the wide range of prepared food combinations with which they may be incorporated. I have discussed this with Dr. Dollar who is in charge of the radiation biochemistry set-up at the University of Washington. He has outlined the procedures necessary to approach accreditation of a product by the Food and Drug Administration. His most optimistic estimate of time lapse is three years and a more probable estimate of five years. This seems to me fantastic. Ninety-odd percent of the basic facts have been established. If they cannot be correlated into assessment of a new product of essentially similar character there is something terribly wrong with the system.

The differences and variables can be so easily bracketed (as between two products so similar as bacon and smoked beef) that rapid progress should be possible from existing knowledge. The estimate of time is unbelievable.

Whether or not it is justifiable, the situation points up the fact that the small entrepreneur is virtually blocked from progress in areas which require this type of government action. He has neither the time or the money to reach these goals no matter what his ambitions or initiative. I point this out in hopes that some means of expediting or simplifying such procedures may become available.

Sincerely yours,

EDUARDO'S FOODS

By E. W. PENTON

EWP:d

ENC.

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4/9

Materials - Food Mail

JAN 13 1964

Dear Senator Jackson:

This is in reference to your letter of December 21, 1963, which forwarded for comment a letter you had received from Mr. E. W. Fenton of Seattle, Washington.

Mr. Fenton's food products, as described by him, are moisture free and hence would keep well, if properly packaged, without radiation treatment. However, radiation may be used to treat dried products in order to free them from pathogens or to pasteurize them, where such treatment is appropriate. It is certainly true that products of uniform size, composition, etc., would lend themselves ideally to radiation treatment as Mr. Fenton says and this lends support to his concept.

It should be made clear to Mr. Fenton that the USARC is not concerned with radiation sterilization of foods but of certain low dose applications. The Commission's program is devoted to extending the fresh shelf life of certain fruits and marine products. The program of the Department of the Army is devoted to producing a sterile product that would keep without refrigeration under conditions of modern warfare. If Mr. Fenton wishes to pursue the radiation sterilization aspect, we suggest he write to Dr. Edward S. Josephson, Associate Director for Food Radiation, U. S. Army Natick Laboratories, Natick, Massachusetts.

The several appended reports discuss the Commission's program in general and may be useful to Mr. Fenton for background.

I trust the above information may assist you in replying to Mr. Fenton. Mr. Fenton's letter is returned as requested.

Sincerely yours,

Info. sys. to:
AGRD
DCM
AGM

(Signed) Harry H. Feilberg
Chairman

RDE:DED
SHEA:mas
1/3/64

RDE:DED
Machurek
1/ /64

DD:DED
Fowler
1/ /64

D:DED
Abersold
1/ /64

Honorable Harry H. Jackson
United States Senate

Enclosures:
As stated above. AGRD

AGM DCM OM COMZ.LIAS.
1/ /64 1/ /64 1/ /64 1/ /64

Ch...

1-13-64

Materials for Jack Seaborg Papers

HENRY M. JACKSON, WASH., CHAIRMAN	THOMAS G. HENCKS, CALIF.
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FRANK STURGES, ALASKA	E. L. MOHRER, N. DAK.
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United States Senate

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

December 21, 1963

HENRY T. WHEELER, STAFF SECRETARY

*DL-3467
C/9
M/R-cc*

Honorable Glenn Seaborg
Chairman
Atomic Energy Commission
Washington, D.C.

My dear Mr. Chairman:

I am enclosing a letter and a newspaper clipping I have received from Mr. E.W. Penton, Eduardo's Foods of Seattle, Washington, concerning his interest in preservation of seafoods by radiation.

I would appreciate your comments on the enclosed so that I may best answer Mr. Penton.

Sincerely yours,

Henry M. Jackson, U.S.S.

HMJ:cs
enclosure

12-21-63

TOC CO. LITERATURE
70
41

December 18, 1963

MAILING ADDRESS: P.O. Box 6691
Seattle, Washington 98116

Senator Henry M. Jackson
Washington, D.C.

Please return to
Eduardo's Foods, Inc.
P.O. Box 6691
Seattle, Washington 98116

Dear Senator:

The enclosed news item is no doubt familiar to you. While generally speaking, I am opposed to the use of government funds in fields where private industry can function, there are certain necessary exceptions. Development of the use of radiation for food sterilization would seem to be one of them.

We have perfected a process for producing many commonly used foods in a solid extruded form free of moisture, which provides great savings in storage, transportation and shelf-space coupled with improved quality. This includes all types of soups, sauces, gravies, ala kings, creamed chipped beef, crab newberg, shrimp curry, etc., etc.

Because of uniformity of composition, size, shape, density, etc., these products - whether used by consumers, packers, the military or in foreign aid, should lend themselves ideally to radiation sterilization techniques.

This development is of vital importance to the Pacific Northwest from both an agricultural and industrial standpoint, particularly because of the facilities at Hanford for research and development.

Do you suppose we could obtain support for a grant or contract of some kind to carry forward this work?

Very truly yours,

EDUARDO'S FOODS

BY


E. W. PEINTON

EWP:d

Use Of Radiation May Revolutionize Fish Industry

Exclusive From
The Los Angeles Times

BY ROBERT C. TOTH

WASHINGTON, Dec. 15.

An ocean-going trawler that would pasteurize freshly caught fish with intense radiation while at sea has been designed for the commercial fishing industry by the Atomic Energy Commission.

It promises several major advantages over present refrigeration techniques, according to a government report.

The length of time the fish can be stored should at least double, more of the fresh taste of the fish should be retained. And trawlers would be able to stay at sea longer and return with large catches to help the hard-pressed industry.

BROOKHAVEN National Laboratories of the AEC, and the Vitro Engineering Co., designed the cobalt-60 shipboard irradiator. They built on research done by the Bureau of Commercial Fisheries and the Massachusetts Institute of Technology.

Commercial fish trawlers,

most all from New England, produce nearly 70 per cent of the domestic fish and frozen fish eaten in the United States. They land 700 million pounds of fish a year, worth about \$38 million.

HOWEVER, because fish

can be kept on land for a limited period in the fresh state, even when on ice, many trawlers must return to port with relatively poor quality fish. And because of the time problem, the trawlers are sometimes only 30 per cent full.

Freezing the fish at sea can

help, but the industry has not accepted the process because the cost of freezing (as distinct from refrigerating) facilities aboard ships would increase the price of the fish in the highly competitive market. Moreover, frozen fish has a poorer taste than fresh fish.

SEATTLE POST INTELLIGENCER 12/16/63

*Matter 6-13. Sub
Letter B-425*

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. IN-439
Tel. Hazelwood 7-7831
Ext. 3446

FOR RELEASE AT 11:00 A.M. EDT
FRIDAY, JULY 26, 1963

Remarks by Dr. Paul C. Aebersold, Director
Division of Isotopes Development
U. S. Atomic Energy Commission
Prepared for Delivery at the
Ground-breaking Ceremony for Seafood Irradiator
Gloucester, Massachusetts
July 26, 1963

Today we are breaking ground for a significant technological advance which promises to lead to the fruitful union of one of mankind's most ancient pursuits - fishing - with that of one of the most modern - nuclear technology. Shortly after Becquerel discovered radioactivity, its use to destroy microorganisms was under study. As early as 1904 S. C. Prescott reported in Science on radiation effects on fungi, thus foreshadowing the possibility of radiation preservation of foods. Only recently has nuclear technology advanced to the point where such use has become feasible.

The ideal goal of food preservation methods has long been to retain the natural or fresh characteristics of the product. The objective of the research and development program on radiation pasteurization of fresh fish and fruits is to extend their refrigerated shelf-life. The radiation pasteurization process seeks to obtain fresh or fresh-like foods to supplement foods preserved by methods such as salting or use of other chemicals, dehydro-freezing, drying, freezing, and canning. The process also seeks to reduce spoilage losses and permit shipment of perishable products to areas where they are not now available.

Our studies on marine products have included work on haddock, soft-shelled clams, crab, flounder and shrimp. This work is being conducted at the Gloucester and Seattle

(more)

7-26-63

Technological Laboratories of the Bureau of Commercial Fisheries, Massachusetts Institute of Technology, University of Washington, Louisiana State University and at other laboratories around the country. The work completed thus far indicates that extension of shelf-life of fresh fish held at refrigerated temperatures does result in a palatable product even after two to three weeks of additional storage.

Along with the technological aspects, we have been pursuing a wholesomeness program to satisfy the safety requirements of the Food and Drug Administration. To date it has been determined that there are no deleterious biochemical changes in vitamins and amino acids in the radiation pasteurized marine products. Research results also show that anaerobic (clostridia) bacteria counts are reduced to a significant degree by irradiation at 50,000 to 350,000 rad and remain at acceptable low levels after some three weeks in storage.

A study to establish the characteristics, and therefore safe use, of packaging materials used with irradiated food products is nearing completion. This will be followed by petitions to the Food and Drug Administration for clearance of such materials.

Today's occasion opens the door to the second stage of development of the technology of food irradiation. The Marine Products Development Irradiator, when completed in late summer of 1964, will have a capacity adequate for conducting large scale demonstration of radiation pasteurization of seafoods and - as a prototype - it will serve to acquaint industry with an irradiation facility. The irradiator will process seafoods at the rate of up to 1,000 pounds an hour at a 500,000 rad dose using a 250,000-curie cobalt-60 irradiation source. Looking to the future, a conceptual design of a shipboard fish irradiator also is being completed.

Industry interest in this technology has been increasing rapidly. It has been sparked in part by the Food and Drug Administration clearance of radiation sterilized bacon for human consumption and also because we have communicated our promising results to interested organizations such as the National Fisheries Institute. Further impetus to commercialization will result from petitions for FDA clearance of seafoods which will be submitted jointly by the AEC and the Army. Thus industry will be able to participate with us in use of this facility for large scale shipping, storage and consumer acceptability tests. In connection with the latter, the problem of

(more)

consumer education is also receiving attention through a study to determine possible consumer apprehensions and the means of overcoming them.

We are aware of the need for careful definitive work and of the problems that may lie ahead. However, based on present achievements, we have confidence in the future of this process. We wish to commend the Gloucester Technological Laboratory for undertaking for us this important phase of development and to provide assurance of our continuing close collaboration with the fishing industry in the furtherance of this technology.

7/26/63

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Everett McKinley Dirksen
Illinois

Material 12 Book for Property

United States Senate
Minority Leader

April 1, 1963

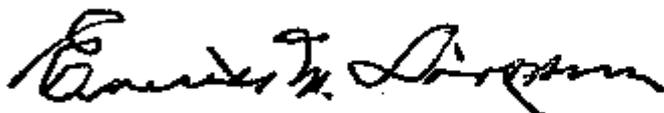
Dr. Glenn T. Seaborg, Chairman
Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Seaborg:

A grant of \$23,200 has been received from the Atomic Energy Commission to expand research on control of post-harvest diseases of fruits and vegetables by gamma irradiation. These funds will be used to expand the staff at the Horticultural Crops Branch Laboratory in Chicago and to support cooperative research on the physiological effects of irradiation treatments with the University of Chicago. The grant is subject to renewal for three years.

The University of Chicago has declined this grant and I am wondering if another educational institute in the Chicago area could receive consideration for this grant.

Sincerely,



Everett McKinley Dirksen

4-1-63

AEC

M. Atensha - 12 - Food Irradiation

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. F-16
Tel. HAZELWOOD 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Tuesday, January 29, 1963)

AEC SELECTS ARCHITECT-ENGINEER FOR SEAFOOD PRODUCTS IRRADIATOR

The Atomic Energy Commission is negotiating a contract with Associated Nucleonics, Inc. of Garden City, Long Island, N.Y., to provide architect-engineering services related to the construction of a Marine Products Development Irradiator (MPDI) at Gloucester, Massachusetts. Associated Nucleonics is a subsidiary of Stone & Webster, Inc., New York.

The facility will be used to demonstrate the technical and economic feasibility of radiation pasteurization of fishery products. Operating on a near-commercial scale it will process seafoods at the rate of up to one ton an hour using a 300,000-curie cobalt-60 radiation source. Estimated cost of the facility is \$600,000. Upon completion in late 1964 it will be operated for the Commission by the Gloucester Technological Laboratory of the Bureau of Commercial Fisheries, U.S. Department of Interior.

The MPDI is being built by the Atomic Energy Commission as part of its radiation-pasteurized foods program. The program is directed toward extending the refrigerated storage life of fresh products, such as fish and fruits, from several days to several weeks. Radiation pasteurization provides fresh or fresh-like foods to markets where these are not otherwise obtainable. Soft-shelled clams, for example, have a high potential for radiation pasteurization since they cannot be frozen and stored without undesirable change.

Food successfully pasteurized by radiation does not lose its characteristic appearance, taste, or odor, but does have a longer refrigerated shelf-life. The energy -- gamma radiation -- emitted by the radiocobalt passes through the food destroying bacteria and other spoilage-causing organisms. With a reduction of over 95% of the bacteria as a result of the process, seafoods such as

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haddock, clams, or shrimp can be kept in ocean-fresh condition for over four weeks under normal refrigeration. Taste panels have judged the resulting products to be excellent. Research results to date indicate that low dose radiation pasteurization does not affect food wholesomeness or nutritive value.

This process would be of major benefit to processors, distributors, and consumers since it can be expected to (1) reduce losses from spoilage; (2) smooth out processing loads; and, (3) provide a more even flow of products to the consumer. The greatest benefit, however, will be the extension of markets for fresh foods into areas now inaccessible by present distribution methods.

The AEC low-dose irradiation program complements the program conducted by the Department of the Army. The Army's objective is total sterilization of foods for military combat rations where storage for months without refrigeration is desirable.

Construction of the Marine Products Development Irradiator will be administered under the technical direction of the Commission's Division of Isotopes Development through the AEC's New York Operations Office.

(NOTE TO EDITORS AND CORRESPONDENTS: This information is being issued simultaneously by the Commission's New York Operations Office in New York City.)

1/29/63

U.S. DEPARTMENT OF COMMERCE

WASHINGTON 25, D. C.

*In levels - 127 and
Preservation*

INTERDEPARTMENTAL COMMITTEE ON
RADIATION PRESERVATION OF FOOD

January 4, 1963

Honorable Glenn T. Seaborg
Chairman, Atomic Energy Commission
Washington 25, D. C.



Dear Mr. Seaborg:

The Interdepartmental Committee on Radiation Preservation of Food met on December 11, 1962, and approved in principle the attached report. This report, entitled "IAEA Panel Report on Radiation Discontamination of Grain," was prepared at the request of the Committee by an ad hoc group of Government officials closely associated with this new and most important food processing development.

The Committee requested this report as essential and appropriate in carrying out its primary objectives which are to:

- 1) provide information and broad guidance for the Government to develop a program on the radiation preservation of food;
- 2) determine how to promote this food processing development into the national economy as rapidly as possible.

The Committee agreed, at its December 11, 1962, meeting, that the heads of the nine agencies and departments represented should study and comment officially on the report prior to the submission by the Chairman of a request to the Department of State for action on obtaining a position from the Indian government regarding an experimental program related to the decontamination of grain by irradiation processing means. Further action on other recommendations made by the ad hoc group in the enclosed report will be considered if the Government of India indicates to the Department of State its desire to consider the program.

May I express, too, our appreciation of the services of Messrs. Paul C. Asbersole, Joseph E. Machurek, George R. Dietz, E. Eugene Fowler, Kevin C. Shea, Charles L. Liverman, Leo A. Whitehair, Spofford English, and Roy E. [unclear] who have outstandingly and continuously furnished their knowledge and services to the Committee.

*DR 198-1
grm/A
W.P.H.*

Honorable Glenn T. Seaborg
January 4, 1963

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We would appreciate receiving your comments by January 22, 1963, if at all possible in order that further action can be expedited.

Sincerely yours,

A handwritten signature in cursive script that reads "A. A. Bertach". The signature is written in dark ink and is positioned above the printed name.

A. A. Bertach
Chairman

Enclosure