HB

388

STATE OF ALASKA
THE LEGISLATURE

POUCH Y - STATE CAPITOL
JUNEAU, ALASKA 99811
907-465-3800

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May, 1988

Copies of minutes listed below were originally included in this file. The minutes are available on the STAIRS database CMPR. In order to save space copies of minutes have not been left in the files.

Mary Van Nimwegen

HHESS	2-3-88	8:30a.m.
HHESS	2-17-88	8:30a.m.
HHESS	2-23-88	8:30a.m.

(7)

HOUSE COMMITTEE REPORT

Date referred: 1/22/88 FURTHER REFERRALS: Judiciary

DATE: 2-23-88

The Health, Education and Social Services Committee has considered HB 388

"An Act relating to irradiated food."

RECOMMENDS:

[X] replace with CS HB 388 (HESS) [X] the same title

[ ] attached amendment(s) [ ] a new title

[X] do pass

[ ] do not pass

[ ] no recommendation

[ ] individual recommendations

[ ] additional referral to the _____ Committee

ADOPTS: [ ] _____ letter of intent

ATTACHES NEW FISCAL NOTE(s):

[X] fiscal impact

[ ] zero fiscal note

[ ] zero with analysis

[ ] same as previous fiscal note published _____

[ ] same as previous zero fiscal note published _____

SIGNING DO PASS:

SIGNING OTHER RECOMMENDATIONS:

Chairman's signature

STATE OF ALASKA
1988 LEGISLATIVE SESSION

BILL VERSION: HB 388
PUBLISH DATE: _____

FISCAL NOTE

REQUEST:

Revision Date: 1/22/88
Title: An Act relating to irradiated food.
Sponsor: Phillips and Goll
Requestor: _____

Agency Affected: Health & Social Services
BRU: State Health Services
Components: _____

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES						
TRAVEL						
CONTRACTUAL						
SUPPLIES						
EQUIPMENT						
LAND & STRUCTURES						
GRANTS, CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	-0-	-0-	-0-	-0-	-0-	-0-
CAPITAL						
REVENUE						

FUNDING: (Thousands of Dollars)

GENERAL FUND						
FEDERAL FUNDS						
OTHER						
TOTAL	-0-	-0-	-0-	-0-	-0-	-0-

POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY						

ANALYSIS: (Attach a separate page if necessary)

The enactment of HB 388 would have no direct fiscal impact on the Department of Health and Social Services.

Prepared by: Elizabeth Ward, Director Elizabeth Ward Phone: 465-3090
Division: Public Health Date: 2-2-88

Approved by Commissioner: Mora M Munson Date: 2-2-88
Agency: Department of Health & Social Services

Distribution (by preparer):
Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

POSITION PAPER
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

House Bill No. 388 February 2, 1988

"An act prohibiting the sale of irradiated food."

Department position:

The Department has not taken a position on this bill for the following reasons. The Department has no staff with training and experience in the irradiation of food. The Department's expertise regarding food products is inspecting the sanitary operations of food production facilities. There is a large amount of information and scientific data on this issue. Although review and analysis of the available data are beyond the Department's current capacity to effectively review and analyze, we are pleased to assist the committee in identifying useful information, including the following background.

FDA Requirements

The treatment of certain food products and spices with ionizing radiation is approved by the U.S. Food and Drug Administration (FDA). FDA has approved the following application dosages: for foods which can comprise more than 0.01% of the daily diet, the dosage cannot exceed 1 kilogray (KGy); for foods which can comprise less than 0.01% of the daily diet, dosage cannot exceed 50 KGy.

FDA Approved Sources of Irradiation

Approved irradiation sources include: radioactive isotopes (Cobalt-60 or Cesium-137) and machines (x-ray or electron beam).

FDA Foods Approved for Irradiation

FDA has approved the application of irradiation to the following foods: fruits/vegetables (slow growth and ripening and control insects); dried spices and herbs (kill insects and control microorganisms); pork (control trichinosis); white potatoes (growth and maturation inhibition); and wheat and wheat flour (control insects).

FDA Labeling Requirements

Labeling requirements have also been imposed by FDA to ensure that the consumer is aware that food they are consuming has been irradiated. Treated products contain a label statement that contains the international irradiation process logo (tulip) and

the statement "treated with radiation" or "treated by irradiation". On April 18, 1988 the requirement for the written warning is scheduled to be withdrawn. This action would leave only the international irradiation process logo on retail packages. FDA has informed DEC that this will probably not occur since the average consumer probably does not know what the logo symbolizes.

Enforcement

The department would enforce the provisions of this bill by inspecting food distributors, warehouses, and retail and wholesale outlets for food labeled with the federally required irradiation symbol and product statement. If irradiated food was found during the course of inspection, the department would embargo the product under the authority in 17.020.230 and require that it be destroyed or returned to an out-of-state distributor.

STATE OF ALASKA
1988 LEGISLATIVE SESSION

BILL VERSION: HB 388
PUBLISH DATE: 1/22/88

FISCAL NOTE

REQUEST:

Revision Date: -
Title: An Act relating to irradiated food.
Sponsor: Peter Goll and Randy Phillips
Requestor: Randy Phillips

Agency Affected: Environmental Conservation
BRU: Environmental Health
Components: Sanitation

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 88	FY 89	FY 90	FY 91	FY 92	FY 93
PERSONAL SERVICES	-	14.9	14.9	14.9	14.9	14.9
TRAVEL	-	-	-	-	-	-
CONTRACTUAL	-	2.0	2.0	2.0	2.0	2.0
SUPPLIES	-	1.0	1.0	1.0	1.0	1.0
EQUIPMENT	-	-	-	-	-	-
LAND & STRUCTURES	-	-	-	-	-	-
GRANTS, CLAIMS	-	-	-	-	-	-
MISCELLANEOUS	-	-	-	-	-	-
TOTAL OPERATING	0	17.9	17.9	17.9	17.9	17.9
CAPITAL	0	0	0	0	0	0
REVENUE	0	0	0	0	0	0

FUNDING: (Thousands of Dollars)

GENERAL FUND	0	17.9	17.9	17.9	17.9	17.9
FEDERAL FUNDS	0	0	0	0	0	0
OTHER	0	0	0	0	0	0
TOTAL	0	17.9	17.9	17.9	17.9	17.9

POSITIONS:

FULL-TIME	-	-	-	-	-	-
PART-TIME	-	1	1	1	1	1
TEMPORARY	-	-	-	-	-	-

ANALYSIS: (Attach a separate page if necessary)

Attached.

Prepared by: Douglas C. Donegan
Phone: 465-2609
Division: Environmental Health
Date: 2/2/88

Approved by Commissioner: Dennis D. Kelso
Date: February 2, 1988
Agency: Environmental Conservation

Distribution (by preparer):
Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

STATE OF ALASKA

OFFICE OF THE GOVERNOR

BILL ANALYSIS

DEPARTMENT	DIVISION	BILL NUMBER	SPONSOR
Environmental Conservation	Environmental Health	HB 388	Peter Goll and Randy Phillips

SHORT TITLE OF BILL

"An Act relating to irradiated food"

DEPARTMENT POSITION The passage of HB 388 would require that the Department expand it's inspection activities at approximately 500 retail markets to ensure that irradiated products were not being sold. The additional time per inspection is estimated to be approximately (Continued)

PREPARED BY	DATE	COMMISSIONER'S SIGNATURE	DATE
Douglas C. Donegan	2/2/88	Dennis D. Kelso	

SUMMARY

OTHER AGENCIES AFFECTED BY BILL	CONSTITUENT GROUP(S) AFFECTED BY BILL

ORGANIZATIONAL SUPPORT FOR BILL	ORGANIZATIONAL OPPOSITION TO BILL

FISCAL IMPACT: ☐ NONE ☐ FISCAL NOTE ATTACHED

BACKGROUND/LEGISLATIVE INTENT

ANALYSIS OF BILL/PROGRAM EFFECTS

AMENDMENTS PROPOSED

PLEASE ATTACH A SEPARATE SHEET FOR ADDITIONAL COMMENTS OR ANALYSIS.

01-009 (Rev. 12/83)

one (1) hour per inspection. These facilities are inspected once per year.

The Department would begin inspecting 51 retail markets in the Municipality of Anchorage, which are not currently inspected by the department. It is estimated that the inspection of these markets would be approximately 2 hours including travel time.

This inspection effort would amount to a total of 602 hours/year or about four months/year.

Position Title	No. of Positions	Range/Step	Barg. Unit
Environmental Sanitarian II	1	16/A	G

Time Status	Staff Months	Location	Election District
F	Four (4)	Anchorage, Ak.	7

Type of Expenditure		Amount
1	2	3
Salary	11.2	
Benefits	3.7	
Premium Pay	-	
Other	-	
Total Personal Services		14.9
Travel		-
Contractual		2.0
Commodities		1.0
Equipment		-
Other		-
Total Cost		17.9

Funding Source for Total Cost		
Federal Receipts	1002	-
G. F. Match	1003	-
General Fund	1004	17.9
GF Program Receipts	1005	-
Other		-

Justification

This position is required to support the implementation of HB 388 "An Act relating to irradiated food." Approximately 500 retail markets would be inspected to ensure that prohibited products were not being sold. All retail markets would be contacted and notified of the new law. It is estimated that the inspection of these facilities would require approximately 2 hours each, including travel time.

The additional inspection effort would amount to a total of 602 hours per year or about four months per year.

Request For New Position

Agency: Environmental Conservation

BRU: Environmental Health

Component: Sanitation

Revised Date

FY 89

POSITION PAPER/Department of Health & Social Services

Position Paper

HB 388

For an Act entitled: "An Act relating to irradiated food."

HB 388 prohibits the sale of irradiated food including spices and food that contains an irradiated ingredient unless the only irradiated ingredient is a spice. While it appears passage of this bill would have economic impact due to the long established practice of irradiating spices, the scope of this position paper is limited to the health considerations of irradiated food.

Background

The health aspects of irradiated food have been studied for many years. The Food and Drug Administration (FDA) has conducted exhaustive reviews of all available studies and has determined that irradiated food is safe for human consumption. The FDA has concluded there is no scientific evidence meeting FDA standards for toxicological studies that shows adverse effects on health from the consumption of irradiated food. Results of studies used to support claims of harmful effects have been rejected due to lack of adequate scientific controls or design, including radiation doses far in excess of those considered acceptable for food processing. In its conservative approach, the FDA has approved the irradiation of certain foods only, and it has limited the radiation doses to one-tenth of those shown to be safe. This position is supported by such diverse groups as the Council for Agricultural Science and Technology, the World Health Organization, the Food and Agricultural Organization of the United Nations, the American Medical Association, and the International Atomic Energy Agency.

In addition to the FDA, numerous national and international organizations recognized in health, food technology, and radiation safety have closely examined claims of harmful effects presently being made by those opposed to food irradiation. In every case, these organizations have judged irradiated food to be safe for human consumption.

Position

Without acceptable scientific evidence showing that irradiation is harmful to health, the department believes it is inappropriate to forbid the sale of irradiated food in the state. Proper labeling of irradiated foods will allow those opposed to it to exercise their choice in the foods they purchase.

The Department of Health and Social Services opposes passage of HB 388.

POSITION PAPER/Department of Health & Social Services

Recommended by: Elizabeth Ward

Elizabeth Ward, M.N.
Director
Division of Public Health

Date: February 2, 1988

Approved by: Myra M. Munson

Myra M. Munson
Commissioner
Department of Health and
Social Services

Date: Feb 2 1988

The Zap Factor

Irradiation Process Sparks National Controversy

Imagine strawberries that stay red and firm for more than a day or two, two-week-old bread that's still fresh, and onions that can stay in the pantry for months without sprouting. That's the promise of food irradiation, a process that advocates say could transform the way food is handled in the U.S.

Zapping food to keep it fresh is not new. Some two dozen nations have approved food irradiation, some as long as 20 years ago.

The U.S. government, which has approved the sale of irradiated fruits and grains, currently is debating whether to broaden the use of irradiation technology for other types of foods.

The process uses gamma, beta, or x-rays to disinfect food, kill microorganisms and bacteria that cause disease, or slow down spoilage. It is used in the U.S. to decontaminate spices, disinfect wheat, inhibit sprouting of white potatoes, control trichinosis in pork, and kill insects in fresh fruits and vegetables.

The irradiation process involves placing items on a conveyor belt that passes a cylinder of radioactive material. Because dosages are low, the food does not become radioactive, but bacteria, insects, and other organisms are killed, allowing the products to stay fresher longer.

Presently, only spices are routinely irradiated in the U.S. Irradiated pork, fruits, and vegetables are not yet available in U.S. markets, although irradiated mangoes and papayas were test-marketed in Miami Beach and Los Angeles supermarkets last year on a limited basis.

Despite the availability of the technology, however, irradiation has not become the dominant method of food processing, partly because of economic considerations. Other processing methods generally are cheaper and at least as effective for most food products.

But the potential for widespread use on products such as poultry and fish has prompted questions about the safety of irradiation technology to both workers and consumers.

Arguments abound as to whether food irradiation is a blessing or a scourge.

Proponents—including the U.S. government, some food companies, and the irradiation industry—assert that zapping food with radiation is a safe and effective way to preserve food. Irradiation not only kills organisms that cause food spoilage, they say, but irradiated food also can be stored without refrigeration, which could have important applications to food supplies in developing countries where refrigeration is limited or nonexistent.

Opponents—mostly environmental and health advocates—point out that available scientific studies fail to prove beyond a doubt that irradiated food is safe to eat.

Although irradiation does not make food radioactive, it does create new chemical substances in the food called "unique radiolytic products" (URPs), some of which are known to be harmful. Many of these URP byproducts have yet to be identified and tested for toxic effects.

Irradiation keeps food fresh longer but studies indicate that the process causes a slight loss in nutrients. The U.S. government is considering whether to allow widespread use of irradiation technology.

Critics note that the Food and Drug Administration (FDA) approved the technique relying on the results of only five studies, even though more than 30 other studies showed that serious toxic effects may occur.

Studies also indicate that food irradiation depletes foods of vitamins and minerals. Although the nutrient loss is slight, if a sizable portion of the public's diet is irradiated, the cumulative effect would be more serious.

Another controversial issue is labeling. Under current FDA regulations, irradiated foods must be labeled "treated with radiation" or "treated by radiation." (Products that are not irradiated but contain irradiated ingredients—such as spices—require no special labeling.)

Written labels on irradiated food will be replaced with a new symbol in 1988.

After 1988, however, irradiated foods will be required only to display a flower-like symbol to indicate that radiation was used. Many consumer groups argue that consumers will not know what the symbol means, and will not be fully informed when the purchase the products.

Handling irradiated produce and other products is not hazardous to supermarket workers or consumers because the products aren't radioactive.

There is speculation that if irradiation expands into the meat and poultry industries, however, workers at the plants could face risk if irradiators are installed in individual plants.

Most irradiation likely would take place in large facilities where workers could be exposed to radioactive materials during use, maintenance, and clean-up of the facilities.

Radiation exposure is known to cause cancer and reproductive and genetic damage. The government has established safety standards that regulate maximum allowable exposure levels for workers, but safety advocates say the standards need to be strengthened.

Whether food irradiation will become widespread is uncertain. Until now, negative public reaction made the food industry think twice before making a major commitment to this controversial technology.

A recent survey revealed that only 16 percent of consumers would purchase irradiated food, compared with 36 percent who wouldn't, and 48 percent who didn't know. Consumers may make the ultimate decision on the issue.

February 8, 1988

Honorable Niilo Koponen
Health, Education & Social Services Committee
P.O. Box V (MS 3100)
Juneau, Alaska 99811

Dear Mr. Koponen,

The Department of Energy provided a grant to the University of Alaska in Fairbanks to conduct a feasibility study on building a demonstration food irradiation facility in Alaska.

Irradiation creates toxic substances, radiolytic products (RPs), which:

- sterilize fruit flies and spoilage microorganisms such as trichina, salmonella and bacteria.
- kill enzymes that produce sprouts in potatoes and onions.
- disable microbes and bacteria necessary for the body's immune system.
- deplete essential vitamins, nutrients and amino acids.
- and as studies indicate cause cancer and genetic mutations.

The Food and Drug Administration (FDA) refutes claim of any ill-effects using theortical calculations backed by 5 studies out of 441 it reviewed. Many of the 436 studies that the FDA dismissed show maladies to animals and humans. (See enclosed articles)

John Gofman, M.D., Ph.D., and professor emeritus of medical physics at U. C. Berkeley who "from a lifetime of research in both heart disease and cancer" claims, "I know what sort of studies are required to ascertain the delayed affects and the cumulative affect on humans of biological agents.... The kind of epidemiologic study required to find out whether or not a diet of irradiated food will increase (or decrease) the frequency of cancer or genetic injuries among humans simply has not been done."

The cornerstone of FDA approval of irradiation is the final report of the FDA Bureau of Foods Irradiated Foods Committee (BFIFC) released in July 1980. The report states, "Calculations based on radiation chemistry clearly indicate that irradiation doses of 100 krad (maximum approved dosage) or less yield a concentration of total radiolytic products in food that is so limited that it would be difficult to detect and subsequently

measure potential toxicological properties. In addition, at this dose unique radiolytic products (URPs) (chemicals found only in irradiated food, toxicity unknown) will be on the order of 3 ppm (parts per million).... Hence because of the low level of total unique radiolytic products produced, it is concluded that food irradiated at doses not exceeding 100 krad is wholesome and safe for human consumption."

Dr. Gofman responds, "Our ignorance about these foreign compounds (RPs & URPs) makes it simply a fraud to tell the public that 'we know' irradiated foods would be safe to eat."

George Tritsch, Ph.D, cancer research scientist at Roswell Park Memoral Institute in Buffalo, New York responds, "I am opposed to consuming irradiated food because of the abundant and convincing evidence in the referred scientific literature, that the condensation of free radicals formed during irradiation (RPs & URPs) produce statistically significant increases in carcinogenesis, mutagenesis and cardiovascular disease in animals and man."

In recognition of the conflicting evidence of food irradiation safety, please support House Bill 388 which bans the sale of irradiated food in Alaska. In addition please ban food irradiation facilities and/or resolve that the U of A Fairbanks end the feasibility study until the Federal government initiates and concludes an inquiry into the wholesomeness and safety of irradiated food. (The Food Irradiation Safety and Labeling Requirement Act of 1987 [HR 956 & S 461] if enacted mandates an inquiry).

We would appreciate a response.

Sincerely,

William Thomas

Sylvia Thomas

Denny Thomas

William, Sylvia & Denny Thomas
9040 Emerald
Anchorage, Alaska 99502

Enclosures:
-Food Irradiation Safety and Labeling Requirement Act of 1987 (Summary)
-"Zap, Crackle, Pop" & "No Fried Food in New Jersey", Magazine Articles
-Food Irradiation Fact Sheet
-Food Irradiation Article, Anchorage Daily News
-Letter to Anchorage Daily News

Alaska State Legislature
House

Official Business

P.O. BOX V
State Capitol
Juneau, Alaska 99811

MEMORANDUM

TO: House HESS Committee

FROM: Representative Randy Phillips R.E.P.

DATE: February 1, 1988

RE: House Bill 388
An Act relating to irradiated food

House Bill 388 would prohibit the sale of irradiated foods within the State of Alaska. According to advice from Terry Bannister, Legislative Counsel, while this particular bill does not prohibit the manufacturing of irradiated food, AS 17.20.340 indicates that such manufacturing would also be prohibited (See Attachment 1).

The provisions contained in House Bill 388 would be added to the Alaska Food, Drug, and Cosmetic Act and this would mean that certain enforcement provisions included in that act would follow with the adoption of the language in this bill. Criminal penalties would be those as set out in AS 17.20.310 (See Attachment 2) and injunctive relief would be as provided in AS 17.20.280 (See Attachment 3). As currently written, the bill does not include provisions for embargo and destruction of these items.

The language in the bill is based on a law adopted in Maine in 1987. Maine is the first state to ban the sale of irradiated foods.

In 1987 the New Jersey Legislature adopted a food irradiation ban; however, the Governor vetoed the bill. Vermont has enacted strict labeling requirements in the event the federal requirements are lifted. Legislation proposing a ban on irradiated food has been reintroduced in New Jersey and is also being considered in New Hampshire, New York, Pennsylvania and Vermont. A list of the states considering food irradiation legislation is attached as Attachment 4. There is legislation also pending in the United States Congress regarding both the food irradiation and labeling issues (H.R. 956 and S. 461).

Food irradiation is being considered as a possible food preservation method. The actual process involves the use of cobalt-60 (an isotope that must be manufactured in nuclear reactors from nonradioactive cobalt-59) or cesium-137 (a water soluble byproduct of both nuclear weapons production and nuclear power generation). (See Attachment 5 for an article explaining this process and Attachment 6 for a history of food irradiation.) In 1958, Congress classified food irradiation as a food additive. This meant that before the process could be used,

it had to be approved by the FDA under the Federal Food, Drug, and Cosmetic Act. While the FDA has approved food irradiation for five different uses [control of insects in wheat (1963), inhibit sprouts in potatoes (1964), control of trichinosis in pork (1985), slow growth and ripening and control pests in produce, and to kill insects and microorganisms in herbs and spices (1986)] the only use in the United States at the present time is in some spices and herbs. I have attached a list of spices and herbs that are being irradiated at the present time (See Attachment 7).

The greatest concerns I have with the food irradiation process are as follows:

1. Safety of the process and effect on humans ingesting irradiated foods.

2. Questions about the wholesomeness of irradiated foods (See Attachment 8).

3. Risks to the environment from the irradiator plants. There is danger both to the workers in an irradiation plant as well as residents of the surrounding area. I have attached a list of incidents that have occurred at some of the forty irradiation plants that current operated within the United States (See Attachment 9). Attachment 10 shows the location of the forty irradiation facilities in the U.S.

3. Possible creation during the process of mutuant and/or radiation resitant bacteria and the effect of the elimination of nonresitant bacteria making it easier for the mutuant bacteria to survive.

4. Possible creation during the process of potent carcinogens called aflatoxins.

5. Possible elimination of the organisms that produce signals and odors that alert people to food spoilage while the bacteria that causes food poisoning may be more resitant to radiation and therefore still present.

6. Radioactive food may occur if the process is not handled properly.

8. Transportation of radioactive materials. If Alaska were to have an irradiator plant, and this is one of the areas being researched by the University of Alaska at Fairbanks, the radioactive materials would have to be brought in from somewhere. To my knowledge, the nearest stockpile of cesium-137 is at Richland, Washington, near the Hanford plant and this would mean that such products would have to be trucked, barged or flown to Alaska. In addition, since cesium-137 is water soluble, if there were an accident enroute or at any such plant, the results could be devastating.

9. Safety questions exist concerning the storage of the radioactive material.

For your information, I have also attached a list of articles that I have available on this subject (See Attachment 11). If you wish to do further review on the matter, please do not hesitate to contact me.

I would appreciate your support of this legislation.

FOOD IRRADIATION
1987 INTRODUCED AND ENACTED LEGISLATION

STATE BILL # OR CHAPTER # (1987 Laws/ Acts)	SUMMARY
AK SJR 33 (Intro 5/87)	Makes provisions relating to irradiated food.
HI SB 971 (Intro 3/87)	Makes an appropriation to promote consumer acceptance of irradiated agricultural products from Hawaii.
IL HB 212 (Intro 2/87)	Amends Food, Drug and Cosmetic Act. Requires labeling of irradiated foods sold at retail for off-premise consumption.
MA SB 47 z (Intro 5/87)	Provides for an investigation and study by the Department of Public Health relative to the potential health risks of food irradiation.
ME Chap. 174	Prohibits the knowing sale of irradiated food, with the exception of irradiated spices when those spices are only an ingredient in the food. Provides that irradiated spices are irradiated food and their knowing sale is prohibited.
NH HB 1082 (Intro 1/88)	Relates to irradiated food.
NJ AB 3150 (Intro 11/87)	Prohibits distribution and sale of irradiated food.
NJ SB 2571 (Intro 1/88)	Prohibits distribution and sale of irradiated food.
NJ SR 43z (Intro 2/87)	Memorializes Congress to rescind Food and Drug Administration's approval of food irradiation.
NY AB 4106 (Intro 5/87)	Defines "irradiated food"; makes it unlawful for any merchant, broker or processor to knowingly sell any irradiated food until studies of the effects on human health, on consumers, and on workers so exposed and impacts associated with transportation of radioactive materials used in processing are received and accepted by various state commissioners.
NY AB 5442 (Intro 6/87)	Defines food exposed to any process of irradiation as adulterated food.
PA HB 1632 (Intro 7/87)	Prohibits the sale of food products which have been exposed to or treated with radiation for preservative purposes or any other reason.
PA HB 1912 (Intro 10/87)	Defines adulterated food in relation to radiation under the Pure Food Law.
VT HB 635 (Intro 1/88)	Prohibits the sale of irradiated foods.

1/21/88 (Source: Information for Public Affairs, "State Net")

Irradiating food growing preservation method

Most groups say irradiation is the safest way to keep food from spoiling and to kill bacteria

Recent federal initiatives are paving the way for a significant increase in the use of low-dose irradiation on foods in the United States.

New Dept. of Health and Human Services (HHS) regulations, it appears, by the Office of Management and Budget (OMB), will permit irradiation of grain and fresh fruits and vegetables. Sweeping legislation now before Congress would further encourage irradiation of foods — a practice considered beneficial because it destroys insects, parasites, and microorganisms, including those that cause disease and promote spoilage.

In irradiation, food is exposed to ionizing energy from radioactive isotopes of cobalt or cesium or from devices that produce controlled amounts of beta rays or x-rays. For at least 20 years, some food and food products, including wheat and potatoes, have been irradiated abroad without adverse effects. At least 28 countries now irradiate some foods.

But the process has been little used in the United States. Although existing Food and Drug Administration (FDA) regulations now allow irradiation for insect disinfestation in wheat, sprout inhibition in white potatoes, and control of microorganisms and insects in herbs and spices, only the latter use has been widespread.

THIS MAY CHANGE, however, as the HHS reviews new uses and regulations for irradiation:

- In July, 1985, HHS gave the go-ahead for irradiation in the processing of pork, a process that is believed to eliminate the threat of trichinosis even if the pork is undercooked or eaten raw. These regulations — with comment from the U.S. Dept. of Agriculture (USDA), which regulates pork — are nearing OMB review completion.
- Just before leaving office, HHS Secretary Margaret Heckler signed off on regulations that would permit the irradiation of fresh fruits and vegetables to kill pests and prolong shelf life.
- HHS is considering extending the irradiation process to poultry, and studies of this application are now under way.

FOOD IRRADIATION ALSO has occupied the attention of federal legislators recently. Four House committees are considering H.R. 696, a food irradiation development and control bill that would allow irradiation of many foods at regulated doses (the lowest level to achieve effectiveness).

Under the proposed legislation, the FDA would retain general authority to regulate food irradiation. But the definition of irradiation in the Food, Drug, and Cosmetic Act would be changed so that it would be regulated as a process, like boiling or freezing, rather than a food additive.

The legislation would also require national uniformity in the regulation of food irradiation and would create a commission to coordinate and consolidate all food irradiation research, encourage investment by private sources in food irradiation, and promote a wider public understanding through educational programs.

A companion bill, S 288, with similar provisions, has not been debated.

Irradiated foods must now carry the word 'picowaved' on their labels together with the international logo symbolizing irradiated foods.

THE CURRENT INTEREST in food irradiation springs from concern about the safety of pesticides, particularly when used in the post-harvest disinfestation of fruits and vegetables. Specifically, the discovery in 1984 that the post-harvest fumigant ethylene dibromide (EDB) leaves a toxic residue on food — followed by the banning of EDB by the Environmental Protection Agency — encouraged consideration of irradiation as an alternative to pesticide use.

The FDA, HHS, and USDA — as well as other proponents — all contend that irradiation in low doses actually has a wide variety of beneficial applications: It eliminates trichinae spirals in pork, the Medfly in citrus fruits, and the codling moth in apples; could destroy *c. botulinum* and salmonella in red meats, poultry, and fish; and extends the shelf life of fresh fruits, vegetables, and grains.

In November, 1985, the American Medical Association testified in favor of the proposed federal irradiation legislation before the House Agriculture Committee's subcommittee on Department Operations, Research, and Foreign Agriculture.

A. Harold Lubin, MD, director of AMA's Dept. of Foods, Nutrition, and Personal Health, testified that food irradiation produces no significant reduction in the nutritional quality of food and has a number of important beneficial effects, including killing the microorganisms that cause food spoilage.

JOSEPH A. LUIZZO, PHD, professor of food science at Louisiana State U. in Baton Rouge, praised the process as a food preservative.

"We've found that 90-95% of all bacteria are killed during the irradiation process," said Dr. Luizzo, who once worked under contract from the Atomic Energy Commission on food irradiation in the preservation of shrimp. "Food irradiation would allow the people in places like Iowa and Kansas to have fresh shrimp," he said, noting that his studies showed a 39-day shelf life for shrimp kept on ice after irradiation.

"There was no destruction of nutrients, either," he added.

THERE MAY BE drawbacks to the process. For example, research shows that some foods undergo color or texture changes when irradiated. Ironically, this may lead the public to assume that a food is not fresh when actually the shelf life has been extended.

In addition, some opponents to the process have suggested that food irradiation presents a hazard to the public and to plant workers.

Robert Alvarez, who is director of the Nuclear Weapons and Power Project of the Environmental Policy Institute, a public-interest group based in Washington, D.C., testified before Congress that the irradiation of food involves an ultrahazardous technology, which he said "poses several types of risks to the public and workers."

Food irradiation facilities would generate as much as 10 times more low-level radioactive wastes than all sources combined in the United States for the year 1981, he said, adding that existing irradiation facilities are poorly regulated. Alvarez also contended that irradiation intended to eliminate one food hazard may intensify another — for example, by producing radiation-resistant bacteria and viruses.

Other critics, such as the Health and Energy Institute of Washington, D.C., another public-interest group, claim that carcinogenic or genetic problems could arise from irradiating foods.

BUT THE MAJORITY of observers contend that irradiation is safe. HHS and FDA have both taken this position, as has the AMA.

"It is important to note that food irradiation does not make the irradiated food radioactive, since it is done at energy levels well below those required to induce radioactivity," the AMA's Dr. Lubin said in testimony before Congress. He added that, given widespread public interest in nutrition and health, physicians will need to be in a position to reassure patients who are concerned about the safety of the process.

A committee formed by the World Health Organization to study the subject of food irradiation in other countries in 1981 issued a report on "The Wholesomeness of Irradiated Food," which called the process safe and "free from toxicological hazard."

In a lengthy report on food irradiation, the American Council on Science and Health, a national association that is devoted to consumer education, states that the levels of radiation approved for treatment of foods "do not have enough energy to induce residual radioactivity in the food."

The council also said that workers who take proper precautions need not worry about adverse health risks. Irradiation facilities must comply with regulations issued by the Occupational Safety and Health Administration, the Nuclear Regulatory Commission, and the FDA, the council noted.

THE SAFETY ISSUE of food irradiation has been a problem for HHS, which has had difficulty finding a acceptable way to explain irradiation to the public. Reluctant to require the use of the word "radiation" for package labels because the word alone could arouse consumer fears and cause misunderstanding, HHS, against the advice of some in the FDA, ultimately substituted the word "picowave," meaning low-level ionizing energy, for "radiation."

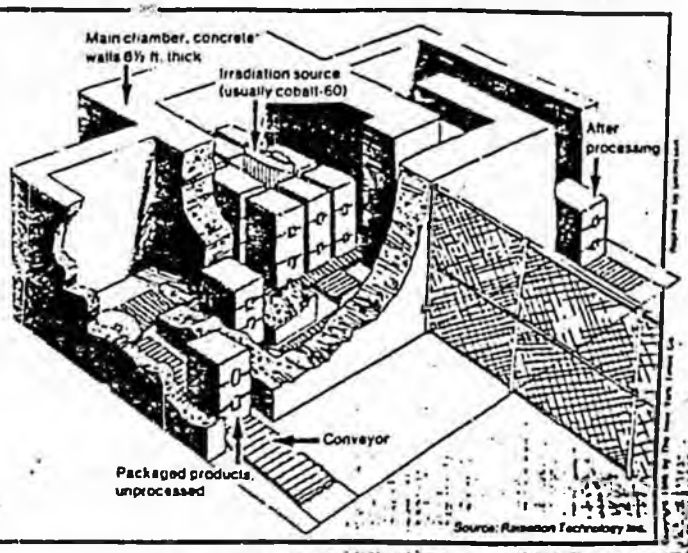
Irradiated foods must now carry the word "picowaved" on their labels together with the international logo symbolizing irradiated foods. The circular symbol that holds a stylized rose with two petals was developed in the Netherlands several years ago and is used on many packaged irradiated foods abroad.

Most of the handful of irradiation firms in this country currently earn their money by sterilizing medical equipment and supplies and some food spices. They have stated in reports that public endorsement of the irradiation process by just one large, well-known food company would persuade consumers that the process is safe.

—Linda Bosy

How Food Is Irradiated

In a food irradiation facility, packaged food rides on a conveyor to a chamber, where it is exposed to gamma rays emitted by a source of radioactive energy, usually cobalt-60, an isotope produced in nuclear reactors. The fence separates products to be irradiated from those already processed.



Source: Radiation Technology Inc.

ATTACHMENT 5

History of Food Irradiation

1898 - Bactericidal effects of x-rays first observed.

1905 - Patents for food irradiation process first issued in United States and Europe.

1920 - U.S patent granted for irradiating beetles in tobacco with x-rays.

1930 - French patent issued for preserving food by irradiation.

1943 - U.S. Army contracts with Massachusetts Institute of Technology to study feasibility of extending shelf life of food with irradiation.

1947 - MIT reports that shelf life of food can be extended through irradiation, offering a new method for assuring provisions for combat troops in remote battlefields.

1953 - U.S. Army Quartermaster Corps takes up food irradiation study at its laboratory in Natick, Mass., in conjunction with MIT, in federally funded study of irradiation of meat, fish, fruits, vegetables and dairy products.

1963 - U.S. Food and Drug Administration approves gamma irradiation to preserve canned bacon and for insect disinfestation of wheat and wheat products.

1964 - FDA approves irradiation for sprout inhibition of white potatoes.

1966 - FDA approves labeling requirements for irradiated foods.

1968 - FDA rescinds bacon irradiation rules after finding the studies on which original approval was made were based on poor laboratory quality controls.

Late 1960s - American astronauts and Russian cosmonauts begin eating radiation sterilized foods in space.

1969 - United Kingdom approves use of radiation sterilized foods in hospitals.

1975 - American astronauts and Russian cosmonauts share a meal of irradiated food in space aboard connection of Apollo-Soyuz capsules. Space explorers continue to dine on radiation sterilized food, as do others requiring such food in isolation, such as hospitalized bone marrow transplant patients.

1979 - FDA's Director of Bureau of Foods establishes the Irradiated Food Committee to provide a total reassessment of all relevant issues applicable to irradiated foods.

1981 - FDA publishes advanced notice of proposed rules on food irradiation in the *Federal Register.*

1981 - FDA offers to approve the use of irradiation for treating the California medfly crisis, provided certain conditions were met. Process not used because no person or organization applied for its use.

1983 - FDA approves irradiation of a specific list of spices and vegetable seasonings for microbial decontamination.

1984 (Feb. 14) - FDA publishes its proposed rule in *Federal Register* to allow irradiation of fresh produce for sprout inhibition, shelf-life extension and insect disinfestation of fresh produce and for sterilizing spices.

1984 (June 19) - FDA approves irradiation treatment to control insect infestation in garlic powder, onion powder and dried spices.

1985 (April) - FDA expands list of dried spices and vegetable seasonings that can be irradiated.

1985 (June) - FDA allows certain dried enzymes to be irradiated to control insect and microbial infestations.

1985 (July) - FDA approves low dose irradiation of pork and pork products to control trichinosis, the parasitic worm found in the muscles of some infected hogs.

1985 (December) - Canadian government announces it will allow food irradiation at up to 1,000 kilorads, 10 times the dose allowed in the United States, with only limited labeling requirements.

1986 (January) - The U.S. Department of Agriculture approves its own rules and guidelines for irradiating pork products.

1986 (April) - FDA publishes its final rule on post-harvest, low dose irradiation treatment of fresh fruits and vegetables and high dose irradiation of spices in the *Federal Register.*

1986 (June) - The British Advisory Committee on Irradiated and Novel Foods issues report recommending that food irradiation be legalized in the United Kingdom at doses up to 1,000 kilorads and that labeling be required.

1986 (June) - The People's Republic of China opens a commercial-size food irradiation plant in Shanghai and announces plans to build five regional food irradiation plants around the country.

1986 (July) - The U.S. Department of Energy announces it will build six regional food irradiation demonstration centers in the states of Alaska, Florida, Hawaii, Iowa, Oklahoma and Washington. A transportable cesium food irradiator is already operational under the DOE's Byproducts Utilization Program.

1986 (September) - Irradiated Puerto Rican mangoes go on sale in a one-time only test market in North Miami Beach, marking the first time in history that irradiated food is made commercially available in the U.S. The two tons of irradiated mangoes, at $1.49 a pound, are sold out within a week.

1986 (September) - Canadians announce plans to open food irradiation demonstration center in Montreal.

1987 (January) - USDA's Animal and Plant Health Inspection Service's rules for irradiating Hawaiian papaya are published in the *Federal Register.*

1987 (February) - USDA's petition for irradiation of chicken and poultry products to control salmonella is published by the FDA in the *Federal Register.*

1987 (March) - FDA rejects requests to put a hold on its new food irradiation rules adopted in April 1986, pending its decision on whether to hold requested public hearing on the new rules.

1987 (March) - FDA publishes petition from Radiation Technology, Inc., requesting irradiation treatment of poultry to control salmonella. Petition is similar to one published in February by the USDA.

FDA'S LIST OF FOODS AUTHORIZED FOR IRRADIATION

FOODS:

Fruits and Vegetables (April 18, 1986)
Pork (July 22, 1985)
Wheat, Wheat Flour
White Potatoes
Dried Enzyme Preparations

HERBS AND SPICES (Dried): (since July 1983)

Allspice	Cardamon	Cloves	Fenugreek	Marjoram	Oregano	Poppy Seed	Spearmint
Anise	Celery Seed	Coriander	Garlic Powder	Mustard Seed	Paprika	Rosemary	Star Anise Se
Basil	Chamomile	Cumin Seed	Ginger	Mustard Flour	Parsley	Saffron	Tarragon
Bay Leaves	Chervil	Dill Seed	Grains of Paradise	Nutmeg	Pepper, Black and White	Sage	Thyme
Caraway Seed	Chives	Dill Weed	Horseradish	Onion Powder	Red Pepper	Savory	Turmeric
Black Cumin	Cinnamon	Fennel Seed	Mace	Orange Petals	Peppermint	Sesame Seed	

* All the above listed foods are *authorized* for irradiation. That means they could legally be irradiated at any time. Presently we know of no whole foods that are routinely being irradiated and sold on a retail level with the following exceptions:
Puerto Rican mangoes were test marketed on a limited basis in Miami, Florida in Sept. 1986. (See Consumers Take Notice, Vol. 1, No. 4).
A small amount of spices being used in processed foods.
Although they are considering a request from Radiation Technology, Inc. the FSIS has not yet authorized any commercial irradiator to treat pork.

HOT NEWS

Cesium Salad

Brussels

Wild mushrooms in Belgium and Luxembourg have been found to contain dangerously high levels of radioactive cesium 16 months after the Chernobyl nuclear disaster in the Soviet Union, officials said yesterday.

A Luxembourg government official said it had banned the sale of one type of mushroom after tests showed cesium levels greater than recommended safety levels.

P.S.: Cesium never quits.

Home-Dumping

Radioactive Waste
Dump Plan Ratified

California has ratified a four-state compact that provides for the dumping of low-level radioactive waste in the state's eastern desert into the next century.

Legislation ratifying the pact was signed Thursday by Governor Deukmejian.

The bill by Assemblyman Steven Peace, D-Chula Vista, puts California into compliance with a 1980 federal law that requires the states to dispose of low-level radioactive wastes within their borders. If ratified by North and South Dakota and Arizona, it would be the first pact of its kind in the nation.

The waste — to be buried 40 feet underground in a dump site as large as three football fields — will consist of contaminated items, such as gloves, tools and other supplies used by hospitals, laboratories and nuclear plants. It will not include spent fuel from nuclear reactors.

CHERNOBYL'S LEGACY

It seems radiation, like guilt, keeps on giving. According to a study of the April 26, 1987 Soviet accident by the Lawrence Livermore National Laboratory in Livermore, California, the nuclear accident released as much long-term radiation into the world's air, topsoil and water as all the nuclear tests and bombs ever exploded. The report goes further to say this long-term radiation may contain 50% more cesium-137 than the total radiation produced by all atmospheric tests. Cesium-137 does not decay into harmless products for more than 600 years.

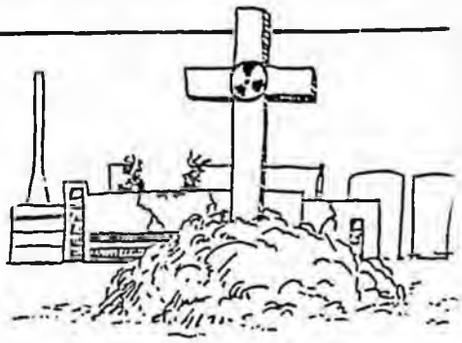
Using computer projections, Dr John Gofman, Professor Emeritus of Medical Physics at the University of California (Berkeley), estimated that 1 million people, including over half a million outside the Soviet Union, will develop cancer as a result of the Chernobyl accident and half of these cancers would be fatal.

In a separate projection Ernest Sternglass, Ph.D., of the Radiology Department at The University of Pittsburgh, Pennsylvania, arrived at a similar estimate: 150,000-600,000 additional cancer deaths in Europe resulting from Chernobyl.

Both these estimates are derived from research by Dr. Abram Petkau, published in 1972 (the Journal of Health and Physics). Dr. Petkau's experiments showed that very low dose radiation over a prolonged period (protracted low dose exposure) produces unexpectedly large free radical damage compared to short exposures to medical x-rays or direct radiation from atomic fallout. This occurs, according to Petkau, because the free radical process becomes extremely efficient at low levels of radiation. Low dose radiation produces fewer free radicals which are statistically better able to do damage to the cell membrane. The insidious action of radiation on DNA in the cell produced mutations that lead to cancer, cancer is a free radical process. However, at high doses of radiation over a short period of time, the free radical process becomes very inefficient due to the extremely large number of free radicals generated per unit volume. These radicals are so reactive they smash into each other and literally wipe themselves out.

Dr. Petkau's observation seems to explain why less people died immediately after Chernobyl and Hiroshima than anticipated. Based on data from the Hiroshima experience, leukemia and other cancers are currently occuring among children and adults at 100-1000 times the predicted rate 40 years after the bomb.

You'd think we might have learned b_ radiation is unforgiving.



LOOKING FOR THE K.O.

In the August 21st issue of the Food and Drug newsletter, the editors of this industry bulletin analyzed the food irradiation controversy with some interesting insights.

"Food producers aren't enthusiastic about the process. They hesitate because of certain unproven aspects of the technology, high costs and popular rejection of irradiated foods as dangerous. Retailers share the anxiety about customer resistance."

In an interview with Sharon Bomer *ex-director* of The Coalition For Food Irradiation (CSFI), Bomer confesses "there were irradiation companies that tended to blow the issue out of proportion and to make fantastic claims." Bomer was talking about companies in the business of irradiating medical supplies and who wanted to move into food irradiation.

George Giddings, formerly of Isomedix, a company that irradiates medical supplies, feels that what hurt food irradiation was The Department of Energy (DOE).

"The DOE program is the single most controversy-raising aspect of food irradiation," said Giddings. "The strident anti-nuclear types see (it) as a ploy of DOE in favor of the nuclear power industry. They see a conspiracy to push food irradiation...If this program were eliminated and there was no hypothetical possibility of implementing this cesium plutonium scenario, I think much of the crazy food irradiation controversy would evaporate in no time."

Bomer blames the commercial irradiators and Giddings blames the DOE for the failure of food irradiation. Both of them seem to ignore the fact that the people in the anti-food irradiation movement have a deep commitment to safety of the food supply and the environment.

The Food & Drug newsletter editors conclude "If this debate were a boxing match, it would be even at

ATTACHMENT 7

Coalition for Alternatives in Nutrition and Healthcare
(C A N A H)

P.O. Box B-12
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Compilation of Bioassay Data on the Wholesomeness of Irradiated Food Items by Dr. J. Barna

Dr. Jozsef Barna of Budapest, Hungary published "A review of 1223 studies on the wholesomeness of some 278 different irradiated foods and feeds concerning the period from 1925 to date" [1979 when his report was published in Acta Alimentaria, Vol. 8 (3) pp. 205-315].

The following is an extrapolation of the information which indicates "adverse effects are indicated in italics":

Albumin - ovalbumin

- *anaphylactic reaction*
- *increased serological activity*
- *increased precipitation in serological test*
- *loss of serological activity*
- *reduced capacity to sensitization*

Amino Acids in Medium

- *inhibition of bacterial growth on pH3*

Apple Juice

- *inhibited growth of seeds*
- *increased chromosome aberration in plant cells*
- *cytotoxic in plant*
- *antibacteric (bactericide and bacteriostatic)*
- *radiomimetic effect*

Apricot

- *retarded growth*
- *reduced body weight*
- *reduced weight gain*

Aqua Destillata

- *cytotoxic in plant*

Bacon

- *worse acceptance*
- *retarded growth*
- *reduced body weight*
- *reduced weight gain*
- *loss of body weight*
- *disturbance in breeding performance*
- *reduced number of progeny*

Bacon (Cont'd.)

- *reduced viability of offspring*
- *reduced RBC*
- *reduced haemoglobin content*
- *more frequent incidence of cataract*
- *increased mortality*
- *increased postnatal mortality*
- *more frequent tumour incidence*
- *increased malignity of tumour*
- *more hypophysis tumour*

Barley

- *increased chromosome aberration in plant cells*

Bean

- *reduced biological value*

Beef

- *reduced biological value*
- *reduced food efficiency*
- *reduced protein utilization*
- *reduced food consumption*
- *worse acceptance*
- *disturbance in development*
- *reduced growth*
- *reduced body weight*
- *reduced weight gain*
- *reduced weight of testicle*
- *increased relative weight of epididymis*
- *increased liver weight*
- *reduced reproductive performance*
- *disturbance in breeding performance*

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Beef (Cont'd.)

disorder in reproductivity
earlier manifestation of first oestrus
reduced fertility
fertility disorder
conceptual difficulties
reduced number of progeny
less parturition of pregnants
reduced number of pups per litter
increased haematocrit value
increased haemoglobin content
incidence of primary lymphocytic thyroiditis
extension of prothrombin time
lower prothrombin rate
hypoprothrombinaemia
glycosuria
disturbances in metabolism of fat and vitamins
increased phagocytosis due to antigen effect
increased liver cytochromoxidase activity
increased liver tributyrinase activity
increased far content in the liver
lower riboflavine excretion to urine
reduced serum vitamin E level
vitamin E deficiency
vitamin B_2 deficiency
vitamin K deficiency
insufficient coprophagia
reduced coprophagia
reduction of life span
increased mortality
increased mortality of progeny
haemorrhagic syndrome

Blood Serum/Plasma

inhibited growth of microorganism

Bread

lymphopenia
worse acceptance

Butter

disorder in reproductivity
reduced fertility
fertility disorder
conceptual difficulties
reduced total number of young born

Butter (Cont'd.)

reduced number of pups per litte
reduced number of young at weani
reduced vitamin E level in liver
increased mortality of progeny
reduced number of progeny

Cabbage

reduced SGPT activity
reduced AP activity in intestina mucosa
reduced GOT activity in tissues
increased esterase activity in tissues
reduced AP activity in tissues
reduced MAO activity in tissues
increased alanin-beta-aminopeptidase in tissues
reduced amino-oxidase activity in tissues
changed condition of pelage and skin

Cakes

worse acceptance

Carbohydrate Solution

increased chromosome aberration in microorganisms
inhibited growth of microorganis
antibacteric (bactericide, bacteriostatic) effect
growth inhibition in cell cultur
mutagen effect

Carrot

reduced food efficiency
reduced growth rate
retarded growth
reduction of body weight
reduced weight gain
reduced vitamin A level in liver
increased malignity
formation of toxic substances radiotoxins

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Casein

reduced biological value
reduced digestibility
reduced growth
increased kidney weight
influenced moving activity
increased mortality
inhibited growth of microorganisms
late effect on microorganisms
lower number of emerging insect
longer duration of larval development

Cauliflower

worse acceptance

Celery

formation of toxic substances, radiotoxins

Cereal (Grain)

more frequent diseases
chronic nephritis
peritonitis

Chicken (cooked, stewed)

reduced nutritive value of lipid
reduced biological value
retarded growth
reduced intensity of growth
increased liver weight
increased kidney weight
conceptual difficulties
reduced nubmer of pups per litter
glycosuria
increased haematocrit value
increased haemoglobin content
increased SGOT activity
reduced SGPT activity
reduced AP activity in intestinal mucosa
reduced GOT activity in tissues
increased GOT activity in tissues
increased esterase activity in tissues
reduced AP in tissues
reduced MAO activity in tissues
increased alanin-beta-aminopeptidase in tissues

Chicken (Cont'd.)

reduced amino-exidase activity in tissues
incidence of primary lymphocytic thyroiditis
increased phagocytisos due to antigen effect
reduced ascorbic acid content of adrenal
increased mortality of progeny
inhibited growth of microorganisms
antibacteric (bactericide, bacteriostatic) effec

Clam

affected liver weight
affected kidney weight
affected spleen weight
increased kidney weight
reduced testis weight
increased BUN level
reduced body weight
reduced measure of testis
reduced fertility
reduced viability of embryos
reduced hatchability

Coconut

extended chronaxy time

Coconut Milk

decreased gain in plant tissue weight
antimitotic effect (retardation or inhibition of mitosis in animal cells

Codfish

reduced biological value
reduced organ weights
reduced weight of liver in female
reduced uterus weight
reduced weight of caecum in female
increased weight of spleen in femal

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Codfish (Cont'd.)

increased spleen weight
increased kidney weight
reduced testes weight
disorder in reproductivity
inhibition of spermiogenesis
reduced resistance of spermatozoa
reduced activity of spermatozoa
reduced osmotic resistance of spermoatoids
lengthening of the oestrus cycle
higher globulin alfa-fraction value
reduced serum A/G quotient
increased SGOT activity
reduced SBChE
elevated SAP
increased serum aminotransferase
lower serum cholesterol level
reduced GPT activity in liver
increased liver aminotransferase
decreased liver BChE
decreased liver succinate dehydrogenase
decreased liver alanin aminotransferase
reduced aminotransferase in liver
reduced liver succino-dehydrogenase activity
reduced GPT activity in kidney
reduced succino-dehydrogenase activity in kidney
reduced ascorbic acid content of adrenal
more frequent intercurrent diseases
increased mortality of progency
more frequent pituitary adenoma
more frequent atrophy of genital tract
degeneration (atrophy) of testicles
degeneration of ovary

Compote (Fruit)

increased weight of spleen
reduced number of pups per litter
more frequent incidence of cataract
more frequent tumour incidence
hypophysis tumour
increased postnatal mortality
increased growth

Corn (Maize)

reduced digestibility
reduced weight gain
reduced weight of offspring
lower weight of progeny at birth
oestrus disorder
longer reproductive cycle
reduced fertility
more frequent epithelioma
increased frequency of lymphoblastoma in liver, thymus, lung, spleen, kidney

Corn Meal

longer duration of development of the larvae of Tribo

Crackers

worse acceptance

Cranberry

reduced growth

Dessert Powder (gelatine, vanilia)

worse acceptance
reduced growth rate

Diet (complete)

reduced food consumption
reduced palatability
reduced nutritional quality
reduced growth
reduced growth rate
reduction of weight or weight
reduced weight gain in female
slower growth of females
reduced body weight
increased kidney weight
disturbance in reproduction
disturbance in breeding performance
reduced fertility

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Compilation of Bioassay Data (Cont'd.)

Diet (complete - cont'd.)

fertility disorder
sterility
higher male and female sterility
elevated number of dead implantation
reduced number of pups per litter
reduced number of progeny
lower live-birth percentage
reduced litter number at weaning
reduced lactation performance
lymphopenia
shift from lymphocytes towards neutrophilic cells
leucopenia
leucocyte degeneration
reduced concentration capacity of kidney in female
increased cytochrome oxidase activity in liver
reduced serum transaminase
reduced SGPT activity
reduced SAP
reduced vitamin A level in liver
vitamin A deficiency
vitamin K deficiency
reduced transketolase in erythrocytes
changed condition of pelage and skin
more frequent intercurrent diseases
rachitis
increased mortality
elevated mortality
increased neonatal mortality
increased perinatal mortality
increased mortality of progeny
haemorrhagic syndrome
rupture, dilatation of heart auricle
testicular atrophy
histological laesio in testes, spleen lymph node and liver
inhibited growth of microorganisms
increased polyploidia
increased backmutation frequency
mutagen by DNA repair
mutagen effect by HMA

Diet (test)

reduced food consumption
reduced nutritive value
reduced protein quality
reduced digestibility of starch
reduced body weight
reduced growth
reduced growth rate
delayed appearance of pelage
delayed opening of eyes
reduced thymic involution
increased thymus weight
affected sexual function
disturbed reproductive function
disturbed reproductive performance
reduced fertility of male
extended mating period
longer time for producing
prolonged gestation length
reduced number of viable offspring
reduced viability of offspring
reduced litter number at weaning
more frequent cannibalism
reduced lactation performance
lymphopenia
reduced leucocyte count
higher number of neutrophilic leucocytes
increased serum nucleic acids (RNA, DNA) content
hypoproteinaemia
reduced serum A/G quotient
increased blood AChE activity
increased serum aldolase activity
reduced serum BChE
reduced serum tributyrinase
increased cytochromoxidase activity in liver
reduced activity of transketolase in erythrocytes
antifolic acid effect
vitamin E deficiency
ascorbic acid deficiency
folic acid deficiency
more frequent intercurrent diseases

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Compilation of Bioassay Data (Cont'd.)

Diet (test - cont'd.)

increased preimplantation resorption
increased mortality of progeny
slower rate of thymus involution
increased number of cell in thymus
increased incidence of mamma fibroadenoma
increased chromosome aberration in animal cells

Diet Extract

increased backmutation frequency

Diet (synthetic, semi-synthetic, purified)

reduced lipid digestibility
reduced starch digestibility
reduced growth
reduced growth rate
reduction of weight or weight gain
loss of body weight
increased liver weight
decreased weight of spleen
reduced weight of pups at weaning
inferior reproductive performance
reduced lactation index
decreased peroxidation rate in endoplasmatic reticulum
vitamin K deficiency
increased mortality
dilated coecum

Diet for farm animals

reduced biological value
reduced net protein digestibility
reduced food efficiency
reduced palatability
reduced growth rate
slower growth rate
reduced body weight
reduced egg production
delayed age at which the first egg was laid
delayed maximuzation of hatchability
increased mortality

Diet for humans (MEAL kitchen ready etc., for cosmonauts, volunteer consumers)

reduced growth

Egg (powder, dried whole)

reduced growth
reduced lactation index
absence of maternal instinct
more frequent cannibalism
increased postnatal mortality
increased mortality of progeny

European Plaice Fish (Pleuronectes platessa)

less quick growth of females on irradiated diet
relative reduction in liver weight

Fat

reduced biological value
reduced digestibility
reduced reproductive capacity
disturbance in breeding performance
reduced sexual function in females
influenced motility of gastronintestinal tract
extended chronaxy time
increased mortality of progeny

Fat (animal)

Beef fatty tissue
reduced growth
reduced fertility
reduced survival of offspring
vitamin A deficiency
reduction of life span
encephalomalacia

Butter fat
reduced growth
reproductive disturbance
increased mortality of offspring

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Fat (animal - cont'd.)

Lard
- absorption disturbances
- distrubed fat absorption
- disturbed digestion
- increased mortality
- more frequent tumour incidence
- changes in fatty acid composition of endoplasmic retic. of liver
- decreased hydrolysation activity of lipase in tissues
- low lipid peroxidation rate

Pork fatty tissue
- reduced growth
- vitamin A deficiency
- encephalomalacia

Fish (canned cooked, culinary fishery products, preserves, pasta)
- reduced biological value
- reduced nutritive value of lipid
- reduced protein utilization
- reduced growth rate
- reduced weight of testicle
- increased weight of spleen
- disturbance in breeding performance
- reduced activity of spermatozoids
- extended oestrus cycle
- more frequent cannibalism
- increased SGOT activity
- reduced SGOT activity
- increased SGPT activity
- reduced ascorbic acid content of adrenal
- more frequent intercurrent diseases
- higher blood sugar level at starving
- increased mortality of progeny
- increased excitability
- inhibited growth of microorganisms

Flounder (yellow tailed Fish (Limanda ferruginea)
- reduced protein utilization
- elevated SAP in female
- more pronounced enlargement of the salivary gland

Flour
- increased weight of spleen
- physiopathological injuries in fertility
- reduced number of viable offspring
- increased preimplantation loss
- physiopathological changes in longevity
- increased mortality of progeny
- thyroiditis
- more frequent tumour incidence
- increased meiotic chromosome aberration

Food (unidentified)
- reduced biological value
- reduced protein quality
- worse acceptance
- retarded growth
- reduction of weight
- reduced weight gain
- reduced reproductive capacity
- disturbance in breeding performance
- reduced fertility
- sterility
- reduced sexual function in females
- reduced RBC
- increased RBC
- decreased lipid digestion
- changes in immunological reactivity
- formation of toxic substances, radiotoxin
- increased cytochromoxidase activity in tissues
- toxic effect
- risk in irradiated food consumption
- few anomalies require further research
- more frequent incidence of cataract
- more frequent incidence of blind individuals
- increased mortality
- increased mortality of progeny
- thyroiditis
- rupture and dilatation of heart auricle
- haemorrhagic diathesis
- more frequent tumour incidence
- reduced fecundity of insects
- functional disorder in the thyreoid gland
- cytotoxic effect in animal cells
- mutagen effect on animals

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Food Product of Plant Origin

reduced biological value
reduced fertility
reduction of life span
teratogen effect
cytotoxic effect in animal cells
carcinogen effect
mutagen effect on animals

Fructose

inhibited growth of plants or plant tissues
decreased gain in plant tissue weight
cytotoxic effect in animal cells
inhibited growth of normal animal cells
inhibition of microbial growth
impaired respiration and oxidative phosphorylation
inhibition of the labelling of protein and DNA by radioactive precursors

Gelatine

reduced nutritive value
reduced growth rate
cytotoxix effect

Glycine

increased chlorophyll mutant rate

Glucose

leucopenia
lymphopenia
disorder of haematopoiesis
decreased gain in plant tissue weight
lower number of emerging insect
longer duration of larval development
increased chromosome aberrations in animal cells
increased chromosome aberration in plant cells
inhibited growth of rhizoma tissue
inhibited growth
inhibition of microbial growth

Glucose (Cont'd.)

impaired respiration and oxidative phosphorylation
inhibition of the labelling of protein and DNA by radioactive precursors
inhibited reproduction of microorganisms
cytotoxic effect in animal cells
inhibited growth of normal animal cells
antibacteric (bactericide, bacteriostatic effect
reduced rate of respiration
cytogenetic abnormalities
increased rate of chlorophyll mutants
increased dominant lethalita in Drosophil
Increased sex linked lethal mutation in Drosophila
increased autosomal recessive lethal mutation in Drosophila
increased forms of phenotypic alteration in Drosophila
Mutagen effect by HMA
mutagen by in vitro microbial test

Gluten

reduced protein value
reduced growth rate
reduced number of eggs laid
reduced hatchability of eggs

Grape

inhibited physiological activity of Saccharomyces

Green Bean

reduced intensity of growth
increased spleen weight
fertility disorder

Ham

retarded growth
reduction of weight
reduced weight gain
reduced number of pups per litter
reduced RBC
reduction of life span

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Herring (marinated)
- extended chronaxy time
- increased excitability of CNS

Histidine
- inhibited growth of microorganisms

Indian Mackerel Fish (Rastrelliger kanagurta)
- anaemia

Jelly Powder
- reduced growth

Lima Bean
- reduced biological value

Lipid
- reduced digestibility

Macaroni
- worse acceptance

Marinades
- hypothermia of central origin
- extended chronaxy time

Meat (culinary, preprepared, etc.)
- reduced fertility
- disturbance in metabolism of fat and vitamins
- change in allergen
- vitamin E deficiency
- vitamin B_2 deficiency
- internal bleeding
- increased mortality of progeny
- haemorrhagic syndrome
- inhibited growth of microorganisms
- late effect on microorganisms

Meat (organs)
- reduced body weight of youngs

Meat Product (culinary)
- vitamin B_1 deficiency
- vitamin B_2 deficiency

Medium
- inhibited growth of seeds
- inhibited growth of root tip per meristem
- inhibited growth of insect
- inhibited growth of plant or plants tissue
- supression of root hair formation
- lower number of emergi[illegible] insects
- reduced emergence rate of adults insect
- increased chromosome aberration in animal cells
- increased chromosome aberration in plant cells
- increased chromosome aberration in microorganisms
- increased chromosome aberration in Drosophila
- increased mutation if Drosophila
- increased number of polyploid animal cells
- chromatid aberrations in plants
- cytotoxic
- cytotoxic effect in animal cells
- cytotoxic effect in plant
- cytotoxic effect in Drosophila
- antimitotic effect (retardation or inhibition of mitosis) in animal cells
- antimitotic effect
- micronucleus formations
- inhibited growth of normal animal cells
- inhibited growth of microorganisms
- inhibited RNA synthesis capacity of fibroblast
- inhibited DNA synthesis in bacerria
- reduced DNA synthesis
- antibacteric (bactericide, bacteriostatic) effect
- reduced number of microbe colony
- reduced number of viable microbes
- reduced physiological activity of microorganisms
- mutagen effect on microorganisms
- increased mutations in plant tissue

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Medium (Cont'd.)

increased mutation in Drosophila
increased sex-linked lethal mutation test in Drosophila
increased aberrant forms and phenotypic alteration in Drosophila
mutagen effect on animals

Milk (evaporated, powdered, whole)

reduced biological value
worse acceptance
reduced body weight
loss of body weight
changed anaphylactogenic activity
increased lethal shocking dose to allergenic response
reduced allergenic properties
reduced antigen-allergen activity
increased mortality
antibacteric (bactericide, bacteriostatic) effect

Mushroom

reduced food efficiency
reduced food consumption
reduced weight gain
reduced weight of liver in male
reduced weight of pituitary
reduced weight of uterus
reduced weight of kidney
disturbance in reproduction
(unreadable) of toxic substances, radiotoxins
toxic
increased [illegible]natal mortality
inhibi[illegible]th of microorganisms

Oil

reduced reproductive capacity
disturbance in breeding performance
reduced sexual function in females
increased mortality of progeny

Oil (animal)

Fish oil
reduced food efficiency
reduced protein utilization
retarded growth
reduction of weight
reduced weight gain
positive BSP
disturbances in absorption
reduced total protein content
hypoproteinaemia
higher globulin gamma fraction value
increased mortality
pigmentation of liver
pigmentation of spleen

Herring oil
reduced food consumption
reduced growth
less rate of exidative drug metabolism in the endoplasmic retic
greater induction of the oxidation metabolism of drugs
reduced rate of oxidative demethylati of aminopyrine
increased oxidative demethylation of aminopyrine
reduced hydroxylation of aniline
lower hydroxylation of biphenyls
reduced rate of metabolism of benzpy
decreased peroxide concentration of endoplasmic retic
inhibited rate of lipid peroxidation
high lipid peroxidation
greatly increased resistance to peroxidation
increased antioxidante titer
changes in fatty acid composition of endoplasmic retic. of liver

Oil (plant)

Cereal oil
incidence of encephalomalatia

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Oil (plant - cont'd.)

Corn oil
- reduced digestibility
- reduced food consumption
- reduced growth
- increased liver weight
- increased fat content in liver
- changes in fatty acid composition of endoplasmic retic. of liver
- less rate of oxidative drug metabolism in the endoplasmic retic.
- reduced rate of oxidative demethylation of aminopyrine
- reduced hydroxylation of aniline
- reduced rate of metabolism of benzpyrene
- greater induction of the oxidation metabolism of drugs
- decreased peroxide content ration of endoplasmic retic.
- inhibited rate of lipid peroxidation

Cotton seed oil
- reduced growth
- lymphocyte infiltration

Soyabean oil
- reduced utilization of metabolizable energy
- reduced digestibility
- reduced food efficiency
- reduced protein utilization
- reduced food consumption
- disturbances in absorption
- decreased or disturbed fat absorption
- reduced growth
- retarded growth
- reduced body weight
- reduction of weight
- reduced weight gain
- increased liver weight
- more fragile RBC
- hypoproteinaemia
- reduced serum protein content
- increased serum gamma globulin level
- reduced serum lipid content
- reduced serum phospholipid content
- increased serum cholesterin level
- bradycardia

Oil (plant - cont'd.)

Soyabean oil (cont'd.)
- functional disorder of the liver
- positive BSP
- reduced thyroid function
- toxic effect
- decreased body temperature
- reduced oxigene uptake
- hypothermia of central origin
- diarrhoea
- incidence of encephalomalatia
- reduced excitability of CNS
- reduced life span
- increased mortality
- thyroid degeneration
- dilatation of small intestine, liver
- pigmentation in liver
- pigmentation in spleen
- testicular atrophy
- progressive transformation of adrenal cortex

Oil (Wisson-oil)
- increased frequency of lymphoblastom in liver, thymus, lung, spleen, kidney

Onion
- increased spleen weight
- increased testicle weight
- increased liver weight
- reduced ovary weight
- reduced gonads weight
- reduced RBC
- reduced WBC
- leucopenia
- reduced haematocrit value
- fused rib cartilages
- more frequent skeletal abnormality
- higher incidence in abnormalities of trunk skeleton
- myeloid and RES hyperplasia
- leucocytosis in liver
- haemosyderosis
- pigmentation in liver
- pigmentation in spleen
- pigmentation in kidney

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Onion (Cont'd.)

osteodistrophia
deformation of testicles
degeneration of ovary

Orange

reduced growth rate
haemosyderosis
mucinous cerebral degeneration
inhibited growth of seeds
increased chromosome aberration in plant cells
cytotoxic effects in plant
radiomimetic effect in plants
reduced medullar hyperplasia of adrenal

Orange Juice

antimitotic effects (retardation or inhibition of mitosis) in plant cells

Papaya

increased liver weight
aspermia
detrimental effect on offspring
aplasia of small intestine

Parsley

formation of toxic substances, radiotoxins

Peach

reduced growth
loss of body weight
reduced weight gain
reduced viability of offspring
toxic effect
more frequent tumour indicence

Peanut

increased frequency of lymphoblastoma in liver, thymus, lung, spleen, kidney

Peas

reduced biological value

Pepton in medium

cytotoxic effect

Pineapple

Jam
increased haemoglobin content
increased haematocrit value
incidence of primary lymphocytic throiditis
reduced fructose oxidation in heart
glycosuria

Juice
increased chromosome aberration in plant cells
cytotoxic effect in plant
radiomimetic effect in plant
depressed rate of mitosis
increased mutations in plant tissue

Plant

allergen reaction
formation of toxic substances, radiotoxins
increased chromosome abberation in plant cell
cytotoxic effects in plant
antimitotic effects (retardation or inhibition of mitosis) in animal cells
micronucleus formations
inhibited reproduction of microorganis
increased mutations in plant tissue

Plant Extracts (leaves, Vicia faba)

reduced growth
inhibited growth of seeds
inhibited development of seeds
inhibited growth of root
inhibited growth of plants or plants tissue

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Plant Extracts (Cont'd.)

increased chromosome aberration in plant cells
cytotoxic effects in plant
antimitotic effects (retardation or inhibition of mitosis) in animal cells
antimitotic effects (retardation or inhibition of mitosis) in plant cells
micronucleus formations
inhibited growth of normal animal cells
inhibited growth of malignant tissue
inhibited growth of microorganisms
reduced germ cell survival
inhibited DNA synthesis of plant
inhibited reproduction of micro-organisms
reduced number of microbe colony
mutagen effect on microorganisms
increased mutations in plant tissue

Pork (cont'd)

worse acceptance
decreased or disturbed fat absorption
reduced growth rate
retarded growth
reduction of weight
reduced weight gain
reduced weight of offspring
reduced weight of pups at weaning
conceptual difficulties
reduced number of progeny
reduced number of pups per litter
reduced number of young at weaning
increased phagocytosis due to antigen effect
reduced auto-oxidation rate
reduced fatty acid oxidation in kidney mitochondria
increased cytochromoxidase activity in liver
increased cytochromoxidase activity in kidney
increased cytochromoxidase activity in heart
reduced transketolase activity in erythrocytes

Pork (Cont'd.)

increased cytochromoxidase activity in tissues
vitamin B_6 deficiency
increased mortality
increased postnatal mortality
increased mortality of progeny
haemorrhagic syndrome
myocardial lesion
tyroid gland cancer
increased ATP-ase activity in tissues

Potato (white, cooked, raw)

reduced net energy
reduced biological value
reduced food consumption
reduced growth
retarded growth
reduction of weight
reduced weight gain
reduced weight of liver in females
affected ovary weight
reduced weight of ovary
reduced relative weight of spleen
reduction relative weight of lung
lowered weight of progeny
reduced weight of offspring
delayed opening of eyes
delayed opening of ear
delayed appearance of pelage
delayed coming out of teeth
reduced fertility
conceptual difficulties
increased resorption
altered measure of ovarium
extension of gestation period
reduced litter size
reduced number of progeny
influenced tolerance of galactose loading
toxic effect
more frequent diseases
more frequent respiratory diseases
more frequent incidence of cataract
increased embryonal resorption
increased embryo mortality
increased perinatal mortality
increased mortality of progeny

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Potato (Cont'd.)

- focal myocarditis
- coronary arteriosclerosis
- more frequent abscesses pneumonia
- bronchiectasia
- intestinal nephritis
- lesion in spleen, liver and lymph nodes
- testicle laesio
- more frequent tumour incidence
- spleen oedema
- reduced fecundity of insect females
- increased chromosome aberration in animal cells
- cytotoxic effect in animal cells
- micronucleus formations
- inhibited growth of microorganisms
- mutagen effect by DLT
- increased mutagen index

Potato Extract

- loss of body weight
- injured spermatozoon, early spermatid, developing spermatocytes
- increased postimplanation loss
- reduced WBC
- allergen reaction
- formation of toxic substances, radiotoxins
- toxic effect
- inhibited growth of seeds
- inhibited development of seeds
- increased chromosome aberration in animal cells
- increased chromosome aberration in plant cells
- cytotoxic effect in animal cells
- antimitotic effect (retardation or inhibition of mitosis) in animal cells
- antimitotic effects (retardation or inhibition of mitosis) in plant cells
- micronucleus formations
- inhibited growth of malignant tissue
- inhibited growth of microorganisms
- antibacteric (bactericide, bacteriostatic) effect

Potato Extract (Cont'd.)

- mutagen effect on microorganisms
- mutagen effect by DLT
- mutagen effect on animal

Potato in medium

- inhibited growth of seeds
- inhibited growth of root tip
- increased chromosome aberration in plant cells
- antimitotic effects (retardation or inhibition of mitosis) in plant cells
- micronucleus formations

Protein

- reduced biological value

Protein (animal)

- Milk protein
  - reduced biological value
  - change in antigenicity
  - increasing lethal shocking dose in gross anaphylaxis
  - slight diarrhoea
- Corn protein
  - reduced protein digestibility

Raisin

- reduced food efficiency
- reduced growth rate
- retarded growth
- reduction of weight
- reduced weight gain

Red Fish (Ocean Perch) (Sebastes marinus)

- increased weight of spleen
- lower serum cholesterol level
- longer sleeping time from hexobarbital
- elevated SAP
- inhibited liver microsomal enzyme activity
- decreased liver aminopyrine N-demethylating and aniline-hydroxylating activity

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Ribose

inhibition of microbial growth
reduced rate of respiration
mutagen by in vitro microbial test
impaired respiration and oxidative phosphorylation
inhibition of the labelling of protein and DNA by radioactive precursors

Rice (polished too)

worse acceptance
reduced growth
increased neonatal mortality
increased perinatal mortality
lower free amino acid content in liver

Sausage

worse acceptance

Shrimp

worse acceptance
functional disorder of the thyroid

Soy Bean

extended chronaxy time

Spice Mixture
(allspice, black pepper, coriander, cumin, marjoram, nutmeg, paprika)

reduced growth rate
slightly reduced body weight
reduced weight gain
reduced liver GOT activity
reduced liver GPT activity
reduced depot fat

Starch

reduced digestibility
cytotoxic effect
reduced water intake
reduced body weight
reduced thymus weight in females
reduced kidney weight in male
increased WBC
reduced RBC

Starch (Cont'd.)

reduced haematocrit value
changed blood glucose level
increased BUN
reduced BUN
changed serum Na+ level
reduced serum P level
reduced SGOT
reduced SAP
increased male mortality
increased postnatal mortality
hyperplasia of stomach mucosa
changes in renal tubules
incidence of kidney cyst
cytotoxic
altered generating time of S. cerevisia

Sterol (beef, egg, pork, yeast)

hepatoma

Strawberry

reduced food consumption
worse acceptance
reduced growth
retarded growth
reduction of weight
reduced weight gain
increased weight of testicles
increased pituitary gland weight
reduced prostate weight
increased rel. thyroid weight
increased rel. adrenal weight
increased rel. kidney weight
reduced liver weight in female
reduced liver weight in male
reduced heart weight in female
reduced spleen weight in female
reduced weight of offspring
first hatch chickens of F_1 performed poorly
greater incidence of head abnormalities in semen
decline in RBC
decline in haemoglobin content
periodical drop in egg production
increased mortality
increased embryo mortality

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Strawberry (Cont'd.)

increased mortality of progeny
incidence of liver fatty infiltration
increase in kidney concretions
incidence of cystic kidney
incidence of chronic nephritis
more frequent tumour incidence
trend to higher incidence of tumours
chromatid aberrations in animals
increased aberrant anaphase in plant cells

Sucrose (saccharose)

growth inhibition
inhibited lipid synthesis
inhibited protein synthesis
inhibited DNA synthesis
inhibited liver mitochondrial oxidative phosphorylation
improved oxidative phosphorylation in liver mitochondria
inhibited growth of seeds
inhibited growth of root tip per meristem
inhibited growth of plants tissue per cell
decreased gain in plant tissue weight
increased chromosome aberration in animal cells
increased chromosome aberration in plant cells
chromatid aberrations in animals
chromatid aberrations in plants
increased meiotic chromosome aberration
increased aberrant anaphase in plant cells
cytotoxic effect in animal cells
antimitotic effects (retardation or inhibition of mitosis) in animal cells
aberrant mitosis in animal cells
impaired respiration and oxidative phosphorylation
inhibition of the labelling of protein and DNA by radioactive precursors
inhibited growth of normal animals cells per tissue
inhibited growth of malignant tissue
inhibited growth of microorganisms
inhibited growth of pollen
reduced rate of respiration

Sucrose (Cont'd.)

increased mutations in plant tissue
increased mutation in Drosophila
increased dominant lethality in Drosophila
increased sex linked lethal mutation in Drosophila
increased autosomal recessive lethal mutation in Drosophila
increased aberrant forms of phenotypic alteration in Drosophila
mutagen by in vitro microbial test

Sugar

chromosome aberrations
cytotoxic effect
mutagen by in vitro microbial test

Sweet Cherry Juice

antibacteric (bactericide, bacteriostatic) effect

Thiamin in medium

cytotoxic effects in plant

Tomato

permeability changes in tissue hemato-membrane of different organs

Tunafish (Thunnus thynnus)

conceptual difficulties
reduced number of pups per litter
increased mortality of progeny

Turkey

reduced growth
reduced weight gain

Vitamin Solution

increased mortality

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Wheat

reduced protein value
loss of body weight
increased liver weight
changed female liver weight
increased testicle weight
increased spleen weight
affected spleen weight
decreased spleen weight
changed male spleen weight
reduced reproduction of insect
reduced spermium number
reduced primary spermatocyte
affected spermatogonia
reduced spermatogonial A & B cells
reduced fertility
longer reproductive cycle
reduced germ cell count in testis
reduced RBC
decreased reticulocyte number
reduced number of neutrophilic leucocytes
changed serum albunim level
raised blood glucose
changed serum Ca level
formation of toxic substances, radio-toxins
lower serum inorganic phosphatase level
lower survival
increased mortality of progeny
pathological alteration in female liver
incidence of oedema in liver of females
periacinar infiltration in liver
tendency of steatosis
more frequent epithelioma
more frequent tumour incidence
more frequent incidence of lymphosarcoma
increased embryonal death
increased chromosome aberration in animal cells
more frequent incidence of polyploida at weaning
increased number of polyploidia in animal cells
increased meiotic chromosome aberration
increased number of aneuploid cells in tests

Wheat (Cont'd.)

aneuploidia
aberrations in chromatids and centromes
cytotoxic in animal cells
reduced germ cell survival
reduced viability of insect
mutagen by DLT
increased mutagenic index
increased chlorophyll mutants rate

Wheat Extract

increased incidence of chromosome abberation
inhibition of seed germination
mutagen effect

Wheat Flour (biscuit)

reduction of weight
reduced weight gain
increased weight of spleen
reduced prepubertal growth
fertility disorder
reduced litter number at weaning
reduced number of pups reared
reduction of life span
more frequent cannibalism
more frequent tumour incidence
more frequent mummary adenoma
increased number of non viable progeny
increased mortality of progeny
increased stillbirths
increased meiotic chromosome abberation in animal cells
increased cytogenetic abnormalities

Wheat Middling

reduced growth rate
reduced number of eggs laid
reduced hatchability of eggs

Wheat Product

increased number of polyploid animal cel

Xylose in medium

decreased gain in plant tissue weight

Yeast (dried)

inhibited growth of microorganisms

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"Storage time following irradiation can also alter the results of animal feeding studies or cytotoxicity, mutagenicity tests in such a way that changes disappear during storage or decrease gradually with it. In some cases detrimental results of feeding studies may be attributed to poor quality or improper preparation of food prior to irradiation or to inadequate storage conditions after irradiation. Adverse effects could be considerably reduced when irradiation was carried out in a nitrogen atmosphere or under buffered conditions at neutral pH."

"Often vitamin deficiencies were involved in the disorders, since supplementation of vitamins reduced or eliminated the adverse symptoms (growth retardation, fertility disturbances, increased mortality, etc.) of deficiencies. It is worth noting that supplementation of vitamin E did not necessarily reduce or eliminate the disorders in reproduction. Supplementation of other components of diets have also been observed to correct adverse effects in the parameters investigated. Thus addition of antioxidants reduced mortality and increased growth rate. Adverse effects in feeding studies have been eliminated by correcting amino acid imbalance."

"Among the biotechnical factors, adverse effects ascribed to ingestion of irradiated food may be derived from the test organisms used. Thus pathological effects observed during feeding test with irradiated food occurred spontaneously in animals fed on similar but non irradiated diet."

"The author is deeply indebted to the staff of the Biology Department of the Central Food Research Institute, Budapest, for their valuable technical assistance; he wishes also to thank Prof. K. Vas for his interest and help in this work."

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A Short History of Trouble

Irradiation Hall Of Shame

The industrial irradiation industry is relatively new. Created in the mid 1970's to sterilize medical supplies and packaging materials, this young industry has had a troublesome safety record. Problems have included radioactive leaks, spills, worker overexposures, failed or bypassed safety systems and failure to report to the Nuclear Regulatory Commission. The state of New Jersey hosts many of these problem plants. What follows is a summary of the 13 most significant incidents which have occurred in the last 12 years.

JUNE 16, 1974 Chief of radiation operations at the Isomedix irradiation plant in Parsippany, N.J. received an estimated 400 rem radiation dose, when he failed to take proper safety precautions. William McKim barely survived the one or two second overexposure to 147,000 curries of cobalt-60. Mr. McKim was in critical condition for one month before recovering.

1976-1980 In 1976 a double encapsulated cobalt-60 source was found leaking at the Isomedix irradiation plant in Parsippany, N.J. Following ion-exchange filtration, the source pool water was dumped down the plant's toilet. An extensive cleanup program followed which involved jackhammering concrete from the walls and floor of the source pool. During cleanup operation, Chem-Nuclear Corp. found the toilet and toilet pipe to be radioactive. Eventually, the toilet, tools, and parts of the source pool were shipped to a radioactive burial ground.

MARCH 14, 1977 The Nuclear Regulatory Commission fines Radiation Technology Inc. [RTI] $4050.00 following an October 1976 inspection which identified 10 violations of RTI's license. Violations incuded, failure to report a leaking cobalt-60 source, failure to adequately evaluate radiation doses to workers, disposing of radioactive material as normal trash and failure to provide required training to employees.

SEPTEMBER 23, 1977 An employee at the Radiation Technology Inc. [RTI] plant in Rockaway, N.J. entered the radiation cell for 10-20 seconds and received a whole body dose between 150-300 rems. The direct cause of the overexposure was a decision by RTI management to operate the facility with the safety interlock system inoperative.

SEPTEMBER 2, 1982 A service technician at the irradiation plant at the Institute for Energy Technology Norway, was exposed briefly to the 650,000 curie cobalt-60 source. The plant worker received an estimated dose of 1,000 rems, and died on September 15, 1982 from radiation injury.

JUNE 11, 1986 Radiation Technology Inc., cited in 1982 as a source of ground water pollution, was ordered by the State of New Jersey to pay a $600,000 directive to study the problem. Volatile organics such as trichloroethylene, methylene chloride, and trichloroethane were found in test wells drilled on RTI's 15 acre site in Rockaway, N.J. The toxic products were stored in 100 bulging, rusty, leaky 55 gallon drums on the company's property.

JUNE 24, 1986 A federal grand jury indicts Eugene T. O'Sullivan, San Jose, Calif., and Bruce J. Thomas of Somerville, N.J., both employees of International Nutronics Inc. [INI] of Palo Alto, Calif. INI and the two employees are charged with conspiracy, mail fraud, wire fraud, and concealing a radiation spill from the Nuclear Regulatory Commission [NRC]. In 1982, INI found a leaking cobalt-60 source in their source pool. A cleanup was begun which involved pumping the radioactive water through filters. During the filter operations, which were left running unattended overnight, a discharge line became detatched, spilling radioactive water onto the floor of the plant. INI employees were then instructed to dump the water down bathroom drains and into the public sewer system. INI then delayed an NRC inspection and attempted to hide radiation contamination from inspectors. (see detailed article in this issue)

JUNE 24, 1986 The Nuclear Regulatory Commission [NRC] revokes operating licenses for Radiation Technology Inc. [RTI] at their Rockaway, N.J. facilities. The license suspension comes after an NRC investigation into charges that RTI lied and deceived the NRC in regards to a March 3, 1986 shutdown. The March shutdown came after the NRC found RTI had bypassed safety equipment during plant operations, a repeated RTI failure, identical to the failure which lead to the worker overexposure in Sept. 1977. The NRC has turned this case over to the N.J. Justice Dept. for consideration.

SCIENCE BOX

COBALT-60 is a radioactive isotope of the metal cobalt. It is created by bombarding nonradioactive cobalt rods in a nuclear power reactor. Cobalt-60 gives off gamma rays and beta particles as it decays.

REMS are an arbitrary measure of radiation effects on living tissue. Like degrees or pounds, the number of rems increase as exposure to radiation increases. One chest X-ray, given to a 150 pound adult gives a dose of 5/100ths of one rem.

LIST OF THE 40 IRRADIATION FACILITIES IN THE U.S.

(not including those that can be found at hospitals of Universities)

This information was received by correspondence with the NRC (Nuclear Regulatory Commission)or the state licencer's who is in charge of radioactive materials. Information on the specific irradiation companies was received by correspondence or through phone calls with the companies.

ALABAMA - None

ALASKA - None

ARIZONA - None

ARKANSAS - (1) PROCESSED TECHNOLOGY INC., P.O. BOX 256, West Memphis, AR, 72301. They irradiate: Food(on reaearch basis), medical products, cosmetics, and pharmaceutical products with Cobalt 60. P.T.I. is a subsidiary of Radiation Technology out of Rockaway, New Jersey.

CALIFORNIA - (3) INTERNATIONAL NUTRONICS INC., 1962 Barranca Rd.,Irvine, CA 92714 and INTERNATIONAL NUTRONICS INC., 1237 North San Antonio Rd., Palo Alto, CA 94303. They irradiate: Spices, Medical devices, medical products, electronic components, parts for nuclear reactors,gem stones, and cosmetics. Cobalt 60 is used.
RADIATION STERILIZERS,1401 Morgan Circle, Tustin, CA, 92680. They irradiate: Spices, medical devices, and "Bag in a Box"- a plastic bag that slips into a cardboard box that wine comes in. Cobalt 60 is used.

COLORADO - (2) COBE LABORATORIES, 1185 Oak Street, Lakewood, Colorado, 80215-4407 They irradiate: Medical devices and Gem stones. Cobalt 60
IOTECH INC., 11080 Irma Drive, Northglenn, CO, 80233. They irradiate: Medical products. Cesium 137 is used.

CONNETICUT - (1) BECTON DICKENSON, North Canaan, CT. Cobalt 60

DELAWARE - None

FLORIDA - (1) SHERWOOD MEDICAL, 2010 New Daytona Rd., Deland, Florida, 32720. They irradiate: Medical products. The Florida licensing office said they are aware of two other irradiation facilities both tentative as of Jan. 1987. One to be operated by a commercial firm out of Tampa and the other to be a joint facility by the D.O.E. and the Dept of Agriculture out of Gainsville. Construction by CH2M Hill. The commercial firm will irradiate strawberries and D.O.E. food.

GEORGIA - (1) RADIATION STERILIZERS INC., 2300 Mellon Court, Decatur, Georgia, 30035. They irradiate primarily medical supplies but also irradiate spices and "Bag in a Box." They use Cesium 137.

HAWAII - None

IDAHO -None

ILLINOIS - (3) ISOMEDIX INC.,7828 Nagle Ave., Morton Grove, ILL. 60053. They irradiate: Spices, disposable medical supplies, medical devices, nuclear device testing, cosmetic research and food research.

ILLINOIS - (cont.) ISOMEDIX INC., 1880 Industrial Dr., Liberty, Ill., 60048 They irradiate: Some spices, disposable medical supplies, medical devices, some nuclear device testing, cosmetic research and food research.
RADIATION STERILIZERS INC., 711 East Cooper Court, Schamberg, Ill. 60195. They irradiate: Spices, medical products, cosmetics, gem stones, and nuclear testing equipment.

INDIANA - (1) ELI LILLY AND COMPANY, Lilly Corporation Center, Indianapolis, Indiana, 46285. They irradiate: pharmaceutical products. (address: 307 East McCarty Street)

IOWA - None

KANSAS - None

KENTUCKY -None

LOUISIANA - None

MAINE -None

MARYLAND - (2) Both irradiators are NEUTRON PRODUCTS, 22301 Mount Ephraim Rd., Maryland, 20842. They irradiate: food stuffs (non-commercial), cosmetics, baby powder, hand lotion, cosmetics packing, gem stones, personal care products, nuclear reactors parts, polymers, and medical devices. One irradiator has one and a half million curies and the other 400 curies of Cobalt 60. Neutron Products is primarily involved in construction of Cobalt 60 rads.

MASSACHUSETTS - (1) ISOMEDIX, 435 Whitney Street, Northborough, MA., They irradiate: some spices, disposable medical supplies, medical devices, some nuclear device testing, cosmetic research and food research.

MICHIGAN - None

MINNESOTA - (1) 3M (Minnesota mining and Manufacturing Company), 220 -2E-02, 3M Center, St. Paul, MN, 55144-1000

MISSISSIPPI - (1) ISOMEDIX INC., Industrial Park South, Box 2044, Columbus, MS, 39704. They irradiate: Some spices, disposable medical supplies, medical devices, some nuclear device testing, cosmetic research, and food research.

MISSOURI - None

MONTANA _ None

NEBRASKA - (2) BECTON DICKINSON AND COMPANY, 150 South 1st, P.O. Box 686, Broken Bow, NE, 68822. They irradiate: Medical supplies only.
SHERWOOOD MEDICAL, P.O. BOX 1169, Norfolk, NE 68701. They irradiate: medical supplies.

NEVADA - None

NEW HAMPSHIRE - None

NEW JERSEY - (6) ISOMEDIX, 9 Apollo Drive, Whippany, NJ, 07981. They irradiate:

NEW JERSEY -(cont.) Isomedix- Some spices, disposable medical supplies, medical supplies, medical devices, some nuclear device testing, cosmetic research and food research.
ISOMEDIX,25 Eastmans Rd., Parsippany, NJ 07054, They irradiate: see above, Isomedix.
ETHICON, (Johnson and Johnson), Route 22, Sommerville, NJ, 08876 They irradiate: Medical Products
RADIATION TECHNOLOGY,108 Lake Denmark Rd., Rockaway, NJ 07866 They irradiate: Food(research and development), medical devices, cosmetics, Spices, electronic components, testing of nuclear devices, Gem stones, personal care products, and food packaging. They use Cobalt 60.
PRECISION MATERIALS CORPORATION, Replogle Ave., Mine Hill, NJ 07801.
PROCESSED TECHNOLOGY, Salem. NJ. (Subsidiary of Radiation Technology. They irradiate: Food on a research basis, medical products, cosmetics, and pharmaceutical products. Cobalt 60 is used.

NEW MEXICO - None

NEW YORK - None

NORTH CAROLINA - (1) PROCESSED TECHNOLOGY INC., P.O. BOX 757, Haw river, NC, 27258. They irradiate: Food on a research basis, medical devices. cosmetics, and pharmaceutical products. (Subsidiary of Radiation Technology) Cobalt 60 is used with a 1.3 million curie source.

NORTH DAKOTA - None

OHIO - (2) ISOMEDIX, 4405 Marketing Place, Groaveport, Ohio, 43125, They irradiate: see Isomedix New Jersey.
RADIATION STERILIZERS, 305 Enterprise Drive, Westerville, Ohio, 43081. They irradiate: see Radiation Sterilizers, California. They use Cesium 137 for irradiation.

OKLAHOMA - None

OREGON - None

PENNSYLVANIA - (1) PERMAGRAIN PRODUCTS INC.,115 Reactor Road, Karthaus, PA. 16845. They irradiate: Manufactured floor products.

RHODE ISLAND- None

SOUTH CAROLINA - (2) BECTON-DICKENSON AND COMPANY, Airport Rd., Sumter S.C., 29150. They irradiate: Medical Supplies.
ISOMEDIX, Highway 295, P.O. Box 3408, Spartanburg, SC, 29304 They irradiate: Some spices, disposable medical supplies, medical devices, some nuclear device testing, and food research.

SOUTH DAKOTA - (1) 3M, 601 22nd Ave., South, Brookings, SD 57006. They irradiate: Medical Products.

TENNESSEE -None

TEXAS - (6) RADIATION STERILIZERS INC., 3001 Wichita Ct., Ft Worth , TX, 76140. They irradiate : Spices, Food on a research basis, medical products, cosmetics, gem stones, and nuclear device testing.
SHERWOOD MEDICAL, 400 Maple Street. Commerce, TX. They irradiate:

TEXAS -(Cont.) Sherwood Medical: Medical Products.
AMERICAN PHARMASEAL COMPANY: one Butterfield Trail, El Paso, TX 79906. They irradiate: Medical Products. (Two unit facility.)
ETHICON INC., P.O. Box 511, San Angelo, TX 76902. They irradiate: Medical Products. (A Johnson and Johnson Company.)
SURGIKOS INC., P.O. Box 130, Arlington, TX 76010. They irradiate: Medical devices. (A Johnson and Johnson Company)
JOHNSON AND JOHNSON, U.S. Highway 75 South, Sherman TX 75090 They irradiate: Medical Products.

UTAH - (1) ISOMEDIX, 9120 South 150 East, Sandy ,Utah, 84070. They irradiate: disposable medical supplies, some spices, some nuclear devices, cosmetics research and food research.

VERMONT - NOne

VIRGINIA - (1) APPLIED RADIANT ENERGY CORPORATION, 2432 Lakeside Dr., Lynchburg, Virginia, 24501. They irradiate: Spices, Flour, Wheat, Medical devices, Pharmaceutical products, Electronic components, personal care products, douches (expermental to date) and marine samplers.

WASHINGTON- None, But two are in the conceptual phase. One will be a fixed location irradiator and the other a transportable unit for agricultural products.

WEST VIRGINIA -None

WISCONSIN - None

WYOMING - None

Representative Randy Phillips
File on Food Irradiation
January 18, 1988

NOTE: *indicates a report attached to Karla Hart's 11/19/87 research
**indicates a report attched to Hart's 11/30/87 supplemental research

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-The Proposal for Creating a Nuclear Food Industry-

What is food irradiation?

Food is irradiated by exposure to gamma rays or x-rays after harvest (or slaughter). This is done to kill insects and bacteria, to prevent sprouting, and to slow ripening by altering the chemical structure of these organisms. Irradiation changes the food itself.

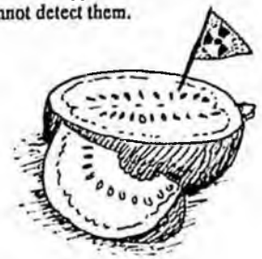
Food irradiation facilities use radioactive isotopes (*Cobalt 60 and Cesium 137*) or x-ray generators. This creates health and safety hazards and raises large ecological issues, discussed in this brochure.

How does it work?

Generally, food is irradiated in a specially constructed chamber that has concrete walls 6-8 feet thick. The radioactive material is in the center of the chamber. Food is carried to the radioactive source on a conveyor belt.

Irradiation levels range from 15,000 rads (to kill sprouting enzymes in potatoes) to 3 million rads (to kill bacteria in spices). By comparison, a chest x-ray gives off about 0.05 rads. The dosage of irradiation given to spices equals 60 million chest x-rays.

When radiation strikes food, it alters and damages cells by rearranging their molecular structure. This kills organisms and delays ripening. Radiation changes the food as much as it does insects or bacteria. Vitamins and enzymes are destroyed. New and altered compounds are produced. These changes do not affect the appearance of the food, so the consumer cannot detect them.



Industry representatives say that irradiation is permitted in 28 countries. **Only limited amounts of a few food items are irradiated commercially in very few countries.** Most countries allow irradiation only for experiments and don't irradiate food for public consumption. It is illegal to irradiate food in Great Britain. It is illegal to irradiate food for domestic consumption in West Germany. Consumers in Japan and the Netherlands protested food irradiation, and the Netherlands stopped irradiating food for domestic use; the Japanese government halted its exploration of food irradiation. To avoid further protest, distributors of irradiated potatoes in Japan stopped labeling them as such.

Is It Safe to Eat?

We believe irradiated food is unhealthy and unsafe to consume.

- Animals fed irradiated foods have developed testicular tumors, kidney disease, shortened lifespans, loss of weight, increased rate of infertility and death in offspring.
- In the only study done on humans, malnourished children were fed irradiated wheat. The children developed abnormal blood cells called polypoids, which contain more than the normal set of chromosomes. The study was repeated on rats and monkeys, with similar results.
- At currently authorized dosages (100,000 rads) there is great danger of increased production of carcinogenic aflatoxins in food.
- There is significant nutrient injury at 100,000 rads, and even greater nutrient destruction at higher dosages. Vitamins C, B_1, B_2, and B_6, A, E, and K, amino and nucleic acids are damaged. If food irradiation is used to kill microorganisms that are currently destroyed by freezing and heating procedures, very high dosages of radiation will be required (1 million rads). This will dramatically damage food, depleting it of nutrients like thiamine (B_1), and creating toxic radiolytic products.
- When food is irradiated, radiolytic products are formed. George Tritsch, Ph.D., cancer research scientist says, "Until one knows what compounds are produced, one cannot be assured that no carcinogens are being formed. The amounts are irrelevant, since food is consumed during the entire lifetime, and only a single carcinogenic insult is needed to produce a malignant tumor."
- The most extensive survey ever undertaken on irradiated food research was conducted by Dr. Joseph Barna for the Hungarian government in 1979. Dr. Barna reviewed 1,223 studies on the wholesomeness of irradiated foods and tallied the reported effects. Dr. Barna's findings reveal 1,414 adverse effects on food and animals. Only 185 beneficial effects were found.

How was it approved?

In 1980, the Food and Drug Administration, using "theoretical calculations in radiation chemistry," determined that irradiated food was safe and wholesome. By 1982, the FDA had found 5 out of 413 studies it reviewed which "could be said to support safety." On April 18, 1986, the FDA approved its own theoretical hypothesis, rejecting all contrary evidence, and authorized the irradiation of fruits, vegetables, pork, spices, herbs, teas, and seeds.

Where does the radiation come from?

The major sources of gamma radiation for food irradiation are *Cesium 137* and *Cobalt-60*. Cesium 137 is a by-product of Department of Energy nuclear weapons production and nuclear power generation. Water soluble, it is the most abundant isotope in the nation's nuclear waste and will be the most important source of gamma radiation. Radioactive Cobalt-60 is made from non-radioactive Cobalt-59, and its production generates new nuclear waste.

Is it environmentally safe?

The leading government food irradiation proponent envisions a thousand irradiation facilities operating in the U.S. near agricultural areas, airports, seaports, and large cities. Since the irradiation service industry (which now deals mostly with medical supplies) began in the mid 1970's, there have been three Cobalt-60 leaks, several contaminations and worker exposures, as well as numerous safety violations. With a thousand irradiation facilities operating in the U.S., shipments of large quantities of radioactive materials on the nation's highways will increase dramatically. The probability of more safety violations and radiation accidents will rise frighteningly. Such consequences are usually irreversible.

What foods are irradiated?

The FDA has approved the radiation of wheat, wheat flour, fresh fruits and vegetables, pork, and 60 herbs and spices. So far, only herbs and spices are being irradiated. About 1% to 2% of our nation's spices and herbs are currently irradiated.

Will irradiated foods be labeled?

The FDA does not require labeling of irradiated ingredients. For example, potato soup made of irradiated potatoes need not be labeled. In fact, millions of pounds of spices were irradiated in 1986 (*Food Processing Magazine, June, 1985, p. 89*), with no indication to consumers. These spices were all used as ingredients in processed foods.

The FDA does require that irradiated whole foods carry a written label, but this requirement expires on April 18, 1988. The only indication of irradiation then will be a flower symbol called the "radura." Most irradiated foods will be *unlabeled* ingredients. Consumers will not be informed or protected.

Will food irradiation replace pesticides?.

Irradiation proponents say food irradiation will reduce dependency on pesticides. Actually, food irradiation is a post-harvest treatment. It will not replace one ounce of chemical soil treatment or pesticide used during growth. In all cases, irradiation will be used *in addition* to chemicals applied in the fields. In some cases, chemicals will be *added*, to facilitate irradiation.

Food irradiation has been touted as a replacement for the post-harvest fumigant, EDB. EDB was banned in 1983 when it was found to be carcinogenic. On detailed examination, very little EDB was ever actually used as a fruit and vegetable fumigant. Non-toxic alternatives to EDB, such as CO_2 and "double-dipping" water baths are cheap, proven, and available.

Who promotes food irradiation?

Private contractors and the federal government are its chief promoters. Food irradiation research is now being funded by the U.S. Department of Energy (D.O.E.), with taxpayers' dollars. For each of fiscal years 1986 and 1987, $5,000,000 was appropriated for this purpose by Congress. The D.O.E. would like to find some use for their troublesome nuclear waste. The D.O.E. is trying to build six demonstration irradiation facilities in the U.S. to promote industry use of Cesium-137.

Who's working for consumers?

The National Coalition to Stop Food Irradiation—over 70 chapters, affiliated groups, and supporting organizations—is working to protect consumer interests across the U.S. To find the affiliate nearest you, write N.C.S.F.I.

What you can do

- Educate yourself on food irradiation and share your concern. Reproduce and distribute this brochure as often as you like.
- Avoid Irradiated foods. Consumer power speaks loudly through our choices. Inform your grocers of your concern. Tell them you do not want irradiated foods, and that you want them to identify foods with irradiated ingredients. *You have the right to know.*
- Contact your elected officials. Ask your Congressmember to co-sponsor and support the **Food Irradiation Safety and Labeling Requirement Acts of 1987** (*HR 956 & S461*) introduced on February 4, 1987 in the House of Representatives and in the U.S. Senate.

These bills, if passed, will halt the irradiation of fresh fruits, vegetables, and pork, and mandate detailed studies of irradiation's impact on our food and environment. HR 956/S461 require clear and honest labeling of irradiated foods—whole foods *and* ingredients—and prohibit the export and import of illegally irradiated foods.

As of November, 1987, 83 members of the House have co-sponsored HR 956, and 10 Senators have co-sponsored S461. Write your Representative/Senator and urge their co-sponsorship of HR 956/S461.

Write to:

Your U.S. Representative
House of Representatives
Washington, DC 20515

and

Your U.S. Senator
U.S. Senate
Washington, DC 20510

What is N.C.S.F.I.?

The National Coalition to Stop Food Irradiation is a non-profit organization that began in 1984. N.C.S.F.I. was organized to educate the public, and provide assistance to groups and individuals who are concerned about food irradiation.

SIGN ME UP!

_____ INDIVIDUAL membership in N.C.S.F.I. or local chapter. Includes a year's subscription to Food Irradiation Alert! and a complimentary bumper sticker. ($15.00)

_____ INDIVIDUAL RETAIL OUTLET/NON-PROFIT ORGANIZATION membership, including information MANUAL, subscription, and bumper sticker selection. ($75.00)

_____ FOR-PROFIT ORGANIZATION membership, includes same material as for non-profit organizations, above. ($125.00)

_____ Send me information on STARTING A LOCAL CHAPTER.

_____ I ENCLOSE A SPECIAL CONTRIBUTION FOR YOUR WORK.

_____ Information MANUAL, 238 pages of scientific studies, articles, fact sheets, media clips in a 3-ring binder. ($20.00)

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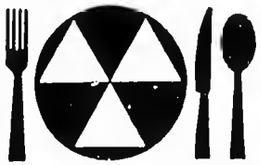
FOOD IRRADIATION



A Health Hazard

National Coalition to Stop Food Irradiation

P. O. Box 590-488
San Francisco, CA 94159
(415) 566-2734

Alaska State Legislature

Please enter into the record my testimony to the House HESS
committee name

committee on HB 388, dated 1/15/88.
bill/subject

I am opposed to food irradiation because the process uses waste products from the nuclear power and nuclear weapons industry. This industry should be dismantled in its entirety, because it is a threat to all life on Earth. The industry is eager to legitimize itself by finding a so-called non-polluting use for its waste products. In truth however the development of such a market for nuclear waste will only encourage the industry to expand and generate more waste. Even though the radiation from the waste is utilized for a brief period of time, the waste still remains radioactive and still has to be disposed of ultimately.

Regardless of the health effects with irradiated food, this technology should be stopped in its tracks because of its unavoidably dangerous effects.

Signed: Ed Berg
Testifier

Representing (Optional)

2682 Goldhill Road Fairbanks AK 99709
Address

479-3796
Phone No.

Irradiated food

Jan. 11, 19[illegible]
Box 83
Cordova, AK 99574

To the editor:

Great Britain, New Zealand and West Germany have all banned the sale of irradiated food. Japanese parliament has withdrawn all support for food irradiation. Maine prohibits it; New Jersey and Oregon are in the process.

Nevertheless, University of Alaska Fairbanks plans to build a food irradiator using atomic waste to zap Alaskan food. The process, by which food is passed through a chamber and exposed to Cesium-137, changes the molecular structure of food and involves the transporting and storage of atomic waste. Each plant would house roughly the same amount of Cesium-137 as was released in the Chernobyl accident.

The university claims that irradiation will increase shelf life and destroy pathogens. However, the botulism organism is "perversely resistant." A dose sufficient to kill other bacteria would leave botulism with no competition to impede its growth. In addition, lab tests show that salmonella develops resistant strains to irradiation. "Irradiated products are more susceptible to infection by molds and fungi."

Malnourished children in India fed irradiated wheat, developed multiple chromosomes and a leukemia type anomaly. As well as causing cancers and reduced fertility rates, irradiated foods are depleted of key vitamins and amino acids. The process will add up to 10 cents per pound to the price of food.

Unless we speak out now, food irradiation will be here. If you are opposed, here is what can be done:

1) Tell any food suppliers or handlers that you deal with.

2) Support Sen. Kerttula's Senate Bill 33 requiring foods whose components have been irradiated be so stated.

3) Write legislators requesting a ban on irradiated foods in the state and a halt to building of a food irradiator.

4) Express opposition to John P. Zarling—Director, Institute of Northern Engineering, U.A.F., 525 Duckering Bldg, Fairbanks 99775.

5) Ask Sens. Stevens and Murkowski and Congressman Young to co-sponsor and to support the Bosco-Mitchell bills which would set up a study of food irradiation through the National Academy of Sciences, before further irradiation takes place.

6) Join the Alaska Chapter National Coalition to Fight Food Irradiation, 1650 Thuja, Anch. 99507.

Keep in mind that a handful of concerned citizens can change the course of events.

Sincerely,
Ms. Rocky Stone

Greater Fairbanks Chamber of Commerce

First National Center
709 Second Avenue
(907) 452-1105
P.O. Box 74446
Fairbanks, Alaska 99707

MAR 2 1 1988

RESOLUTION #10-0388

AK

RESOLUTION ON IRRADIATION

WHEREAS, the State of Alaska has requested the Institute of Northern Engineering at the University of Alaska Fairbanks to conduct a study on the potential social and economic benefits and conduct a study on the potential social and economic benefits and risks that may be realized from food irradiation technology; and

WHEREAS, the Institute of Northern Engineering will not complete the study until the fall of 1988; and

WHEREAS, both the House and Senate have bills before them that would ban the sale of irradiated products in Alaska, thus foreclosing any future window of opportunity; and

WHEREAS, the United States Congress through the Department of Energy has made available to Alaska a $5 million grant over a period of time for the purpose of conducting a range of studies regarding the feasibility of the process in Alaska; and

WHEREAS, the potential economic benefits to Alaska are in the areas of international trade and increased quality and selection of available food products, especially in rural Alaska; and

WHEREAS, economic development is a priority of the Governor for the State of Alaska and of the Greater Fairbanks Chamber of Commerce for the Interior and the state;

NOW THEREFORE BE IT RESOLVED, that the Greater Fairbanks Chamber of Commerce believes HB388 and SB355 should be postponed, or at least amended, pending the results from the study;

BE IT FURTHER RESOLVED that the Greater Fairbanks Chamber of Commerce urges the Governor and the state legislators to defer a decision on the proposed legislation until those results are available.

Dated this 14th day of March, 1988.

By Mike Kelly
Mike Kelly

By _____
W.R. Cox

HC02, Box 7630-A1
Palmer, Alaska 99645-9709
February 10, 1988

Honorable Ron Larson
Alaska House of Representatives
Pouch "V"
Juneau, Alaska 99811

Dear Representative Larson;

Recently I heard of HB-388 (Phillips & Goll) and a companion bill, SB-355 (Kerttula) which have been introduced and related to prohibiting the sale of irradiated food in Alaska.

I certainly am not an authority on irradiation, however, I know that this process is still undergoing testing by the U. S. Government. To my knowledge no hazard has been detected in, or through the ingestion of, irradiated food. Just as we do not radiate after receiving an X-ray, no radioactivity is retained by irradiated product. I have no direct economic interest in irradiation, but I am concerned that, at the least, HB-388 and SB-355 are premature.

As you may be aware irradiation offers the prospect of significant benefit. Irradiation can be used to sterilize meat, poultry, seafood and other food item and greatly extend their shelf life. It similarly extends shelf life of fruits and vegetables, not only by sterilization, but by delaying ripening and inhibiting sprouting. Lastly, the process is used to inactivate trichinae in pork, and insect pests in grain and other vegetable products without resorting to chemical treatment. The introduction of some of these pests,(weed seed, nematodes and insects) represent a threat to Alaskan agriculture.

Some opposition to Alaskan sale of radiated food is an effort to restrict the importation of materials which might compete with locally grown products. Such a tactic, which restricts trade, has potential to limit the future exportation of Alaskan products. Fine quality Alaskan vegetables, selected fish products and reindeer meat have potential for export and would benefit from shipment without the need for refrigeration. Bills, such HB-388, will inhibit the use of irradiation for this purpose in the state, and certainly would preclude sale of the products here.

Problems with agriculture in Alaska are not biological. The products can be produced here. Our problems are people problems,... financing, marketing, pricing, transporting, competing and attitudes. Such prohibitions as HB-388 represent an additional artificial detriment to development of Alaska's renewable resources.

If there is any assistance that I can be on this issue, please don't hesitate to call. I sincerely appreciate the honor of being recommended by you for the Board of Game.

Respectfully,

Robt. H. Parkerson, Ph.D.