

1905



1964



1988



2014



# THE FOOD IRRADIATION CHRONICLES:

Delivering Food to People Around the World



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SCIENCE ADVANCING HEALTH

START HERE



Food irradiation is part of the answer to providing a sustainable, diverse and safe food supply to the world's population. Availability and acceptance of this technology opens up international export markets and provides opportunity for growth of local and international businesses.

1905



## PIONEERING THE SCIENCE OF FOOD IRRADIATION

In the U.S. and Britain, patents are issued for a food preservation process that use ionizing radiation to kill bacteria in food.

The patents are based on the first instance of scientific work studying food irradiation. So the science behind food irradiation dates back to experimentation at the turn of the 19th century.

**Source:** *Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003



1953



## LAYING THE GROUNDWORK

The U.S. Army develops the National Food Irradiation Program and begins experiments with fruits, vegetables, dairy products, fish and meats.

These early studies serve as background data for regulatory approval of food product irradiation in the years to come.

Source: [United States Environmental Protection Agency](#)





1960-61

## EXTENDING THE SHELF LIFE OF POTATOES

Canada approves the irradiation of potatoes.

Canada's approval of potato irradiation marks one of the very first approvals of irradiated food for general consumption by Canadian consumers. A team led by Frank Warland builds a mobile food irradiator which becomes known as the Mobile Irradiator Program. It demonstrates the utility of irradiation to inhibit sprouting and extend produce shelf life.

**Source:** *Isotopes and Innovation: MDS Nordion's First Fifty Years, 1946-1996*, by Paul Litt;  
*Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003



1963-64

## IRRADIATED FOODS APPROVAL IN THE U.S.



The U.S. Food and Drug Administration (FDA) approves the irradiation of potatoes, wheat and flour.

This marks a first occasion for irradiated food to be approved for sale and general consumption by American consumers.

**Source:** *Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003

1961

## JOHN MASEFIELD FOUNDS NEWFIELD PRODUCTS



The Newfield Products irradiation facility is established in St. Hilaire, Quebec, Canada by John Masefield.

Newfield Products is the first example of the commercial use for food irradiation and the first full-scale, purpose-built irradiator. John becomes one of the most influential pioneers in the field of radiation processing.

**Source:** *Isotopes and Innovation: MDS Nordion's First Fifty Years, 1946-1996*, by Paul Litt

1964



## SETTING THE INDUSTRY STANDARD FOR DESIGN OF COBALT-60 SOURCES

Nordion designs and manufactures the first C-188 type Cobalt-60 source used to irradiate food.

The C-188 becomes the industry's design standard for Cobalt-60 sources. 50 years later (this book was produced in 2014), the design of the Nordion C-188 Cobalt-60 source remains the industry standard used in the majority of commercial irradiation facilities around the world.

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**What is Cobalt-60?** It's a radioactive metal that emits gamma rays. The rays disrupt living cells like bacteria through damage to DNA and other cellular structures. Learn more at [Nordion.com/gamma](http://Nordion.com/gamma)



1970s



## ASTRONAUTS ENJOY SAFE MEAT IN SPACE

The National Aeronautics and Space Administration (NASA) adopts irradiation to sterilize meat for astronauts to eat while in space.

Irradiation is still used by NASA today.

**Source:** St. Louis County Government, [Food Irradiation History](#)

1980

## USDA'S HISTORICAL FOOTPRINT IN FOOD IRRADIATION



U.S. Department of Agriculture (USDA) inherits the food irradiation program from the U.S. Army.

Today, the USDA is a key contributor to the scientific and technical aspects of food irradiation, as well as a regulatory body governing food irradiation's commercial use for phytosanitary purposes.

Source: [U.S. Environmental Protection Agency \(EPA\)](#)

**“no evidence of adverse effects  
as a result of irradiation”**

1981

## IRRADIATED FOOD IS NUTRITIOUS AND SAFE

An international expert committee publishes  
*Wholesomeness of Irradiated Food*.

This overarching and historical scientific-based document concludes that any food irradiated up to 10kGY causes no toxicological hazards and introduces no nutritional problems in food.

**Download:** [The Wholesomeness of Irradiated Food](#) by P.S. Elias, Diretor, International Food Irradiation Project, Karlsruhe, Federal Republic of Germany



1983



## IRRADIATION OF SPICES

Canada and the U.S. approve irradiation of spices.

Some spices imported from around the world require sterilization to prevent illness. In 1983, irradiation becomes an alternative treatment to Ethylene Oxide, which is a carcinogenic and explosive gas.

**Source:** *Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003

1983

The logo for Codex Alimentarius, featuring the word "CODEX" in large, bold, black capital letters above the word "ALIMENTARIUS" in smaller, green, spaced-out capital letters. The logo is centered within a white circular background.

**CODEX**  
ALIMENTARIUS

## ACHIEVING WORLDWIDE PARAMETERS AND PROCESS STANDARDS

The worldwide standard for the application of irradiation up to 10kGy is adopted.

The Codex Alimentarius Commission of the FAO/WHO Food Standards Program—representing 130 countries—adopts a standard for the application of irradiation to food. The world now has a standard for the parameters and the processes for food irradiation.

**Source:** General Standard for Irradiated Foods Codex Standard 106-1983, REV.1-2003  
Food and Agriculture Organization (FAO)  
World Health Organization (WHO)

1984

## ERADICATION OF A COSTLY AGRICULTURAL PEST

Screwworm flies are eradicated from the U.S. and Mexico using the Sterile Insect Technique (SIT).

The SIT program releases screwworm (*Cochliomyia hominivorax*) flies, made sterile by irradiation, into the population. This effort results in the eradication of the screwworm in different regions of the U.S. and Mexico from 1957-1984. It's estimated that the economic benefit to livestock producers from screwworm control between 1962 and 1976 was in excess of US\$1 Billion.

Source: [FAO](#)



1986

## IRRADIATION ALLOWS FOR GREATER VARIETY AND QUALITY OF FRUITS AND VEGETABLES

The U.S. approves the irradiation of fruits and vegetables up to 1kGy.

This approval means irradiation can now be used to extend shelf life and eliminate pests from imported produce to protect domestic crops. It opens the door to wider distribution and import of fruits and vegetables into the U.S. giving consumers greater choices and retail businesses greater economic opportunities.

**Source:** *Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003



1986



## RADURA SYMBOL TO LABEL IRRADIATED FOODS

As part of their approval, the U.S. FDA and other international bodies require that irradiated foods be labeled with a RADURA symbol and a statement “treated with radiation.”

Labeling allows consumers to make informed choices when selecting food products.

**Source:** FDA, *Irradiation in the production, processing and handling of food. Final rule, Fed. Reg., 51: 13376-13399 (1986)*

1987

## WORLD-CLASS APPLIED RESEARCH AND SPECIALITY GAMMA PROCESSING



**nordion**

**GAMMA CENTRE OF EXCELLENCE**

The Canadian Irradiation Centre (CIC)—now Nordion's Gamma Centre of Excellence (GCE)—is established in Laval, Quebec, Canada.

In partnership with the Institut Armand Frappier at L'Université du Québec, the CIC primarily focuses on research and development of food irradiation. Today the GCE continues to offer services and conduct applied research in the areas of food irradiation, new materials research and training.

Visit [Nordion's Gamma Centre of Excellence](http://Nordion.com/Gamma)

Watch the reveal video at [Nordion.com/gamma](http://Nordion.com/gamma)

1988

## INTERNATIONAL FOOD IRRADIATION TRADE AGREEMENT



The FAO, WHO, IAEA, ITC and WTO adopt an international food irradiation trade agreement.

The group convenes at an international conference and adopts an agreement on provisions to accept, control and trade irradiated foods on a global scale.

**Source:** *Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003

International Atomic Energy Agency (IAEA)

International Trade Centre (ITC)

World Trade Organization (WTO)

1989

## MAKING THAI FOOD SAFE AND MARKETABLE

Thai Irradiation Center is established.

In the outskirts of Bangkok, the first full-scale irradiation facility in Thailand, under the Ministry of Science and Technology, is established. The facility is certified by the USDA for fresh fruit irradiation and by the European Union for spice irradiation. Today the center buzzes with activity processing boxes of spices, surgical gloves, onions, dried papaya, pet food and a locally-made sausage called "Nham."

**Source:** Thailand Department of Agriculture  
Read [Making Thai Food Safe and Marketable World](#)



1990

## MAKING POULTRY SAFER

The U.S. FDA approves the irradiation of poultry.

Food-borne diseases can result from poultry contaminated by pathogenic micro-organisms such as Salmonella. Though it doesn't eliminate the need for clean handling and appropriate cooking, irradiation of poultry helps to control Salmonella and makes poultry safer for consumption.

**Source:** *Irradiated Foods*, 5th Edition, Paisan Loaharanu, M.S. for the American Council on Science and Health, May 2003



1992

## FOOD IRRADIATION PROCESSING AS A BUSINESS

Food Technology Service, Inc. (FTSI) begins commercial operations in Mulberry, Florida.

Entrepreneurs see the opportunity in food irradiation as a business as well as improving the safety and quality of food. FTSI (now Sterigenics) owns and operates an irradiation facility that uses gamma irradiation produced by Cobalt-60 to process various food and non-food items for shelf-life extension and reduction of micro-organisms. Since its opening, irradiated strawberries, tomatoes and citrus fruits have been marketed at several retail outlets in Florida and Illinois.

**Source:** *Facts About Food Irradiation*, 1999, International Consultative Group on Food Irradiation



.....  
[Visit Food Technology Service, Inc.](#)

1993



“Irradiation is  
a safe and effective  
process that increases  
food safety..”

## AMERICAN MEDICAL ASSOCIATION MAKES A STATEMENT

The American Medical Association (AMA) endorses food irradiation.

The AMA's endorsement is significant in consumer acceptance that irradiated foods are safe and nutritious.

Source: [Food Irradiation Today](#)

1993

## 'JACK IN THE BOX' FOOD POISONING EVENT

The 'Jack in the Box' E. coli outbreak involves Jack in the Box restaurants in California, Idaho, Washington and Nevada.

This event in 1993 is described as "far and away the most infamous food poisoning outbreak in contemporary history." More than 600 people are infected with the *Escherichia coli* O157:H7 bacterium originating from undercooked beef patties in hamburgers. Food irradiation may have prevented this outcome.

Source: [Wikipedia](#)



1997

## MAKING MEAT SAFER

The U.S. FDA approves the irradiation of meat products.

The agency amends its regulations to permit irradiation of refrigerated or frozen uncooked meat products to extend shelf life and reduce levels of micro-organisms that could result in food-borne diseases.

Source: [EPA](#)



1998

## INFORMED CONSUMERS CHOOSE IRRADIATED FOOD



A consumer acceptance of irradiated food study is published.

A study of irradiated food concludes that consumers need to be informed about food that has been irradiated. This allows choice based on facts. When consumers are informed, they tend to choose irradiated over non-irradiated products where food safety is concerned.

**Source:** *Consumer Acceptance of irradiated food: theory and reality*, Radiation Physics and Chemistry, Vol 52, Nos 1-6, pp. 129-133, 1998

2000

## FOOD IRRADIATION IS COMMERCIALIZED

Ion Beam Applications (IBA) and Nordion open a joint venture irradiation facility in Mexico.

Today, the facility is owned and operated by Sterigenics International Inc. This facility is one of over 60 facilities operating in 30 countries to irradiate food for commercial purposes.

**Source:** *Facts About Food Irradiation*, 1999, International Consultative Group on Food Irradiation  
Read about [Sterigenics' history](#)



2000

## OMAHA STEAKS ADOPTS FOOD IRRADIATION

Omaha Steaks begins a program to irradiate all ground beef products.

Omaha Steaks, one of America's larger marketers of beef, has a tradition of bringing quality, great taste, convenience and the latest in food technology to customers. When irradiation of ground beef is approved, Omaha Steaks immediately begins researching the process. Convinced of the benefits of irradiated products to consumers, Omaha Steaks begins a program to irradiate all of their ground beef products. Use of irradiation continues Omaha Steaks' commitment to offer superior quality and safety.

Sources: Omaha Steaks, [Q&A About Irradiation](#)



2000

## IRRADIATION PROCESSOR OPENS HAWAIIAN MARKET

Hawaii Pride irradiation facility is established.

The establishment of this E-beam facility promotes the export of food products from Hawaii to U.S. and Asian markets. The facility is still in operation today and treats tropical products such as papayas, mangosteens and purple sweet potatoes. A second irradiation facility, Pa'ina Hawaii, is established in 2012 to continue increasing export opportunities.

**Source:** Peter A. Follett, Eric D. Weinert , *Phytosanitary irradiation of fresh tropical commodities in Hawaii: Generic treatments, commercial adoption, and current issues*, Radiation Physics and Chemistry 81, 1064-1067, 2012



**What is E-beam?** It's an electric powered machine which makes high energy electrons. The electrons disrupt living cells through damage to DNA and other cellular structures. Learn more at [Nordion.com/gamma](http://Nordion.com/gamma)

2002

## FOOD MANUFACTURERS PROMOTE BENEFITS OF IRRADIATION TO CONSUMERS

Wegmans introduces irradiated ground beef.

Wegmans irradiates their ground beef and markets it as a top-shelf, premium product in the meat department. They explain, "Some people like to use the irradiated ground beef because it could be cooked to the temperature that they like, sometimes medium or medium rare."

**Source:** Wegmans' presentation, "Opportunities in Phytosanitary Irradiation" Workshop, Chapman U, Anaheim, CA, 2014



Enjoy BBQing? Click the YouTube icon to watch Wegmans Executive Chef Russell Ferguson prepare Grilled Cheddar Burgers with Applewood Smoked Bacon

2005

## MAKING OYSTERS SAFER TO EAT

The U.S. FDA approves irradiation of live mollusks.

*Vibrio vulnificus*, found in raw oysters and clams, can cause severe illness if consumed. The approval means that irradiation is now an available method to inactivate *Vibrio vulnificus* and make mollusks safer for consumption.

**Source:** *Irradiated Foods*, by Paisan Loaharanu, M.S., The American Council on Science and Health, 2007





2005



## MORE FOOD IRRADIATION PROCESSORS ENTER THE INDUSTRY

Sadex Corporation is established in Sioux City, Iowa, U.S.

Entrepreneurs take note of the opportunity that food irradiation presents as a business. Sadex Corporation begins operations. Its E-beam facility has the capacity to process upwards of 150 million pounds of red meat, poultry or fresh fruits and vegetables and animal feed combined annually.

Visit [Sadex Corporation](#)



2006

## OPPORTUNITIES INCREASE TO IMPORT EXOTIC FRUITS TO U.S.



USDA-APHIS publishes a pioneering rule providing generic low-dose radiation quarantine treatments to control insects.

A generic treatment is a single treatment that controls a broad group of pests without adversely affecting the quality of a wide range of commodities. During the years leading up to 2006, India, Mexico, Pakistan, South Africa, Thailand and Vietnam receive approvals to export fruits to the U.S. using generic radiation treatments.

**Source:** Peter A. Follett, Eric D. Weinert, *Phytosanitary irradiation of fresh tropical commodities in Hawaii: Generic treatments, commercial adoption, and current issues*, Radiation Physics and Chemistry 81, 1064-1067, 2012

2006

## ANOTHER MAJOR OUTBREAK OF FOOD-BORNE ILLNESS STRIKES U.S.



**E. coli bacteria in uncooked spinach infects 199 people in 26 U.S. states.**

The outbreak is traced to organic bagged fresh spinach—sold as conventional produce—grown on a 50-acre (200,000 m<sup>2</sup>) farm in San Benito County, California. The Centers for Disease Control speculate that the dangerous and potentially deadly strain of *E. coli* O157:H7 originated from irrigation water contaminated with cattle feces or from grazing deer. Of the 199 people infected, 3 people die and 31 suffer from kidney failure. Food irradiation may have prevented this outbreak of food-borne illness.

Source: [Wikipedia](#)

2007

## EDUCATING CONSUMERS ON BENEFITS OF IRRADIATION IS KEY TO FOOD SAFETY



Researchers study the effect of education on consumer acceptance of irradiated foods.

Almost a decade later, another consumer study concludes that education has a positive impact on consumer attitudes. When consumers are provided with accurate supportive information, most accept that irradiated foods are wholesome and beneficial. A majority of consumers in the study indicate they would purchase irradiated products if they were available on the market.

**Source:** Bhumiratana, N., Belden, L.K., Bruhn, C. 2007. *Effect of an educational program on attitudes of California consumers toward food irradiation*, 27(10): 744-748, Food Protection Trends



# 2007



## A LUSCIOUS TASTE ARRIVES IN U.S. FROM INDIA

First legal shipment of Indian mangoes lands at Kennedy Airport, U.S.

This is probably the most eagerly anticipated fruit delivery ever. Since India first applied to ship mangoes to the U.S. in 1989, the fruit had been barred because it could harbor the mango seed weevil, a pest absent from North America. A solution emerges in January 2006, when the Agriculture Department allows the importation of produce treated with low doses of irradiation to kill or sterilize insects.

**Source:** [A Luscious Taste and Aroma From India Arrives at Last](#), *The New York Times*, May 2, 2007



2008

## U.S. FDA APPROVES LEAFY GREENS FOR IRRADIATION

U.S. FDA approves irradiation of spinach and leafy greens for pathogen reduction.

In the wake of the 2006 *E. coli* outbreak that pulled fresh spinach off store shelves, the FDA issues a food irradiation ruling. Robert Brackett, senior vice president and chief science and regulatory affairs officer says, "We're very pleased to see one more tool that we can use to have what's a nutritious, good product become even safer."

Source: [Irradiation OK for Spinach, Iceberg Lettuce](#), WebMD



2008

## EXOTIC GUAVA TO U.S. FROM MEXICO

First importation of Mexican guava is allowed into the U.S.

Mexican guava had previously been banned for the U.S. because it was a common carrier of the fruit fly. Food irradiation becomes the only phytosanitary treatment method allowed by the U.S. on Mexican guava.

Source: [U.S. allowing irradiated guava imports](#), The Packer, October 15, 2008



**What is phytosanitary treatment?** As a phytosanitary treatment, doses of irradiation kill pests. Phytosanitary treatments also prolong the shelf-life of some products; for example, potatoes. Learn more at [Nordion.com/gamma](http://Nordion.com/gamma)

2011

## FOOD IRRADIATION INCREASES THE OPPORTUNITY FOR EXPORTS

USDA Animal and Plant Health Inspection Service (APHIS) propose a rule to allow irradiation facilities to be built in the Southern U.S.

By allowing the phytosanitary treatment at point of entry in the Southern U.S. states, the USDA APHIS ruling increases the access of exporters of exotic fruits and vegetables to the U.S. market.

**Source:** Federal Register / Vol. 76, No. 189 / Thursday, September 29, 2011 / Proposed Rules 7 CFR Parts 305 and 319 [Docket No. APHIS-2009-0100].





2011

## IRRADIATION FACILITY SUPPORTS EXPORTS FROM MEXICO

Benebion irradiation facility opens in Guadalajara, Mexico.

Established specifically for the treatment of Mexican fruits and vegetables for export, Benebion treats fresh fruits such as mango, sweet citrus and guava that require phytosanitary treatment; dehydrated foods that require bacteriological safety such as garlic, onion powder and chile powder; and strawberries, blackberries, raspberries and blueberries that require shelf-life extension.

Visit [Benebion](#)

2012

## INCREASING CAPACITY FOR FOOD IRRADIATION



Gateway America establishes an irradiation facility in Gulfport, Mississippi, U.S.

Ideally located adjacent to the Gulfport Biloxi International Airport, Gateway America is the first-ever facility having the ability to accept product via air, sea freight or road. The facility is a complete cold chain distribution center for imported produce, including phytosanitary treatment, tracking, storage and distribution logistics.

Visit [Gateway America](#)

2013

## REMOVING TRADE BARRIERS IN AUSTRALIA AND NEW ZEALAND

Tomato and capsicum irradiation is approved for importation to Australia/New Zealand.

Food Standards Australia New Zealand (FSANZ) grants permission to irradiate tomato and capsicum as a quarantine measure. As there are rigorous requirements for an appropriate and efficacious treatment for fruit fly for quarantine purposes, the approval will increase domestic and international trade in tomatoes and capsicums.

Source: [Food Standards](#), Australia New Zealand



2014

## EXOTIC PERSIMMONS TO U.S. FROM SOUTH AFRICA

U.S. opens market to South African persimmons.

The USDA completes the first phytosanitary irradiation test of an imported commodity in the Southern U.S.. The test shipment of South African persimmons (MOR USA) is irradiated at Gateway America's facility in Gulfport, Mississippi.

Source: [USDA Persimmons Irradiation Test at Gateway America](#), Food Irradiation



2014

## MAKING SHELLFISH CONSUMPTION SAFER



### U.S. FDA approves irradiation of shellfish.

The FDA amends their existing food additive regulations to allow the safe use of ionizing radiation on crustaceans (e.g., crab, shrimp, lobster, crayfish, and prawns) to control food-borne pathogens and extend shelf life. The decision is based on a rigorous safety assessment that considered 1) potential toxicity, 2) the effect of irradiation on nutrients, and 3) potential microbiological risk that may result from treating crustaceans with ionizing radiation. The evaluation takes into consideration previous evaluations of the safety of irradiation of other foods including poultry, meat, molluscan shellfish, iceberg lettuce and fresh spinach.

Source: [FDA](#)

2014



## AN ACCEPTED FOOD PRESERVATION OPTION

Canada's contribution to food irradiation showcased at a museum exhibition.

The Canadian Agriculture and Food Museum, located in Ottawa, Canada, launches a new exhibition: Food Preservation: The Science You Eat. Drawing on history and some myth busting, the exhibit showcases food irradiation as an accepted food preservation alternative.

Source: [Canada Agriculture and Food Museum](#)

Food irradiation is part of the answer to providing a sustainable, diverse and safe food supply to the world's population. Availability and acceptance of this technology opens international export markets and provides opportunity for growth of local and international businesses.



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