

Food Irradiation: A Powerful Nuclear Tool for Food Safety

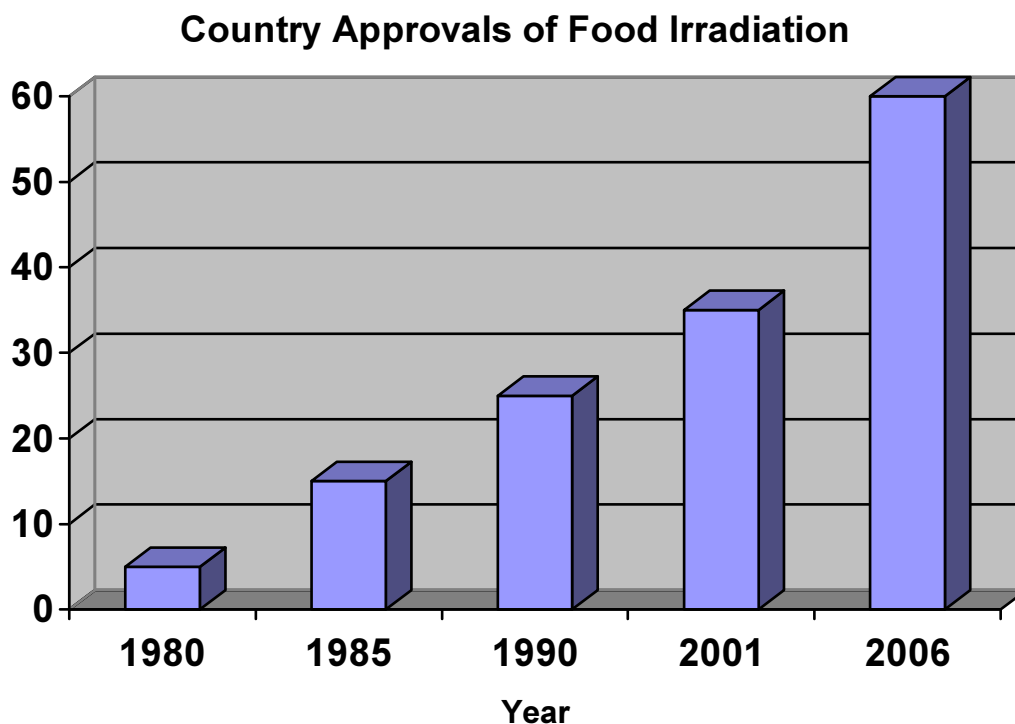
Consumer demand for safe, wholesome and nutritious foods is increasing on a worldwide scale. This demand, together with ever increasing global trade in foodstuffs, brings with it a number of related concerns: the possible contamination of foods by harmful micro-organisms; the need to protect crops from insect pests; and the need to support international trade and economic development.

In response to these concerns, many countries have introduced stricter sanitary (human health) and phytosanitary (plant health) controls on the food industry. The increasing relevance of these controls for consumers and policy makers alike has resulted in a heightened interest in food irradiation as a valuable technique for dealing with food safety issues. Food irradiation can destroy the microbes that carry disease, reduce the need for harmful chemicals used to control insect pests in fruits and vegetables, and serve as a useful addition to conventional food processing technologies (such as pasteurization, curing, and drying) that are used to preserve and extend the shelf life of foods.

The Technique: Food irradiation is a process of exposing either packaged food or food in bulk to precisely controlled amounts of ionizing radiation for precisely specified durations of time. The process is entirely automated, involving no human exposure to radiation sources. It is also not sensitive to temperature, meaning it can be carried out in a climate controlled environment to keep food fresh. Most importantly, irradiation does not increase radioactivity levels in food or otherwise make it dangerous for human consumption.

National and Public Acceptance: Decades of meticulous research have definitively proven the safety of food irradiation techniques. This work culminated in the revision, in 2003, of the relevant FAO and IAEA standards and codes.¹ Overall, the response to food irradiation from national authorities has been positive, and when consumer concerns are addressed through sound information campaigns, there is steady progress in the public acceptance and implementation of these techniques.

¹ Joint FAO/WHO Codex Alimentarius Commission General Standard for Irradiated Foods – as well as the associated Code of Practice for Radiation Processing of Food. The Guidelines for the Use of Irradiation as a Phytosanitary Measure were also finalized by the Interim Commission for Phytosanitary Measures.



To date, health and safety authorities in over 60 countries worldwide have approved the irradiation of over 60 kinds of foodstuffs. These include spices, grains, chicken, beef, seafood, fruits, vegetables and other food products. An estimated 500,000 metric tons of various foods are treated annually in approximately 180 gamma irradiation facilities that use radioactive sources such as Cobalt-60 and Cesium-137, as well as in about a dozen electron beam facilities.²

Sanitary and Phytosanitary Applications of Irradiation Techniques: In the United States alone, an estimated 76 million cases of food-borne disease occur each year, resulting in an estimated 325,000 hospitalizations and 5,000 deaths. Sanitary (human health) applications of food irradiation have long been used to target harmful food-borne micro-organisms such as *salmonella* and *e.coli*, and have been applied primarily to animal products such as chicken, seafood and beef. However, a recent rise in outbreaks of food-borne disease traced to produce – such as a significant 2006 outbreak of *e.coli* in the US caused by contaminated spinach – is leading to concerted efforts in some countries to expand the use of these applications to fruits and vegetables.

² For more detailed information, please refer to the IAEA Clearance of Irradiated Foods Database at <http://nucleus.iaea.org/NUCLEUS/nucleus/Content/Applications/FICdb/FoodIrradiationClearances.jsp?module=cif>

Phytopsanitary (plant health) applications of irradiation target insect pests, such as fruit flies, which can infest and destroy harvested grains and produce. Though the value of these applications was first recognized in the early seventies, particularly as a quarantine treatment, rising health, safety, and environmental concerns related to insecticide use have considerably magnified the interest in these techniques.

In 1989, the US Animal and Plant Health Inspection Service (APHIS) published the first rule to allow the use of irradiation as a phytopsanitary treatment; and in January 2006, the US regulatory framework was expanded to approve the treatment of imported fruits and vegetables. To date, India, Mexico and Thailand have already signed Framework Equivalence Work Plans to allow for the export of irradiated fresh fruits to the USA. Although the USA is presently the only country applying irradiation as a quarantine treatment on a commercial scale (4,000 metric tons annually), other countries such as Australia and New Zealand have carried out initial market trials with irradiated fresh fruits.

Future research and development of sanitary and phytopsanitary techniques will likely focus on complex foods (e.g. prepared meals), the application of higher doses along with other complimentary and supplementary technologies, (e.g. controlled atmosphere packaging, high pressure processing, antimicrobial compounds and edible coatings), and the prevention of allergic reactions to foods. These efforts, coupled with the continuing need for consumer education related to the benefits and safety of irradiation, will continue to ensure the successful implementation of these techniques.

The Role of the IAEA in Promoting Food Safety: The role of the IAEA in this field is to support the research and development of food irradiation techniques, to assist Member States in obtaining the necessary expertise and equipment to apply them, and to be a leader in international efforts to establish guidelines for the use of radiation for sanitary and phytopsanitary purposes. The Agency recently collaborated with the International Plant Protection Convention (IPPC) in the development of Guidelines for the Use of Irradiation as a Phytopsanitary Measure to cover specific irradiation doses for generic groups of insect pests. These collaborative efforts resulted in the Agency hosting an IPPC Technical Panel on Phytopsanitary Treatments in December 2006 to develop these phytopsanitary applications with a view towards establishing internationally harmonized standards. Future efforts will focus on the urgent need to increase training for quarantine inspectors of national plant organizations, to continue research on insect groups sensitive to irradiation, and to study the tolerance of certain fruits to irradiation.

Since its creation in 1964 as part of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, the Food and Environmental Subprogramme, in continuous and close collaboration with the World Health Organization, has been at the forefront of international research and coordination efforts dedicated to food safety issues. The innovative work of this subprogramme and its partners promotes public health, international trade, and economic development in Member States through contributions to the progressive expansion in the use of food irradiation techniques, the creation of international food safety standards, and the harmonization of Member State legislation regarding food safety. Through the IAEA, and with the help of its partners, the Food and Environmental Subprogramme will continue to be a leader in applying its breadth of scientific knowledge and technical competencies for the benefit of Member States.