Irradiated Foods

Since 1974 the Japanese consumer has enjoyed nutritious, wholesome potatoes irradiated to inhibit sprouting. Invented by Japanese researchers and legally authorized by the government of Japan, this process produces 15,000 to 20,000 tons of potatoes per year. Treatment still occurs in the same plant at the Shihoro Agricultural Co-Operative, Hokkaido. Ironically, this successful beginning was followed by a steady decline in food irradiation research. Currently, Japan is so far behind other nations in this technology it is termed a "food irradiation underdeveloped country". There is, however, renewed interest in this food preservation process as the Japanese government considers clearance for importation of irradiated spices. Clearly, the path towards importation and consumer acceptance of irradiated foods must not be paved by misunderstanding and emotion but unbiased scientific data. Thus, this article presents a brief and accurate discussion of what food irradiation is, what it is used for, and its safety and effect on foods. The focus of this article is to address concerns of the Japanese consumer regarding the consumption of irradiated foods imported from the United States.

Food irradiation is a very versatile, controlled process accomplished by exposure of the product to carefully measured doses of ionizing radiation. The term "ionizing" is used because electrically charged particles "ions" are produced which kill or injure microorganisms and insects by damaging their DNA. The waves or radiant energy pass through and are not retained by the food. In newer facilities machines are used which produce high energy beams. Machines can, of course, be turned off eliminating the constant emission of rays from radioisotopes.

Performed to achieve specific objectives without changing the foods quality, doses vary with the type of food being treated and the desired effect. Ionizing radiation is measured in kilograys (kGy), which is a unit of ionizing energy absorbed by food during irradiation. A low dose (1kilogray kGy, or less) is used to inhibit sprouting, delay ripening, and kill insects and parasites. A medium dose (1-10 kGy) extends shelf-life, kills spoilage and pathogenic bacteria, and can increase juice yields and reduce cooking times. A high dose (above 10 kGy), is used to decontaminate certain food additives and ingredients to enhance food safety. Combined with mild heat, a high dose can also be used on meats and prepared meals to achieve industrial sterilization.

More extensively studied than any other food preservation process, irradiation does not make food radioactive, nor generate radioactive wastes or produce harmful mutant strains of microorganisms. Treatment does, however, increase the safety profile of foods and prevent the introduction of exotic pests entering Japan in or on fresh produce. Furthermore, irradiation may replace hazardous chemical fumigants, sprout inhibitors and post-harvest fungicides in imported fresh produce. Unlike food treated by heat (e.g., canning) irradiation is a "cold treatment"; the temperature of the food remains low, so there are no major nutrient losses or changes in texture, color or flavor. It leaves food closer to its natural state.

As with all food preservation treatments, irradiation can produce a variety of unwanted changes in foods and not all foods are amenable to irradiation. With fresh fruits and vegetables irradiation causes changes in cells which may result in softening, uneven ripening and sensitivity to chilling. In milk even low doses of irradiation causes off-flavors. Extensive research by food scientists has determined the types of foods suitable for irradiation as well as the treatment parameters that minimize unwanted changes.

In addition to the aforementioned unwanted effects, certain radiolytic products are produced in foods as a consequence of irradiation. It is important to note that the term radiolytic

does not mean radioactive or toxic. It simply means that these substances are formed during an irradiation process. Most radiolytic products are substances also found in non-irradiated foods or in foods that have been processed by other means, such as heat and drying. The safety of radiolytic products has been thoroughly studied in toxicity tests and feeding studies (human and animal) conducted in Japan, Europe, Australia, Canada and the United States[1]. Based on these studies the World Health Association declared irradiated foods safe.

In the United States the Food and Drug Administration (FDA) regulates all aspects of irradiation including what products it can be used on and what dose can be used. The U.S. Department of Agriculture (USDA) is responsible for the inspection and monitoring of irradiated meat and poultry products and for the enforcement of FDA regulations concerning those products. Whole foods treated with irradiation must be label with the international logo for irradiation, a "radura".


Radura

Several issues have recently propelled this safe, effective food processing and preservation technology to center stage. Those most pertinent to the Japanese consumer includes the necessity and opportunity of a secure food supply free of microbial pathogens and certain preservatives.

References

Delincée, H., Pool-Zobel, B.L., Rechkemmer, G. Genotoxicity of 2-dodecylcyclobutanone. Report by the Bundesforschungsanstalt für Ernährung (BFE-R-99-01), Institute for Nutritional Physiology of the Federal Nutrition Research Institute, Karlsruhe, Germany, 1999, pp. 262–269.

Loaharanu, P. 2003. Irradiated Foods, Fifth Edition. American Council on Science and Health. New York. http://www.acsh.org/publications/pubID.198/pub_detail.asp

Summers, C.H. 2005. Toxicology testing of the unique radiolytic product 2-dodecylcyclobutanone. Proceedings of the 34th Annual United States-Japan Natural Resources Meeting, Susona, Shizouoka, Japan.

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[1] Although no evidence of any hazard has been found, advocacy groups opposed to radiation of food often cite studies on the potential toxicity of a class of compounds called 2-alkylcyclobutanones which are created in trace amounts by irradiation of foods containing animal fats. Formation of these compounds in meat is similar to the production of other unwanted substances in cooked foods such as: benzene in boiled eggs, acrylamide in French fries and benzopyrine in barbequed meat. Although studies demonstrated genotoxic effects by a purified congener of 2-alkylcyclobutanones in rat colon cells isolated from the treated animals (Delincée *et al.* 1999), the applied concentrations were high (14.9 mg/kg BW) and by far exceeded exposures which would be encountered after daily consumption of irradiated foods. Summers (2005) reported that this same congener did not cause mutagenesis using six, state-of-the-science, short-term genotoxicity tests. Furthermore, and most significant, several long term feeding studies of irradiated meats have failed to show any adverse effects on man and animals (Loaharanu 2003).

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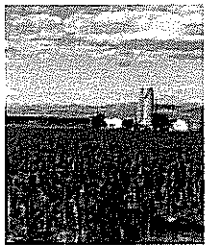

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