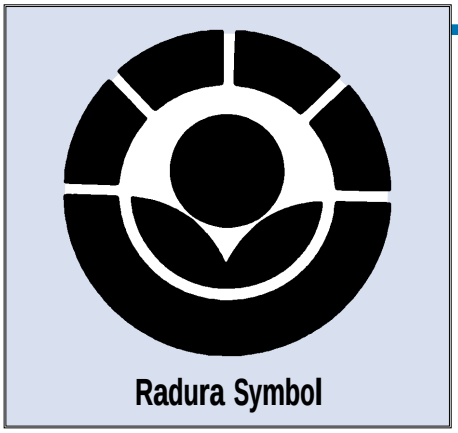
Facts
National Pork Producers Council
QUALITY & SAFETY
American Meat Science Association

Authors: *Misty Pfeiffer, Texas A&M University*
Sharon Luchsinger, Kansas State University
Reviewer: *Elsa Murano, Texas A&M University*

Pork Irradiation Project

General Fact Sheet

The advantages of irradiation in controlling microorganisms like Trichinella spiralis and Salmonella in pork are well known. The effects of irradiation on pork quality and consumer acceptance were not as clear. That was the purpose of research conducted at Kansas State University (KSU).[1,2] Ultimately, consumer acceptance of irradiated pork products will depend on the consumer's continued confidence in its quality. Irradiation has the potential to enhance microbial safety of pork while not affecting its quality, according to the resultsproject conducted at KSU, in Manhattan, Kansas.



Radura Symbol

How Irradiation Works

Irradiation is a physical food treatment similar to heat pasteurization and canning. Food passes through an enclosed irradiation chamber where it is exposed to one of three types of ionizing energy, gamma rays, machine generated electrons or x-rays. Gamma rays from cobalt-60, accelerated electrons, and x-rays are currently commercially available. The duration of exposure to ionizing energy, density of food and amount of energy emitted by the irradiation source determine the dose of irradiation to which the food is exposed.

Irradiation, which does not make food radioactive, disrupts the organic processes that lead to food decay. By interacting with water and other molecules that make up food, gamma rays, x-rays or electrons are absorbed by the molecules they contact. During the process, microbial cells, such as bacteria, yeast, molds and parasites are killed. Thus, food irradiation holds great promise in the control of food-borne diseases, which are a worldwide health problem. With irradiation, energy simply passes through the food, but unlike chemical treatments, irradiation leaves no residue. Since irradiation is a "cold process," it does not significantly increase the temperature of treated foods. Thus, irradiated products can be shipped, stored or eaten immediately after treatment.

In the United States, the Food and Drug Administration (FDA), which has regulatory control, must approve the use of the irradiation process for foods (Table 1). They require that all irradiated foods must bear the "radura" symbol (Illustration 1) on the product label. The radura symbol signifies that the product has been subjected to irradiation treatment. The product label must also state that the product has been "treated by ionizing radiation" or "by irradiation."[3]

Cost/Benefit of Irradiation

In 1993 the USDA estimated that Campylobacter, Clostridium perfringens, E. coli O157:H7, Listeria monocytogenes, Salmonella, and Staphylococcus aureus caused 3.6 to 7.1 million cases of foodborne disease annually.[4] Salmonella alone was estimated to cause 0.7 to 3.8 million cases per year at a cost of $0.6 to 3.5 billion. Loaharanu summarized that the benefits of irradiation would exceed the costs by a ratio of 2.2-2.8:1 and that irradiation of 10% of the U.S. poultry production would result in $50 million of annual savings.[5] Although current cost estimates for irradiation of poultry range from five to nine cents per pound, costs of less than one cent per pound have been reported by the French.

NATIONAL PORK PRODUCERS COUNCIL
P.O. BOX 10383 • DES MOINES, IA 50306 USA • 515 223 2600 • FAX 515 223 2646 • pork@nppc.org

Pork Irradiation and Pork Quality

In the KSU study, researchers evaluated quality in irradiated pork, as measured by sensory panel, as well as consumer acceptability of irradiated boneless pork chops. Using three levels of irradiation from either accelerated electrons produced by a linear accelerator or from gamma rays from the decay of cobalt-60, the sensory quality of chilled and frozen pork chops was evaluated. Researchers found that irradiation at ≤ 3.85 kilogray (kGy) had minimal to no effect on the flavor, texture, and aroma of chilled or frozen pork chops.

The investigators noted that aerobically packaged, irradiated pork chops were slightly more bitter, tougher and displayed less of the desired browned/roasted attribute than non-irradiated pork chops, although this did not affect the overall acceptability of the product. Vacuum-packaged irradiated pork chops were more stable in color. Researchers determined that using the right combination of packaging conditions and packaging film would make irradiation a viable intervention technology to produce safe, high quality pork.

In the consumer study, consumers found no differences between irradiated and non-irradiated pork samples for overall acceptance, meatiness, freshness, tenderness or juiciness. Based on the consumer acceptance study, researchers believe the potential market acceptance of irradiated, vacuum-packaged, chilled, boneless pork chops is promising.

Mean ratings and standard errors (SE) for traits on boneless pork chops evaluated by consumers

Trait	Dose, kGy 0	2.5	SE
Overall Acceptance	6.2	6.3	0.2
Meatiness	7.3	7.4	0.1
Freshness	5.8	5.9	0.2
Tenderness	5.8	5.9	0.2
Juiciness	5.5	5.7	0.2

The Future of Pork Irradiation

Historically, consumers have rejected irradiated products, but consumer attitudes toward irradiation seem to be changing. Consumer studies consistently demonstrate that when provided with science-based information, a high percentage of consumers are willing to buy and prefer irradiated foods.[6] Thus, with suitable consumer education on the benefits of food irradiation technology, the potential food safety and product quality gains by the pork industry could be significant.

References:

[1]Luchsinger, S. E., D. H. Kropf, C. M. Garcia Zepeda, E. Chambers IV, M. E. Hollinsworth, M. C. Hunt, J. L. Marsden, C. L. Kastner, and W. G. Kuecker. 1996. Sensory analysis and consumer acceptance of irradiated boneless pork chops. J. Food Sci. 61 (6): 1261-1266.

[2]Luchsinger, S. E., D. H. Kropf, C. M. Garcia Zepeda, M. C. Hunt, J. L. Marsden, E. J. Rubio Canas, C. L. Kastner, W. G. Kuecker, and T. Mata. 1996. Color and oxidative rancidity of gamma and electron beam-irradiated boneless pork chops. J. Food Sci. 61 (5): 1000-1005, 1093.

[3]Hayes, D.J., E.A. Murano, P.S. Murano, D.G. Olson, and S.G. Sapp. 1995. Food Irradiation: A Sourcebook.

[4]USDA. 1996. Bacterial Foodborne Disease: Medical costs and productive losses. U.S. Dept. Of Agriculture, Agricultural Economics Report No. 741.

[5]Loaharanu, P. 1994. Cost/benefit aspects of food irradiation. Food Technol. 48(1): 104-108.

[6]Bruhn, C.M. Consumer Attitudes and Market Responses to Irradiated Food. J. Food Protection, 1995; 58(2): 175-181.

For more information contact:

National Pork Producers Council
P.O. Box 10383
Des Moines, Iowa USA
515 223 2600
Fax: 515 223 2646
Internet: pork@nppc.org
Web: http://www.nppc.org/

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