



Meat Irradiation Technology Usage: Challenges and Recommendations from Expert Interviews

ABSTRACT

Although developed to improve microbial food safety and used in the space program, irradiation is not used as widely as its potential advantages would indicate. Consumer acceptance of this technology has been studied since the 1980s, but few have examined the barriers to the use of this technology in the meat industry. This paper reports findings from expert interviews that explored the barriers and strategies of food irradiation usage in the meat industry in the United States. In Phase 1, a cohort of 13 experts participated in interviews to identify the barriers and motivators of irradiation usage; in Phase 2, a cohort of 23 experts participated in interviews to evaluate information sheets and provide recommendations for the next step of information extension and technology utilization. The belief that consumers will not accept irradiated meat was identified as the major barrier to using irradiation. Experts concurred that consumer education is crucial for the adoption of food technologies such as irradiation. They recommended that trade associations, government

agencies, and university extension should utilize digital and social media to advocate the use of less understood food technologies such as irradiation.

INTRODUCTION

Foodborne illness is an important public health issue in the United States, with an estimated one in six Americans (or 48 million people) getting sick each year (4). Recent outbreaks associated with meat and poultry products caused by pathogens such as *Escherichia coli* O157:H7, *Salmonella* and *Listeria monocytogenes* demonstrate that the microbial safety of meat continues to be a concern in spite of significant advancements in technology that have improved the safety of meat products (1). Minced or ground meat products are particularly susceptible to microbial contamination, since the surface microbial load is transferred to the interior during the process of grinding (26). In 2014 alone, ground beef was the contaminated food or ingredient implicated in five of the 25 multistate outbreaks, four of which were caused by Shiga toxin-producing *E. coli* and one of which was caused by *Salmonella* (4).

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Irradiation holds tremendous promise to increase meat safety, extend the shelf life of food, and reduce or eliminate foodborne pathogens. Food is irradiated by exposure to a controlled amount of ionizing energy to achieve certain processing objectives, such as pathogen reduction or elimination (6). Depending on the product characteristics and dosage applied, irradiation can result in 99 to 99.999% pathogen reduction in food (24). Several organizations, such as the United States Food and Drug Administration (FDA), United States Department of Agriculture (USDA), World Health Organization (WHO) and Food and Agriculture Organization (FAO) have conducted in-depth safety assessments of the technology and have concluded that food irradiation is safe (9, 19). The Food and Drug Administration approved the use of irradiation for poultry in 1990, red meat in 1997 and tropical fruits in 2002 (20). Over two decades have passed since its first approval, but the food industry has yet to embrace this technology. Thus, irradiated meat and poultry are not commonplace at retail outlets. Canada's 2017 authorization of irradiation for ground beef, plus the growing use of irradiation as a phytosanitary treatment for tropical fruits, suggests that the barriers to use of this technology might be getting lower (12).

Several consumer surveys have been conducted in an effort to understand consumer perceptions and attitudes toward emerging non-thermal technologies such as irradiation (7, 18, 25). Consumers' apprehension toward irradiation stems from a lack of information about the benefits and risks associated with the technology. Consumer research has demonstrated that consumer education about irradiation and its benefits improves their perception of irradiation and their willingness to purchase irradiated food, either at equal prices and at a small premium (2, 8). One study that examined the effect of a benefit statement on the perception of irradiation found that 15% of consumers who considered irradiation unsafe, and 64% who were uncertain about the safety of irradiated red meat, expressed willingness to purchase irradiated meat after hearing the benefit statement (13). More recently, 57% to 74% were ready to buy irradiated beef or poultry after reading a statement about benefits (8). Consumers have expressed willingness to pay a premium of between 5 to 50 cents per pound for irradiated beef (22).

Several organizations involved in the meat industry have conducted internal surveys to determine the demand for irradiated food and consumer willingness to purchase at stores, though none of this information is available in the public domain to inform the market at large. In March 2000, over one hundred chefs who were surveyed had high levels of willingness to purchase irradiated ground beef (5). However, a gap exists in knowledge about the barriers and strategies needed of key players in the meat industry, such as processors, packers, retailers, and restaurant owners. Little study has been performed on the challenges these individuals

face in implementing irradiation at scale and making this option more widely available to consumers.

This paper used an expert interview approach to understand the barriers confronting processors, retailers and restaurant industry members to the use of irradiation and the strategies to increase its implementation and that of other food technologies. The insights gained from this work will contribute to informing outreach programs and addressing the barriers identified.

MATERIALS AND METHODS

Participants

The expert interview, a qualitative empirical approach, was used to identify motivators, barriers, and strategies of irradiating meat in the industry. Expert interview studies tend to have small sample sizes and to lack random sample selection procedures (15, 17). Instead of randomly selecting participants, the expert interview imposes narrow candidate criteria. The research team identified industry experts with extensive knowledge and history working in the meat industry or retail food businesses and those who are involved in the decision-making process regarding the implementation of food technologies in a corporation. Included were food safety and quality assurance managers, meat industry processors, and retail food businesses and restaurant managers. Invitation letters were emailed to a list of nominated experts generated from a major meat trade association contact list and by personal direct contact of owners and managers of restaurants and retail food businesses. A subsequent semi-structured 20-minute telephone interview was scheduled. The research protocol was approved by the Institutional Review Board (IRB) at the University of California Davis, and interviewers were trained to conduct interviews prior to data collection.

Procedure

This investigation had two phases, each of which used a semi-structured qualitative interview approach to identify barriers and strategies of food irradiation usage in the meat industry. A semi-structured qualitative interview was considered to be ideal for the target population, since this approach is flexible and allows for the elaboration of important details and inclusion of factors not previously considered by the interviewers (11, 14). Phase 1 focused on the barriers and was conducted from January to May 2016 by authors Shankar and Feng. Phase 2 was conducted from April to July 2017 by author Ramos, to elicit strategies to address needs of stakeholders and evaluate the information sheets developed as a result of Phase 1 suggestions.

Phase 1 interview questions were prepared to employ various probes to explore responses. The questionnaire was divided into seven sections comprised of 22 questions and was designed to gauge the barriers and motivators to employing irradiation. The first section was designed

to ascertain the expert's experience in the meat industry, familiarity with irradiation and sources of information regarding irradiation. The second section included probes to understand how decisions were made about implementing irradiation and the factors that contributed to that decision. The third section included probes to explore possible consumer surveys conducted by the expert's organization, protocols followed and the expert's views on recent studies regarding consumer acceptance of the benefits and safety offered by irradiation. Experts were asked about cost considerations of irradiation, whether their organization had previously considered the costs associated with recalls, and how the two compared with each other. To assess if the absence of nearby irradiation facilities was a barrier to its use, experts were asked their organization's willingness to consider using irradiation if irradiation facilities were available in their organization's vicinity. Experts were also presented with findings from research on the sensory properties of irradiated meat in comparison with non-irradiated meat to evaluate whether this had influenced their decision on use of irradiation. Finally, experts were asked if there was any information about irradiation that they would find useful and the preferred format in which they would like to receive information.

After an expert had received and read the information sheet designated for their specific industry type, a telephone interview, Phase 2 of the study, was scheduled. The interview consisted of twelve questions. Experts were recruited by use of the same invitation letter used in Phase 1. Experts interviewed in Phase 2 were not necessarily the same individuals as those in Phase 1. In Phase 2, experts were asked if any of the information was new to them, what they thought was most and least effective in explaining the benefits of irradiation, whether the information was credible, whether additional information should be addressed, and what barriers prevented them from using irradiation today. They were asked whether they thought the information could be useful and how it should be shared within the industry. Experts were also asked whether they thought a company would prefer to develop consumer information themselves. In order to receive more feedback on the information sheets, other industry experts were interviewed, in addition to those in Phase 1.

Intervention

The information sheets were developed; a sample information sheet is presented as *Appendix 1*. Topics included "why it is safe," "what the potential cost is," and "whether there is any sensory characteristic change," which were the top three barriers identified in Phase 1 interviews. The objective of the information sheets was to address the barriers to the use of irradiation by the meat industry. The information sheets were two pages of content and an additional page of references. Although the information

contained in all information sheets was the same, one sheet was directed toward the meat processors, one was for grocery stores and distribution companies (retailers), and one was for the restaurant industry.

Data analysis

Interviews were conducted and transcribed by one or two of the first three authors under the supervision of authors Feng and Bruhn. All data were managed and analyzed by NVivo (QSR, 2016). The content of the interviews was analyzed to identify differences between and consensus among the experts with regard to each question.

RESULTS AND DISCUSSION

Phase I: Awareness of irradiation and barriers and motivators to its use

A total of 30 individuals in positions of authority were sent an email to assess their willingness to participate in the study; one person declined to be interviewed, 13 did not respond, and 16 responded favorably. Of the 16 who responded favorably, 3 were unable to schedule the time for the interview, and responses from the remaining 13 experts were transcribed verbatim. Thus, a response rate of 43.3% was achieved. Of the 13 experts, five were from the processing industry, four were from restaurants, and four from retail outlets. The characteristics of the experts' organizations are listed in *Table 1*.

A majority of the experts interviewed ($n = 11$) were familiar with irradiation because their extensive experience in the industry and were familiar with detailed aspects of the technology, such as its operation and benefits. The sources from which experts learned about irradiation included graduate school, conferences, trade journals, and magazines within the organization. Some reported learning about irradiation after reports of large-scale recalls or outbreaks. Two experts who operated independently owned restaurants were unfamiliar with irradiation. About half, 54% ($n = 7$) of the experts reported having considered irradiating their meat or sourcing irradiated products to reduce foodborne pathogens, with experts from medium or large-scale processors and restaurant chains being more likely to have considered irradiation than their small-scale counterparts.

Motivators for using irradiation included enhancing food safety, decreasing the potential risk of microbial contamination that leads to outbreaks or recalls, protecting the brand reputation and lowering litigation costs associated with outbreaks or recalls.

The major barriers to implementation of irradiation identified in this study are listed in *Fig. 1*. For those not currently offering irradiated products or having discontinued it after its previous introduction, consumers' perceived non-acceptance of irradiated meat products was identified as the major barrier to using irradiation. Sixty percent of the processors ($n = 3$) reported discontinuing production and sale of irradiated

TABLE 1. Participating experts' organization characteristics (n = 36)

Characteristics	Frequency	
	Phase 1 (n = 13)	Phase 2 (n = 23)
Location		
Arkansas	2	0
California	5	4
Colorado	2	8
Florida	0	1
Illinois	1	1
Iowa	0	2
Missouri	0	1
Nebraska	0	1
Texas	2	2
Washington	1	0
Wisconsin	0	1
Australia	0	1
Canada	0	1
Total number of employees		
Processors		
Less than 200	0	7
200–500	2	1
5000–10000	1	1
Over 10000	2	5
Restaurants		
Less than 50	2	1
1000–10000	1	1
Over 10000	1	2
Retail Outlets		
Less than 200	0	2
200–500	0	2
Over 10000	4	1

meat because of dismal sales. Experts from large-scale retail outlets (n = 2) reported that they had explored consumer interest in irradiation within their own company in the form of surveys and had concluded that consumers tend to prefer 'safe but clean and natural food' or 'natural and minimally processed food' and tend to associate unconventional or non-traditional food processing technologies with higher perceived risk. One expert from a major retail outlet remarked, "Consumers view irradiation as an extreme kind of food processing and are adverse to it."

Consumers' choice was also reported as the major barrier by large-scale restaurants (*Fig. 1*). One expert from a large-scale restaurant reported not pursuing irradiation since their consumer research demonstrated that a certain percentage of their customers were not comfortable with the technology. However, no details were provided regarding the protocol of the survey or the information provided to consumers. An expert from a processing company found similar expressions of concern in their in-house assessment of consumer attitudes toward irradiation but acknowledged that

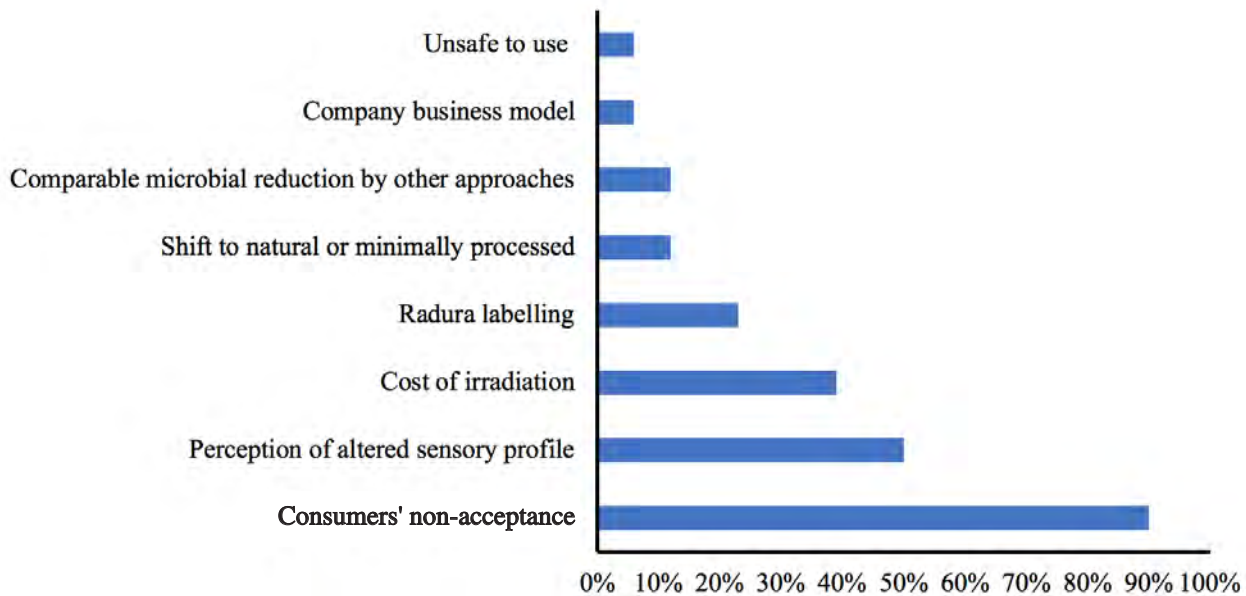


Figure 1. Barriers identified to the use of irradiation among meat industry participating experts in Phase 1 (n=13).

they did not ask consumers how they would view the other microbial treatments the company commonly employed. The requirement to disclose this processing method and not others constitutes a primary barrier to irradiation use.

In spite of promising results from consumer surveys, companies were skeptical about these studies. They expressed concern that consumer survey responses may not necessarily translate to real life purchasing decisions and that consumers who express interest in purchasing irradiated meat, even at a premium, upon learning about the benefits may not necessarily do so in an actual purchasing environment when offered conventionally processed meat at the regular price.

None of the companies interviewed had explored the cost of irradiation compared with the cost of recalls. Food recalls present a tremendous liability to the meat industry, given the loss of sales, costs associated with litigation, and negative media publicity. Some experts reported exploring other strategies and intervention methods to reduce the number of recalls and increase microbial safety and have introduced measures to validate these strategies. One expert indicated that various processing methods such as pasteurization, lactic acid preservation or a combination of hurdle technologies could be employed to achieve a degree of microbial reduction similar to that achieved by irradiation.

In the United States, all irradiated food except spices must bear the radura, the international symbol for irradiation, along with the statement “treated with radiation” or “treated by irradiation.” Many food industries view this is an obstacle and believe that alternate phrasing such as “electronically pasteurized” could prove beneficial (10). In a study to assess the perception of the radura labeling (21), 67% of consumers

considered it to be a symbol of quality and were more likely to purchase irradiated food, 6% viewed the symbol as a warning, 17% were unaffected and 10% did not recognize the symbol. However, one expert from a well-known retailer remarked that “the label frightens consumers. If irradiation is to gain more acceptance among consumers, irradiation should be considered a processing aid by the regulatory authorities or in legislation that would not necessitate the radura labeling.” Another expert pointed out that while consumers take no issue with irradiated spices offered at retail outlets, the irradiation of meat somehow evokes a lot of concern. The expert was unclear as to what causes this difference in attitudes but speculated that this could be due to different radura labeling requirements for spices or consumer unawareness of the use of irradiation on spices.

Many processors lack the irradiation equipment and therefore the product would have to be irradiated at an external facility. The current limited availability of irradiation facilities across the country requires the meat to be transported to a facility, resulting in additional transportation and handling costs. This was cited as one barrier by an expert whose company discontinued production of irradiated ground beef. Concerns were also voiced regarding the design and engineering of the irradiation process, which would result in an uneven exposure of the product, with the interior receiving the right dose but the exterior being exposed to a higher dose of irradiation. In order to achieve microbial reduction superior to that achieved by their current process, the sensory properties may also be slightly adversely affected, stated one expert. The expert, however, expressed the willingness of

the organization to reintroduce irradiated products or even install appropriate irradiation facilities at their processing facility, if the above barriers could be addressed.

Perception of an altered sensory profile was voiced as a major concern by experts, especially from large-scale restaurants. One of the four experts from restaurants reported conducting sensory studies within their organization and stated that the irradiated meat produced by their specific process had detectable off notes in comparison with other cooking processes. Previous research shows that vacuum packaged beef patties exposed to 0.3 or 4.5 kGy dose of radiation were rated as having less beef flavor than non-irradiated beef patties by a trained sensory panel (16). In another study, conducted with ham and beef frankfurters, no significant differences in off-flavor notes were observed between irradiated and non-irradiated ham but were observed for the frankfurters (23).

The company business model was indicated as one reason for not irradiating meat by a major restaurant chain that takes complete ownership of all the steps from production to transportation. The model and company policy thereby prevent them from sourcing irradiated meat and would require them to set up an irradiation facility, which was a prohibitive investment for the organization at this time.

Other concerns voiced included consumers viewing processors as being lax with enforcement of safety standards if they adopt an irradiation process and consumers' false sense of security while handling irradiated beef, which could lead to increased risk of cross-contamination. One expert from a major retail chain described the organization as being "risk averse," preferring to play it safe rather than be an early adopter of the technology.

Phase II: Evaluation of info sheets

A total of 23 interviews of industry members were conducted to evaluate the messages on the info sheets. This sample consisted of fourteen poultry and beef processors, five grocery and distribution members, and four restaurant industry members. Eight members were female; fifteen were male. Three industry processors had worked in the meat processing industry for over fifteen years. One meat industry processor had worked in the industry for over 50 years. Another expert had worked in the restaurant industry for over 22 years. The characteristics of the experts' organizations are listed in *Table 1*.

Almost all experts agreed that none of the information was new to them and the info sheets covered all the key concerns related to use of irradiation. Many experts responded that the reduced likelihood of a foodborne outbreak is the most important benefit. Four experts responded that 'how irradiation alters the food' is the most effective information at explaining the benefits. Two experts stated that the fact that irradiation can help extend the shelf life of some products was the least effective benefit. All industry members

responded that the information was credible, especially with the peer-reviewed articles in the reference list. Another expert responded, "There are some barriers to it (utilizing irradiation), truthfully, things like this info sheet need to go out to the public. We need to work hard on public perception of food irradiation." Many experts responded they would consider using irradiation. One expert stated, "I have no problem with irradiated products. I actually prefer it and look for them at a retail store or restaurant."

The experts wanted to see more quantifiable figures on the benefits of using the technology and a showcase of research supporting how irradiated foods are safe to consume. Some suggested expanding the discussion on sensory and nutritional changes when products are irradiated. One expert stated, "The off-flavor notes have a huge impact on the product." One expert pointed out that availability of facilities and economic feasibility is a big challenge that was not listed in the info sheets. While requesting more information, experts still prefer a short info sheet to keep the reader's attention.

Consistent with Phase I results, after reading the info sheets, half of the experts still considered consumer perception and acceptability of irradiated foods products as the biggest barrier. Many are opposed to using the word 'irradiation' to market the technology.

Many experts mentioned that future research is needed on alternative technology, such as high-pressure processing, and sustainability of food technologies, including irradiation. The economic impact, on both the use of irradiation and the potential cost of a foodborne outbreak that can be prevented by the use of irradiation, is valued. One expert explained, "It would depend on the cost... Cost is a big factor for companies to look into."

When asked if they would want to display an info sheet to inform consumers about irradiation products, responses differed. About half of the experts declined to use an info sheet, while half considered it useful. People who did not want to display the sheet considered the content too scientific for the general public and too long to display on the label or the retail aisle, and they were afraid of scaring consumers away. Most experts suggested posting the info sheets on their websites or a trade/commodity association's websites.

Several participants stated that previously irradiated meat had been introduced to the market place by their companies, but because of significant resistance from their customers, the products were pulled off the shelves immediately. Factors that may influence consumer perception were unclear and not shared by the participants, including whether consumer education and communication were provided prior to and during the irradiated product introduction, what efforts were made to address consumers' concerns, and how long the products stayed on the shelves. Irradiated ground beef has been offered at a major northeastern grocery supermarket chain in the U.S. since 2002. The market chain made

significant efforts to educate their employees, state extension personnel and the local department of agriculture prior to the launch. To introduce the product, they developed fact sheets and webpages to explain the benefits and the process of irradiation of ground beef to consumers.

Until today, irradiated ground beef is still on their shelf and in their menu to provide extra protection to their consumers. Retailers could consider demonstrating their commitment to consumers by setting up safety stations in which irradiation was part of a complete array of safe handling topics addressed. Irradiation could be presented as the choice for those seeking more protection against certain foodborne illnesses. Research confirms that effective science communication employing media could increase consumer receptivity to irradiation, especially when such communication comes from trusted sources (3). Actual marketplace behavior of consumers exposed to information about potential benefits must be documented [2]. Messages describing the benefits of the process are more effective than statements of regulatory approval and endorsements (8). Documenting consumer marketplace response to being provided with an effective message would address the gaps the industry identified between survey research and actual purchase behavior.

Recommendations

One major producer indicated that it is inappropriate to expect the meat or poultry industry to inform the public about irradiation. The scale of education required is too large and the public would be less likely to believe an industry that is both providing the education and delivering the product. This is a public health measure, and educational efforts should be led proactively by government agencies such as FDA, USDA, and CDC, and by public health educators. Restaurants, as one of the largest buyers of meat, can play a huge role in enforcing higher quality standards in the meat industry and creating a demand for the use of safety-enhancing technologies such as irradiation. As one of the experts mentioned in the Phase 2 interview, *"I don't mind being the first one (who uses irradiation), but there needs to be more of a community effort rather than one person stepping out there with this information."*

Limitations

The expert interview, as a qualitative research method, allows us to gain a deeper understanding of irradiation

utilization in the meat industry, but this method has some obvious limitations, including small sample size and lack of randomized sample selection. We are aware that it is difficult to generalize the results from this study to the entire industry. Future research with a larger and more representative sample can help address these limitations.

CONCLUSION

In both Phase 1 and Phase 2, experts agreed that consumer education continues to be crucial for the adoption of technologies such as irradiation. Despite its introduction over two decades ago, a large proportion of consumers are unaware of the benefits irradiation can have with regard to food safety. Audience-targeted consumer education may be effective in addressing the concerns towards the use of irradiation. Messages delivered through mass media could be effective, with those made available at retail establishments. Strategies could include utilizing digital and social media by way of trade associations, government agencies and university extensions, to be advocates of food technologies such as irradiation. Within the food industry, vertically integrated communication may also be effective. Larger companies could serve as pioneers to promote safe food enhancing technology by producing, retailing and using irradiated food products. The findings from this study shed light upon the barriers and strategies related to the use of irradiation commercially for meat products. A multi-pronged approach involving educating consumers about the benefits of food irradiation and making consumer research information available to the industry will help generate confidence in this technology and overcome barriers to its commercial implementation. Modified info sheets focusing on behavior change can be used as a guide by policymakers, educators, and marketers. Future studies can explore the impact of different information delivery formats, including videos and pictures, on consumer purchase behavior in the marketplace.

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IAFP Secretary Election

Attention IAFP Members:

Ballot information will be emailed February 1, 2019 to all IAFP Members (*non-student*) to cast their vote for the Association's 2019–2020 Secretary. Candidates are **Alejandro "Alex" Castillo** and **Michelle Danyluk**.

Voting deadline is Tuesday, March 5.



APPENDIX 1. An example of information sheets used in Phase 2 evaluation. The target audience for this information sheet was restaurant owners or quality control managers.

What Restaurant Owners Need to Know About Food Irradiation

What is food irradiation?

Food irradiation is a food safety tool that can help reduce dangerous foodborne pathogens. Irradiation destroys bacteria and can improve the safety and shelf life of food.¹ The Food and Drug Administration approved the use of irradiation on meats, poultry, and shellfish.⁶ Specific vegetables, grains, fruits, and meats can be irradiated. However, not all products have undergone the approval process and some foods may be less suitable for irradiation.

Irradiation destroys disease-causing microorganisms by exposing food to electron beams/ionizing radiation. Energy passes through the food much like when food is placed in the microwave or an x-ray; no detectable levels of radiation or energy are left in the food.⁶ Irradiated foods are no less wholesome and nutritious than their non-irradiated counterparts.² Irradiation cannot reverse spoilage or make spoiled food good². Irradiated foods are not radioactive.⁵ All research indicates that irradiated food is safe for consumption.



Why does it matter?

Irradiation can make foods safer by significantly reducing the number of foodborne infections and deaths.¹ Irradiated foods can provide extra protection for high-risk populations such as infants, older people, pregnant women and those with compromised immune systems. The Economic Research Service of the USDA estimates that the cost of diseases caused by *E. coli* O157:H7 in improperly cooked ground beef is between 200 and 440 million dollars yearly.¹³ The Council for Agricultural Science and Technology estimates as many deaths as 9,000 annually from foodborne diseases.¹³

Is it safe?

Each food irradiation application must be evaluated for chemical safety, microbiological safety and nutritional adequacy.¹ The United States Department of Agriculture and the Food and Drug Administration have approved food irradiation for use on red meat, poultry, and shellfish.³ The American Medical Association, the World Health Organization, and the Centers for Disease Control and Prevention have all stated that irradiated foods are safe.¹ Thirty-seven countries have approved the use of irradiated foods.⁴

What are some benefits of irradiated foods?

- Irradiating foods can reduce the risk of certain foodborne diseases (such as those caused by *E. coli*, *Salmonella*, *Campylobacter*, and *Listeria*)
- Food irradiation extends the shelf life of some products by destroying or inactivating spoilage organisms
- Irradiation can provide extra protection for people with compromised immune systems from foodborne diseases



Does irradiation alter the food?

Food irradiation can cause some minor sensory changes due to the oxidation of free radicals that can lead to slight flavor changes in food. Irradiation can also cause other changes such as the loss of some vitamins. However, this is comparable to other food processing methods like heating or canning.⁴ Irradiation does not “cook” the food; it is still fresh. Irradiated meat and poultry should be refrigerated and handled carefully to avoid reintroduction of harmful or spoilage bacteria.² Therefore, irradiation does not replace safe food handling practices.²

Will irradiation increase the cost of food?

The irradiation treatment adds a few cents to the cost of food.⁶ This is minimal compared to the loss of productivity and the cost of food recall to the industry. Food recalls and outbreaks can put a company out of business or lead to imprisonment if legal action is taken. In 2006, a spinach outbreak linked to *E. coli* O157:H7 led to the direct loss of twelve million dollars to spinach growers, not including losses related to consumers after-outbreak avoidance.⁸

How do I know if a food has been irradiated?



- Irradiated foods are labeled with the “radura”— the international symbol for irradiation accompanied with the words “Treated by irradiation” or “Treated with radiation.”²
- Irradiated spices used in dishes are not required to be labeled.²

Who are some of the leading food businesses that carry irradiated meats?

Wegman’s grocery chain began selling irradiated ground beef in 2002.¹¹ The irradiated meat is priced competitively with non-irradiated meat.¹ Schawn’s carries irradiated ground beef products from Huisken’s Meats of Minnesota on their website.¹² All ground beef sold by Omaha Steaks is irradiated.¹² These products are all labeled, but irradiated food offered in a restaurant does not require labeling.

What do consumers think about irradiated food?

Even though the public is faced with misinformation about food irradiation, interest in purchasing irradiated foods is increasing. A study published in 2016 evaluated messages using the topics ‘Benefit’, ‘Nutrition’, and ‘Authority’ to measure consumers’ willingness to purchase irradiated meats.⁹ When provided with information that addressed benefits of the process 72% of consumers expressed an interest in purchasing irradiated food with 76% of these consumers willing to buy even if the product was 10% more expensive than the non-irradiated meat.⁹ Consumers are interested in the safety, taste, nutrition, and price of irradiated foods.⁹ Providing information addressing these topics increases the likelihood of consumers to purchase irradiated foods.

