

Irradiated food, good; foodborne pathogens, bad

TO HUNDREDS IN the audience, Elsa Murano explained how the federal government decides to approve methods for food decontamination. Those decisions are always based on whether a technology is safe and effective. "Irradiation meets both of these criteria," said Murano, undersecretary for the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA). "Irradiation has been approved by the Food and Drug Administration [FDA] for meat and poultry as well as for a variety of other foods. Irradiation has been endorsed and supported by many highly respected public health organizations, including the Centers for Disease Control and Prevention [CDC], the American Medical Association, and the World Health Organization [WHO]. In fact, it is one of the most thoroughly researched processes in existence."

Murano was the keynote speaker at the First World Congress on Food Irradiation, held in conjunction with the Food Marketing



Murano

Institute Show, in Chicago, Ill., on May 5-6. The First World Congress was sponsored by the National Food Safety and Toxicology Center at Michigan State University. Murano and the speakers who followed her did their best to refute the words of an antinuclear activist who had gained access to the floor during a question-and-answer period that followed the Congress's opening statements. The activist, from the Public Citizen group, had sternly lectured the audience on the dangers of food irradiation, as based on alleged scientific research that Public Citizen had in hand. Even before the First Congress officially commenced, the activist had passed out literature claiming that research had shown that animals fed irradiated foods had suffered adverse health effects, including "premature death, mutations, fetal death and other reproductive problems, residual radioactivity, immune system dysfunction, fatal internal bleeding, a rare form of cancer, organ damage, blood disorders, tumors, nutritional deficiencies, and stunted growth." The literature was dismissed by speakers as junk science, and the activist's lecture did-

Public health was the goal of food-irradiation researchers, business executives, and others at the First World Congress on Food Irradiation.

n't last long as many in the audience of scientists, engineers, company executives, sales persons, and others shouted him down into finally asking a question—it was, after all, the question-and-answer period.

Food irradiation is needed in the United States, Murano explained, because the nation carries a burden of foodborne illness. Data from CDC show that while there is progress in fighting foodborne illness, it remains a significant national public health problem. CDC estimates that 76 million illnesses, 325 000 hospitalizations, and 5000 deaths are caused each year in the United States by foodborne pathogens. Many other cases of foodborne illness go unreported.

As such, Murano said, FSIS is implementing a "broad and long-term science-based strategy" to improve the safety of the products it regulates. Food irradiation is included in that strategy.

Murano emphasized that FSIS has made "a conscious effort" to encourage industry to use new decontamination technologies within food processing plants. In fact, her agency intends to streamline the approval process for such technologies "as much as possible so we do not hinder industry innovation."

Even though irradiation has been approved for various meat and poultry products at different dose levels for years, it lately has received attention because of congressional action associated with the 2002 Farm Bill, she said. That bill, which includes several provisions related to irradiation, mandates that commodities such as meat and poultry that are treated by any technology approved by the USDA and the FDA to improve food safety (of which irradiation applies) must be made available to the National School Lunch Program (NSLP). The bill also directs FSIS to develop an educational program on irradiated meat and poultry products.

Currently, FSIS is working with the Food and Nutrition Service (FNS) and Agricultural Marketing Service to implement the Farm Bill provision to make irradiated products available through the NSLP. FNS is pilot testing educational materials through the state of Minnesota, with materials being de-

veloped so that schools and the families they serve will have the educational materials they need to make an informed decision once irradiated products are offered.

FSIS also is charged with educating the broader public, Murano said, about irradiation and other processes to reduce pathogen levels on meat and poultry. For example, a brochure on irradiation is being developed that will be tested in focus groups. "In addition, we are considering partnering with universities around the country to educate the educators about irradiation," she said.

Minnesota meat

Minnesota leads the nation in promoting food irradiation, and Ronald Eustice is not shy about announcing that fact. Eustice is executive director of the Minnesota Beef Council, which is in charge of research and promotional efforts on behalf of Minnesota's 35 000 cattle producers.

Eustice summarized the many technologies that have helped increase life expectancy in the United States. For example, pasteurization has helped to eliminate tuberculosis, immunization has made the iron lung obsolete, and chlorination has helped to make the water supply safe. "During this decade, food irradiation will take its place as the fourth pillar of public health," he said.



Eustice

meat kill you? The *E. coli* threat." It was, he said, the time of the Hudson Food incident, when 25 million pounds of ground beef were recalled because of safety concerns.

The Minnesota Beef Council started looking into food irradiation after deciding that

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the technology would “do for the beef industry what pasteurization has done for the dairy industry,” Eustice said. The beef industry knew from its own research that ground beef had received mixed reviews from consumers when it came to food safety. “Only 61 percent of consumers give ground beef an A or B in food safety,” he said. “We needed to make absolutely certain that this hamburger was free of deadly bacteria, because if we didn’t, it would cost us big time—illness, hospitalization, disability, bad publicity, lost business, lawsuits, and death.”

So, in 1997, Minnesota’s Beef Council began its “journey,” as Eustice called it, and started having food tastings, “with a[n irradiated] hamburger patty and a box of toothpicks, vision, and courage,” he said. “We quickly learned that education is the key to consumer acceptance.”

The journey was based on a plan developed to identify and contact opinion leaders and invite them to workshops and seminars. The sampling of irradiated foods continued, with offers of ground beef and papaya at state fairs, women’s expos, and food shows. The Beef Council also worked with the state’s media to educate them about the benefits of food irradiation.

Public/private partnerships have paved the way for acceptance of irradiated foods in Minnesota, according to Eustice. For education purposes, the Beef Council has partnered with the state’s Department of Health and Department of Agriculture, retailers, and restaurateurs.

On a national basis, the education of the public about food irradiation continues. Eustice revealed some figures from a recent survey. About 400 midwestern consumers were asked about their knowledge and awareness of food irradiation and their acceptance of it. According to Eustice, the responses to questions were as follows:

What do consumers think?
(396 responses)

Aware of beef irradiation (total):
68 percent
Males: 77 percent awareness
Females: 63 percent
Illinois: 66 percent
Iowa: 67 percent
Kansas: 60 percent
Minnesota: 76 percent
Nebraska: 73 percent
Wisconsin: 65 percent

*Is irradiated ground beef
a good thing to market?*

Yes: 78 percent
No: 10 percent
Didn’t know: 12 percent
Males: 86 percent said it is a good thing
Females: 73 percent
Illinois: 74 percent
Iowa: 75 percent

Kansas: 72 percent
Minnesota: 85 percent
Nebraska: 83 percent
Wisconsin: 78 percent

There are critics of food irradiation, of course, but the Beef Council has been at every protest in Minnesota to provide the voice of science-based reason, according to Eustice. “We’ve been at every protest that’s ever been held,” he said. “I’ll tell you, [the activists] never were able to get more than a handful of people, and usually they had to import them from other states.” Then with an eye toward the activist in the audience, Eustice exclaimed, “Freedom of speech is a right and a privilege, but we are all held accountable for the truth and we need to separate fact from fiction.” He then urged audience members to “speak out. We cannot let half-truths, hearsay, and innuendo predominate. We must correct that misinformation. Don’t fall for scare tactics on food irradiation.”

The fact, Eustice continued, is that the United States is moving forward with food irradiation. Today, irradiated ground beef is available in about 6500 supermarkets and 2000–3000 restaurants. In Minnesota, it is available “on every corner,” he said. “I can go to the filling station and buy it at the SuperAmerica [convenience store]. I can go down the street just a little farther and it’s available at Dairy Queen. I can go farther and I have a Cub Foods Store and they have, in some cases, eight different types of irradiated ground beef from two different manufacturers.”

Eustice quoted the January 2003 edition of *Meat Marketing & Technology* magazine, in which editor Dan Murphy wrote, “In the last 12 months, irradiation of raw ground beef has moved from one of the constellation of antimicrobial treatment options to the technology of choice for controlling *E. coli* 015787.”

The Minnesota Beef Council has taken its show on the road, preaching the benefits of food irradiation during workshops in Illinois, Mississippi, Georgia, South Carolina, Michigan, Missouri, Wisconsin, North Dakota, Iowa, Pennsylvania, New York, Alabama, Kentucky, Indiana, New Mexico, Nevada, Montana, Tennessee, North Carolina, and Arkansas. The group has talked with the Council of State and Territorial Epidemiologists. Eustice’s journey has an urgency. “It’s not a question of if there will be more [ground beef] recalls, but when,” he said. “We can stop it. If not us, then who? If not now, then when?”

Food inspection odds

John Masfield, chairman of the Food Irradiation Processing Alliance and founder of Isomedix Inc. (a food irradiation business now owned by Steris Corporation), warned of the risks of not moving toward

food irradiation in the United States. “In the year 2000,” he said, “the United States imported nearly \$49 billion worth of food products, including about \$8 billion worth of fruits, vegetables, and juices—many from places with lower standards of water quality and sanitation.”

This plethora of imports has expanded beyond any reasonable inspection capacity, he said. For example, three years ago, 700 FDA inspectors faced the daunting task of overseeing 30 000 food manufacturers and processors, 20 000 warehouses, 785 000 commercial and institutional food establishments, 128 000 grocery and convenience stores, and 500 000 vending machines. “That’s called ‘workload,’” he mused.

Accordingly, only about 1 percent of imported foods were inspected. “It’s not surprising, therefore, that imported foods have caused foodborne disease,” he said. For example, there have been reported cases of hepatitis A from Mexican strawberries.

Even the USDA—which, he said, has 10 times the employees of the FDA, can inspect only about 20 percent of the foods. Thus, he reasoned, “Food irradiation is one safety tool whose time has come.”

Masfield, quoting from the *Wall Street Journal*, said, “Antitechnology advocates are circulating unfounded claims that irradiation poses a health hazard. It is time for all of us to stop responding to the scare mongers. We must listen to scientists who are unanimous in their conclusion that food irradiation, not more government regulation, would make America’s food supply even safer.”

Masfield found it interesting that the pasteurization of milk took more than 40 years to gain widespread acceptance, while the acceptance of food irradiation has passed 50 years. “Food irradiation by comparison with most food processes has been meticulously studied,” he said. “It’s high time that food irradiation takes its place amongst the panoply of accepted food safety processes. Indeed the cost of foodborne illness to individuals, to society, and to food companies, should encourage everyone to collaborate their efforts to ensure safer food.”

Worldwide regulations

The International Consultative Group on Food Irradiation (ICGFI) is an international collection of scientists sponsored by the United Nations. ICGFI has played a major role in establishing regional efforts around the world to regulate the irradiation of foods in conformity with a public standard.

Established in 1984, the group will disband in May 2004. “We have decided that our job is done for the moment,” said ICGFI member Peter Roberts, a consultant to the New Zealand Institute of Geological Nuclear Sciences, the New Zealand Food Safety Authority, and the International Atomic Energy Agency.

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When ICGFI was organized in 1984, it declared that irradiated food was "safe and wholesome to 10 kilogray," said Roberts, but not everyone around the world was buying it. For ICGFI member governments, fundamental questions remained in trying to establish a framework by which food irradiation could operate both within a country and on an international scale.



Roberts

So work for the ICGFI in the late 1980s concentrated on three issues, according to Roberts: use of irradiation as a quarantine treatment, use of irradiation to ensure hygiene quality, and public information on food irradiation.

By the 1990s, guidelines were prepared for regulating control of food irradiation facilities, Roberts said. ICGFI produced codes and "technical monographs" of food irradiation practices related to specific applications. Between the codes and technical monographs, "you have all the information you need if you are a food processor or in-

Asian countries and through Africa, Latin America, the Asian Pacific and the Near East, said Roberts. But it is a slow process. While there is agreement in principle among countries to adopt a model regulation style, implementation has been limited to a few countries. "Most countries are still regulating on a case-by-case basis," he said.

Once ICGFI expires next year, a new and similar organization is expected to spring up, Roberts predicted. "We hope the new organization has a broader representation of expertise in deciding the new relations of food safety security and quality in trade," he said. "We certainly want to encourage links to the food industry, irradiation processes, and consumer organizations, and maintain appropriate representation from the nuclear science agencies."

In the early days of ICGFI, nuclear science agencies "tended to dominate," Roberts said, but now a shift is being felt "more and more to the food safety authorities, to the agricultural side of things."

Gerald Moy, staff scientist with the Program of Food Safety for the World Health Organization, said his organization encourages its member states to consider all measures to eliminate or reduce foodborne pathogens. "Given its unique ability to destroy pathogens in solid food, food irradiation may be one of the most significant contributions to public health to be made by food science and technology since pasteurization was introduced to assure the safety of milk," he said.

WHO has been at the forefront of assessing the safety of food irradiation as "a prerequisite to its wider spread application in improving and extending the world's food supply," Moy said.

Paisan Loaharanu, co-organizer and founder of the First World Congress on Food Irradiation, questioned why irradiation is the only physical food process that is regulated as if it were a food additive. "The promulgation of the Food Additive Amendment [in 1958] by the U.S. Food and Drug Administration under the [1938] Food, Drug, [and] Cosmetic Act . . . , which considered radiation sources for irradiating foods as additives, resulted in a practice in many countries in regulating irradiation as a food additive," he said.

Loaharanu, a Vienna-based international expert on food irradiation, headed the joint food irradiation activities of the U.N. Food and Agriculture Organization, the International Atomic Energy Agency, and WHO.

Even after adoption of the Codex General Standard for Irradiated Foods and its associated Codes of Practice by the Codex Alimentarius Commission in 1983 (which recognizes irradiation as a physical food process similar to heating and freezing), he explained, most countries still opt to regulate irradiation as an additive.

In some countries, according to Loaharanu, regulatory authorities require specific data to demonstrate not only the "wholesomeness" of irradiated food but clear "technology needs" prior to granting approval for specific irradiated food items or classes of foods. Efforts to harmonize national regulations on food irradiation, he said, have been slow, while irradiation is making "rapid progress" to meet requirements for food safety and trade.

Turning to the subject of packaging for irradiated foods, Loaharanu said, "While there is a consensus that irradiated foods should be labeled to provide necessary information to consumers and is being regulated as such, the regulatory requirements for labeling of irradiated ingredients in other foods are far from being harmonized." Loaharanu closed by calling for labeling requirements that fully inform the consumer but do not erect any trade barriers.

Consumer response

Christine Bruhn, past chair of the Food Science Communicators and of the Nutrition Division of the Institute of Food Technologists, discussed research conducted for the Center for Consumer Research of the University of California-Davis. Bruhn opened her talk by stating that "consumers recognize disease and contamination, and that these are indeed food safety dangers. They also recognize that food handling is a potential danger; food handling as it relates to microorganisms and bacteria." Consumers also are "familiar with salmonella and *E. coli*," she said.

Even knowing these dangers, consumers do things that put them at risk, she said. For example, many rely on the color of meat to tell them when it is cooked. "Yet, [research] has shown that one out of four hamburgers that are brown has actually not reached sufficient temperature to destroy *E.coli* 015787," she said. Further, even under controlled and observed testing, volunteers have risked cross-contamination of their food by not washing their hands as frequently as needed. "As many as . . . 60 percent are not following proper hand-washing procedures," she said. "As many as 30 percent don't cook or cool adequately, again placing themselves and their fam-



Bruhn

The ICGFI's framework for food irradiation and regulation has been adopted by Asian countries and through Africa, Latin America, the Asian Pacific and the Near East, said Roberts.

terested in seeking to make a petition to have a process approved," he said. The codes and monographs include information on food irradiation safety, the behavior of food under irradiation, and on applying new practices.

ICGFI in the 1990s also intensified "information transfer," according to Roberts. Brochures for public consumption were published, and in 1998, a Web site went on line (<www.iaea.or.at/icgfi/>). Roberts urged audience members to consult the site as a starting point for schooling in food irradiation—basic information about the technology, who is doing it, what the regulations are in 50 countries around the world, and the locations of authorized plants. "There are a number of documents [on the Web site] for today's health industry, consumer organizations, and governments to understand and realize what food irradiation is all about," he said.

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illies at risk for food-borne illness.”

Bruhn said that because consumers are aware of food-safety issues, most will accept food irradiation if the advantages of the technology are spelled out. Gender also

The presence of children is a critical factor from a public health point, too, she noted. “If there are children in the household, people are generally more cautious in accepting something new,” she said. “I think

this is a great concern for those of us who are interested in public health. We know that children are among those who are most susceptible to food-borne illness. That is a factor we must consider in developing our messages.”

Bruhn discussed surveys in which consumers were

asked questions about irradiated food products. Based on the way the survey questions were posed, she said, the consumers by a majority favored the availability of such foods. The bottom line, she said, is that “informed consumers will prefer irradiated product. The majority of them will because of the safety benefits it will provide.”

She said it was important to get the word out to consumers that irradiated food is not radioactive, and that testing—on rats, mice, guinea pigs, dogs, monkeys, and rabbits—has shown there are no ill effects from such food.

Then, in a revelation that had to make even the most ardent activist squirm in his seat, Bruhn conveyed information about claims of the alleged presence of chemical by-products formed in irradiated foods called cyclobutanes (or 2-ACBs). In the literature passed out before the meeting by Public Citizen, that group claimed that 2-ACBs were shown to promote the carcinogenesis process in rats, and to cause genetic damage in rats and in human cells, as based on recent research done by German scientists. But in reality, as related by Bruhn, the lead German researcher had refuted the claims of Public Citizen. The researcher stated that Public Citizen had taken the German research, translated it to English, and then made the translation fit the argument that Public Citizen wanted. Said Bruhn: “We have a statement from the [German] professor himself, who said, ‘I want to distance myself from the conclusions the [activists] reached. The [Public Citizen] report contains a number of incorrect statements.’” The researcher’s letter concluded that “the 2-ACBs fed to animals or consumed by humans have shown no adverse affects attributed to the irradiation treatment.”

Bruhn then topped off her presentation by quoting a line from an earlier speaker: “The ill-effects of irradiated foods are unknown because no one has been able to find them.”—*Rick Michal* **NW**

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plays a factor in how people accept food irradiation. “Men are more positive than women,” she said. “This is not unique to irradiation. This is true for any food safety issue. Women are generally more protective, more hesitant about new technologies, and more concerned about any potential risks.”

Socioeconomic levels also are “major” factors in influencing acceptance. “Consistently, we can find greater acceptance of new technologies in upscale markets,” she said. “People are generally more positive toward anything new in an upscale market.”