

BETTER SAFE THAN SORRY

Irradiation could be answer to beef safety assurance concerns — if the beef industry can overcome the negative public perception and high cost associated with it.

BY ANGIE STUMP

In January 1993, the Dolan sisters of Seattle became deathly sick after eating a cheeseburger at a newly opened Jack-in-the-Box restaurant in their neighborhood. During that month in the western United States, four people died and more than 350 became seriously ill after eating beef that contained the invisible pathogen, *Escherichia coli* O157:H7, also known as E. coli.

Following this scare, many Americans

and a number of activist groups voiced their concerns about meat safety. The beef industry reacted by taking steps to improve beef safety and inspection, as well as to educate restaurant workers and consumers on safe handling, preparation and cooking of beef products.

Even with the best education and inspection systems, our industry cannot guarantee the consumer a 100-percent safe beef product.

A growing number of meat scientists believe it is

possible to come close, however, if the beef industry would implement a technology tool called irradiation. Although the beef industry and USDA has been reluctant to adopt this technology, new research studies and peer pressure from the pork and poultry industries are forcing the beef industry to take a serious look at irradiation.



What is Irradiation?

Irradiation is simply the use of a form of energy (ionizing radiation) to treat food products for the control of microorganisms and insect infestations, and to inhibit sprouting and to delay ripening.

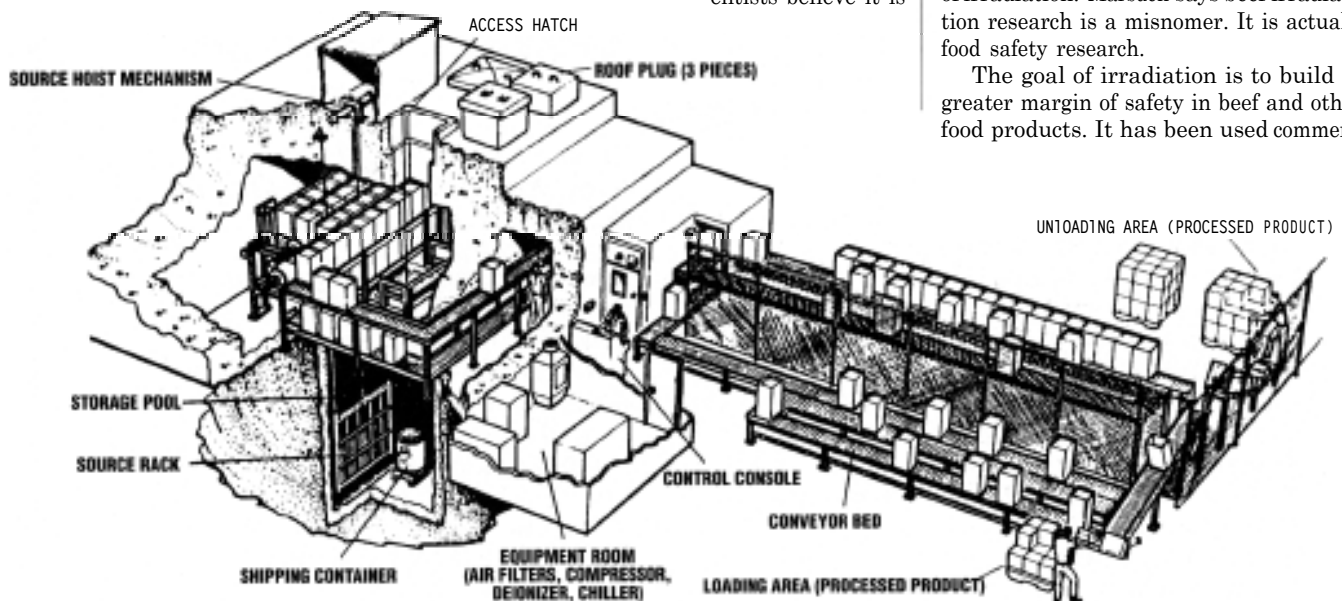
"It provides the framework for combating E. coli in beef and providing a safer and better quality beef," says James Marsden, regents professor of meat science at Kansas State University.

In January 1995 the Food Safety Inspection Service (FSIS) issued regulations on the beef industry mandating microbial testing of fresh meat.

"If the measures put on the beef industry were effective we'd support them," says Don Kropf, meat scientist at Kansas State University. "But I think we can do better than the physical trimming and washing of beef to kill pathogens."

One way Kropf and other meat scientists believe to be more effective is the use of irradiation. Marsden says beef irradiation research is a misnomer. It is actually food safety research.

The goal of irradiation is to build a greater margin of safety in beef and other food products. It has been used commer-



A radionuclide commercial automatic tote-box irradiator. Meat products are brought in on a conveyor belt. The cobalt is kept in a 25-foot pool. The speed and time the product is in with the cobalt equals the amount or dose of irradiation. (Illustration courtesy of Atomic Energy of Canada Ltd.)

cially in poultry products since 1990 and pork products for trichina control since 1985. Fruits and vegetables are also irradiated, but it has not been approved for beef, lamb or fish.

Irradiation is needed because of the increasing requirement to reduce pathogens in raw food products and because of the mishandling of perishable food products.



Types of Irradiation

Food irradiation is an accepted process for various foods in 40 countries. The process is comparable to pasteurizing milk.

In the United States, approximately 40 large-scale radiation facilities are now operating to treat non-food products. Three sources of ionizing radiation are available. They include:

- Gamma irradiation\Cobalt 60 – a radioactive material that does not transmit radioactivity to treated foods.
- X-rays – This form of concentrated radiation penetrates deep into the product, but is not as efficient as the other sources.
- High energy electron beams – very efficient but have a low level of penetration.

Iowa State University has a \$6 million electron accelerator that subjects products to electronic pasteurization. Irradiation by electron beams and X-rays is also possible at Iowa State.

The use of irradiation eliminates trichina in pork and decreases or eliminates bacterial pathogens, E. coli, and salmonella in raw beef, pork and poultry.

Using irradiation gives food a greater image of safety and reality, Marsden says.



Research Findings

In 1981 the World Health Organization stated that no toxicological hazard resulted from consuming food irradiated at up to 10 kiloGrays (kGy).

Since then the American Meat Institute has funded a three-part study of the irradiation of meat. The first study was a consumer survey of how they perceived the use of irradiation. The study found that irradiation ranks with other technologies like pasteurization.

"There was a fairly wide acceptance of food irradiation," Marsden says.

Determining the levels of radiation to kill pathogens in raw meat was the second study. It established the D levels, or

**TABLE 1 Gallup Poll
Concern About Safety of Food**

	Total
(Base)	1005 people
Very Concerned	43%
Somewhat Concerned	36
Not Too Concerned	15
Not At All Concerned	6
Don't Know	*
Total	100

* Less than 0.5%

how many (kGy) of radiation is needed to kill certain pathogens.

Marsden explains the experiments found that very low levels of irradiation are needed and that the levels already acceptable for poultry would work for beef.

The third phase of the study was to evaluate the quality of product after irradiation. This study, conducted at Kansas State University, measured the palatability, color and product life of raw and pre-cooked ground beef patties and steaks exposed to low-dose irradiation in vacuum and aerobic packaging.

Expert sensory panelists did not find undesirable flavor, aroma or texture traits comparing the irradiated to the control samples.

A final study, solving the logistical problems of irradiation and to determine

how it can be used effectively and efficiently in the processing industry is in the proposal stage.

Marsden says the current proposal is to use an electronic pasteurization process, like color TV, with the power source being electricity, "We are trying to develop the most cost efficient and consumer friendly way to irradiate foods," he says.

The research done on beef irradiation has been funded by checkoff dollars. Producers' commitment to food safety has been the driving force for the project.



The Future of Food Irradiation

"Whether or not irradiation is done in the future," Marsden says, "the work that has been done has set the stage." It will determine at what

**TABLE 2 University of Georgia
Concerns of Participants About Food Safety Issues**

	% Responding No Problem	% Responding Extremely Serious Problem	Mean Response
Pesticide Residues	16.9	55.4	3.72
Animal Drug Residues	20.2	52.5	3.58
Growth Hormones	13.1	58.6	3.72
Food Additives	26.5	42.8	3.29
Bacteria	15.3	51.0	3.62
Irradiation	38.0	26.0	2.90
Naturally Occurring Toxins	42.4	26.3	2.90

BETTER SAFE THAN SORRY

levels and what type of packaging.

Irradiation has been proven to kill bacterial pathogens in meat and increase the shelf life, thereby decreasing waste. Still, many questions remain unanswered, including the high cost of irradiation. Estimates on cost of irradiating in the U.S. food industry is at 4 cents to 8 cents a pound. In France the cost is 1 cent per pound.

Another question is the proper packaging of irradiated products. Kropf says they are still looking for the right packaging system to use. More research is needed, along with cooperation with regulatory people who work with packaging.



Consumer Perception

Many different ideas about irradiation exist. Kropf says consumers need to be educated on why irradiation is done, how it works and its effects. Research shows that after educational intervention, the percentage of consumers purchasing irradiated ground beef increased from 51.5 percent to 70.9 percent.

Consumers are beginning to accept irradiated foods. In the United States, irradiated food has been sold continuously in four retail stores for more than three years. The success of these stores clearly shows consumers will buy irradiated food.

"Meat has so much to do with good nutrition," Kropf says. Many people in nursing homes and hospitals need it in their diets and they need more assurance that it is safe.

Kropf says we don't want another incident to occur like the Jack-in-the-Box outbreak. In order to prevent that, we need to be able to assure safety to our consumers.

"Everybody has a role in the safety of beef," he says. "It needs to be delivered to our consumers safe and then we need to be sure that it's handled safely in the home."

AJ



Ground beef is prepared for irradiation treatment at a Kansas State University meat science lab by research assistants Sharon Luchsinger and Claudia Garcia.

Researcher Goes Full Circle with Irradiation

Irradiation is not a new technology.

Don Kropf, meat scientist at Kansas State University, was in charge of an irradiation project during his military service back in the 1950s, when food irradiation research was initiated. He even served on taste panels for irradiated foods.

The original intent of food irradiation was sterilization – to remove all bugs and then develop a room temperature stable product. Kropf says they did have some problems with irradiation levels in meat early on, including burnt and animal hair flavors.

Kropf never dreamed he'd come back to this research 40 years later. He says irradiation technology has changed since he was in the military. For example, the original dose levels were approximately 20 times higher than used today.

When giving a presentation on irradiation, Kropf always tells his audience, "I do not glow in the dark. Irradiated meats are not radioactive."



Meat scientist Don Kropf (center) is conducting an irradiation research project at Kansas State University. Beef products are being evaluated for quality, palatability, color and product life after irradiation exposure.