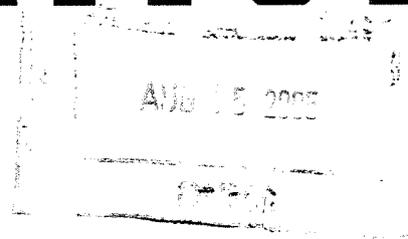


IRRADIATION

by John Henkel



A Safe Measure For Safer Food

BEEF is one of the U.S. food industry's hottest sellers—to the tune of 8 billion pounds a year, according to trade figures. Whether at a fast-food meal, a dinner on the town, or a backyard barbecue, beef is often front and center on America's tables.

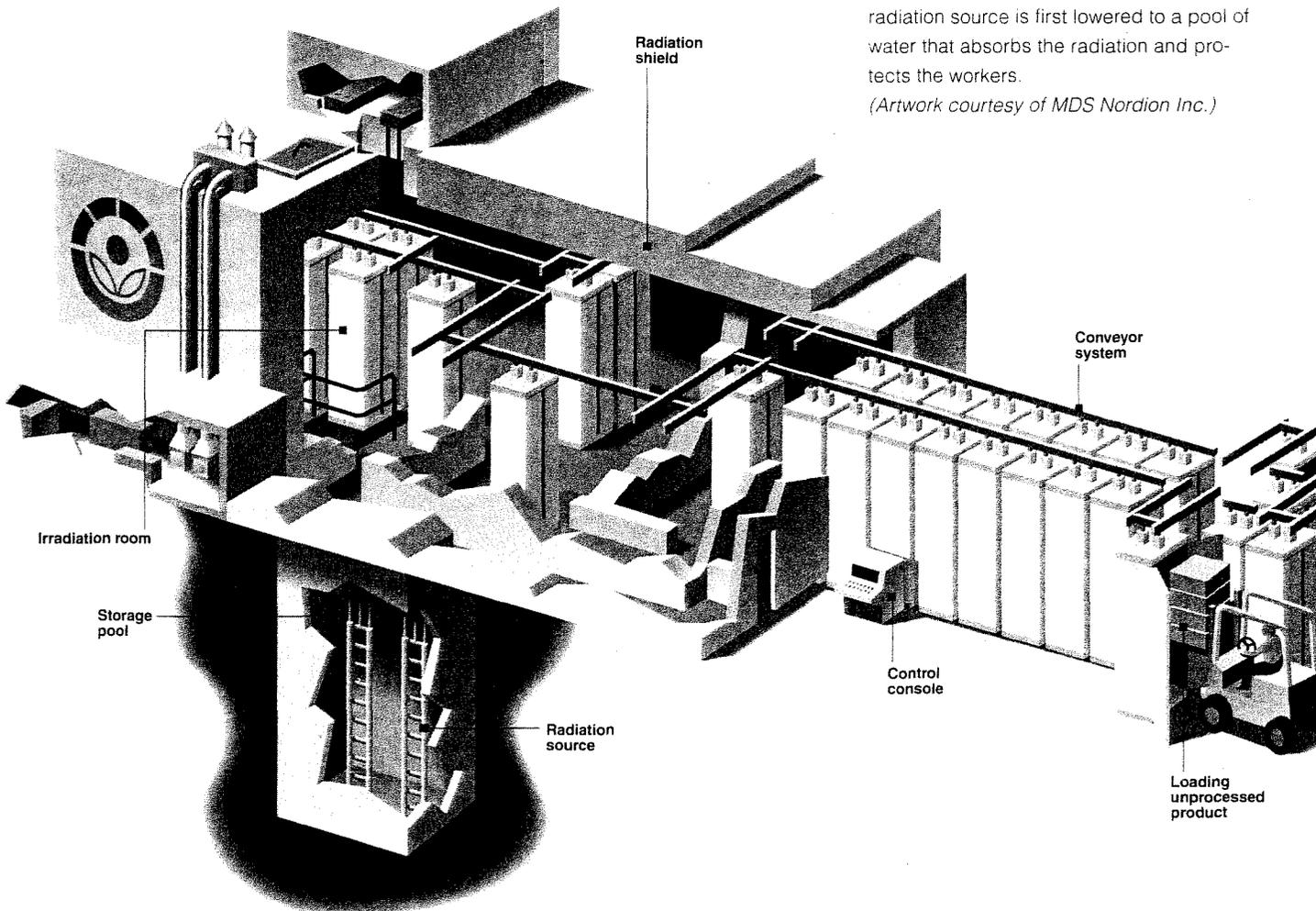
But in recent years, beef, especially ground beef, has shown a dark side: It can harbor the bacterium *E. coli* O157:H7, a pathogen that threatens the safety of the domestic food supply. If not properly prepared, beef tainted with *E. coli* O157:H7 can make people ill, and in rare instances, kill them. In 1993, *E. coli* O157:H7-contaminated hamburgers sold by a fast-food chain were linked to the deaths of four children and hundreds of illnesses in the Pacific Northwest.

In 1997, the potential extent of *E. coli* O157:H7 contamination came to light when Arkansas-based Hudson Foods Inc. voluntarily recalled 25 million pounds of hamburger suspected of containing *E. coli* O157:H7. It was the largest recall of meat products in U.S. history.

Nationally, *E. coli* O157:H7 causes about 20,000 illnesses and 500 deaths a year, according to the

At a typical irradiation facility like the one below, an automated conveyor system moves products into a shielded room for irradiation treatment and then removes them. If employees need to enter the room, the radiation source is first lowered to a pool of water that absorbs the radiation and protects the workers.

(Artwork courtesy of MDS Nordion Inc.)



federal Centers for Disease Control and Prevention. Scientists have only known since 1982 that this form of *E. coli* causes human illness.

To help combat this public health problem, the Food and Drug Administration, in December 1997, approved treating red meat products with a measured dose of radiation. This process, commonly called irradiation, has drawn praise from many food industry and health organizations because it can control *E. coli* O157:H7 and several other disease-causing microorganisms. As with other regulations governing meat and poultry products, irradiation will be authorized when the U.S. Department of Agriculture completes its implementing regulations.

Though irradiation is the latest step

toward curbing food-borne illness, the federal government also is implementing other measures, which include developing new technologies and expanding the use of current technologies.

A Long Safety Record

FDA's red meat approval added another product category to the already lengthy list of foods the agency has approved for irradiation since 1963. These include poultry, fresh fruits and vegetables, dry spices, seasonings, and enzymes.

As part of its approval, FDA requires that irradiated foods include labeling with either the statement "treated with radiation" or "treated by irradiation" and the international symbol for irradiation, the radura (pictured above). Irradiation

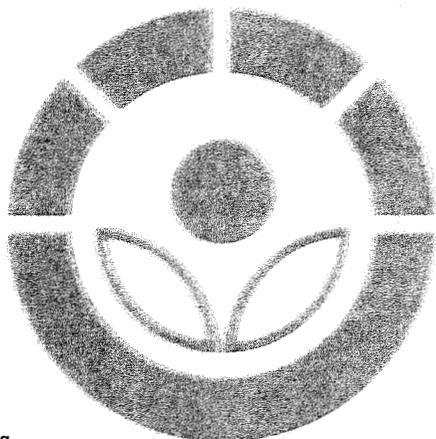
labeling requirements apply only to foods sold in stores. For example, irradiated spices or fresh strawberries should be labeled. When used as ingredients in other foods, however, the label of the other food does not need to describe these ingredients as irradiated. Irradiation labeling also does not apply to restaurant foods.

FDA has evaluated irradiation safety for 40 years and found the process safe and effective for many foods. Before approving red meat irradiation, the agency reviewed numerous scientific studies conducted worldwide. These included research on the chemical effects of radiation on meat, the impact the process has on nutrient content, and potential toxicity concerns.

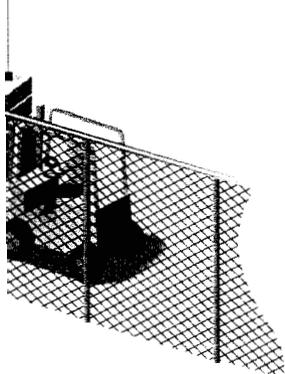
In this most recent review and in pre-

Irradiating food is similar to passing luggage through an airport scanner.

Berry Successful Irradiation



Inloading
processed
product



The huge sign hanging over the rows of boxed strawberries left little doubt for Chicago-area grocery shoppers that the produce before them was something new and unusual.

Not that the berries looked any different. But the massive poster above them bore a message in mammoth letters that might as well have been neon: "Treated by irradiation for freshness and health." To the store owner's surprise, patrons flocked to the new product, buying nine times more of it than of standard strawberries.

That scene took place in 1992 at Carrot Top, one of the first retail stores to venture into the then-uncharted realm of irradiated foods. The decision to stock radiation-treated berries in the store, however, came slowly. Owner Jim Corrigan spent about a year reading up on the irradiation process and passing details to his regular customers through periodic newsletters. He says informing customers before the store actually stocked the new products helped allay possible fears.

When the Florida-grown strawberries finally arrived, along with irradiated oranges and grapefruits, shoppers were well acquainted with the process and responded with sales.

Today, Corrigan remains enthusiastic. He says irradiation ensures that strawberries will be free of insects and will keep longer—in some cases, up to three weeks, versus three to five days for conventional berries.

"One of our ways of rating the freshness of strawberries is to examine the small hairs that grow by the seed," he says. "If they are standing up and plentiful, the strawberries are still fresh. [With irradiated strawberries] we see a lot of that after three weeks."

The products remain steady sellers, and Corrigan has since added irradiated onions and papayas to his stock. ■

—J.H.

vious reviews of the irradiation process, FDA scientists concluded that irradiation reduces or eliminates pathogenic bacteria, insects and parasites. It reduces spoilage, and in certain fruits and vegetables, it inhibits sprouting and delays the ripening process. Also, it does not make food radioactive, compromise nutritional quality, or noticeably change food taste, texture or appearance as long as it's applied properly to a suitable product.

Health experts say that in addition to reducing *E. coli* O157:H7 contamination, irradiation can help control the potentially harmful bacteria *Salmonella* and *Campylobacter*, two chief causes of food-borne illness. The Centers for Disease Control and Prevention estimates that *Salmonella*—commonly found in poultry, eggs, meat, and milk—sickens

FDA's approval of red meat irradiation adds to a lengthy list of foods approved for the process, including poultry, fresh fruits and vegetables, and dry spices.

as many as 4 million and kills 1,000 per year nationwide. *Campylobacter*, found mostly in poultry, is responsible for 6 million illnesses and 75 deaths per year in the United States. A May 1997 presidential report, "Food Safety from Farm to Table," estimates that "millions" of Americans are stricken by food-borne illness each year and some 9,000, mostly the very young and elderly, die as a result.

FDA officials emphasize that though irradiation is a useful tool for reducing food-borne disease risk, it complements, but doesn't replace, proper food handling practices by producers, processors and consumers.

Limited Success So Far

Though irradiation would appear to have much going for it, retail outlets have been slow to carry irradiated foods. This, experts say, is partially because many store owners and food producers fear consumers won't buy the products based on misgivings about radiation in general.

But some stores have plunged in anyway—with limited success. Carrot Top, a Chicago-area grocery market, was one of the first to carry irradiated fruits (see "Berry Successful Irradiation"). Owner Jim Corrigan says the products have been selling steadily since 1992. Other stores—mostly small, independent markets—have followed suit, offering irradiated vegetables, fruits and poultry to a modest, but loyal, group of irradiation-savvy customers.

Because irradiated red meat is not yet on the market, it remains to be seen if consumers will buy products such as irradiated ground beef—or if large food processors will even offer it. Irradiated products sold to date have cost slightly more than their untreated counterparts because of the extra step irradiation adds to food processing. But in the future, these costs could be offset by improved

shelf life and increased consumer demand, according to food trade groups.

Major food companies such as poultry processors, meat packers, and grocery chains have yet to embrace irradiation, not only because of perceived consumer attitudes, but also due to logistics. Food Technology Service Inc., in Mulberry, Fla., is the only irradiating facility dedicated solely to treating agricultural products. More than 40 other facilities nationwide primarily handle sterilization of medical supplies, though these plants also can irradiate food products. In fact, it was a New Jersey-based medical irradiation company, Isomedix Inc., that petitioned FDA to approve red meat irradiation.

Beyond physical distances and lack of facilities, sheer product volume makes it unlikely that irradiation will be widespread anytime soon. The domestic poultry trade, for instance, processes about 25 billion pounds per year, according to industry figures. Says Kenneth May, spokesman for the National Broiler Council, which represents poultry producers: "We think [irradiation is] a process that will work. But for practical purposes, we just don't see anything happening with it in the near future." He adds, however, that if the public really wants an irradiated product, the poultry industry will find a way to deliver it.

Will Consumers Accept It?

Before irradiation can really take off, the public must "warm up" to a method associated with nuclear energy, a source that carries its share of negative perceptions. George Pauli, Ph.D., FDA's food irradiation safety coordinator, compares irradiation to milk pasteurization, another decontaminating process that dramatically curbed disease but took decades before achieving public acceptance. "When the public finally sees a need for irradiation and realizes its value, I think people will accept it,

maybe even demand it," Pauli says. "But you have to give them time."

A Louis Harris poll released in 1986 found that 76 percent of Americans considered irradiated food a hazard. But later studies have shown that consumer attitudes can be changed through education.

In 1995, researchers at the University of Georgia reported that 87.5 percent of consumers had heard of irradiation but knew little about it. So the university set up a "simulated supermarket setting" and labeled irradiated products, put posters at the point of sale, and developed a slide show explaining irradiation. "Our goal was to see which one of those techniques was most effective in changing people's attitudes," says Kay McWatters, agricultural research scientist and one of the study authors.

The study found that any kind of education helps convey the benefits of irradiation, McWatters says. "But the one that turned out most effective was the slide show, because visual images and [narration] are much more attention-getting than just a static label or poster."

After the study's education strategy, about 84 percent of participating consumers said irradiation is "somewhat necessary" or "very necessary." Fifty-eight percent said they would always buy irradiated chicken if available, and 27 percent said they would buy it sometimes.

Another study in 1997 by the Food Marketing Institute had similar results. After receiving education about the process, 60 percent of those in the study said they would buy irradiated foods.

Carrot Top owner Corrigan also discovered this on a small scale after sending his regular customers information about irradiation in periodic newsletters.

Luggage and Milk

Other studies, however, show that many consumers still question if irradiation is safe. They wonder if the process

Many spices are irradiated, which eliminates the need for chemical fumigation to control pests.

transfers radiation to the product or if it causes chemical changes in the food that might be hazardous. Even the word "irradiation" is scary to some, carrying images of atomic explosions or nuclear reactor accidents.

But as long as radiation is applied to foods in approved doses, it's safe, says FDA's Pauli. Similar to sending luggage through an airport scanner, the process passes food quickly through a radiation field—typically gamma rays produced from radioactive cobalt-60. That amount of energy is not strong enough to add any radioactive material to the food. The same irradiation process is used to sterilize medical products such as bandages, contact lens solutions, and hospital supplies such as gloves, sutures and gowns. Many spices sold in this country also are irradiated, which eliminates the need for chemical fumigation to control pests. American astronauts have eaten irradiated foods since 1972.

Irradiation is a "cold" process that gives off little heat, so foods can be irradiated within their packaging and remain protected against contamination until opened by users. Because a few bacteria can survive the process in poultry and meats, it's important, Pauli says, to keep products refrigerated and to cook them properly.

Irradiation interferes with bacterial genetics, so the contaminating organism can no longer survive or multiply. Although chemicals called radiolytic products are created when food is irradiated, FDA has found them to pose no health hazard. In fact, the same kinds of products are formed when food is cooked.

Praises and Protests

Though irradiation has its share of detractors, many prestigious organizations endorse it, including the World Health Organization, the International Atomic Energy Agency, the American Medical

Approved Uses of Irradiation

FDA approved the first use of irradiation on a food product in 1963 when it allowed radiation-treated wheat and wheat flour to be marketed. In approving a use of radiation, FDA sets the maximum radiation dose the product can be exposed to, measured in units called kiloGray (kGy). The following is a list of all approved uses of radiation on foods to date, the purpose for irradiating them, and the radiation dose allowed.

Food	Approved Use	Dose
Spices and dry vegetable seasoning	decontaminates and controls insects and microorganisms	30 kGy
Dry or dehydrated enzyme preparations	controls insects and microorganisms	10 kGy
All foods	controls insects	1 kGy
Fresh foods	delays maturation	1 kGy
Poultry	controls disease-causing microorganisms	3 kGy
Red meat (fresh)	controls spoilage and	4.5 kGy
(such as beef,	disease-causing	7 kGy

Radiolytic products, formed when food is irradiated, are similar to those formed by cooking food. FDA has found them to be safe.

Radiation's Positive Side

Scientists first studied radiation as a way to improve food products in the 1930s, but research didn't begin in earnest until just after World War II. At that time, the U.S. Army was seeking a means to lessen dependence on refrigeration and replace K rations and other preserved products that troops used in the field.

In the early 1950s, the Atomic Energy Commission (now part of the U.S. Department of Energy) explored food irradiation as part of President Eisenhower's "Atoms for Peace" program. This research differed from the Army's in that it examined the effects smaller radiation doses had on certain fruits and vegetables. The end result was not a sterile product but one where insects would be killed or sterilized. Because this produce still could spoil, refrigeration was needed. But at least potentially harmful insects would not cross state or national borders.

Such research, augmented by studies from other countries, established that the most important benefit from irradiation could be the control of disease-causing pathogens and that the maximum practical and effective dose depended on the food and the purpose for irradiating. ■

—J.H.

Association, and the American Dietetic Association. Trade groups such as the National Meat Association, the Grocery Manufacturers of America, and the National Food Processors Association also support irradiation.

However, some groups have given irradiation a thumbs down. Consumer activist Jeremy Rifkin, president of the Pure Food Campaign, says more attention should be placed on raising healthier livestock, which he says would reduce pathogens and make irradiation unnecessary. The Center for Science in the Public Interest calls irradiation "expensive" and "an end-of-the-line solution to contamination problems that can and should be addressed earlier."

But with so many influential organizations backing irradiation, along with concerns about rising numbers of disease cases, the stage is set for the process to pick up momentum, despite negative sentiments, supporters say. First, however, says FDA's Pauli, the food industry needs to get more irradiated products into the marketplace. "Most people in this country haven't even seen an irradiated food," he says. "When products start appearing, then the public can make up its mind." ■

John Henkel is a staff writer for FDA Consumer.

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