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College of Agricultural Sciences

### From the Department of Dairy and Animal Science

This regular column from Penn State's Department of Dairy and Animal Science features the research findings, student opportunities, and reports on other important topics generated in the Department. The back issues of the column are archived on *Lancaster Farming's* Internet [www.lancasterfarming.com](http://www.lancasterfarming.com) home page. Look for them.

#### THE CASE FOR IRRADIATING MEAT AND POULTRY

William R. Henning  
Extension Meat Scientist  
Penn State

The meat industry continues to be under pressure to produce products that are essentially free from bacteria that can cause illness.

Even though a great deal of progress has been made in reducing pathogens and spoilage bacteria on meat and poultry, it is still not free from pathogens. In fact, increased testing frequency and improved recovery and testing methods have led to more pathogens being found and more recalls of meat products.

There is only one method capable of removing essentially all pathogens. Although meat processors have adopted many new intervention methods, ionizing radiation (irradiation) of meats is the only one that can provide safe food to the consumer, practically eliminating pathogens.

Although research on meat irradiation has been conducted in the U.S. since 1953, the final rule approving irradiation for all raw meats became effective Feb. 23, 2000. To date, only one new irradiation facility has been built to accommodate treatment of meat products.

This facility, in Souix City, Iowa, has a commitment from several large meat processors to irradiate ground beef patties. Many in the food industry

thought that by now, consumers would be faced with purchasing decisions about irradiated meats, but this has not happened at the rate expected. Only one retailer in western Pennsylvania and one door-to-door distributor (Schwann) is actively marketing irradiated ground beef patties.

Ionizing radiation can improve the safety, quality, and variety of foods available to consumers. Although other processing measures can reduce bacteria levels in raw foods, irradiation is more effective because it can eliminate pathogens such as *E. coli* 0157:H7, which is good news for many consumers who don't care for their burgers overcooked. It also would give a margin of safety for high-risk groups such as hospitals, nursing homes, schools, and families with small children.

Unlike cooking, which also eliminates pathogens, irradiation does not change the fresh character of the product. It also has the benefits of delaying ripening of fruits and preventing sprouting in vegetables.

Foods and other consumer products are treated by exposing the product to a source of gamma rays. Gamma rays are similar to other energy rays such as X-rays, microwaves, and even radio waves. The difference is in the length of the wave that affects its ability to directly change cell functions or components.

The energy of the wave breaks chemical bonds in the DNA

stands of organisms such as bacteria and insects so they cannot multiply and eventually die. Irradiation works mostly by indirect methods by forming free radicals from water (O and OH). The OH radicals are responsible for about 90 percent of the disruption the DNA in the living cells present. Many production factors also affect the effectiveness of the irradiation treatment: growth phase of the bacteria, temperature, water and fat content of the food, and the presence of ingredients such as salt.

The process is rather simple. The object being treated is passed through a protected area where it is bombarded with gamma rays. The rays pass through the product and the product is rendered safe. The two methods of producing gamma rays are either a radioactive "source" such as cobalt or cesium or it is an electrically generated "beam" in a linear accelerator.

Electron beams are similar in many ways to X-rays but produce more energy and have a more destructive effect on bacteria. In some cases, electron beam and X-rays are used in combination to increase the effect of the electron beam.

The cobalt "source" is much less expensive to construct initially, but this is offset by the cost of disposing of the radioactive waste. Electron beam plants are more expensive to construct and they do not penetrate the products as well as the source type.

Normally, the electron beam will penetrate only about two-inches, which means a box of frozen beef patties must be treated from both sides.

The first research on irradiation of meats began in the late 1800s. The first patent was issued for irradiation of meats in 1921.

In 1953, the U.S. army became interested in a method of preserving meat for troops in the field. They opened a research facility for testing irradiation at Natick, Mass. Later, food was ir-

radiated for the astronauts in the space program.

At this point, there are two processing plants designed to treat foods with ionizing radiation. One in Plant City, Fla., processes some fruits and vegetables using a cobalt source. Other plants are operating in Canada and Europe.

Today a few foods such as wheat, potatoes, strawberries, and many consumer products are being treated by ionizing radiation. Nearly all spices have been treated with irradiation to kill insects and other parasites. It was found that this treatment is both effective and safer than the old method of using ethylene oxide.

Many fruits and vegetables are irradiated for such reasons as delayed ripening, reduced sprouting, and removal of insects. The use of irradiation is widely used in medical/pharmaceutical products. Some examples are medical supplies such as alcohol wipes, cotton balls, adhesive bandages; contact lenses/cleaning solutions; eye droppers, and ointments; dental supplies; drug mixing/dispensing systems; surgical instruments, surgical gloves, and gowns; syringes and needles; thermometers/covers; topical ointments; and animal vaccines.

In addition, many consumer products are typically sterilized by irradiation such as baby bottles and nipples, pacifiers, and teething rings; cosmetics; food packaging; pet food and rawhide dog toys; and feminine hygiene products.

What about the safety of irradiating foods? Food officials around the world have given the stamp of approval to irradiation, even consumers in Europe consume many foods which have been treated with irradiation.

One issue that has been raised by some opponents is the question of the food safety. First, the product is not radioactive. Even though they were treated with gamma rays, they were never radioactive. The effects on meat quality, another frequent concern, are minimal. Because the dosage levels of treatment are

very low, there is no discernible changes in flavor or aroma at the lower levels approved today.

The processes approved for irradiation of meat products does not sterilize the product. It must still be properly handled before and after treatment. Some have used the term "electronic pasteurization" to describe the process more accurately it is pasteurization, not sterilization, and it is being done through electron beams, not exposed to radioactive materials.

So, if this process really works and if it is really that safe, why hasn't it been more widely adopted? Many food retailers across the country have made irradiated ground beef available to consumers but have not advertised it. Why? Fear of being picketed by consumer groups.

Many consumer advocate groups such as Center for Science in the Public Interest (CSPI) have voiced strong opposition to the process. Their claim is that meat processors will relax other food safety practices if they have a final process step, which kills pathogens. Of course, this is untrue as meat processors view this process as another means to eliminate pathogens from their products.

Other, more radical "consumer" groups have threatened store pickets and boycotts. It seems that food retailers and fast food restaurants have been intimidated by threats of picketing by a few radical groups.

One fast food spokesperson once said, prophetically, that everyone wants to be the first to be second to use irradiated meats. What he is saying is that no one wants to be subjected to negative publicity and public scrutiny of being first to adopt this technology. After the initial onslaught of criticism and pickets, the next users of the product will have it easy.

If consumers are not given the facts about the benefits of the treatment of meat with low doses of ionizing irradiation, they are likely to have enough concerns to avoid purchasing it.

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