Foodborne illness has been and continues to be a concern for people in the United States and the world. Although thorough cooking will destroy any bacteria found on poultry or poultry products, the improper handling and cooking of raw poultry has been linked to cases of foodborne illness.

Several kinds of bacteria are commonly found on poultry and poultry products, including bacteria that typically cause spoilage of the food and bacteria that cause disease. As an additional measure to help control these types of bacteria on poultry, the U.S. Department of Agriculture (USDA) in 1992 approved the use of ionizing radiation (irradiation) for raw, packaged poultry. This rule allows packaged fresh or frozen poultry to be irradiated with the smallest, most practical dose of irradiation to control bacteria.

Irradiation decreases or eliminates many of the bacteria that typically cause food spoilage; more important for the consumer, it also reduces or eliminates many of the bacteria that cause disease.

The U.S. Food and Drug Administration (FDA) and the Joint Expert Committee on Food Irradiation, which includes representatives from the World Health Organization and the International Atomic Energy Agency, agree that irradiation of poultry products is safe.

What is irradiation?

Food irradiation is the process of exposing food or food products to high-energy electromagnetic waves. All of the colors that we can see are made up of the same types of energy—waves in the electromagnetic spectrum. And just as the white light that comes from the sun can be broken down into the colors of the rainbow, the entire spectrum can be broken down into different types of waves.

Three types of ionizing radiation are used to irradiate food: gamma rays, X-rays, and electron beams. Most people have had at least one X-ray in their lifetime. Just as these X-rays do not make people radioactive, the use of irradiation does not make food products radioactive.

Although machinery has been developed that can generate both electron beams and X-rays, gamma rays are produced only by radioactive substances called radioisotopes.

Two isotopes are commonly used for food irradiation: cobalt-60 and cesium-137. In addition to being used for food safety, X-rays and the gamma rays from cobalt-60 are used extensively in the medical industry to sterilize medical supplies.

During the irradiation process, pre-packed food items are exposed to the energy source. Even though there may be differences in the type of energy that is used, all of the energy passes through the food. During this passage, some of the...
energy disrupts the normal activities of the bacteria cells. This disruption either kills the cell outright or makes it impossible for the cell to reproduce, thereby decreasing the number of bacteria on the product.

Because this energy passes through the food product, the food is not cooked at the doses that are approved for food irradiation. Food irradiation is not the same as microwave cooking. A microwave uses energy waves that have a longer wavelength than those of irradiation. Although these longer wavelengths have lower energy, some of that energy heats up the water molecules in the food, thereby heating the food.

Food irradiation is considered a “cold process” that does not significantly increase the temperature of the food being processed. Therefore, the food remains fresh and uncooked.

**How does irradiation help?**

Foodborne illness is generally caused by bacteria such as *Salmonella* spp., *Listeria monocytogenes*, *Campylobacter jejuni*, *Clostridium perfringens*, and other bacteria or their by-products.

In an estimation of the effectiveness of irradiation, the Food Safety and Inspection Service (FSIS) of the USDA found that irradiation of poultry with approved doses will eliminate 99.5 percent to 99.9 percent of *Salmonella* organisms on the treated food. This is a large decrease. Because the approved doses of irradiation do not sterilize the treated food, it is possible that some bacteria will remain. However, if the number of viable bacteria on a product is decreased greatly, the opportunity for that organism to cause disease is statistically reduced.

Because some bacteria may remain on the product, the food must still be handled, refrigerated, and cooked properly to prevent the product from being contaminated again or cross-contaminated by other foods or food preparation surfaces.

**Is irradiation used in the U.S.?**

Although irradiated poultry is sold in a few U.S. markets, most consumers have been slow to accept irradiation as an alternative to chemical antimicrobial treatments.

Spices and other seasonings that have been treated with irradiation have been on the market since the 1950s and are still available.

Irradiation has been used to treat fruits such as strawberries, grapefruit, and oranges, and these fruits have been test-marketed successfully in the United States. The reason that most consumers have approved these uses is that irradiation extends the shelf-life of these fruits.

**What types of poultry products can be irradiated?**

The USDA-FSIS rule allows for irradiation of retail and wholesale packages of fresh or frozen uncooked poultry. This includes products such as whole birds, cut-up birds, ground poultry meat, and hand-boned and skinless poultry products.

**What are the packaging requirements?**

Poultry must be packaged before it can be irradiated. The packaging material must prevent cross-contamination of the irradiated product by keeping out liquids and microorganisms.

Air must be able to enter the package because an airtight package might produce an anaerobic environment that would be conducive for the growth of *Clostridium botulinum* or *Clostridium perfringens*. Because irradiation does not destroy all of the bacteria, spoilage can still occur before either of these organisms can produce enough toxin to produce disease.

**What are the labeling requirements?**

Irradiated food products are labeled, not as a warning, but as a source of information for consumers. All packages of poultry that are
treated by irradiation carry the green, international radiation sign (the radura, Fig. 1), as well as the words “Treated with Radiation” or “Treated by Irradiation.” The handling statement “Keep Refrigerated” or “Keep Frozen” also must be present.

Only accurate and documented claims, such as “Irradiated to Control Foodborne Bacteria,” can be made about irradiation.

**Figure 1.** The international food irradiation symbol (the radura) has been established to designate food products that have been irradiated.

**What are the benefits of irradiation?**

Irradiation cannot be used on all foods, and it is not a miracle technique that will solve all food-related problems. When it can be used, however, irradiation treatment can significantly lower the risk of foodborne illness, delay spoilage, and reduce chemical residues in foods by replacing some of the chemicals currently used.

Irradiation adds little to the cost of poultry and is part of a comprehensive, industrywide program to reduce the microbial contamination of raw poultry.

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This publication was revised from an earlier version written by Sarah G. Birkhold, former Extension Poultry Specialist.