UNIVERSITY OF FLORIDA

Food Irradiation Slide Show [1]

Mark L. Tamplin [2]

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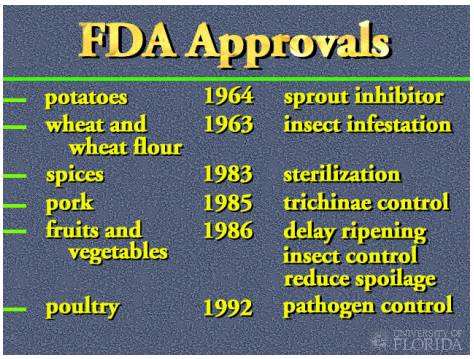
Treating foods with ionizing radiation is a very important application of technology for today's food supply. It is not a new food process. In fact, the first patent for food irradiation was issued in 1905. It has also received more scrutiny than any food process to date. Scientists, public health agencies, medical organizations, and government agencies have evaluated irradiation of foods for over 40 years, and endorse it as a way to provide consumers with a safe and nutritious food supply. No valid studies have shown that it is an unsafe food technology.



In the US, the Food & Drug Administration has approved food irradiation (or "ionizing irradiation") for a variety of products. Wheat and wheat flour were approved in 1963 to kill insects that like to eat and spoil grain products. Potatoes were approved in 1964 to prevent them from forming roots. In 1983, spices were approved to kill insects and bacteria found in raw spices. Pork was approved in 1985 to kill the worm that causes trichinosis. Then in 1992, poultry was approved to kill bacteria, such as salmonella, that can infect humans. Today, the major reason to irradiated food is to kill the dangerous bacteria that infect, and sometimes kill, people.

Numerous organizations endorse food irradiation as a method to prevent foodborne diseases. These include the World Health Organization, the American Medical Association, the United Nations, US Department of Agriculture, and the US Food & Drug Association. These agencies recognize that food irradiation can save people from unnecessary disease and suffering, as well as dramatically increase the shelf-life of otherwise highly perishable products.

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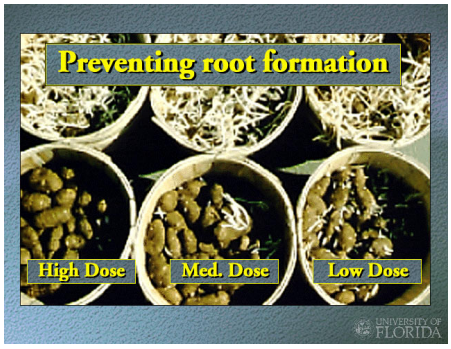
Commercial food irradiation plants are located in many countries around the world. Belgium irradiates more than 10,000 metric tons of food per year; China has been irradiating foods for many years; Japan irradiates potatoes; France and other European countries utilize food irradiation to enhance the safety of foods and decrease spoilage. In many instances, the first use of food irradiation occurred in countries where food cannot be allowed to spoil, while trying to feed millions of citizens.

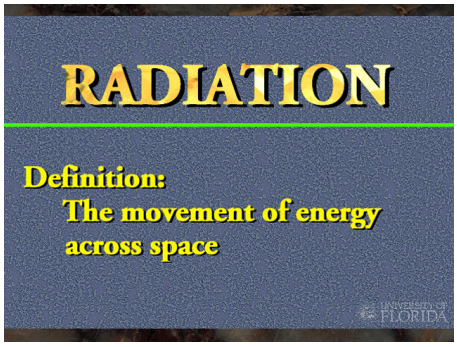


Worldwide, one of the most common reasons to irradiate foods is to prevent root formation. This slide shows low, medium and high doses used to treat potatoes. The potatoes at the top of the slide show what happens when they do not receive any irradiation treatment. This contrasts what happens at various levels shown at the bottom of the slide.

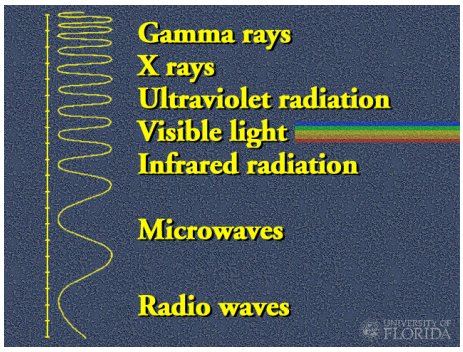
Strawberries can be treated to prevent growth of common fungi that cause rapid spoilage. In fact, irradiated fresh strawberries can be stored and enjoyed for many more days by consumers, and shipped to many distant destinations. This illustrates and important benefit of food irradiation, specifically less dependency and use of pesticides on fruits and vegetables.

Irradiation is also used to kill insects that live on and spoil wheat grains and flours.

Today however, food irradiation has received much more attention because it is needed to kill the bacteria and viruses that are found in foods, and that cause an estimated 9,000 deaths and more than 60 millions foodborne infections in the US. In fact, industry and public health officials admit that food irradiation was the only technology that could have prevented the dangerous *E. coli* O157:H7 bacteria from contaminating the raw hamburger patties linked to hundreds of serious infections at fast food restaurants.

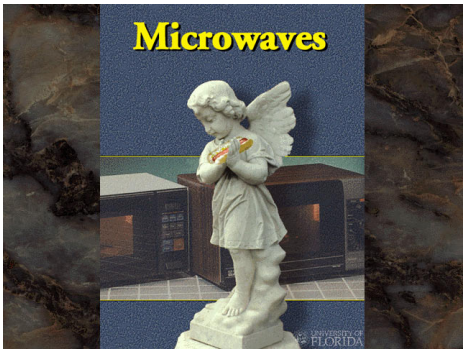


Irradiating foods is not a complex process. Radiation, either from the sun, fire, a toaster, or in a oven, is needed and used by us to grow and cook foods. It is important to understand that radiation is simply the movement of energy across space.

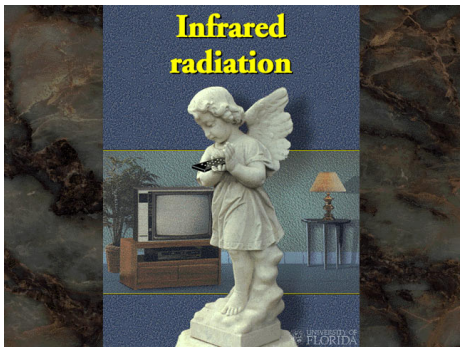


Gamma waves most commonly used to treat foods, are just one of the many forms of energy that we use every day to improve our quality of life.

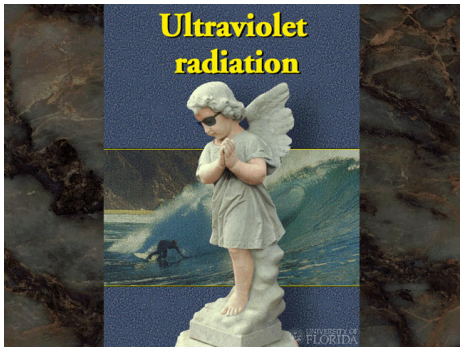
Radio waves have low energy, and are all around us.



Microwaves are more powerful, yet they contact our bodies every day without harm. They are used in microwave ovens, cellular phones, automatic store door openers, police radar guns, and satellite signals that hit all points on earth. Yet, they do not cause us harm because the “dose” of energy is not high enough. Remember, as with all substances, the dose is the important factor, not simply its presence.



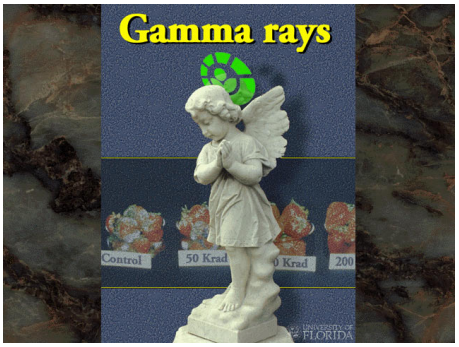
Infrared energy comes from the sun and produces high levels of heat, however we do not commonly think of it as dangerous (unless we get trapped inside a hot car!). Infrared energy also comes from TV channel and stereo remote control devices, garage door openers, and heat lamps.



Ultraviolet radiation is a much stronger form of radiant energy. We know that too much UV can cause our skin to receive a sun burn. In other situations, ultraviolet light can be used to kill germs in operating rooms and food kitchens. Many people recognize UV radiation as a "black light" that make objects glow.

A still more powerful form of energy is X-rays. Like gamma rays usually used for food irradiation, both are "ionizing" forms of energy. This means they are powerful enough to break chemical bonds.

We use X-rays to take fast pictures of our bodies to diagnose diseases, and to diagnose tooth decay or impacted wisdom teeth. We know that X-rays can be dangerous if we receive too much radiation, but we never worry that our teeth will become radioactive. And we know that the X-rays that are used at airports to see through our carry-on luggage will not make our clothes, or an apple in a purse, radioactive.

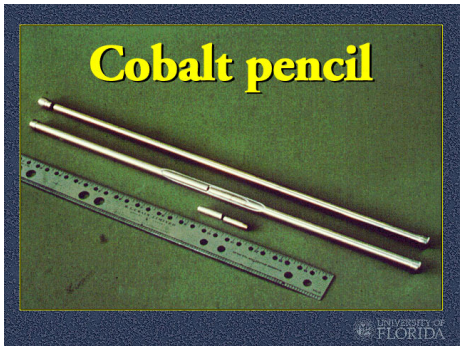


Gamma rays are commonly used at food irradiation plants because they are very powerful, and only small amounts are needed to kill harmful germs on foods. They are also used at the more than 40 existing irradiation plants that already are treating medical supplies, feminine hygiene products, baby bottle nipples, pacifiers, and many more common home and industry products.

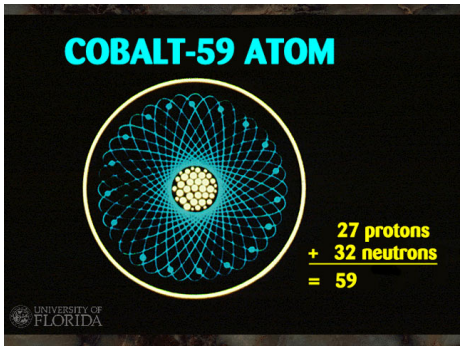
We interact with all of these previously discussed types of radiation every day, but at doses that do not cause our bodies harm. X-rays come from televisions and computers monitors; smoke detectors contain minute amounts of radioactive material to detect fires; gas ranges emit traces of radon gas; cosmic radiation (radiation more powerful than gamma rays) comes from the sun and bombards the earth; and X-rays and gamma rays are used to diagnose diseases and treat cancers.

We also use many products that are treated with the same radiation that is used for foods. Baby bottle nipples, pacifiers, bandaids, hair brushes, jellies, latex products, and feminine hygiene products like tampons and tampex, are irradiated with gamma waves. We know that these common irradiated products will not do us harm, and we realize that because they are sterilized by radiation, it benefits our health. Surprisingly, the government does not require companies to label these products as "treated with irradiation", as they do foods. If they did, many people would probably have much less anxiety with irradiated foods.

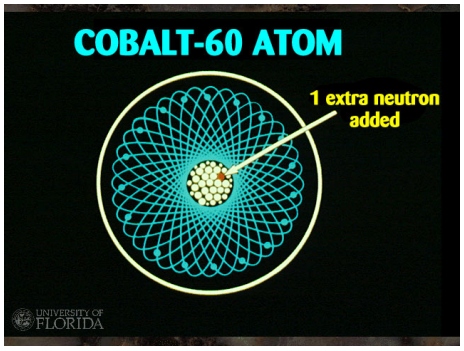
You might also wonder where we get the radioactive material that is used in food radiation plants. Food radiation plants commonly use a metal called cobalt. Cobalt is usually obtained from mines in Canada. It is purified, then made into small pellets that are not radioactive.



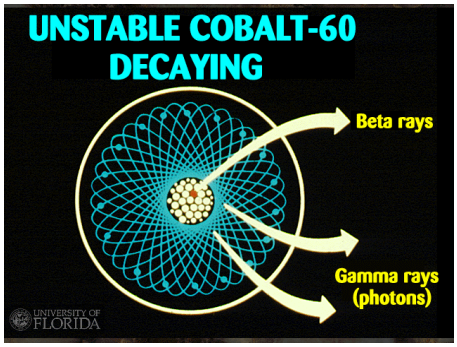
These pellets are then placed in "pencils" that are about 3/8's of an inch thick and 15 inches in length. However, before they can be useful to pasteurize or sterilize products, the cobalt must be made into a radioactive form. Commonly, , these pencils of cobalt are used as control rods in existing nuclear power plants, and as a consequence, become radioactive. Cobalt is mined; it is waste produced by nuclear industries.



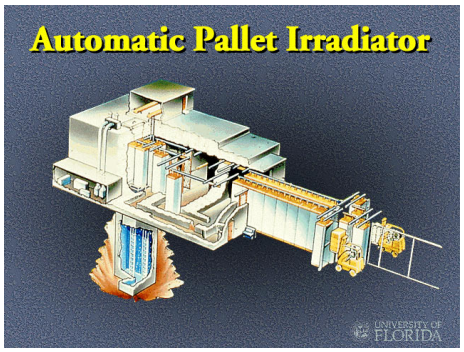
Cobalt is exists as cobalt-59, a natural element, when mined from the ground. It is not radioactive.



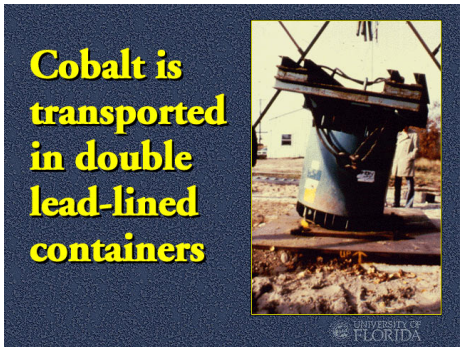
When it is bombarded with radiation within a nuclear power plant, one extra neutron is added to the center of the atom.



This “excited” form of cobalt releases several types of radiation. The gamma rays are the ones which are used to treat foods, personal hygiene products, medical supplies, and to treat cancers.



While in the nuclear power plant for about one year, only approximately 10% of the cobalt becomes radioactive. When this is done, it is shipped to the over 40 existing commercial irradiation facilities that are active in the US, plus hundreds of cancer treatment facilities.



The cobalt pencils are packaged in double lead-lined containers which have been tested under worse-case scenarios, ensuring that no accidents will occur. The safety record for shipping radioactive materials in the US is excellent. The cobalt is shipped by truck or train ....

and used in the many hospitals, commercial facilities, and food irradiation plants. Currently, there is only one irradiation plant in the US dedicated to providing safer foods. This is Food Technology Services, Inc. in Mulberry Florida.

Even though irradiation is used widely in the US and abroad to treat personal, household and medical products, you probably will not find few labeled irradiated foods in your local food store. Instead, the US consumer is faced with a beneficial technology without a marketplace.

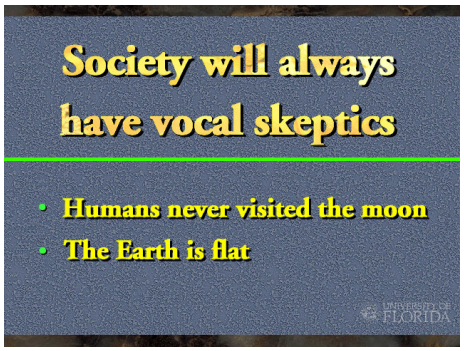
In essence, this situation is a step back in food safety policy. We have a proven safe method to kill dangerous germs on foods the infect and kill consumers, yet they still have no access to these safer products.

The most apparent factor limiting widespread sale of irradiated foods is industry "anxiety". For example, no large food store wants to be the first to sell irradiated chicken, even though it could reduce the number of human salmonella infections, and the fact that surveys show that consumers would prefer these less hazardous products. Instead, they fear they will lose money due to a few individuals who might carry anti-food irradiation signs in front of the store. Meanwhile, their local competitors might gain a market advantage.

However, even before a food item can appear on a food store shelf, there are currently major obstacles that must be overcome. First, the FDA requires that the term "treated by irradiation" must be displayed on the treated food. Early on, the term "picowave" was proposed for this process, similar to "microwave", referring to the size of the energy wave. However, this was not allowed by the government. The result is that there is always a knowledge barrier that must be addressed when the consumer sees the word "irradiation."

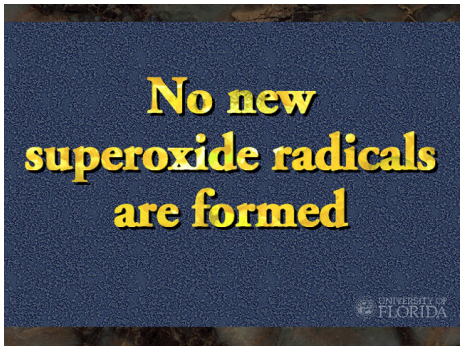
In addition, the FDA requires that a petition be submitted through the food additive process for nearly each food group, before it can be legally irradiated. This is a paradox, since the FDA has acknowledged that food irradiation does not "add" anything unusual or unsafe to the product. Unfortunately, this process can take years before the food is approved to be treated.

So, what will likely increase the demand for irradiated foods.? First, consumer demand could urge the food industry to make irradiated foods available. Also, the government could mandate that some products be irradiated so that foodborne disease can be decreased. However, as in almost all cases, more foodborne illnesses and deaths will likely be necessary to before food irradiation becomes more common.

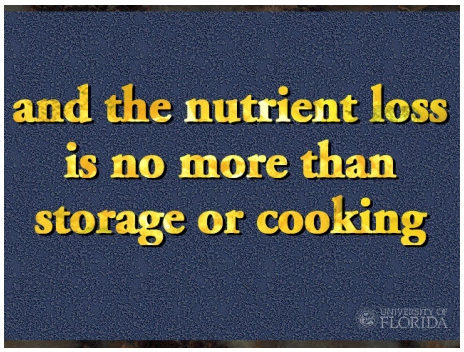


However, even while irradiated products are introduced into markets, we must continue to provide accurate information to consumers who hear that this technology is not safe. We must realize that society will always have skeptics, no matter how convincing data show that a technology is safe. Of course, a debate is a always a healthy process, but at some point, society must move on when technology is discovered that will improves our quality of life.

A common question among consumers is "Are unique or unusual compounds found in irradiated foods?" The answer is "No." Yes, the irradiation process does produce changes in foods, but these are no different than what happens when these same foods are stored on the countertop or in the refrigerator, or especially when foods are cooked. Cooking produces far more changes in a food compared to irradiation.



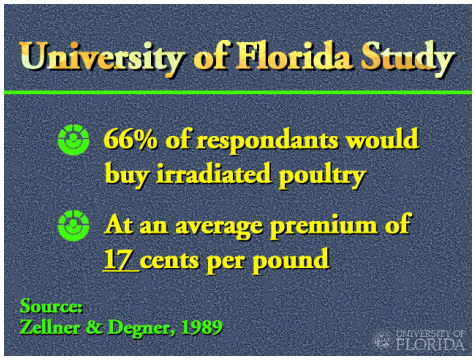
Another common question "Can free or superoxide radicals be formed when foods are treated with ionizing radiation?" The answer is Yes, but no different when foods are cooked. Free radicals sound dangerous, but they are normally produced anytime dry surfaces are heated. For example, toasting bread produces a high amount of free radicals. However, when free radicals contact water, such as in the mouth, they disappear immediately and do not cause harm.



Ionizing radiation does cause some loss of nutrients, but far less than what happens when foods are cooked. Also, nutrients are naturally lost when foods are simply stored on the countertop or in the refrigerator. B vitamins are some of the most sensitive vitamins in foods, and they decrease some when foods are irradiated. However, nutrition experts have stated that eating irradiation foods will not cause people to suffer from nutritional deficiencies. In one experiment, chicken was irradiated versus not irradiated, then both were cooked. When nutrients were measured in the final cooked chicken, there were no differences between the irradiated and nonirradiated cooked chicken.

When the World Health Organization, American Medical Association, numerous other health organizations and panels of health experts have examined numerous research studies of irradiated foods, no adverse health effects have ever been shown.

Do US consumers want to have a choice to purchase irradiated foods? In a large survey of over 1,000 people, the Gallop organization determined that 73% have heard something about food irradiation; and 24% have some knowledge of the food irradiation process. 54% stated that they would be likely to purchase irradiated foods over nonirradiated foods when they learned of the benefits and organizations that endorse the process. In fact, 60% stated that they would be willing to pay 5% more for irradiated hamburger



In 1989, a University of Florida study found that 66% of those surveyed would buy irradiated poultry when they understood that the process would kill salmonella bacteria, and they would pay an average of 17 cents more per pound for the benefit.

Scientifically based information shows the benefits of irradiated foods. Similar to when pasteurized milk began many years ago in the US, there were skeptics who tried to prevent it from being sold. However, the health benefits far outweighed any concerns, and we know today that this food technology has prevented the transmission of diseases from cows to humans.

Today, we need to empower citizens with information which will allow them to have access to the new and beneficial technologies, such as irradiated foods. This is also a type of pasteurization, and we need it to improve the quality of our life.