

Irradiation and Vegetables Don't Mix

Fact Sheet • February 2007

Recent outbreaks of *E. coli* bacteria in lettuce, spinach and onions have reinvigorated interest in irradiation as a way to prevent food-borne illness. The worst outbreak was caused by contaminated pre-cut spinach from California, which killed three people and sickened more than 200 others in 26 states.

Some food industry and government officials believe future outbreaks can be warded off by irradiation, which kills bacteria with high doses of radiation from radioactive materials and linear accelerators. Such hopes, however, are misguided.

First, irradiation cannot legally be used to kill bacteria on vegetables. The U.S. Food and Drug Administration in 1986 approved irradiation to kill insects on vegetables and to extend shelf-life. But this approval was for radiation doses that are too low to kill harmful bacteria such as *E. coli*.

And as it now stands, the FDA may not be in the position to approve the higher radiation doses necessary to eradicate bacteria. Very little testing has been conducted on the safety and wholesomeness of irradiated vegetables – and no published research is known to exist on whether irradiated lettuce and spinach are safe for human consumption.

The only vegetables that have been studied to any extent are potatoes and onions, and the results have been mixed. Though in most experiments animals fed irradiated potatoes and onions suffered no apparent health problems, this has not always been the case. Offspring of rats died younger when fed

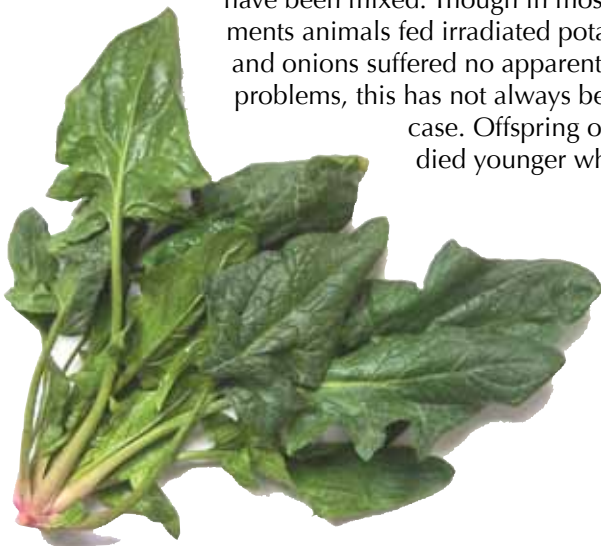
irradiated potatoes,¹ chromosome damage was observed in mice fed irradiated potatoes.² These studies were done with foods irradiated at low doses.

The bottom line is that the FDA has little idea whether people could get sick if they eat irradiated lettuce, spinach or any other vegetable.

Even if it does become legal someday, irradiating vegetables to kill bacteria is highly impractical. First, blasting lettuce or spinach with the equivalent of tens of millions of chest X-rays can ruin its flavor, odor, texture and color. Compared to dried spices and frozen meat, the products that have typically been irradiated in the past, vegetables are considerably more delicate. Their cellular structure cannot withstand the effects of irradiation, which along with killing bacteria damages everything else in its path.

Romaine lettuce, for example, was found to be “significantly less firm” when irradiated at doses even too low to significantly reduce bacterial contamination.³ In another study, a taste panel reported that irradiation ruined the color, firmness and overall quality of romaine lettuce.⁴ For vegetables in general, another study found that “irradiation may induce undesirable changes in quality, such as softening, browning, and loss of vitamin C.”⁵

Second, there is no system in place to irradiate large amounts of vegetables and deliver them to market. Today, only two commercial irradiation facilities specifically designed to irradiate food are in operation. One was built exclusively to irradiate meat and is located in Iowa, which has only six acres of lettuce farms and five acres of spinach farms, according to the US Department of Agriculture. The other, in Florida, has a small capacity and mainly treats meat and meals for hospital patients.



Building an infrastructure of irradiation facilities to treat a meaningful portion of the 9 billion pounds of lettuce and nearly 1 billion pounds of spinach consumed in the U.S. each year would be an extreme challenge. Vegetable production is far less centralized than meat production (which has failed in the marketplace), so finding hubs for irradiation facilities to treat vegetables would be difficult. And, fresh lettuce, spinach and other vegetables have a very short shelf-life, so they very likely could not survive the additional transportation and handling time that irradiation requires.

Further, vegetables have a very low profit margin — for farmers, processors, distributors and retailers alike. The added expense of irradiation, which dramatically increases the price of meat, would likely make treating lettuce and spinach unaffordable.

Perhaps most significantly, Americans have expressed their dislike and distrust of irradiated foods for more than 40 years, since the FDA legalized irradiated wheat in 1963. Numerous test marketing efforts have failed, including irradiated ground beef from 2000 to 2004, and various irradiated fruits in the late 1980s and early 1990s.

Many types of food can legally be irradiated and sold in the U.S., including beef, poultry, pork, eggs, shellfish, juice and spices. Yet beef is the only labeled irradiated food currently known to be sold in U.S. grocery stores today, and this in only a few states. If sold by itself, irradiated lettuce and spinach would have to be labeled, and consumers have

consistently been repelled by these labels. According to a 2000 poll by the Food Marketing Institute, nearly two-thirds of people surveyed said they would not eat irradiated foods.

Irradiation has experienced waves of interest over years, most notably following the 1993 *E. coli* outbreak caused by contaminated Jack-in-the-Box hamburgers in the Northwest. But after nearly 100 years of research, this technology has not been shown to be an effective, affordable or realistic solution to any food safety problem.

Instead of pursuing irradiation, vegetable growers and processors should improve flawed sanitation practices that can give rise to bacterial contamination in the first place. Infected manure from a nearby beef cattle ranch was blamed for the *E. coli* spinach outbreak in California. In response, testing of water used for irrigation and processing should be improved, vegetable processing plants should be inspected more thoroughly, livestock operations located near cropland should be more tightly regulated, and vegetable processors should be better trained.

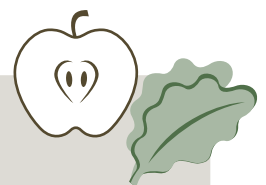
Allowing contaminated vegetables to be irradiated would simply mask unsafe production practices, while supplying lower quality, less nutritious and potentially hazardous food. American consumers expect more from the food industry and their government representatives.

Endnotes

- 1 Brownell, L.E. et al. "Growth, reproduction, mortality and pathologic changes in rats fed gamma-irradiated potatoes." Contract report No. DA-49-007-MD-581, Department of the Army, Office of the Surgeon General, 1959.
- 2 Osipova, I.N. et al. "Influence of the storage and culinary treatment of irradiated potatoes on the cytogenic activity of potato extracts." *Voprosy Pitaniya (USSR)*, 4:54-57, 1975.
- 3 Prakash, A. et al. "Effects of low-dose gamma irradiation on the shelf life and quality characteristics of Cut romaine lettuce packaged under modified atmosphere." *Journal of Food Safety*, 65(3):549-553, 2000.
- 4 Han, Jaejoon et al. "Quality of packaged romaine lettuce hearts exposed to low-dose electron beam irradiation." *Lebensm. Wiss. U. Technol (Germany)*, 37:705-715, 2004.
- 5 Fan, X. et al. "Warm water treatment in combination with modified atmosphere packaging reduces undesirable effects of irradiation on the quality of fresh-cut iceberg lettuce." *Journal of Agricultural and Food Chemistry*, 51:1231-1236, 2003.



The radura is the international symbol for irradiated food.



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