Facts about Food Irradiation

Q:

Does irradiation adversely affect the nutritional value of food?

A:

No more so than other food processing and preservation methods used to achieve the same purpose.

Nutritional Quality of Irradiated Foods

Extensive research has shown that macronutrients, such as protein, carbohydrates, and fat, are relatively stable to radiation doses of up to 10 kilogray. Micronutrients, especially vitamins, may be sensitive to any food processing method, including irradiation. Different types of vitamins have varied sensitivity to irradiation and to some other food processing methods. For example, vitamins C and B-1 (thiamine) are sensitive to irradiation as well as to heat processing. The Joint Expert Committee of the Food and Agriculture Organization (FAO), World Health Organization (WHO), and International Atomic Energy Agency (IAEA), which examined these and other issues, stated in its conclusions in 1980 that irradiation does not induce special nutritional problems in food.

The change in nutritional value caused by irradiation depends on a number of factors. They include the radiation dose to which the food has been exposed, the type of food, packaging, and processing conditions, such as temperature during irradiation and storage time.

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ICGFI is an international group of experts designated by Governments to evaluate and advise on global activities of food irradiation. It was established under the aegis of the Food and Agriculture Organization of the United Nations, World Health Organization, and International Atomic Energy Agency

Most of these factors are also true for other food preservation technologies. For example, measurement of vitamin C content in three varieties of apples kept in cold storage for up to 1 year showed decreases of between 40% to 70%, depending on the variety of apple. Yet it has never been suggested that cold storage is an inappropriate technology for apples and should not be used.

Reports of high vitamin losses from irradiation of pure vitamin solutions, or by using doses higher than those which would be used at commercial irradiation facilities, have no relevance for predicting the radiation sensitivity of a particular vitamin in food. The complexity of the composition of foods often protects individual vitamins from radiation decomposition.

Seemingly conflicting results of low versus high losses of vitamin C for some foods may be attributed to differences in analytical approaches used by researchers. Some have measured only ascorbic acid, while others have measured total vitamin C, a mixture of ascorbic acid and dehydroascorbic acid. Both acids have vitamin C biological activity and are easily transformed from one to the other. If only ascorbic acid were measured, any apparent reduction in vitamin C level would be exaggerated.

Just as vitamins vary in their sensitivity to heat, so do they vary in their sensitivity to radiation. This sensitivity depends upon the conditions under which food is irradiated. Vitamins A,E,C,K and B-1 (thiamine) in foods are relatively sensitive to radiation, while some other B vitamins such as riboflavin, niacin, and vitamin D are much more stable.

Losses are generally less if oxygen is excluded and if the temperature during irradiation is low. Under optimal conditions, vitamin losses in foods irradiated at doses up to 1 kilogray are considered to be insignificant. At higher doses the effect of irradiation will depend on the specific vitamin, temperature, dose, food, and packaging. Depending on the food, thiamine levels may be reduced further by storage and cooking if the food has been exposed to air during storage, but not necessarily if it has been packaged without oxygen. ■

Scientific and Technical References:

Safety of Irradiated Foods, by J.F. Diehl, Marcel Dekker Inc., New York (1990).

"Composition of Australian Foods, Apples and Pears", by R.B.H. Wills and El-Ghetany, *Food Technology in Australia*, 38 (1986).

Wholesomeness of Irradiated Food, Report of a Joint FAO/IAEA/WHO Expert Committee, Technical Report Series No. 659, World Health Organization, Geneva (1981).

Status of Food Safety and Inspection Service Irradiation Activities, USDA (September 1988).