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The Great Vitamin Robbery

What Irradiation Does to the Nutrients in Your Food

The Crime

A central goal of modern society is a healthy and well-nourished population. In pursuing this aim, the U.S. government spends hundreds of millions of dollars a year telling Americans what we should eat in order to get all the vitamins and other essential nutrients needed to be healthy.

At the same time, however, U.S. government officials have given their wholehearted support to an industry that literally robs food of its vitamin content. Does the left hand know what the right hand is doing?

Extensive research dating to the 1950s has found that irradiation destroys between 2 percent and 95 percent of the vitamin content in food. At the moment, very few irradiated products are on sale in grocery stores. However, with its approval of the irradiation of fruits, vegetables, poultry, pork, beef, eggs, juice and sprouting seeds, the Food and Drug Administration is allowing the irradiation of foods that comprise nearly half of the human diet. If the FDA goes forward with plans to approve the irradiation of ready-to-eat foods and shellfish, *most* of our food supply could be irradiated.

The potential scale of The Great Vitamin Robbery would then be truly staggering: *up to 95 percent of certain vitamins in more than half of the food consumed in the U.S. could be lost.*

How Irradiation Zaps Vitamins

Today, it is legal to irradiate food with radiation doses between 1 and 30 kiloGray — the equivalent of 33 million to 1 billion chest x-rays. Among the chemicals formed by exposure to radiation are hundreds — or perhaps thousands — of unique radiolytic products and free radicals that have never been completely identified, much less adequately evaluated for safety.

What researchers do know is that free radicals are thug chemicals — just one can initiate tens of thousands of chain reactions that can have serious health effects. These range from destroying cell membranes and disrupting crucial processes in the body, to re-programming DNA and forming mutant cells. Research has also shown that these free radicals break down and destroy vitamins.[1]

And It Keeps on Zapping

The irradiation industry frequently argues that vitamin losses due to canning, freezing, drying, storing and cooking are unavoidable and happen to all food anyway. Irradiation, however, will not replace any of these decontamination and preservation techniques — it will be yet another nutrient-depleting process that food will undergo before it reaches your plate. Moreover, irradiation is qualitatively and quantitatively different from these other treatments: Vitamins continue being destroyed, long after the irradiation "treatment" has taken place.

Unlike heat sterilization, for example, irradiation results in the formation of new chemicals that remain in food and continue to react during storage and cooking. These chemicals have been shown to destroy vitamins at a

higher rate during storage than other treatments. What's more, cooking accelerates this process even further. This is of particular concern, as one of the main reasons that the food industry is so enthusiastic about irradiation is because it helps extend shelf life. Food items could be kept on shelves for weeks or months and shipped even longer distances without spoilage, resulting in major savings for the food industry. So, the very way that the industry intends to make use of irradiation means an even higher rate of vitamin loss.

The Ugly Details

Vitamins are essential to human health and life itself. They support bodily functions, protect cells and tissues, prevent deficiency diseases and can help prevent other diseases such as cancer and heart disease.

Research has shown that *all* vitamins can and do suffer substantial losses due to irradiation. For example: 91 percent of vitamin B_6 in irradiated beef stored for 15 months and 33 percent of vitamin B_{12} in meat can be lost.[2,3]

The five vitamins profiled below are the most sensitive to radiation "treatments."[4] They are also among the vitamins that many people are *already* not getting enough of. Up to one in five people, for instance, get inadequate supplies of vitamins A, C and E.[5] Where research has been conducted, information is provided on the synergetic effects of irradiation (irradiation plus storage plus cooking), as this indicates what the vitamin value of a food will be at the point that really matters — when it is actually consu med.

Vitamin A / Beta-Carotene

- **Recommended Daily Intake:** Men, 1000 micrograms; Women, 800 micrograms.[6]
- **Sensitivity to irradiation:** High/Medium: 4-50 percent loss
- **Why do you need it?** For good vision, healthy skin and healthy cells and tissues; to fight infection; to aid bone growth. It may also help fight cancer and heart disease.
- **What happens if you don't get enough of it?** Deficiency may lead to higher susceptibility to infection and poorer eyesight. Ultimately, deficiency can result in death.
- **Where can you get it?** Eggs, meat and fish. Also present in the form of a precursor called beta-carotene in plants, which your body converts to vitamin A. Sources are carrots, pumpkin, potatoes, winter squashes, cantaloupe, pink grapefruit, apricots and most dark green, leafy vegetables.
- **Can its food sources legally be irradiated?** Yes
- **What the research says:** Irradiated liver lost 4 percent more vitamin A than unirradiated liver after one week; after two weeks, the irradiated meat had lost 18 percent more than the non-irradiation meat.[7] Irradiated potatoes lost 50 percent of their beta-carotene content after six months in storage.[8] Up to 80 percent of the vitamin A in irradiated eggs is lost after one month of storage.[9] Research is not available on possible additional accelerated loss during cooking.

Vitamin B_1 (Thiamine)

- **Recommended Daily Intake:** Men, 1.5 micrograms; Women, 1.1 micrograms
- **Sensitivity to irradiation:** High: 11-95 percent loss.
- **Why do you need it?** Helps cells convert carbohydrates into energy; essential for the functioning of the heart, muscles and nervous system.
- **What happens if you don't get enough of it?** A deficiency can cause weakness, fatigue, psychosis, and nerve damage.
- **Where can you get it?** Fortified breads, cereals, pasta, whole grains, lean meats, fish, dried beans, peas, and soybeans.
- **Can its food sources legally be irradiated?** Yes
- **What the research says:** Vitamin B_1 loss in unirradiated rolled oats is 0 percent during storage (3 months) and 8 percent during cooking — a total loss of 8 percent. For irradiated rolled oats, 37 percent is lost during treatment; another 18 percent is lost during storage; and a further 19 percent is

lost during cooking — a total loss of 74 percent. These kind of synergetic losses where found to be typical for a range of foods.[10] Even with using low temperatures during irradiation to try to minimize nutrient loss, chicken still lost between 11 and 45 percent of its B_1 content.[11] Results for haddock, beef, turkey, ham, bacon, peaches and beets showed losses of 70-95 percent.[12]

Vitamin C

- **Recommended Daily Intake**: Men, 45-60 micrograms; Women, 45-60 micrograms
- **Sensitivity to irradiation:** High: 20-90 percent loss.
- **Why do you need it?** For healthy gums, teeth, bones and muscles; to help heal wounds and fight infection; to act as an antioxidant to protect cells. It may also reduce the risk of heart disease, cancer and cataracts.
- **What happens if you don't get enough of it?** Can lead to fatigue, anorexia, muscular pain and greater susceptibility to infection and stress. Deficiency can lead to scurvy.
- **Where can you get it?** Green peppers, citrus fruits, strawberries, tomatoes, broccoli, greens, potatoes, and cantaloupe. Most other fruits and vegetables contain some vitamin C; fish and milk contain small amounts.
- **Can its food sources legally be irradiated?** Yes
- **What the research says:** Irradiation has been shown to destroy 13 percent of the vitamin C in orange juice. One-third of vitamin C in potatoes is destroyed. [13] After 40 days of storage, lemons lost 90 percent of vitamin C.[14]

Vitamin E

- **Recommended Daily Intake:** Men, 10 micrograms; Women, 8 micrograms
- **Sensitivity to irradiation:** High: 17-91 percent loss
- **Why do you need it?** It is a powerful antioxidant that helps protect body tissues and cells. It may also help fight heart disease, cancer, Alzheimer's, cataracts and improve the immune system.
- **What happens if you don't get enough of it?** Vitamin E deficiency can cause a progressive neural degeneration syndrome involving reduced reflexes, decreased sensation and ataxia. If not treated soon enough, then the debilitation is irreversible. It may also be linked with depression and infertility.
- **Where can you get it?** Wheat germ, corn, nuts, seeds, olives, spinach, asparagus, and other green leafy vegetables and vegetable oils.
- **Can its food sources legally be irradiated?** Yes
- **What the research says:** Vitamin E loss in unirradiated hazelnuts is 4 percent after 3 months of storage, and a further 29 percent during cooking — a total loss of 33 percent. For irradiated hazelnuts, 17 percent is lost during treatment, 25 percent is lost during storage, and a further 49 percent is lost during cooking — a total loss of 91 percent. This kind of synergetic loss was found to be typical for a range of foods.[15]

Vitamin K

- **Recommended Daily Intake:** Men, 65-80 micrograms; Women, 55-65 micrograms
- **Sensitivity to irradiation:** Medium
- **Why do you need it?** Known as the "clotting" vitamin — without it, blood will not clot. It may also help maintain strong bones.
- **What happens if you don't get enough of it?** May lead to improper coagulation of the blood and hemorrhaging.
- **Where can you get it?** Cabbage, cauliflower, green leafy vegetables, cereals, soybean, and other vegetables. Also made by the bacteria that line the gastrointestinal tract.
- **Can its food sources legally be irradiated?** Yes
- **What the research says:** A study to assess the effects of vitamin K deficiency in rats caused by feeding irradiated beef resulted in the death of 70 percent of the male rats.[16]

WANTED:

Who are the guilty parties behind The Great Vitamin Robbery?

The Food Industry...

...which wants to cut its costs and increase its profits. Many corporate, factory-style farms use dirty handling practices. Meat is regularly contaminated by feces, urine, pus and vomit. Rather than cleaning up food factories and hiring more food inspectors, the industry wants a quick and cheap fix.

The Nuclear Industry...

...which is keen to find new markets for their outmoded technology. The list of advocates for food irradiation includes companies such as the Titan Corp., the defense contractor that is using linear accelerators originally designed for the "Star Wars" program to irradiate food. Titan is dependent on handouts from the federal government for a hefty chunk of its revenue — 80 percent.

The FDA...

...which has failed in its responsibility to demonstrate that irradiation is needed, beneficial, safe and ethical. Beyond the fact that the FDA has ignored irrefutable evidence that irradiation destroys vitamins and other nutrients, the agency has failed to conduct the required 100-fold safety tests, and has ignored numerous studies indicating that irradiated foods contain hazardous chemicals. Instead, the agency has based its support for the industry primarily on seven poorly conducted studies dating back to the 1960s.

Notes

[1] Diehl, J.F. "Combined effects of irradiation, storage and cooking on the Vitamin E and Vitamin B_1 levels of foods." Presented at the 33rd Annual Meeting of the American Institute of Nutrition, 1969.

[2] Urbain, W.M. *Advanced Food Research,* 24:155-227, 1978. Cited in Murray, D.R., *Biology of Food Irradiation*, Somerset, England: Research Studies Press, 1990.

[3] Webb, T. and Lang, T. *Food Irradiation - The Facts*. Rochester, Vermont: Thorsons Publishing Group, 1987.

[4] Kilcast, D. "Effect of radiation on vitamins." *Food Chemistry*, 49:157-164, 1994. Ranking of vitamin sensitivity to radiation: High: C, B_1, E, A; Medium: beta-carotene and K; Low: D, B_2, B_6, B_{12}, B_5, Folic acid, Pantothentic Acid, B_{10}, Choline.

[5] United States National Health and Nutritional Examination Survey (NHANES III, 1988-94), cited in Song W.O. and Kerver J.M. "Nutritional contribution of eggs to American diets." *Journal of American Nutrition,* 19 (5 Suppl):556S-562S, 2000.

[6] Data for Recommended Daily Intake, vitamin functions and food sources cross-referenced from MEDLINEplus Encyclopedia, www.nlm.nih.gov; and the Vitamin and Mineral Guide, www.thriveonline.com.

[7] Diehl, J.F. "Vitamin A in irradiated foodstuffs." *Zeitschrift fuer Lebensmittel-Untersuchung und Forschung,* 168:29-31, 1979. Cited in Stevenson, M.H., "Nutritional and other implications of irradiating meat." *Proceedings of the Nutrition Society* ,53:317-325, 1994.

[8] Janave, M. T. and Thomas, P. "Influence of post-harvest storage of potato carotenoids." *Potato Research,* 22:365-9, 1979. Cited in Kilcast, 1994.

[9] FDA Memorandum from Kim M. Morehouse (Division of Product Manufacture and Use) to William Trotter (Division of Product Policy), April 11, 2000.

[10] Diehl, 1969.

[11] Hanis, T. et al. "Poultry meat irradiation: effect of temperature on chemical changes and inactivation of microorganisms." *Journal of Food Protection*, 1989. Cited in Kilcast, 1994.

[12] Ziporin, Z. Z. et al. U.S. Army Medical Nutrion Laboratory. April 1957.

[13] Gibbs, Gary. *The Food That Would Last Forever*. Garden City Park, New York: Avery Publishing Group, 1993.

[14] Maxie, E.C. et al. *Radiation Botany*, 405-411, 1964. Cited in Murray, 1990.

[15] Diehl, 1969.

[16] Metta, V.C. et al. "Vitamin K deficiency in rats induced by feeding of irradiated beef." *Journal of Nutrition*, 69:18-21, 1959. (Co-sponsored by the Surgeon General of the U.S. Army)

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