Letters

When Food Is Irradiated

I would like to take exception with certain statements made by Hardin (Letters, 1 Mar.) regarding the irradiation of food. He states that "no one desires irradiated food." I find it difficult to fathom this and hope that my rebuttal adds some clarification. Food irradiation studies have, after all, been underway for close to 20 years with a number of definitive objectives which are, in order of increasing dosage: sprout inhibition, insect disinfestation, disinfection, pasteurization, and sterilization.

Before a foodstuff that has undergone irradiation processing may be made commercially available, application must be made to obtain an FDA clearance. Processing of foods with ionizing radiation (electrons or gamma rays) is considered a part of the Food Additives Amendment to the Food, Drug and Cosmetic Act, and as such, an extremely extensive petition must be compiled before a Commissioner signs the order enacting a particular food regulation. An informative description of the petition content is given in an FDA pamphlet *Preparation and Processing of Food Additive Petitions: Radiation Application to Food*, Bureau of Science Staff Seminar, May 1967. Contained in the above document is a statement made by Robert S. Roe, associate director, Bureau of Science, as follows:

> The same general procedures are followed in the development of radiation regulations as are followed in the development of regulations for other types of food additives such as preservatives, emulsifiers, anticaking agents, etc. In the case of *any* food additives, FDA's primary responsibility is to determine that the additive or the process to be regulated is safe and that it does accomplish the intended effect. Therefore, proposals for regulations must be supported by data adequate to establish these facts.

Once approval is granted (and only three commodities have been approved to date, namely: potatoes for sprout inhibition, wheat and wheat products for insect disinfestation, and bacon for sterilization), the consumer stands to be the biggest gainer. The Atomic Energy Commission is currently sponsoring the preparation of FDA petitions covering fish, shellfish, fruits, and vegetables. The Army Quartermaster Corps is preparing petitions on red meats, as well as supporting AEC petitions, and now is awaiting FDA approval on a ham petition.

It is absurd to state blandly, as Hardin does, that "there are merely commercial interests that believe they stand to gain financially by the development of a food-irradiation industry." Consider for a moment the potential gain to the consumer that can be brought about by food irradiation. First, the product must be FDA-approved. Second, foods that do not lend themselves to alternate means of food processing may become widely available, such as mangoes and papayas. Increased shelf life is in the offing for fruit and vegetable products, as well as poultry and seafood. Reduction in food spoilage would result in very important economic advantages to the farmers, shippers, wholesalers, as well as the retail outlets, and ultimately, the consumer. Relatively low levels of radiation are effective in destroying normal spoilage organisms and at slightly higher levels *Salmonella* organisms are totally destroyed. These levels are only about one-tenth the dosage required for food sterilization. The ability to store irradiation-sterilized foodstuffs for long periods of time without refrigeration has obvious advantages to the military as well as for the housewife. The potential social implication of irradiated foods is quite obvious when considering the needs of newly developing nations and areas of chronic food shortage.

In order to compete in the market place, food that has been processed with gamma radiation from cobalt-60 or cesium-137 radioisotope sources, or from accelerator-produced electrons, must be competitive with other methods of food processing. When a process has reached this level of development, and when vast resources have been expended for research in order to assure the public of nontoxic, wholesale commodities, then we are no longer dealing solely with a question of academic interest, but one with widespread socioeconomic implications.

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. . . Instead of food irradiation being supported by "merely commercial interests that believe they stand to gain financially by the development of a food-irradiation industry," as Hardin contends, almost all research in the United States, except for Lipton's patent (*1*) on irradiation of dehydrated vegetables, is supported wholly or in part by our government. The responsibility for research and development is split between the Army and the AEC; foods treated by high doses of radiation (sterilization) are being developed by the Army, and foods treated with low doses of radiation (pasteurization) are being developed by the AEC. Investment by government organizations in fiscal year 1968 is greater than $2 million. Moreover, the interest in food irradiation is international. Twenty-five foreign governments have programs in food irradiation (*2*), and the International Atomic Energy Agency, the World Health Organization, and the Food and Agriculture Organization of the United Nations also support programs on food irradiation. This is certainly far from the "narrow circle of a few industries and research laboratories" to which Hardin refers.

Hardin also says, "No one *desires* irradiated food." Anyone who has tried to get fresh seafood in the Midwest at any but the best restaurants will certainly dispute that. A dose of 0.2 megarad will give fresh finfish sufficient shelf-life to be marketed anywhere in the United States at a cost of only a few cents greater than the frozen product. Similarly, Hawaiian papayas now available only on the West Coast could be made available over much of the United States by treating them with a dose of less than 0.15 megarad. Furthermore, Hawaiian mangoes given the same dose could be sold on the mainland, where they are now quarantined because of a seed weevil that current fumigation techniques do not affect.

The problem in underdeveloped countries with large populations is not so much one of production as it is one of storage. Losses of dried fish in Mali (*3*) from insect infestation are estimated at 50 percent of the finished

product. In Argentina, wheat losses from insect infestation during storage amount to the equivalent of 40 million kilos of bread. In the Congo, 50 percent of the harvested sorghum—a staple for Central Africans—is destroyed by insects (*4*). Irradiation at less than 0.1 megarad kills or sterilizes these insects and reduces storage losses greatly, with no discernible effect on the food. Several million people could be fed from the resulting food supply.

As far as the hazards of consuming irradiated foods are concerned, studies of rats and dogs fed foods for over 2 years, irradiated at doses proposed for foods to be consumed by man, have produced no defects in the animals or their offspring directly attributable to the fact that their food was irradiated.

Food irradiation is not a fad, but an important and valuable new technique, and the consumer should look forward to its use because it means he will have fresh food throughout the year.

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References

1. C. W. Schroeder, "Dehydrating Vegetables," U.S. Patent 3,025,171 to Thomas J. Lipton, Inc., 13 Mar. 1962 (filed 11 Dec. 1956).
2. J. H. Clausen and J. W. Osburn, Jr., "Food Irradiation Activities Throughout the World," *U.S. Dept. Commerce Rep.* (Government Printing Office, Washington, D.C., 1968).
3. M. Aref, A. Timbely, J. Daget, *Alexandria J. Agr. Res.* **12**, 95 (July 1964).
4. S. Baron, *Freedom From Hunger* (magazine of the FAO) **8**, 6 (Mar.–Apr. 1967).

In the course of 15 years of research in the field and of service on scientific advisory committees, I have reviewed work on the wholesomeness and safety of irradiated foods, including extensive long-term feeding studies with different species of animals who were fed a variety of irradiated foods in several laboratories throughout the world. While experiments on certain foods are still in progress, including studies on possible mutagenicity, results to date confirm the wholesomeness of irradiated foods. Therefore, I assure Hardin that experiments to establish the "burden of proof" have been carried out and that the evidence is not inconclusive. It should be pointed out that "100 percent safety" will not be established in this or any other biological testing program and I know of no scientist involved in these experiments who has said that "food irradiation is 100 percent safe."

Hardin also stated that Auerbach ("The chemical production of mutations," 1 Dec., p. 1141) commented on "evidence that irradiation of food makes

it mutagenic for mice." What Auerbach actually said was "experiments on mice might give clearer evidence. . . ." To my knowledge no mutagenicity studies on irradiated foods have been carried out with mice.

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Pitfalls of Language Training

Page's "Omnibus language proposal" (Letters, 22 Sept. 1967) suggested that several foreign languages be taught simultaneously to graduate students in the sciences. He reported that Fritz Zwicky said the Swiss employ this method because students can more easily remember similarities and differences as they pursue several languages. For many years the City College of New York required its students in arts and sciences to take three foreign languages which were begun successively in the first, second, and third years and met five times a week. Such rigorous treatment produced satisfactory practical linguists even among those with little aptitude. If nothing else, it proved the merits of extensive and continuous exposure to a language.

Yet I would discourage both Page and Zwicky because students lacking linguistic training cannot, with less time and less intensive study, acquire satisfactory skills, even in their scientific fields. Syntax and lexicology are too complex for superficial study. Zwicky claimed that scientific terminology tends to be the same in most languages. This is true of those terms formed from Greek and Latin, but not if all tongues are included. "Nitrogen" in German can be *Stickstoff*, in Dutch *stikstof*, and in French it is more likely to be *azote* than *nitrogène*. It might be possible to acquire a workable vocabulary in a linguistic branch by simultaneously studying the Romance languages, or the Slavic languages, or Teutonic languages, but this would not produce a speaking knowledge or basic understanding of syntax. Even with more intensive study of closely related languages, so many similarities are misleading and confusing that CCNY prohibited students from initiating more than two such languages simultaneously, such as Spanish and Portuguese or even Spanish and Italian.

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