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Irradiation Update

'Pasteurizing' approach used on semi-commercial basis for overseas sales; Natick irradiated beef feeding tests completed

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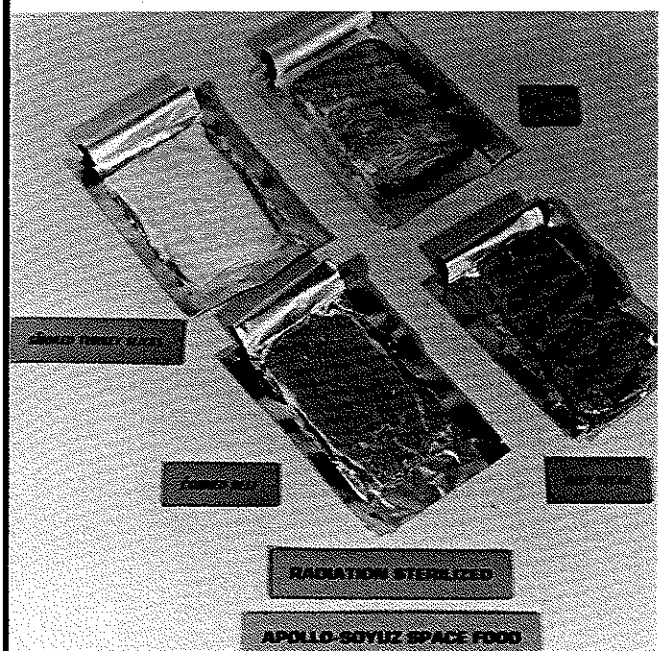


Carefully controlled tests vividly illustrate the effect of irradiation on the preservation of strawberries (above). Radiation sterilized meats—beef, corned beef, ham, and turkey—used for space flights show the broad range of cured and uncured meats that can be processed

The commercial use of irradiation for pasteurizing and/or sterilizing food has moved another step forward with the first sales of irradiated codfish to Holland. Because of the energy crisis and the possible reduction of raw produce as a result of rationing of irrigation water, irradiation is likely to receive increasing attention as a means of both preventing spoilage and of saving energy.

The U.S. Army Natick Research and Development Command is continuing their work on food irradiation with positive results. Beef feeding tests have been completed and the final report will be issued within several months—preliminary analysis appears favorable. Feeding tests with ham, poultry, and pork are ongoing. Petition for use of irradiation on beef should be filed with FDA before end of 1977.

Irradiation of poultry and meat to destroy salmonella—only a slight amount of irradiation is needed—has potential for substantially reducing illness associated with salmonellosis, suffering, and lost time from work.

U.S. Army Natick Research

The Army, in a national program on food irradiation which began in 1953, has slowly overcome a long series of obstacles and is close to filing a petition with the Food & Drug Administration for approval of irradiated sterilized beef. In 1963 and 1964 the FDA approved white potatoes irradiated to inhibit sprouting during storage and wheat and wheat flour irradiated for insect disinfestation.

The irradiation process is attractive because there is only a slight temperature rise in the foods during the course of the treatment. It is considered a "cold process." The irradiated foods undergo minimal changes in texture, flavor, odor, and color so that on the plate of the consumer the irradiation-preserved food is almost

indistinguishable from fresh food freshly prepared.

Animal feeding studies to evaluate the safety of irradiated beef were started in the fall of 1971 and have now been completed. Preliminary evaluation of the results of the test appear favorable. The final evaluation and report will be completed within the next two to three months. The tests were designed to compare any measurable biological indicator of experimental animals fed irradiated beef against the same indicators of control animals fed nonirradiated beef. The tests covered four meat variables; gamma-ray irradiated beef, electron irradiated beef, heat sterilized canned beef, and frozen beef.

In 1975, after a thorough review of the progress made, the Assistant Secretary of the Army for Research and Development directed an accelerated program to assess wholesomeness concurrently for three additional radappertized (radiation sterilized) meat items, chicken, pork, and ham. Feeding tests on these three foods are now in progress.

Future actions—the petition to FDA for approval of irradiated beef will be submitted in the fall of 1977. The Army hopes to submit petitions to FDA for clearance of chicken, pork, and ham in 1981. The petitions will be in six volumes; each volume will be written by specialists in the subjects and reviewed by a great many experts.

Semi-commercial operations

Dr. Martin A. Welt, President of Radiation Technology, Rockaway, NJ, the company handling the processing, pasteurization, and shipment of fish to Holland (see box) foresees two timely and substantial benefits from the use of irradiation for food preservation. These are a savings in energy consumption and reduction in loss of food through spoilage. Soaring energy costs and reduced food raw materials may be the catalyst needed to bring about irradiation processing of foods in the U.S.

During the past twenty odd years, with cheap energy and low-cost food economy, there was little incentive for government agencies or large food companies to push ahead more rapidly with food irradiation. This is now changing dramatically—as evidenced by the energy crunch and usage curtailment during this past winter. Also, the projected reduction in California crop production because of necessary rationing of irrigation water, growers may receive only 25% of normal water supply.

The distribution of total energy requirements for food in the U.S. has been estimated as: households account for 30%, wholesale and retail trade 18%, transportation 33%, food processing 3%, and agriculture making up the difference with 16%. It has also been estimated that irradiated food products, because of reduction of freezer and refrigeration requirements, may result in energy savings in excess of 50%. When compared to thermally processed foods, irradiation requires less energy to process and could result in substantial transportation cost savings because of reduction in packaging weights.

A recent Swedish study involving processed peas—including processing, packaging materials, six months central storage, 500 km transportation, 50-60 days in combined wholesale depot and retail storage, and 20 days of home storage—showed a total energy requirement equivalent to 4500 KWH/ton for frozen versus 6500 KWH/ton for canned. Building on these projected energy requirements, Dr. Welt estimates that the total energy requirements for radiation pasteurization at 169 KWH/ton and for radiation sterilization at 1400 KWH/ton—a substantial savings potential with radiation pasteurization or sterilization.

Raw produce

Much of the research work with irradiation at the U.S. Army Natick Research and Development Command has been concentrated on sterilization of foods for military consumption. However, the use of irradiation for pasteurization of fresh fruits and vegetables and for meat may be of equal or greater significance.

Destruction of fresh fruits and vegetables caused by mold growth, even under refrigeration, often assumes tremendous proportions. Estimates have been made that as much as 25% of the fresh strawberries harvested are destroyed by mold. Other fruits and vegetables suffer similarly and some fruits such as fresh peaches are available for a reasonably short marketing period. Also, many fruits and vegetables are harvested before they reach peak quality so that they will maintain a degree of acceptability as they move through distribution channels. Reduction of spoilage or gaining several weeks to a month of additional shelf and marketing life would be significant.

A significant portion of fresh poultry and red meats are contaminated with salmonella—estimates are that at least 50% of poultry are so contaminated. Consequently, these organisms are brought into the home where they contaminate sinks, dishes, cutting boards, etc. No one has been able to arrive at a good figure for the number of man-workdays lost because of illness from salmonella, let alone the suffering and discomfort. And yet, a relatively low dosage of irradiation applied to poultry and meat would pasteurize the food and destroy the salmonella organism. Dosage would be of a low enough magnitude so as not to destroy the fresh character of the poultry or meat.

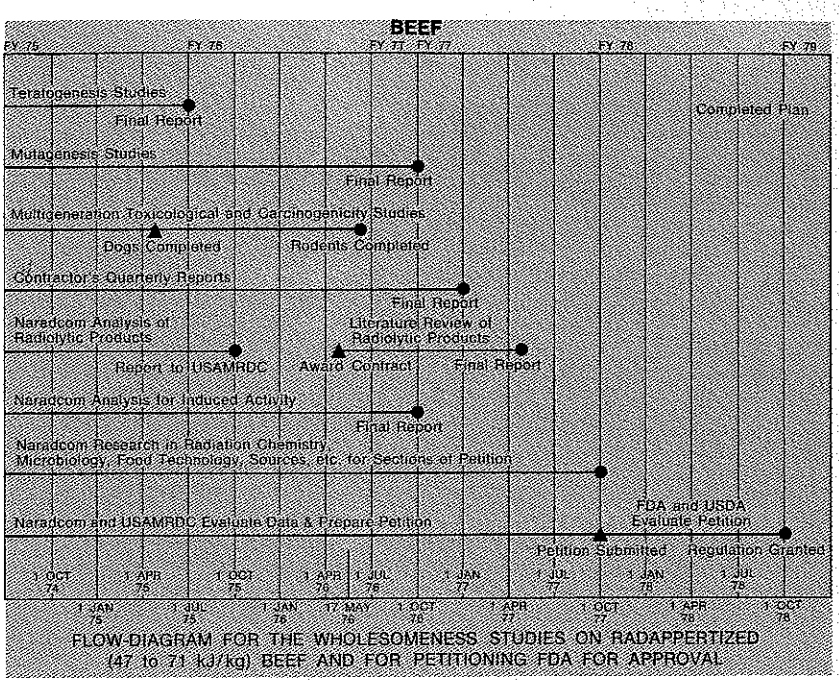
Dr. Ari Brynjolfsson, Chief, Radiation

Export of irradiated codfish

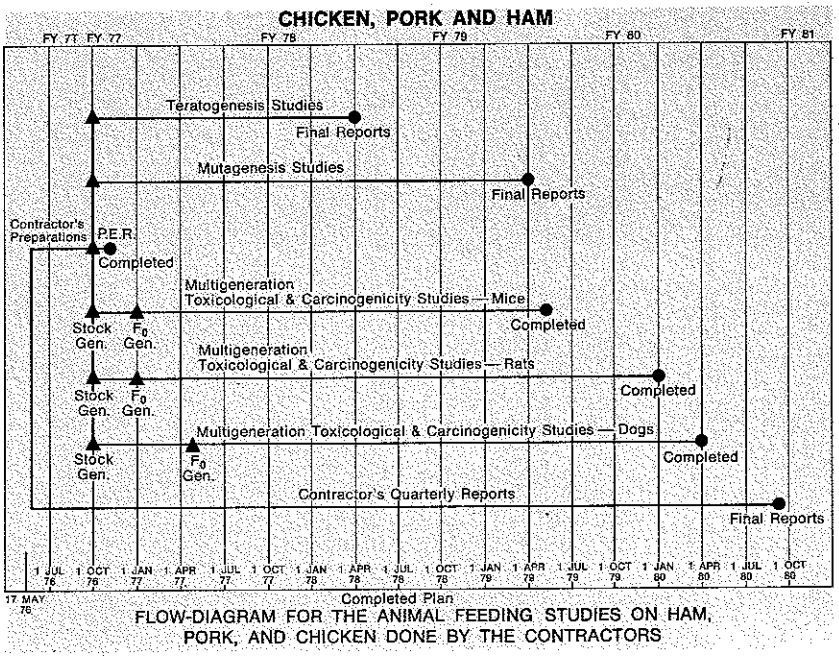
Codfish fillets have been pasteurized by irradiation and shipped to The Netherlands. The first trial purchase covered approximately 60 pounds of fish. Additional orders will be dependent on quality of the fish and approval of Dutch authority.

The fish were cleaned, filleted, wrapped in plastic film, and packed in 30-lb tins. The fish were then pasteurized by irradiation—not sterilized. The fish were shipped under refrigerated temperature via air to The Netherlands. Expected shelf life of the pasteurized fish is about 3 weeks. The Dutch health authorities have recently given approval to the use of irradiation as a means of processing fin fish, poultry, and several other foods.

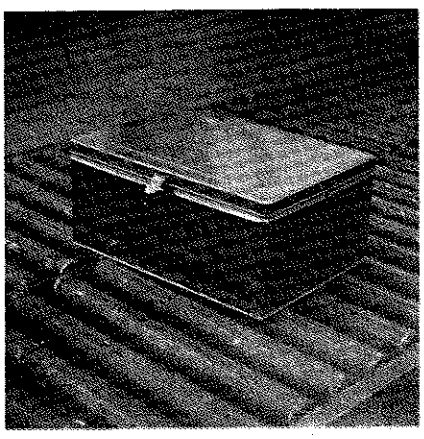
The fish received a relatively light dose of radiation, not enough to sterilize the product, and will be handled, prepared, and consumed as fresh fish. The idea is to extend shelf life of fresh product by several weeks. Ultimately, if this first shipment proves acceptable, other fish varieties including Plaice and native U.S. species such as Snapper and Halibut will be utilized. This will make native U.S. fish available fresh to consumers overseas.



FLOW-DIAGRAM FOR THE WHOLESOMENESS STUDIES ON RADAPPERTIZED (47 to 71 kJ/kg) BEEF AND FOR PETITIONING FDA FOR APPROVAL



FLOW-DIAGRAM FOR THE ANIMAL FEEDING STUDIES ON HAM, PORK, AND CHICKEN DONE BY THE CONTRACTORS



Fish fillets were wrapped in plastic film and packed in tin container—30 lbs/container—before irradiation

Preservation of Food Division, Food Engineering Laboratory, U.S. Army Natick Research and Development Command, summarized their thinking as follows: "Based on our present data we believe it likely that we will succeed in proving to FDA that enzyme inactivated radappertized beef, chicken, pork, and ham are wholesome. We are hopeful that we will succeed also in expanding FDA approvals of the above items to cover a broad spectrum of foods. The petitions for expansions of the approvals will be supported by numerous other feeding studies sponsored by the U.S. Army in the fifties and the sixties, by AEC in the sixties, as well as studies done in many other countries (for instance, Japan, England, The Netherlands, Canada, and India) and by the International Project in the Field of Food Irradiation in Karlsruhe, Germany. We are also hopeful that gradually the world will come to recognize that the food irradiation process when properly used will significantly help reduce suffering from food borne disease, hunger, and malnutrition; and that the process in no way impairs nutrition of the food nor compromises safety for its consumption. As a consequence, throughout the world there will be fewer people hungry and fewer people suffering from food borne diseases over the next 200 years." END

"The National Food Irradiation Program Conducted By The Department Of The Army," is the title of a paper by Dr. Ari Brynjolfsson which covers the history of research work on use of irradiation for food preservation at Natick, the present status, and projections for future. The paper is available from Dr. Ari Brynjolfsson, Chief, Radiation Preservation of Food Division, Food Engineering Laboratory, U.S. Army Natick Research and Development Command, Natick, Massachusetts 01760.

Radiation Technology, Inc. has commercial production facilities available for use of irradiation to preserve foods and to sterilize packaging and other materials. Information on the contract services is available from Radiation Technology, Inc., Lake Denmark Road, Rockaway, NJ 07866.

Information on a "turn-key" radiation processing facility, RTI Model 4100, is also available from Radiation Technology, Inc.
