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Spices & Herbs

Irradiation

Making the world a tastier place

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Irradiation

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The Need to Preserve our Food

From earliest times, people have sought to better manage their food supply by various means of preservation in order to control spoilage, food-borne diseases and insect infestation. Over the centuries, food preservation techniques have evolved as our knowledge of science has grown. Current methods include freezing, drying, canning, pickling, pasteurization, fermentation, cool or controlled atmospheric storage, chemical fumigation and the addition of preservatives. Today, irradiation promises to improve our ability to preserve food, while at the same time reducing the incidence of some food-borne diseases.

Food-Borne Illness is a Worldwide Health Problem

It has long been acknowledged among food and health professionals that food-borne illness is a widespread health problem

It claims lives worldwide. The United Nations Food and Agricultural Organization / World Health Organization (FAO / WHO) Joint Expert Committee on Food Safety reported that illness due to contaminated food is “perhaps the most widespread health problem in the contemporary world and an important cause of reduced economic activity.”

Irradiation of various foods, particularly poultry, shellfish and pork, combined with the cleanest food processing methods, would significantly lower the incidence of illness caused by micro organisms.

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In the United States, the Centre for Disease Control and the Food and Drug Administration estimate that up to 33 million Americans become ill each year as a result of microbial contamination. In Canada, it is estimated that more than two million cases of food-borne illness occur each year. In addition to microbial contamination, world food requirements continue to grow and the problems of food storage, transportation and processing make it necessary to search for alternative methods of food preservation. The FAO estimates that one-quarter to one-third of world food production is lost due to pests, insects, bacteria, fungi and enzymes which eat, degrade or destroy crops.

The magnitude of economic loss due to food-borne disease and the rejection of food contaminated by parasites and pathogenic micro organisms are incalculable.

New and effective methods are needed to make more safer and wholesome food available to the world's growing populations.

How Food Irradiation Works

Food irradiation is a physical means of food treatment comparable to heat pasteurization, canning or freezing. The process involves exposing food, either packaged or in bulk, to one of three types of ionizing energy: gamma rays, machine generated electrons or X-rays. This is done in a special processing room or chamber for a specified duration. The most common source of gamma rays for food processing is the radioisotope cobalt 60. Food is treated by cobalt 60 gamma rays in a facility known as an irradiator.

Gamma energy is electromagnetic radiation of very short wavelength, similar to ultraviolet (UV), visible and infrared light, microwaves and radio waves used for communication. We use these forms of energy for a wide range of purposes; for example, to cook food in microwave ovens.

Food irradiation employs a particular form of electromagnetic energy known as "ionizing radiation." The term is used to describe these rays because they cause whatever material they contact to produce electrically charged particles called "ions."

In specific circumstances, ionizing radiation is a very effective and useful food processing technique.

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Cobalt 60's gamma energy can penetrate food, and just like cooking, canning or freezing, it causes small, harmless molecular changes to the food. Essentially, the energy simply passes through the food being treated, but unlike chemical treatments, leaves no residue. Irradiation is called a "cold process" because it does not significantly increase the temperature of the foods being processed. Irradiated food products can be shipped, stored, or eaten immediately after treatment.

Irradiation works by disrupting the organic processes that lead to food decay. In their interaction with water and other molecules that make up food, gamma rays, X-rays or electrons are absorbed by the molecules they contact. In the process, microbial cells, such as bacteria, yeasts and moulds are broken down, and parasites, insects or their eggs and larvae are either killed or made sterile.

The Benefits

Food processing by irradiation is not a "miracle" technique capable of solving all food preservation problems. It cannot convert spoiled food into high quality food. Also, some foodstuffs are simply not suitable for radiation treatment, just as some are not suitable for canning or freezing or other food preservation techniques.

It can solve some important specific problems and complement other technologies. Food irradiation holds great promise in the control of food-borne diseases such as salmonellosis, which is a worldwide problem. It is also effective in the area of disinfestation, particularly in hot climates where insects consume a large percentage of harvested foods.

It can also extend the shelf life of many foods at competitive costs while offering an alternative to the use of fumigants and chemicals, many of which leave residues.

In many cases, foods irradiated at their optimal storage temperature and in air-tight packages will last longer and retain more of their original texture, flavour and nutrient value than foods thermally pasteurized, sterilized or canned.

The Safety of Irradiated Food

Food irradiation has been the subject of intense research for more than 40 years. International agencies such as the United Nations' Food and Agriculture Organization and the World Health Organization have reviewed this research and concluded that irradiated food is safe

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and wholesome. Similarly, the nutritional value of irradiated food has been found to compare favourably with other food processing methods. In 1983, the Codex Alimentarius Commission, a United Nations group that develops international food standards, concluded that foods irradiated below 10 kGy present no toxicological hazard. Treatment levels below this level are now commonly used throughout the world.

Neither gamma energy nor internationally established energy levels for electron beam machines can make a food product radioactive. Just as X-rays used for airport security do not make your suitcase radioactive, neither does radiation processing make food radioactive.

Treatment Levels and Effects

Irradiating food can produce a variety of results depending upon the specific food and the amount of ionizing energy absorbed by the food. This is usually measured by a unit known as "the gray" Gy or "rad" (1 Gy = 100 rads)

Regulation of Irradiated Foods

Irradiated foods have been approved in more than three dozen countries around the world. Foods are normally approved for irradiation on an individual basis. For example, in the USA an approval is granted by the Food and Drug Administration following its examination of a petition submitted to seek approval for irradiation of a particular type of food. A petition may be submitted by an individual, a private company, an educational institution or any other entity. Other countries have similar procedures.

Irradiated foods offered for sale in grocery stores must be labelled with the international "Radura" symbol. It must be accompanied by the words "Treated by Irradiation" or "Treated with Irradiation." This labelling is required by law to inform consumers that they are buying a food that has been processed. This advisory is needed because irradiation as a process does not leave any indication that the food has been processed. One cannot detect that a food has been irradiated by appearance, taste, smell or touch. This is in contrast to other food processing techniques such as cooking, canning or freezing, where processing is obvious. Irradiated food served in a foodservice establishment does note require any labelling or statement on a menu, as the food received has obviously just been processed.

Labelling is not required in the case where a minor ingredient in a food preparation has been irradiated. An example would be where a spice or dry ingredient has been sanitized by irradiation, and then added in a minor amount to a food product.

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Consumer Attitudes and Commercialization

The technology of food irradiation has received greater interest from the public, media and food industry during the nineties. This has been largely due to the establishment of North America's first dedicated food irradiation facility in Florida, initial marketing of irradiated food treated at that facility and government approval of poultry irradiation.

Consumer studies conducted on a national basis indicate that 45-55% of consumers are willing to buy bacteria reduced irradiated meat or poultry. The endorsement of the process by entities such as the U.S. Department of Agriculture and the American Medical Association gives the process great credibility with consumers. Market trials at grocery stores and exhibitions have confirmed this level of customer acceptance.

Irradiated produce from Florida has been available in certain U.S. markets since 1992. This produce is irradiated to extend shelf life and has been well received by consumers. Irradiated strawberries and mushrooms sometimes out-sell non-irradiated produce by 10 to 1 or more. In 1995, papayas from Hawaii were irradiated for disinfestations purposes, and sold to consumers in the U.S. Midwest.

Poultry has been irradiated to control Salmonella and made available in limited U.S. markets since 1993. More recently, the foodservice market has been using irradiated chicken in growing amounts. Foodservice establishments such as hospitals and restaurants have been purchasing the product on a regular basis. Using pathogen-reduced irradiated chicken in their kitchens reduces the risk of cross-contaminations of harmful bacteria from raw chicken to other foods during preparation.