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HIGH-DOSE IRRADIATION: WHOLESOMENESS OF FOOD IRRADIATED WITH DOSES ABOVE 10 kGy

Report of a
Joint FAO/IAEA/WHO Study Group

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Contents

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1. Introduction

A Joint FAO/IAEA/WHO Study Group on High-Dose Irradiation met in Geneva from 15 to 20 September 1997. Dr F. S. Antezana, Deputy Director-General *ad interim*, opened the meeting on behalf of the Directors-General of the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA), and the World Health Organization (WHO). He said that the three Organizations had had a long and sucessful history of collaboration in the area of food irradiation, which had started as early as 1961. In 1980, the Joint Expert Committee on the Wholesomeness of Irradiated Food had concluded that the "... irradiation of any food commodity up to an overall average dose of 10 kGy[1] presents no toxicological hazard... and introduces no special nutritional or microbiological problems" (*1*). These conclusions clearly established the wholesomeness of any food irradiated up to an overall average dose of 10 kGy.

The reasons for this limitation to doses of up to 10 kGy were essentially two-fold. Firstly, the 1980 Joint Expert Committee was asked to assess the wholesomeness of irradiated foods on the basis of the data available at that time, which mainly concerned doses below 10 kGy. Secondly, many of the anticipated applications for irradiation of food would require doses of less than 10 kGy. Examples of such applications include: the elimination of vegetative bacterial pathogens from foods such as meat, poultry, fish, and fresh fruits and vegetables; the inhibition of sprouting in potatoes and other tubers; the insect disinfestation of grains and dried fruits such as dates and figs; extension of the shelf-life of refrigerated foods; and the treatment for quarantine purposes of fruits and vegetables. Although the Joint Expert Committee recognized that higher doses were needed for the treatment of certain foods, it did not undertake a toxicological evaluation or a wholesomeness assessment of food treated with higher doses, because the available data at that time were insufficient. It concluded that further studies in this area were required.

On the basis of the scientific judgement provided by the Joint Expert Committee in 1980, as well as additional supportive evidence, the FAO/WHO Codex Alimentarius Commission adopted, in 1983, the Codex General Standard for Irradiated Foods, limiting the overall average dose to 10 kGy (*2*). As a consequence, a large number of governments

[1] The gray (Gy) is the unit of absorbed dose of ionizing energy, and is equivalent to 1 joule/kg. The gray replaces the rad (radiation absorbed dose) as the unit of absorbed dose. One gray is equivalent to 100 rads.

(currently 40) initiated regulatory actions permitting the irradiation of a considerable number of food commodities.

With the exception of irradiation of spices and dried vegetable substances, which is widespread, other applications of this technology remain marginal. Misconceptions about whether irradiated food is safe to eat and about how irradiation can complement or replace other methods of preserving food are largely responsible for this situation. Consequently, the beneficial results of food irradiation – the improvement of the hygienic quality of certain foods and the reduction of post-harvest losses – are not generally available to individual consumers, families and societies. There are indications, however, that irradiation will be increasingly used to ensure hygienic quality of food of animal origin and to overcome quarantine barriers in trade in fresh fruits and vegetables. An outbreak of infection with enterohaemorrhagic *Escherichia coli* in the United States of America in August 1997 led to the recall of 25 million pounds (over 10 000 metric tonnes) of ground beef in which the contamination with this pathogen could not be excluded. Events of this kind make a case for the use of food irradiation as a public health technology. Moreover, the use of high-dose irradiation could also result in less dependence on refrigeration of food, which is an energy-intensive technology.

The fact that the international organizations and the Codex limited the dose level to 10 kGy has frequently been interpreted as meaning that this is a dose above which toxic substances could be introduced or nutritional adequacy of foods could be negatively influenced. However, there are current applications of food irradiation involving doses above 10 kGy which indicate that this is not the case. These include the development of high-quality shelf-stable convenience foods for general use and for specific target groups, such as immunosuppressed individuals and those under medical care. Such shelf-stable foods have also been used successfully by astronauts, military personnel and outdoor enthusiasts in some countries. The present Study Group was convened to evaluate the data that have become available on irradiation of foods with doses above 10 kGy in order to determine whether such foods can be