EFFECT OF IRRADIATION ON MEAT AND MEAT PRODUCTS

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INTRODUCTION

Irradiation of foods is considered as the only new acheivement in the area of food preservation during the past few decades. The use of ionizing radiation in food processing, like the presently used commercial processes of freezing, canning and drying, produces no significant reduction in the nutritional quality of proteins, lipids, carbohydrates and mineral constituents (Jospheson et al., 1978). Irradiation, moreover, is comparable to presently used food preservation processes in its effects on vitamins, although nutritional effects vary with the dose of irradiation. Pork treated with irradiation processing for example, retains more of its thiamin than when canned (Thomas et al., 1981). Irradiation treatment can also replace some food additives, or reduce the amounts required. For example, irradiated ham, bacon, corned beef and other cured meats have been produced with much less nitrite than is used in conventional cured meats and are indistinguishable in flavor from commercially produced counterparts (Wierbicki and Heiligman, 1980).

The application of low doses of gamma irradiation has proved to be of great value for increasing the cold storage life of fleshy foods. In Egypt proplems of food losses due to the hot climate and shortage in refrigerating facility, caused complications to the national economy. Egypt faces a serious shortage of dietary animal protein to an extent that frozen meats are imported. Gowaili (1982) determined the minimum losses for locally produced meat and fish to be about 20% and also losses are extended to the imported foods such as meat and fish, being not less than 10%. In order to insure adequate provision of protein stable to the increasing Egyptian population, an intensive national program has been set up under the head line of "Food Security". This aims at increasing food production as well as reducing food losses. Egypt being aware of the role which new technology could play along this line, intensive food technology programmes are now being formulated. Among such technology, radiation preservation of food could be an effective contribution (Hassan, 1980). Since early studies, the Egyptian Atomic Energy Establishement at Inchas in Collaboration with Universities and Research instituents have conducted some studies along this line. This included food technology, food microbiology and wholesomeness studies. Results obtained from such investigation encouraged to upscale the studies on the pilot level. This necessitated bigger radiation sources. The National Center for Radiation Research and Technology has been thus formulated housing large radiation sources furnished with mechanical radiation processing.

Many research works have been conducted in the field of food preservation using such a facilities.

Internationally much research was conducted on food irradiation in 1950s, 1960s and 1970s. Joint efforts were established in the 1960s between the Food and Agriculture Organization (FAO) and the International Atomic Energy Agency (IAEA). In 1970, an "International Project in the Field of Food Irradiation" was established involving 25 countries. Continuing research on toxicology and wholesomeness led to the Joint Expert Committee on Food Irradiation (JECFI), in 1980, to a conclusion that irradiation was a process rather than an additive and that the irradiation of any food commodity up to an overall average dose of* 10 KGy presents no toxilogical hazard, and thereby, toxilogical tests on foods so treated are no longer required (WHO, 1981). The international organization concerned with food standards, the Codex Alimentarius Commission of the United Nations FAO

KGy Kilogray = 100 Kilorad. K.rad=1000 rad. Gy Gray=100 rad.
RDD The basic unit of absorbed dose of ionizing radiation. It equals 100 erg of absorbed energy per gram of absorbing material. (rad = 1.1 rep.).

has also endorsed these recommendations. Five important principles underlie their conclusion:

1. Irradiation is a process with uniform and predictable changes;
2. Radiolysis products pose no short term or long term toxicological hazards based on feeding studies in standards mutagenic tests;
3. Irradiation introduces no special microbiological proplems;
4. Nutritional quality is not compromised; and
5. Irradiation levels used in specific applications should be consistent with the objective (sterilization or pasteurization) and the requirements set by the regulatory authorities.

Acceptance by health authorities of principles elucidated by this international group of experts should speed up world-wide approval of irradiated foods (IFT, 1983).

There are several possible resons for irradiating meats and poultry. They may be stated as follows:

i) To obtain preservation by radappertization (radiation sterilization) or radurization (radiation pasteurization).

ii) To inactive pathogenic bacteria, parasites or viruses.

Radurization can apply to both fresh and processed meat. Its objective is the extension of products or market life through reduction of microbial population, which may include bacteria, yeasts and moulds (Urbain, 1978). There is a growing realization that, whereas the prolonged storage of fresh meat at high temperature after sterilization doses of ionizing radiation would be offset by proteolytic and other deterioration, a substantial extension of the sotrage life of meat preserved by refrigeration would be possible if this were combined with a low dose (Lawrie, 1976).

Urbain (1978) reported that, the sole accomplishement of irradiation is reduction of the initial microbial population, whose outgrowth causes spoilage. Early work demonstrated that irradiation dose in fact do this. Unfortumately microbial spoilage is not the only pathway of deterioration of fresh meat. At least 3 other pathways have been identified:

(1) Myoglobin oxidation, leading to discolorations.

(2) Lipid oxidation, leading to off-flavors.

(3) "Drip" or "Weep", an exudate of reddish serum from the cut meat surface, which, if large, is unsightly.

Irradiation may enhance these pathways of deterioration (Hannan, 1955, Urbain, 1972).

The phosphate is added primarily to control drip. This material, however, also has a very significant sole in preserving color (Urbain, 1978). Alekceyev et al., 1958) reported that, phosphates increased protein solubility and showed antibacterial effect as well as antioxidative effect. Phosphate reduced the indirect damage occured as a result of irradiation (Rhodes, 1969).

Kampelmacher (1983) reported that in retrospect one wonders why the process of food irradiation which offers so many advantages, is so hesitantly accepted or