The Parliamentary and Scientific Committee

INFORMATION FOR MEMBERS
FROM THE
PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY

BRIEFING NOTE 1
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IRRADIATION OF FOOD

Irradiation of food has been illegal in the UK since 1967, with exemptions to sterilise the food of patients susceptible to infection. Elsewhere, commercial application of irradiation has slowly expanded. Today, 36 countries approve the use of radiation processing for more than 40 different kinds of foods and food ingredients, under international guidelines set down by the Codex Alimentarius Commission[1] in 1983.

Since some other European countries employ food irradiation, the EEC has proposed a Draft Directive preventing Member States from prohibiting the marketing of foods irradiated according to the Codex guidelines. The DHSS/MAFF Advisory Committee on Irradiated and Novel Foods (ACINF) had already reported in 1986 that irradiation would be an 'efficacious food preservative treatment that would not lead to a significant change in the natural radioactivity of the food or prejudice its safety and wholesomeness'.

Food irradiation is used in many countries, yet it is effectively banned in the UK. This note provides an overview of the science and technology of food irradiation to help inform debate on this issue.

These developments and the anticipated Government statement on the subject have excited Parliamentary interest, as evidenced by **Early Day Motions 497 and 774**.

This briefing note describes the science and technology underpinning the irradiation of foods in order to assist Parliamentarians reach a view on this issue.

Why irradiate?

Recently *Salmonella* and *Listeria* have become part of our common vocabulary. Disease caused by certain bacteria is a major problem. A relatively low dose of radiation kills such organisms. Spices can be particularly contaminated and would be one of the earliest candidates for irradiation, if authorised.

Food losses after harvest are also very high, particularly in developing countries where they can reach 40-50%. Irradiation can reduce losses due to insect infestation, bacteria and fungi. Losses also occur due to premature germination and sprouting - processes which are also slowed by irradiation.

Some of these applications provide alternatives to chemical methods of preservation (Eg ethylene oxide fumigation) which themselves are under pressure due to concerns over toxicity.

What is involved?

Food is exposed to a radiation source like those used in medical treatment in hospitals, though at higher dose rates. The allowable radiation dose encountered by the food is limited under the international guidelines endorsed by ACINF to a dose of 10kGy or below[2].

Irradiation facilities would require a secure conveyor system to carry the food around the source, a secure radiation room with thick concrete walls and specially designed doors to prevent radiation from escaping. Systems ensure that the radiation source cannot be exposed or switched on until the radiation room is sealed. These also control and monitor the exposure of the food.

Irradiation facilities are substantial investments and would require HSE approval for construction and inspection of their operation under the Ionising Radiation Regulations of 1985.

What happens to the food?

A primary purpose of irradiation is to reduce the numbers of microorganisms responsible for food spoilage or food poisoning. More than 90% of foodborne diseases are due to *Salmonella* or *Campylobacter*, both of which are susceptible to irradiation at 2.5 to 5 kGy. Despite this, the elimination of all disease-causing microorganisms cannot be guaranteed - bacterial spores and viruses are particularly resilient. Consequently ACINF and all other authorities have stressed that irradiation must **not** be used to treat spoiled or unfit food, and food hygiene principles must not be relaxed.

The most obvious questions are 'does the food become radioactive?' or 'will it produce harmful mutant bacteria?'. On the first of these, the ACINF report concluded that any induced radioactivity would be extremely low and in the majority of cases not detectable. On the second, that mutations generally weaken the

1. The Codex Alimentarius Commission is a joint FAO/WHO body which prepares international food standards with a view to their acceptance by governments.

2. The kGy or KiloGray is a measure of radiation dose.

organism and were not likely to constitute a microbiological hazard.

Irradiation can also have other effects on food. Some fats may become rancid and this currently rules out the irradiation of dairy products and whole eggs. Other changes are more akin to those of cooking; thus, although carbohydrate and proteins are unaffected, some vitamins are broken down by radiation to varying degrees, just as they are when heated. Such losses would have to be placed in the context of overall dietary intakes, and would not be significant while irradiated foods comprised a small part of the diet. The current EEC list of foodstuffs authorised for irradiation is in the Table.

FOODSTUFFS AUTHORIZED IN EEC DRAFT DIRECTIVE FOR IRRADIATION TREATMENT AND MAXIMUM RADIATION DOSES

FOODSTUFF	MAX. AVERAGE DOSE (kGy)
Strawberries,papayas,mangoes	2
Dried fruits	1
Pulses(legumes)	1
Dehydrated vegetables	10
Cereal flakes	1
Bulbs and tubers	0.2
Herbs,spices,seasonings	10
Shrimps and prawns	3
Poultrymeat	7
Frog legs	5
Arabic gum	10

Radiation can also break down some chemical molecules which can recombine to give different chemical substances. The possibility of such changes has given rise to extensive toxicological testing of irradiated foods in animals (including one UK study which followed over 100 generations of laboratory animals fed on irradiated food),as well as the study of human experience. After reviewing these, ACINF, FAO/WHO etc concluded that there were no indications of harmful effects on consumers from food irradiated up to a dose level of 10 kGy. The EEC Scientific Committee for Food also concluded that, 'for the specified doses and food classes irradiated, the health significance of irradiation-induced changes was not different from the changes caused by heat treatment'.

Outstanding issues

Concerns remain over the potential use of irradiation in the UK, despite the views of national and international expert bodies that the process is safe.

One is that the technique could be used to mask food which had become unfit for human consumption through contamination or had passed its sell-by date. Bacteria that spoil the appearance of the food could be killed, but the toxins which cause food poisoning, as well as the smell and taste of spoilt food, would remain. Food might be exposed to radiation more than once, either through accident or because the food contained additives, like spices, which had already been irradiated. Since it is not currently possible to test for irradiation, it would be difficult to safeguard against this.

The contrary view holds that the high cost of installing irradiation systems is likely to limit their number and ensure that there will be no 'backstreet' operators. All facilities could thus be effectively regulated as envisaged in the ACINF and EEC reports. Close attention to control, enforcement and documentation is essential to ensure that misuse of the technology is avoided, and central rather than local control is advocated by some to achieve this. A further option would be to require the clear and uniform labelling of any food that had been irradiated, and the EEC Directive includes such a requirement as well as a Logo for this purpose. Current research has developed tests which can pick up the evidence of irradiation in bone or dried substances such as spices, though routinely applicable tests are some way off yet.

Another concern is that the availability of irradiation technology may allow a 'quick fix' for problems which should be solved by more fundamental changes. For example, the ability to irradiate chicken feed or chickens to remove *Salmonella* could dilute pressure to prevent infection in the first place. ACINF and other authorities have emphasised that the availability of irradiation should not detract in any way from the need to apply principles of good manufacturing practice and hygiene, and that irradiation should not be an excuse for sloppiness in this field. Moves have started internationally to develop more specific microbiological standards which would help in this.

Finally, some question whether there is a real need for this technology, or any significant benefit to the consumer. This issue is addressed in the EC Draft Directive which includes consumer benefit among the list of criteria for selection of foods suitable for irradiation.

Further information

Additional details and background information relating to irradiation of food are available from POST, 16 Great College Street (222 7085).

LOGO FOR IDENTIFICATION OF IRRADIATED FOODSTUFFS

The PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY has been set up by the Parliamentary and Scientific Committee to inform Parliamentarians on scientific and technological matters underpinning current issues.