Round-Table Discussion on Food Irradiation

The possibilities of using radiation for food preservation as a way of alleviating the food deficiency problem in a large part of the world has been studied for some 20 years.

Once the idea was recognized as a viable one, scientists had to develop it along three levels: firstly, the technological problems and economic viability had to be faced; at the same time tests had to be initiated to prove the wholesomeness of the irradiated foodstuffs, and then public acceptance and confidence in the end product had to be established.

Work is proceeding along these three lines and in some cases, success has been won on all fronts. In others, it is continuing. As a **FLASHBACK** to the situation **TWO YEARS AGO,** we thought it interesting to reprint excerpts from a round-table discussion at which scientists from five countries sat down to discuss the pros and cons of food irradiation.

Host at the gathering was Dr. Rocco Basson, Director of Chemistry at Pelindaba, South Africa, and the man responsible for directing radiation processing in that country. With him were Dr. Lapidot, Head of the Radiation and Engineering and Processing Section of the Israel Atomic Energy Commission at Soreq; Dr. Saint-Lèbe of the Radioagronomy Service, French Atomic Energy Commission, at Cadarache; Dr. Ulmann, then Director of the Food Irradiation Pilot Plant at Wageningen in Holland; and Mr. Roy Hickman, leader of the International Project in the Field of Irradiation, sponsored by the FAO, IAEA and the OECD Nuclear Energy Agency, centred at Karlsruhe in Germany.

NOTE: The dates referred to throughout were relevant at the time of discussion.

Basson: *The question of food preservation by ionizing radiation has been the subject of much research in a large number of countries for some years. There are indications of an escalation of activities at the present moment and in some countries the full commercial exploitation of the process appears imminent. Nevertheless a great many problems remain to be solved and the obstacles to commercialization may even seem insurmountable in many cases. It would seem that we have now reached the cross-roads and that the final direction which the application of food irradiation will take will be decided within the next few years. The time has come to take a careful look at the present day relevance of this promising new technology and it is thus a great privilege to be able to record the viewpoints on this matter of some of the most highly respected scientists in this field. Gentlemen, I thank you for your cooperation and trust that the consensus of your opinions will result in a deeper understanding of the limitations as well as the potential of this method of preservation.*

To start the ball rolling let us establish the main interest with respect to food irradiation in each of your countries.

Saint-Lèbe: Interest in food irradiation in France exists at both the fundamental and applied levels. As far as the latter is concerned work on potatoes has largely

been completed and studies on maize were recently terminated in favour of research on starch for the food processing industries. The object here is to destroy pathogenic micro-organisms which often contaminate the material without affecting the nutrient qualities, the taste and the technological properties.

Lapidot: Six years ago we in Israel screened the various food items and other agricultural products that may benefit from radiation treatment in a comprehensive survey. The main items that were then selected for exhaustive experimental scrutiny were: potatoes, onions and garlic, citrus fruits, strawberries, avocados and wheat products. Experimental results were very promising and three years ago potatoes and onions were chosen as model items in a campaign for the commercialization of irradiated agricultural products. Other items like bananas, pears, apricots, bell peppers, flowers and boiled or fried eggs, were also tested but the results were not as satisfactory, and because of their smaller economic significance, they were left for future consideration, subsequent to commercial implementation of the former items.

Ulmann: There is considerable interest in the Netherlands at present in the radio-pasteurization of fish, shrimps, soft fruit etc., with a view to obtaining extension of shelf life. In addition there is a growing interest in random applications in the physiological field such as the prevention of sprouting in potatoes and onions and retardation of growth in mushrooms and asparagus.

Basson: *Despite the wide range of products mentioned it is interesting to note that potatoes, onions and grain or grain products are of considerable general interest. In this context it is relevant to note that South Africa is very interested in potatoes and grain products as possible model commodities to demonstrate the feasibility of radiation processing of food and to obtain the initial health authority clearances.*

Moving on to the next point could you describe in more detail the anticipated benefits of the radiation treatment of the items mentioned?

Lapidot: Regarding potatoes, onions and garlic the major benefits realized are threefold – present day losses in cold storage (4°C for potatoes and 0°C for onions) as well as in marketing channels and in the home can be reduced, the products are better looking, have a better texture and are better tasting than the conventionally cold stored products. Furthermore, the shelf life at the greengrocer and at home is considerably extended as there is no sprouting. With citrus we expect to attain the same fungicidal control as is currently obtained by wrapping the fruit with diphenyl paper but without the accompanying chemical residual problem. With strawberries and some varieties of avocados we have achieved sizeable extensions in storage and shelf life. In the case of wheat products in the dry state (wheat grains, flour, semolina, etc.), we expect to achieve effective insect disinfestation prior to storage, at the store and at the home, while in the case of bread we have realized considerable extension in shelf life (over two years.)

Ulmann: The situation is essentially the same in the Netherlands and broadly speaking the major anticipated benefits are: (a) a more sanitary product through microbial reduction or elimination and (b) an increased shelf life for most items.

Saint-Lèbe: As Dr. Lapidot indicates a major advantage of the radiation treatment of potatoes is the extended storage life which provides better utilization for both the consumer and the processing industries. In the case of starch irradiation, where pasteurization is the object, the anticipated benefit is the elimination of the taste, colour and nutritional changes occasioned by heat sterilization. In comparison with

alternative chemical methods of disinfection radiation offers the advantage of eliminating harmful residues.

Basson: *There can be little doubt that the potential benefits of the technique are considerable. Health authority clearances still remain a considerable problem, however. What are your feelings on the likelihood of obtaining early clearances for those products for which technological feasibility has been demonstrated?*

Hickman: If the necessary evidence to support a good petition is available, I see no basic reason why early health authority clearances for general consumption should not be granted. Of course, there are likely to be differences from one country to another.

Ulmann: The philosophy of the Dutch Health Authorities has always been to demand the same stringent wholesomeness data as laid down in the FAO/WHO Code of Practice. In practice, however, they may make the following amendments:

1. Products for which wholesomeness testing has been carried out by others will not necessarily be retested in the Netherlands.

2. For products which only comprise a small fraction of the total diet only semi-chronic wholesomeness data may suffice (e.g. shrimps).

3. For products of which no wholesomeness data are available in the non-treated condition, no data in the irradiated condition may be required (e.g. spices). Moreover physical irradiation treatment is favoured above chemical treatment.

Lapidot: In Israel, clearances have already been granted by the Ministry of Health within a general Food Products Act which prohibited food irradiation for marketing, with exemptions. The first exemptions were potatoes (1968) and onions (1969), irradiated for sprout inhibition. We have now two further petitions under consideration – wheat and wheat products, and farm animal feed (irradiated to eliminate salmonellae and similar micro-organisms).

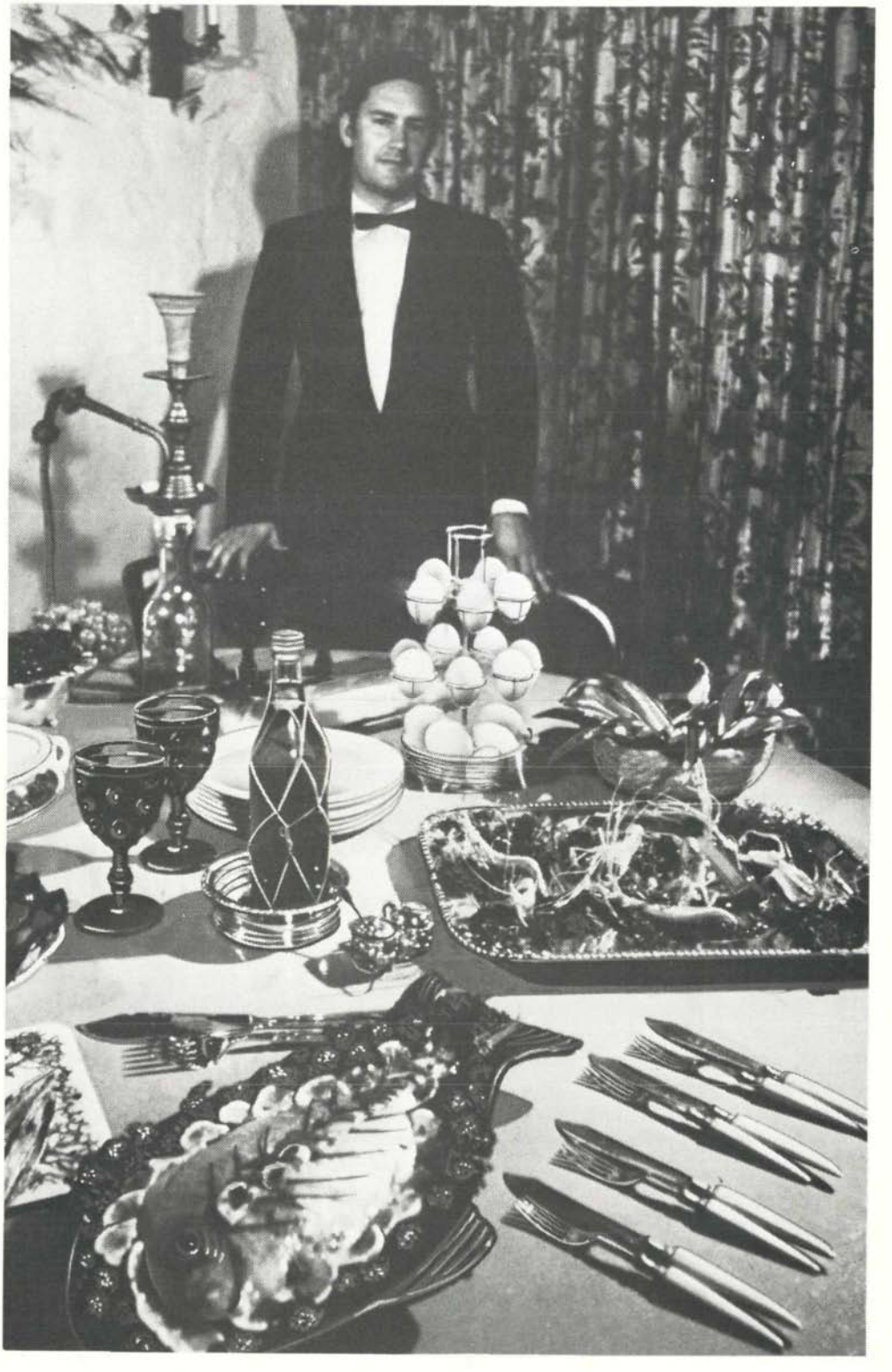
Saint-Lèbe: A programme of toxicological testing of irradiated potatoes was carried out two years ago and a dossier was submitted to the Health Authorities but as yet no clearances have been issued.

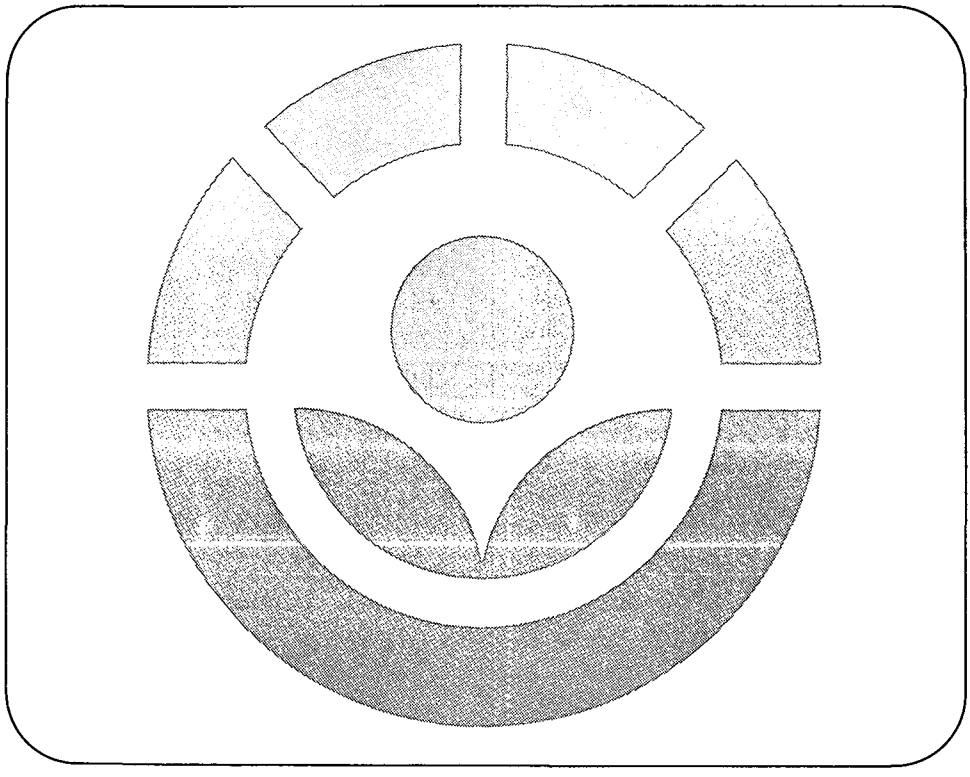
Basson: *Mr. Hickman, you stressed the requirements for the necessary evidence to support a good petition. Would you care to elaborate on your feelings on this matter?*

Hickman: Yes, at the present time, I feel that such evidence is available for only a few products. This is because many health authorities require evidence of the safety for consumption of the specific irradiated food treated in the manner proposed for commercial application. I believe that this is the wrong approach to this problem. All evidence on the wholesomeness of irradiated foods must be relevant to each specific irradiated food. After all, if we were considering the wholesomeness of heated foods, I doubt if we would insist upon comprehensive toxicological and nutritional studies being performed on each individual food treated in this specific manner to be used in practice before we would permit clearance of that food for human consumption. Of course, initially one must be prudent. However, sooner or later the authorities must be prepared to extrapolate safety data from one irradiated food to another, otherwise the amount of testing to be done is quite unreasonable, and is simply not feasible bearing in mind the limited resources that can be devoted to this task.

Basson: *Of course, caution on the part of the authorities is only part of the general prejudice regarding the use of radiation, and unfavourable consumer reaction may also be expected.*

Dr. Rocco Basson awaits his guests at a round-table talk on the preservation of food by nuclear methods





Hickman: I agree, there will be some unfavourable reaction when irradiated food is made available for general consumption. I expect that a small, but vocal minority will very likely exert their pressures through consumer associations, elected representatives, and the health authorities. I believe that most of the people who react in this way are perfectly sincere; they react from fear – fear created by ignorance and mis-information. The best measure to overcome such prejudice is to educate the general public in an honest and frank fashion about food irradiation. This must be a genuine attempt at education. It must, in no sense, be a campaign to promote or advertise food irradiation. For this reason, it must be a low-key campaign. And the time to do this is the present. To initiate a programme of public information at a later stage, concurrent with the introduction of irradiated food in the market place, will appear to be a defensive measure.

Ulmann: With the introduction of the first two irradiated food items on the market – mushrooms and strawberries – we have realised the importance of an early start to an information programme. However, we have found that this should preferably be a fortnight to a month before marketing commences. A second important factor is the correct briefing of the vendor concerning the irradiation process and the irradiated product. In all our trials he was the weakest point. He is the last minute resort to reassure the customer that the article is sound. He is also the one to ensure correct storage conditions (temperature, etc.), and to withdraw the senesced article in time.
The consumers' greatest prejudice is in the word 'irradiated', falsely associated with negative terms such as cancer, death, sterilisation and radioactivity. Hence the Dutch have tried to avoid the word and introduced an irradiated food symbol which could also be used internationally

for exports. This has worked quite well and it is being considered for inclusion into the Food Law as a quality mark.

Saint-Lèbe: I can only endorse these sentiments but I feel that the publicity campaign should be initiated by industry in consultation with irradiator manufacturers and isotope suppliers. It is also my opinion that success depends considerably on the amount of interest shown by large international companies in radiation processing.

Lapidot: There has been widespread belief in Israel, that the general public would reject irradiated products because of a variety of logical and illogical reasons. In view of this, and in order to dispel or prove this belief, we have organized a thoroughly planned and executed test-marketing and consumer acceptance campaign in which many thousands of customers participated. The entire campaign was under the guidance of a team of psychologists and market-research specialists, and their conclusions were quite clear – there is no widespread consumer resistance to irradiated products, provided that the public is properly informed about the benefits of the process and the higher qualities of the products. In fact, here, the customers preferred the irradiated products over the cold storage products at a rate which increased with the increase in price difference between the two. The local reports of the tests mentioned provide data for any country intending to commercialize irradiated agricultural products, and provide good and proven indicators of the 'do's' and 'don'ts' in the publicity and test marketing campaigns. It is hoped that the large scale tests, using a pilot scale demonstration facility capable of processing 1500 tons each of onions and potatoes, will provide further useful data for other countries.

Basson: *The results obtained in Israel and the Netherlands are most illuminating if somewhat unexpected. I feel that we can safely accept that the housewife will buy irradiated food and come back for more if she has the assurance that it is wholesome and if she is convinced of the superior quality of the product. Thus it would seem that two of the major hurdles standing between us and full commercialization – health authority clearance and consumer reaction – can be overcome. The final one is, of course, finding a sponsor sufficiently impressed by the potential of the method, to invest the considerable sums required to establish a facility. Dr. Lapidot, as you are involved with this problem at present, perhaps you could give some idea of the extent of industry interest in your country?*

Lapidot: In Israel various commercial bodies – both private and governmental (such as the vegetable production and marketing board) have cooperated in the funding of the commercialization campaign, and they are now cooperating in the final stages leading to the decision on a commercial irradiation facility and its implementation. It seems however, that a pilot scale facility will have to be set up, perhaps with the aid of international bodies, to bridge the gap between marketing tests using 100-200 ton amounts and full commercialization using 10 000 ton amounts.

Ulmann: The Dutch pilot plant was set up in such a way that industry was one of the investors. During the first operating years several working groups were formed in which representatives from industry took part. For full commercialization, however, more than a proof of technological feasibility is required: the process should be economically competitive and there must be no health restrictions (wholesomeness; legislation). As long as the latter two are not fulfilled commercial interest in the practical application will remain rather platonic.

Saint-Lèbe: The present studies are being supported by both governmental and commercial agencies and are expected to

lead to the establishment of a fairly large pilot plant within the next year. Industry interest is considerable and the firm Ets. Roquette is closely involved in the project.

Basson: *I assume that successful operation at the pilot plant level will lead to a rapid acceleration of progress towards full commercialization.*

Saint-Lèbe: The commercialization of potato irradiation could follow quite soon after clearances have been obtained but I do not believe there is sufficient interest at present. On the other hand it is quite likely that the sterilization of diet for specific pathogen-free laboratory animals will be commercialized in 1975 to be followed soon after by starch pasteurization on a limited scale.

Lapidot: I expect more rapid progress in Israel and the first demonstration food irradiation facility for onions and potatoes should be operational sometime next spring.

Hickman: The reasons for the slow progress towards commercial success are complex. One can lay blame upon any one of a dozen or more important factors. Perhaps the important thing is to realize that all of these factors are interrelated. Without doubt the need for health authority clearances is one such factor why the new international project in the field of food irradiation is devoted to wholesomeness testing and related activities but there are other factors too. This may be easily seen from the fact that although a number of clearances exist for several irradiated products in several countries none of these processes can be described as a commercial success anywhere. Perhaps one of the often overlooked factors is that it is difficult to change well established, traditional harvesting, distribution and retailing methods. So often, irradiation is only feasible where a large bulk of a product can conveniently be brought to a central point at some stage between the producer and consumer. In practice, this may be very difficult to achieve without significant inconvenience or unjustifiable additional handling costs.

Ulmann: Two other factors which I consider relevant are the lack of sufficient demonstration facilities and a lack of international cooperation in the exchange of know-how.

Basson: *The question of clearances particularly at international level has been repeatedly raised. What, in your opinion Mr. Hickman is the likelihood that the IAEA/OECD wholesomeness project will contribute materially to accelerated progress in the field?*

Hickman: I am sure that the Project will play an important role because, firstly, twenty-one countries are now making a coordinated effort to obtain the toxicological and nutritional data necessary to support a petition. It is hoped that many of these countries will follow up this activity by making a coordinated effort to petition the authorities in their individual countries for clearance. This action would have obvious implications for facilitating international trade in irradiated foods. Secondly, the various committees and working groups of the Project ensure regular meetings of senior scientists working in the field of food irradiation. This regular contact is an excellent means of ensuring greater cooperation and coordination between the various national programmes which can only result ultimately in better progress in the field.

Basson: *Do the other gentlemen agree with these sentiments?*

Lapidot: I certainly do, in view of the fact that many health authorities may become more lenient if certain low dose irradiated food items are cleared on a basis of an internationally supported wholesomeness study, with its multinational team of experts and the resulting higher credibility of the recommendations.

Ulmann: The IAEA/OECD Karlsruhe programme will only be a success if the health authorities of the participating nations approve the test protocols beforehand and undertake to follow and use the recommendations afterwards. Only if this is achieved on a 'compulsory' basis will the programme accelerate the introduction of the process.

Basson: *Gentlemen, I feel that this exchange of ideas has been most rewarding and I must thank you for your whole-hearted cooperation.*