Food Irradiation Newsletter

JOINT FAO/IAEA DIVISION OF NUCLEAR TECHNIQUES IN FOOD AND AGRICULTURE
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TO THE READERS

The New Year started with sad news, particularly for the staff of the Food Preservation Section. One of our dear colleagues and friends, Dr. George G. Giddings, passed away unexpectedly on 24 December 1995 because of a sudden heart attack while spending Christmas Holidays with his family in New Jersey. You will find ***In Memoriam*** in honour of George in this issue. Regrettably, the sudden demise of George and a reduction of secretarial staff of the Section resulted in a delay in publishing this issue.

While bidding farewell to George, we welcome back Dr. Mainuddin Ahmed, a former staff member from Bangladesh, who is kind enough to assume the work of George and some of his previous work on a short term consultancy basis from 1 April 1996.

Excerpts of the largest meeting of the ICGFI held in Vienna in November 1995 and the summary report of the ICGFI Workshop on Implications of GATT Agreements to Trade in Irradiated Food, Marseille, France, immediately after the ICGFI Meeting, are included in this issue.

A summary report of a large regional seminar for Africa and Middle East countries, co-sponsored by ECA, FAO, IAEA, IIR, ITC, and WHO, held in Rabat, Morocco in late February this year, is also included. The readers will be interested to know that the seminar attracted wide interest and that efforts to harmonize regulations on food irradiation for these regions have been initiated.

The readers will be interested to know also the conclusions and recommendations of the FAO/IAEA Consultants' Meeting on Development of X-Ray Machines for Food Irradiation, Vienna, October 1995. The major finding of this meeting was that x-rays generated by machine sources with maximum energy of 7.5 MeV could be safely used for food irradiation. In addition, this issue provides an updated list of manufacturers of gamma irradiator and electron beam machines for food irradiation. A list of irradiation facilities which are being used for processing food for commercial purposes are also included.

The FAO Near East Regional Office has maintained an active project on food irradiation. A General Training Course on this subject was held in Cairo, Egypt in March of this year and was attended by 24 participants from 17 countries in the region.

The Food Preservation Section was pleased to learn that the US Department of Agriculture has taken an important step in regulating irradiation as a quarantine treatment of fresh fruits and vegetables against fruit flies regardless of commodities, by publishing a "Notice of Policy" in May of this year. Although the Notice is still subject to public comments, it is reasonable to expect that a regulation to this effect will soon follow and that trade in fresh fruits and vegetables could increase through irradiation processing.

Thanks for the contributions of our readers. Please send your future contribution for inclusion in the next issue before the end of September.

FOOD PRESERVATION SECTION

Staff Members

Mr. Paisan Loaharanu (Thailand)
Dr. Ricardo Molins (El Salvador)
Dr. Mainuddin Ahmed (Bangladesh): Short-term
Ms. S. Espiritu (Philippines)
Mr. C. Thottakara (India)

EXCERPTS OF THE 12TH ICGFI MEETING
Vienna, Austria
7-9 November 1995

The 12th Annual Meeting of the International Consultative Group on Food Irradiation (ICGFI) was held at the Headquarters of the IAEA, Vienna, 7-9 November 1995. It was attended by over 50 designated experts from 29 governments which are members of ICGFI and by representatives of international and non-governmental organizations. The meeting was opened by Dr. P.B. Roberts of New Zealand, the current Chairman of ICGFI, and addressed by Dr. S. Machi, Deputy Director-General, Department of Research and Isotopes of IAEA.

The followings are significant developments, conclusions and recommendations derived from the 12th meeting:

1. The meeting noted with satisfaction that the membership of ICGFI continues to grow. Since the 11th Meeting, Cuba and South Africa became members at the time of the 12th ICGFI Meeting and the Czech Republic became a member starting from 1 January 1996. Thus, the total membership of ICGFI is now 45 governments.

2. The popular ICGFI booklet on "Facts about Food Irradiation" has been translated into Portuguese as a contribution in-kind of the Brazilian government. This booklet is now available in Arabic, English, French, Japanese, Portuguese, Russian and Spanish. The German version of this booklet has been prepared and was being printed by the Egyptian authorities as its contribution in-kind. The Chinese version was being prepared.

3. The ASEAN/ICGFI Seminar on Food Irradiation was held in Jakarta and was well attended by some 60 leading representatives of government institutions of Brunei, Indonesia, Malaysia, the Philippines, Thailand and Vietnam. A policy document on "Benefits of Food Irradiation to ASEAN" was prepared during the seminar and will be submitted to policy makers in ASEAN for consideration. An important aspect of the document dealt with harmonization of regulations to facilitate trade in several irradiated commodities in the region.

4. ICGFI agreed to recommend to FAO, IAEA and WHO to convene jointly a Study Group to evaluate the wholesomeness of food irradiated at doses above 10 kGy, subject to availability of funds. Several countries (Canada, India, the Philippines, South Africa and the USA) have made additional pledges to this effect and some US$ 100,000 could be made available from ICGFI member countries for this event.

5. Following an invitation made by WHO on behalf of ICGFI to the National Agricultural Library (NAL), USDA, Beltsville, Maryland, to become a WHO Collaborating Center on Food Irradiation Information, Dr. P. Andre, Director of NAL, gave a short presentation on the activities of the NAL and described the progress of putting the wholesomeness data on CD-ROM. One CD-ROM was already completed and a copy was given to each country represented at the meeting. The estimated cost of the project was US$ 475,000. ICGFI was informed that NAL was in the process of raising funds for this activity and it would consider becoming a Collaborative Center of WHO in due course.

6. The Food Irradiation Process Control School (FIPCOS) remains a high priority activity of ICGFI. The 4th FIPCOS for operators/supervisors of irradiation facilities was held at the Canadian Irradiation Center in co-operation with the Food Research and Development Center, Agricultural Canada, St. Hyacinth, Quebec in July 1995. Based on the result of a survey, FIPCOS for food control officials continues to be of interest to ICGFI member countries.

7. Several reports and documents prepared by ICGFI were published during the past year:

- Food Irradiation and Consumers, Proceedings of a Seminar jointly convened by ICGFI and the International Organization of Consumer Unions, the Netherlands, September 1993 (ICGFI Document 18, Vienna 1994)

- Code of Good Irradiation Practice for the Control of Pathogenic Microorganism in Poultry Feed (ICGFI Document No. 19. Vienna 1995)

- Code of Good Irradiation Practice for Insect Disinfestation of Dried Fruits and Tree Nuts (ICGFI Document No. 20. Vienna 1995)

- Control of Irradiated Food in Trade - a compilation of principles and international recommendations for regulatory control measures (ICGFI Document No. 21. Vienna 1995)

- ASEAN/ICGFI Seminar on Food Irradiation, Proceedings of a Seminar jointly convened by the Secretariat of Association for South-East Asian Nations, Jakarta, Indonesia, June 1995 (ICGFI Document 22. Vienna 1995)

- Workshop on the Implications of GATT Agreements on Trade in Irradiated Food, Proceedings, Marseille, France, 13-15 November 1995 (ICGFI Document No. 23. Vienna 1995)

- Irradiation of Strawberries - a compilation of technical data for its authorization and control, IAEA-TECDOC-779, Vienna (1994).

8. The ICGFI Programme of Work and Budget for 1996 was approved as per attached Annex. The approval took into consideration the comprehensive Programme of Work and Budget for 1996-98 prepared by a Working Group appointed by ICGFI during 1995. The pledges for financial contribution made at the Meeting amounted to US$ 135,000. These pledges; together with others to be made after the Meeting and the in-kind contribution from member countries; should be sufficient to implement most, if not all, of the activities planned for 1996.

9. R.E. Engel Award. A number of candidates were nominated by government; designated experts for this award. After careful consideration and votes by ICGFI members, the first winner of the R.E. Engel award was Prof. J.F. Diehl, a well-known authority on food irradiation who had served in all Joint FAO/IAEA/WHO Expert Committee on the Wholesomeness of Irradiated Foods from the very beginning. Prof. Diehl retired recently from active service as Director of the Federal Research Center for Nutrition, Karlsruhe, Germany.

10. Following the invitation of the designated expert from Portugal, the 13th Annual Meeting of ICGFI was agreed to be held in Portugal (5-7 November 1996).

WORKSHOP ON THE IMPLICATIONS OF GATT AGREEMENTS ON TRADE IN IRRADIATED FOOD

Marseille, France
13-15 November 1995

The 11th ICGFI Meeting, Bali, Indonesia, 2-4 November 1994 decided to organize a Workshop on this subject to clarify various provisions of the Agreements on the Application of Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT), adopted during the GATT Uruguay Round, for the benefit of designated experts to ICGFI and other interested parties. The ICGFI Secretariat, having explored the possibility of convening the Workshop in co-operation with the World Trade Organization (WTO), decided to convene the Workshop in Marseille, France from 13 to 15 November 1995 following the conclusion of the 12th ICGFI Meeting, Vienna, Austria, 7-9 November 1995. Marseille was selected for the venue of the Workshop because of the possibility of the participants to see a commercial irradiation facility which also processes large quantities of food on a commercial scale, and some irradiated food at retail level. Ambassador Kari Bergholm, Chairman of the SPS Committee, was nominated by the WTO to attend and present lectures on various provisions of the SPS and TBT Agreements, with special reference to trade in irradiated Food.

The Workshop attracted wide interested from ICGFI member governments and other interested parties which sent a large number of representatives to attend (Annex I). The programme of the Workshop is attached as Annex II. Dr. P.B. Roberts, Chairman of ICGFI, served as the Chairman of the Workshop. He was assisted by Mr.J.P. Doussin; Direction Régionale de la Concurrence, de la Consommation et de la Répression des Fraudes, France, who chaired one of the technical sessions. A highlight of the Workshop was a visit to Gammaster Provence, Marseille, to allow the participants to see a commercial irradiator available for food processing in operation.

The participants received clarifications on various provisions of the SPS and TBT Agreements and had an opportunity to discuss their implications to trade in irradiated food. The detailed deliberation of the Workshop is given below.

Symposium on Control of Foodborne Illness: Radiation and Other Non-Thermal Treatments

(Chicago, Illinois, U.S.A. 13-16 May, 1996)

The Symposium was sponsored by the Continuing Education Committee of the Institute of Food Technologists (IFT) and the National Center for Food Safety and Technology (NCFST) of the United States, in cooperation with the International Consultative Group on Food Irradiation (ICGFI). It was held at the Ramada Hotel O´Hare, Chicago, Illinois, U.S.A. 13-15 May, 1996.

The event was attended by 72 participants representing a wide spectrum of the food industry, food regulatory agencies and academia, mostly from the U.S., as well as from five other countries and three international organizations. There were five international and 16 U.S. lecturers. The ICGFI contributed three speakers: Dr. Fritz Käferstein, Head of the Food Safety Unit, World Health Organization (WHO), Dr. Margaret Patterson, Queens University, Belfast, Northern Ireland and Dr. Ricardo Molins, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture. The program was opened with presentations on "Foodborne Disease - A Global and Economic Problem," and "Foodborne Illness in the U.S.A.," which set the framework for the symposium. These presentations complemented each other in highlighting the global magnitude of the foodborne problem, which affects advanced as well as developing countries, and stressed the urgent need to promote wider use of food processing technologies that may help alleviate it.

A very comprehensive program on food irradiation was presented which covered three of the four sessions of the Symposium. Presentations were made on the following topics:

- Historical Review of Commercial Radiation: Sources of Ionizing Energy and Development of Food Applications.
- Current International Irradiation Practices and Regulatory Policy.
- U.S. Congressional Perspectives on Food Irradiation.
- Review of the Effects of Ionizing Radiation on Microorganisms.
- Fresh Produce Disinfestation, Shelf-life Extension and Safety Enhancement.
- Safety Enhancement of Poultry and Egg Products.
- Safety Enhancement of Red Meat.
- Safety Enhancement of Seafood.
- Packaging Materials for Irradiated Foods - U.S. and International Current and Future Research Needs.
- Economic Perspectives of Food Irradiation.
- Food and Food Service Industries Perspectives on Food Irradiation.
- Consumer Perspectives on Food Irradiation.
- Consumer Education about Food Irradiation.
- Retail Experience with Irradiated Foods.
- Combined Treatments of Radiation, Heat, and Other Processing Methods for Improving the Safety and Quality of Foods.

Each session concluded with an interactive discussion between the audience and a panel formed by the session´s speakers. This provided an excellent opportunity for participants to express concerns, ask questions and even challenge members of the panel, and for the latter to expand the information presented.

The growing interest of the U.S. food industry in radiation processing for improving the safety and hygienic quality of food was evidenced by the large proportion of participants that belonged to this sector. One of the most instructive presentations was the direct testimony given by the manager of a supermarket which not only is successfully selling irradiated foods in the Chicago area

but distributes irradiated food to several other supermarkets. Contrary to earlier, negative reports based only on hypothetical consumer surveys, the Symposium provided factual retail sales information indicating that public perception about irradiated food in the U.S. is presently quite favourable, and confirmed the notion that consumers willingly purchase such food when simple but clear information is provided.

On the regulatory side, representatives of the U.S. Food and Drug Administration (FDA) informed that approval of a petition for clearance of irradiated meat is forthcoming; the FDA and the U.S. Department of Agriculture's Food Safety Inspection Service (FSIS), which must also approve any U.S. regulation involving foods of animal origin other than fish and seafood, are coordinating efforts and processing this petition simultaneously. It was remembered with respect and appreciation that this petition was prepared by the late Dr. George Giddings on behalf of Isomedix, Inc. prior to joining the Joint FAO/IAEA Division. Industry representatives indicated that major users of ground beef (i.e., fast-food chains) intend to offer irradiated hamburgers shortly after such clearance is granted.

Several Symposium participants expressed their full support and encouragement to the ICGFI for the work being conducted in such areas as the International Inventory of Authorized Food Irradiation Facilities, the Food Irradiation Process Control School (FIPCOS), the database on food irradiation clearances, etc. In terms of areas in need of continued ICGFI support, the Symposium considered that worldwide harmonization of food irradiation regulations should be a priority; the present disparity in such regulations was perceived as a potential major obstacle for future trade in irradiated food.

A fourth symposium session dealt with other physical, non-thermal food processing techniques already available for commercial use or in advanced stage of development. With the exception of modified-atmosphere packaging, MAP, these techniques are not suitable for treating solid foods but offer good potential for future application in microbial decontamination of liquid and viscous-particulate foods: hyperbaric pressure, high-intensity pulsed light, and high-intensity electrical pulses. The following presentations were made:

- Pulsed High-Voltage Electrical Power as a Food Processing Method.
- Pulsed High-Intensity Light as a Means to Decontaminate Food or Food Contact Surfaces.
- Applications of MAP Packaging in Combination with Other Agents (Lysozyme, Lactoferrin, Nisin) to Extend Refrigerated Food Shelf-life.
- Use of High Hydrostatic Pressure as a Food Processing Method.

High-intensity pulsed light in particular presents characteristics that make it a very promising technology for on-line sterilization of packaging films, especially in combination with aseptic packaging of food.

ECA/FAO/IAEA/IIR/ITC/WHO
REGIONAL SEMINAR ON FOOD IRRADIATION TO CONTROL FOOD LOSSES AND FOODBORNE DISEASES, AND FACILITATE TRADE

Rabat, Morocco
26 February - 1 March, 1996

I. Background

With increasing interest in the role of irradiation as a method to reduce post-harvest food losses, to control certain foodborne diseases and to facilitate wider food trade in countries in the African continent and the Near East region, the United Nations Economic Commission for Africa (ECA), the United Nations Food and Agriculture Organization (FAO), the International Atomic Energy Agency (IAEA), the International Institute of Refrigeration (IIR), the International Trade Center (ITC), and the World Health Organization (WHO), decided to convene a regional seminar in Rabat, Morocco, from 26 February to 1 March 1996.

The Seminar was hosted by the Institut National de la Recherche Agronomique (INRA) and was attended by 140 participants and observers from 23 countries and representatives of several international organizations.

II. Technical Sessions

Four technical sessions covering the potential of irradiation to reduce post-harvest food losses, to improve food safety and public health, to overcome trade barriers, and on the need for harmonization of regulations were held. A total of 26 papers were presented during these sessions. In addition, working groups were convened to draft Action Plans to be considered by governments in the regions on the following topics:

(i) Reduction of Post-harvest Food Losses
(ii) Control of Foodborne Diseases
(iii) Overcoming Trade Barriers
(iv) Harmonization of Regulations
(v) Public Acceptance

The reports of these working groups were discussed in plenary sessions and adopted as follows:

1. Reduction of Post-harvest Food Losses

The participants recognized that post-harvest management of food crops and animal products is not given the attention it deserves in spite of the fact that food security is given priority by the African governments. Food losses due to infestation, sprouting and spoilage microorganisms can and should be avoided. Irradiation is one of the methods to solve these problems.

Post-harvest losses of the following food commodities are of particular importance to the countries in Africa and the Near East:

a) Grains: Insect infestation and microbial growth are the major problems affecting this class of commodities and are regarded as major threats to food security. Although irradiation offers a good solution to these problems, it has its own limitations. These include logistics, storage and reinfestation. The most important alternative method to

irradiation for disinfestation of these commodities is fumigation, which however is becoming increasingly restricted. In this context the phasing out of methyl bromide, the major fumigant used, and the developed resistance of insects to other pesticides can be mentioned.

b) Tubers and Bulbs: Losses in potatoes, onions, yams, cassavas and others are considerable. Irradiation can play a positive role in reducing these losses, although as stated before there are limitation to the use of this technology, including logistics and storage. Alternative technologies include chemical sprout inhibitors.

c) Dried Fish: Losses due to insect infestation of dried fish are considerable and irradiation should be a good technique for reducing them. In the case of dried fish, logistics may be a problem, and proper packaging to avoid reinfestation would be an important aspect.

d) Fresh Fruits and Vegetables: Losses in fruit and vegetables due to spoilage microorganisms and senescence are considerable. As far as local marketing is concerned, the logistic problems referred to above also apply. However, the irradiation process could work well for produce exported through only one or two ports.

e) Dried Fruits and Nuts: These commodities suffer losses due to insect infestation, particularly in regard to exportation and related quarantine requirements. Irradiation could play an important role as these products could be handled and exported through centralised locations.

f) Cocoa Beans: There are problems in the exportation of cocoa beans because of insect infestation, which could be solved by irradiation. Methyl bromide, the major fumigant used for disinfestation of cocoa beans, is being phased out.

Action Plans

A National Steering Committee on Food Irradiation should be established in each country by the government and the scientific community to prepare a data base related to national food losses and to set priorities to solve them. It would also advise the government and the private sector on the role of irradiation to combat these losses, and in promoting the commercial application of food irradiation for this purpose. The committee should identify the agencies or companies interested in developing the process and demonstrating its application in the following areas:

a) Pilot Scale: In cooperation with the interested agencies and companies, large-scale food irradiation trials should be initiated. Where irradiation facilities are not locally available, radiation treatment could be carried out at suitable irradiators in the region. On the basis of trial results, detailed technical and economic evaluations should be conducted and recommendations should be made to the Steering Committee.

b) Commercial Scale: Suitable investors (either private or public) should be identified by the Steering Committee to finance a commercial food irradiation plant.

2. <u>Control of Foodborne Disease</u>

The participants recognized the following problems:

a) All known foodborne diseases of bacterial, viral and parasitic origins also occur in Africa and the Near East.

b) The incidence and prevalence of these diseases are largely unknown for lack of epidemiological studies and laboratory analyses.

c) Foodborne infant diarrhoea is a major public health problem in the region.

d) A number of African countries are affected by cholera, which is a foodborne (including drinking water) disease.

e) Diseases of animal populations such as brucellosis represent considerable hazards to human health.

f) The high incidence and prevalence of foodborne disease in the region is a threat to the economic development of the countries, particularly in relation to the tourism industry.

g) Foodborne disease contributes and aggravates the malnutrition situation among vulnerable population groups.

In the context of Africa, there seems to be rather limited opportunities for irradiation to alleviate the health hazards posed by contaminated food; the reason being logistics, i.e. only certain foods which are available in one particular location and time are suitable for irradiation processing. The following foods which play a role in epidemiology of food-borne disease have been identified as potential candidates for irradiation: poultry from intensive farming, shrimp, spices and animal feed.

Regarding feed, it might be advisable to have it irradiated before it enters international trade, in order to prevent introducing pathogens into importing countries.

Action Plans

a) The most important intervention for the prevention of foodborne disease is hygienic handling of food. Education and information are of utmost importance.

b) In order to obtain an indication about the incidence and prevalence of foodborne disease, surveillance programmes need to be instituted.

c) Countries should exchange information regarding the importance of individual foods in the epidemiology of foodborne disease.

d) Food irradiation has to be considered as a complementary technology, and should be applied where health benefits are likely to be obtained.

e) Regarding food irradiation processing, cost benefit ratios should also include non-measurable consequences such as death, loss of manpower, medical expenses, etc.

f) The HACCP concept is at present considered by many national food control authorities as a desirable alternative to traditional food safety control methods. Irradiation offers a new critical control point for the elimination of pathogens such as *Salmonella*, particularly in raw food of animal origin and minimally-processed food.

3. Overcoming Trade Barriers

Food irradiation is steadily being applied, or being considered for application, in a growing number of countries throughout the world. This development is taking place as a consequence of many factors, among which the need for higher-quality and safer food, and the need to ensure that food commodities entering trade are free of insect pests and have sufficient shelf-life to allow transportation over long distances and global distribution lines are worth mentioning. However, development of trade in irradiated food is being hampered by various problems in many regions of the world, including the African region and countries of the Near East. Among these problems, the lack of clearances for irradiated food in important markets or the existence of unharmonized food irradiation legislation, constitute a major obstacle for the development of national, regional, interregional and international trade in irradiated food. Such problems may soon be experienced even by countries that do not yet have irradiation facilities but might start receiving shipments of imported irradiated food, and therefore, may find themselves unable to properly control and market such food.

In addition, internal as well as external trade in irradiated food in many countries of Africa and the Near East are adversely affected by the lack of appropriate information, or worse, by misinformation, about food irradiation technology. This is particularly true among officials involved in public health and in trade regulatory agencies, among entrepreneurs in the industrial, commercial, agricultural and financial sectors, and among consumers and their representative organizations.

Recent international developments, on the other hand, are opening promising avenues for growth and development of trade in irradiated food. The Agreement on the Application of Sanitary and Phytosanitary measures (SPS) and the Agreement on Technical Barriers to Trade (TBT) administered by the World Trade Organization (WTO), for example, offer the possibility of introducing irradiated food into markets that so far have not been ready to accept them for non-technical reasons. Under the SPS Agreement, governments which have introduced stricter import regulations than recognized international standards, guidelines and recommendations may be asked to furnish justifications on scientific ground to the WTO. The upcoming clearance of irradiation as a quarantine treatment against fruit flies in fruits announced by the United States, in turn, may constitute a major opportunity for the application of irradiation as the technology of choice in trade in lieu of chemical fumigants.

The group recognized the following problems that hinder international trade in irradiated food:

a) Chemical fumigants are being increasingly restricted in types and quantities, and effective alternatives are urgently needed.

b) Irradiated foods may enter markets in countries which have no regulations on food irradiation.

c) Exported food products some times rejected at the port of entry due to sub-standard quality.

d) Lack of regulations and clearances for irradiated foods in all African countries (except South Africa), and in most countries in the Near East (except Iran, Pakistan and Syria).

e) Lack of a harmonized international standards to ensure the quality of irradiated foods entering international trade.

f) Lack of awareness about the benefits and the potentials of food irradiation among the private sector.

Action Plans

The following actions should be taken to facilitate trade within and outside Africa and the Near East:

a) Most countries in the Africa and Near East regions are members of the World Trade Organization (WTO) which enforces a number of Agreements adopted during the GATT Uruguay Round, including the Agreement on Sanitary and Phytosanitary Measures (SPS) which has important bearing to international trade in food commodities including irradiated food. As the SPS Agreement recognizes standards, guidelines and recommendations of competent international organizations including the Codex Alimentarius, countries in the regions are urged to introduce regulations based on the principles of the Codex Alimentarius and on the Codes of Good Irradiation Practice published by ICGFI, so as to enable a harmonized regulatory control of, and facilitate international trade in irradiated foods. Such regulations are needed to control trade in irradiated food even in countries which do not have any irradiation facility.

b) Food irradiation could provide solutions to problems related to quality, safety and shelf-life of foods in trade. However, food irradiation is a part of the entire food processing and distribution chain. Therefore, adequate support infrastructure and facilities must exist to ensure successful use of food irradiation.

c) To facilitate international trade, irradiation facilities should meet the criteria of the International Inventory of Authorized Food Irradiation Facilities established by ICGFI. In addition, food to be irradiated must conform to Good Manufacturing Practices (GMP), and shipments of irradiated food should be accompanied by a certificate of the treatment.

4. Harmonization of Regulations

International standards and recommendations for the control of food irradiation have been developed by the Codex Alimentarius Commission and the International Consultative Group on Food Irradiation (ICGFI). Codex General Principles of Food Hygiene provide the foundation for good manufacturing practices and apply to all aspects of production, from raw materials to finished products. The Codex General Standard for Irradiated Foods and its associated Recommended International Code of Practice for the Operation of Radiation Facilities Used for the Treatment of Food provide important principles for proper operation of irradiation facilities for food processing and for official control of irradiated food.

It is recognised that the lack of policy and/or regulations on food irradiation and/or sales of irradiated foods in most countries in Africa and the Near East is a drawback for technology transfer and trade in irradiated food. Irradiation of food is a proven technology that can solve certain problems experienced in the region with post-harvest food losses and control of foodborne disease.

Action Plans

a) In view of the availability of model regulations on food irradiation in Asia, which was developed by food control officials in the region based on the Codex standards and relevant ICGFI guidelines, it was recommended that this model be adopted/adapted by all countries in Africa and the Near East, emphasizing that irradiation is not to be considered as a substitute for good manufacturing practices. With respect to clearance procedures, it was agreed that countries should adopt the policy of issuing clearances for the irradiation of foodstuffs by food classes as recommended by ICGFI, rather than on a individual product basis.

b) It is recommended that governments in the regions seek assistance from international and inter-regional bodies where applicable to:

i. Create national awareness by organising seminars to familiarise key government officials, the food industry and the public with the benefits of food irradiation;

ii. Develop policy and/or regulations on food irradiation. It is recommended that these two activities run simultaneously to avoid unnecessary delays in adoption of the technology.

5. Public Acceptance

It was recognized that acceptance by the general public of food irradiation as a technology is vital to its successful application. In this context, the public is defined as:

Policy makers: politicians, government officials, government institutions.

Private sector: Industry, research organizations, commerce, trade associations.

Consumers.

The following problems were recognized by the participants:

a) There is confusion between harmful contamination of food by radioactivity and the beneficial effect of irradiation of food.

b) Lack of awareness of the safety, benefits and limitations of food irradiation.

c) Lack of knowledgeable personnel trained to promote food irradiation technology.

d) Lack of resources, budgets and awareness of availability of materials used for public awareness programmes.

e) Lack of communication on food irradiation between various sectors such as politicians, government officials, scientists and consumers.

f) Lack of regulations and proper means of control leading to lack of confidence.

g) Lack of understanding of cost-benefit aspects of food irradiation.

Action Plans

a) The National Steering Committee on Food Irradiation to be established in each country should also be in charge of:

i. Formulating a national strategic plan on food irradiation.

ii. Conducting public awareness campaigns directed at target groups specified above.

iii. Supporting training programmes in food irradiation.

iv. Identifying the most suitable channels through which information relevant to all facts (safety, benefits, limitations, etc.) about food irradiation can be disseminated.

v. Assisting in conducting studies on the cost-benefit of food irradiation technology, especially for the benefit of the community.

b) To bolster public confidence, national authorities should implement effective control mechanisms for food irradiation facilities and irradiated food prior to commercial introduction of the technology or irradiated food.

CURRENT ACTIVITIES OF CO-ORDINATED RESEARCH PROGRAMMES

Study of the Impact of Food Irradiation to Prevent Food Losses in Africa.

This programme, which focuses on commercial utilization of irradiation technology to prevent food losses and thereby enhance food security in Africa, began in 1994 as a continuation of an earlier programme (concluded in 1993) that generated data on optimal irradiation conditions for treating staple and export food commodities. The programme has 10 Research Contracts and one Research Agreement. Three Contracts and one Agreement involve feasibility studies on irradiation of specific products, whereas the remaining seven Contracts involve test-marketing of irradiated foods and determination of consumer acceptance. The second RCM will take place in Tangier, Morocco in June, 1997. The participants are:

Algeria	Dr. Mohamed Malhous, Centre de Developpement des Techniques Nucleaires.
Côte D'Ivoire	Dr. Alberic Kodia, Faculté de Sciences et Technique, Laboratoire National de la Santé Publique.
Egypt	Dr. Mohie El-Fouly, National Center for Radiation Research and Technology.
France	Dr. Claude Hasselmann, Faculté de Pharmacie, Université Louis Pasteur.
Ghana	Mrs. Victoria Appiah, Biotechnology and Nuclear Agriculture Research Institute, Ghana Atomic Energy Commission.
Morocco	Dr. Cautar R'Kiek, Institute National de la Recherche Agronomique.
Nigeria	Dr. David Alonge, Dept. of Veterinary and Public Health, University of Ibadan.
Nigeria	Dr. Amos Akingbohungbe, Dept. of Plant Science, Obafemi Awolowo University.
South Africa	Dr. Amanda Minaar, Faculty of Biology and Agricultural Sciences, University of Pretoria.
Zaïre	Dr. Pene M. Onyembe, Centre Regional D'Etudes Nucleaires de Kinshasa, Commissariat General A L'Energie Atomique, .
Zambia	Dr. Bernard Chishya, Food Technology Research Unit, National Council for Scientific Research.

Irradiation as a Public Health Intervention Measure to Control Foodborne Diseases (Cysticercosis/Taeniasis and *Vibrio* Infections) in Latin America and the Caribbean

This programme is being co-ordinated with the Pan American Health Organization (PAHO/WHO), and has 13 Research Contracts and One Research Agreement. Seven Contracts and one Agreement are involved in research about elimination of *Vibrionaceae* from fresh fish and shellfish; six other contracts are studying the effects of irradiation on survivability and infectivity of *Taenia solium* cysticerci in pork meat. The second RCM for this programme will be held in Buenos Aires, Argentina 7-11 October, 1996. The participants are:

Brazil	Dr. Dilma S. Gelli, Instituto Adolfo Lutz
Brazil	Dr. Leonardo José Richtzenhain, Universidade de Sao Paulo
Chile	Dr. Wilma Tatiana Rubio, Comisión Chilena de Energía Nuclear
Cuba	Dr. Eugenio Cisneros, Instituto de Nutrición e Higiene de los Alimentos.
Ecuador	Dr. Marcelo Cruz, Universidad San Francisco de Quito.
Ecuador	Dr. Ricardo A. Muñoz Burgos, Instituto de Ciencias Nucleares, Escuela Politécnica Nacional.
Guatemala	Dr. Floridalma Cano, Instituto de Nutrición de Centroamérica y Panamá.
Guatemala	Dr. Olga R. Torres, Instituto de Nutrición de Centroamérica y Panamá.
Mexico	Dr. Aline Schunemann de Aluja, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México
Peru	Dr. Armando González, Facultad de Medicina Veterinaria, Universidad de San Marcos.
Peru	Dr. Zoila Torres Rivera, Instituto Peruano de Energía Nuclear.
Uruguay	Dr. Cristina López, Laboratorio de Técnicas Nucleares, Universidad de la República.
Venezuela	Dr. Fernando Lalaguna, Instituto Venezolano de Investigaciones Científicas.
United States	Dr. Marilyn Kilgen, Dept. of Biological Sciences, Nicholls State University.

Standardized Methods to Verify Absorbed Dose in Irradiated Fresh and Dried Fruits, Tree Nuts in Trade

This programme was initiated in December,1993 for a duration of 5 years with the objective of developing standardized methods to verify the min./max. absorbed dose required for insect disinfestation of dried fruits and tree nuts and for quarantine treatment of fresh fruits and vegetables in trade by irradiation. The first RCM was held in Istanbul, Turkey from 5-9 September, 1994 and the second RCM has been planned in Karlsruhe, Germany from 5-9 August, 1996. It has 12 research contracts and 3 research agreements.

The Research Contract Holders are:

Algeria	Ms. Samai Boudjemai, Centre de Developpement des Techniques Nucleaires, Algiers.
Bangladesh	Mr. A. k. Siddiqui, Institute of Food and Radiation Biology, Bangladesh Atomic Energy Commission, Dhaka.
Brazil	Ms. Nelida Lucia Del Mastro, Instituto Pesquisas Energeticus e Nucleares, Sao Paulo.
China	Ms. Meixu Gao, Institute of Nuclear Agricultural Sciences, Beijing.
Croatia	Dr. Dusan Razem, Ruder Boskovic Institute, Zagreb.
Hungary	Dr. Gabor Foldiak, Institute of Isotopes of the Hungarian Academy of Sciences, Budapest.
Chile	Mr. Juan M. B. Espinoza, Depart. Aplicaciones de los Isotopes y Radiaciones, Comision Chilena de Energia Nuclear, Santiago.
Pakistan	Dr. A Sattar, Nuclear Institute for Food and Agriculture, Peshawar.
Portugal	Ms. Maria Eduarda Andrade, National Institute for Industrial Technology and Engineering, Sacavem Codex.
Philippines	Ms. Estelita Gregorio Cabalfin, Philippine Nuclear Research Institute, Quezon City.
Syria	Dr. M.Youssef Mansour, Syrian Atomic Energy Commission, Damascus.
Turkey	Dr. Handan Tutluer, Lalahan Nuclear Research Center for Animal Health, Lalahan-Ankara.

The Research Agreement Holders are:

Germany	Dr. Dieter A.E. Ehlermann, Federal Research Center for Nutrition, Karlsruhe.
Italy	Dr. Piergiorgio Fouchi, Institute of Photochemistry and High Energy Radiation, Bologna.
Saudi Arabia	Dr Hassan Al-Kahtani, College of Agriculture, King Saud University, Riyad.

Irradiation as a Quarantine Treatment of Mites, Nematodes and Insects other than Fruit Flies

This programme is a follow-up of the CRP on Irradiation as a Quarantine Treatment of Fresh Fruits and Vegetables, successfully concluded in 1990, which resulted in increasing acceptance by national and international organizations of irradiation for this purpose against fruit fly infestation. The objective of this programme is to evaluate the effectiveness of irradiation as a quarantine treatment of other arthropod pests in food and agricultural commodities in trade. Seven Research Contract and four Research Agreement Holders constitute this CRP according to the list below. The Third FAO/IAEA Research Co-ordination Meeting on this subject will be convened in Beijing, China, 15-19 July 1996.

Australia	Dr. Neil Heather, Queensland Department of Primary Industries, Brisbane.
Bangladesh	Mr. A. Dayan Bhuiya, Institute of Food and Radiation Biology, Bangladesh Atomic Energy Commission, Dhaka.
Brazil	Dr. Oliver K. Kukuchi, Insituto de Pesquisas Energeticas e Nucleares, Commissao Nacional de Energia Nuclear, Sao Paulo.
China, P.R.	Dr. Liu Xiu-Qiong, South China Agricultural University, Guangzhou.
Japan	Dr. Toru Hayashi, National Food Research Center, Tsukuba.
Philippines	Dr. Eugenia Manoto, Philippine Nuclear Research Institute, Quezon City.
Poland	Dr. Sten Ignatowicz, Agricultural university of Warsaw, Warsaw.
Poland	Mr. Witold Karnkowski, Central Laboratory for Quarantine Control, Torun.
Thailand	Mr. Korbkiat Bansiddhi, Department of Agriculture, Bangkok.
USA	Dr. James H. Moy, Department of Food Science and Human Nutrition, University of Hawaii, Honolulu.
USA	Dr. James Nation, Department of Entomology and Nematology, University of Florida, Gainesville.

Public Acceptance of and Trade Development in Irradiated Food in Asia and the Pacific

This programme was initiated in October, 1994 under the Asian Regional Project on Food Irradiation Phase IV (RPFI-IV). In three earlier phases of RPFI, significant achievements for practical application of food irradiation were made in the region. The objectives of this CRP are to commercially irradiate limited quantities of food, and ensure their wide acceptance and free circulation within and among the participating countries. The experience gained and achievements in the participating countries in commercial application and free circulation of irradiated foods will be transferred to other regional countries. This programme will be completed in December, 1999. The first RCM was held in Manila, Philippines from 23-27 October,1995. As food irradiation has developed significantly in the region, further funding from the FAO/IAEA was considered not necessary. Therefore, the programme is run on research agreements only with the following 11 Research A0reement Holders participating in it:

Bangladesh	Dr. Abdul Karim, Institute of Food and Radiation Biology, Bangladesh Atomic Energy Commission, Dhaka.
China	Mr. Zhichen Xu, Shanghai Irradiation Center, Shanghai.
China	Dr. Peixin Shi, Institute of Application of Atomic Energy, Chinese Academy of Agricultural Sciences, Beijing.
Korea Rep of	Mr. Han-Ok Cho, Korea Atomic Energy Research Institute, Taejon.
Malaysia	Ms. Zainon Othman, Malaysian Institute for Nuclear Technology Research, Selangor.
Pakistan	Dr. Ismail Khan, Al-Technique Corporation of Pakistan (PVT) Ltd, Pakistan Radiation Services, Lahore.
Philippines	Dr. Alicia Lustre, Food Development Centre, Food Terminal Incorporation Complex, Manila.
Philippines	Dr. Concepcion Lizada, Post-harvest Horticultural Research and Training Centre, University of Philippines at Los Banos.
Sri Lanka	Dr. Shanti Wilson, Ceylon Institute of Scientific and Industrial Research, Colombo.
Thailand	Ms. Ampai Ungsunantwiwat, Thai Irradiation Centre, Office of Atomic Energy for Peace, Bangkok.
Vietnam	Mr. Quang Vinh Pham, Irradiation Centre, Vietnam National Atomic Energy Institute, Hanoi.

Production of Safe, Shelf-Stable Foods through High-Dose Irradiation Processing

This programme, initiated in early 1996 for a duration of five years, has the objective of evaluating the effect of irradiation on microbiological safety, shelf-life, acceptability, energy requirements and packaging materials of various shelf-stable and convenience foods, with emphasis on the use of high dose irradiation (above 10 kGy). Seven Research Contracts and six Research Agreement Holders are participating in this programme according to the list below. The First FAO/IAEA Research Co-ordination Meeting on this CRP will be held at the Department of Agriculture of Northern Ireland, Belfast, 9-13 September 1996.

Argentina	Dr. Ricardo Rodriguez, Instituto Nacional de Tecnologia Agropecuaria, Buenos Aires.
Canada	Mrs. Louise Deschenes, Food Research and Development Center, St. Hyacinthe, Quebec.
China, P.R.	Dr. Luo Xueyun, Institute of Food Safety Control and Inspection, Beijing.
Ghana	Dr. Josephine Nketsia-Tabiri, Ghana Atomic Energy Commission, Legon-Accra.
Hungary	Dr. Josef Farkas, University of Horticulture and Food Industry, Budapest.
India	Dr. Pushpa Paul, Bhabha Atomic Research Center, Trombay.
Indonesia	Mrs. Munsiah Maha, Center for the Application of Isotopes and Radiation , Jakarta.
Israel	Dr. Isaac Klinger, Kimron Veterinary Institute, Beit-Dagan.
South Africa	Mrs. Ingrid de Bruyn, Atomic Energy Corporation, Pretoria.
Thailand	Dr. Athapol Noomhorm, Asian Institute of Technology, Bangkok.
U.K.	Dr. Margaret Patterson, Department of Agriculture for Northern Ireland, Belfast.
USA	Dr. Vanee Kamolprasert, National Center for Food Safety and Technology, Summit-Agro, Illinois.
USA	Dr. Donald Thayer, USDA/ARS, Eastern Regional Research Center, Philadelphia.

FAO NEAR EAST REGIONAL PROGRAMME ON FOOD IRRADIATION

1. **Regional Workshop on Techno-Economic Feasibility of Food Irradiation, Damascus, Syria, 16-19 October 1995**

Opening Session:

The Opening Session was held under the patronage of H.E. Mr. Mahmoud Al-Zaobi, Prime Minister of Syria. H.E. Mr. Yousef AlHamad, Minister of State represented H.E. the Prime Minister and addressed the Opening Session. He welcomed the participants to Syria. In his address, Mr. AlHamad indicated that food irradiation is of great importance locally and internationally, and will affect both food availability and the food industry. He thanked FAO/RNE and the Syrian Atomic Energy Commission for organizing the Meeting. The Opening Session was also addressed by Dr. Ibrahim Othman, Director General of the Syrian Atomic Energy Commission, followed by Dr. I.Y. Hamdan, Regional Agro-Industries & Technology Officer, FAO/RNE who delivered the statement of FAO/RNE on behalf of Dr. A.Y. Bukhari, ADG/Regional Representative, RNE. (Annex II). Wide television and press coverage was given to the activities of this Workshop.

Working Sessions:

- The first plenary paper on Opportunities in Food Irradiation Technology with Special Reference to the Near East Region was presented on behalf of Mr. Morton Satin, Chief, AGSI, FAO H.Q. by Dr. I.Y. Hamdan.
  The paper examined key issues of concern on both positive and negative aspects of food irradiation technology. It also highlighted future and potential applications of food irradiation technology.

  A second plenary paper was presented by Dr. R. Molins from the Joint IAEA/FAO Division in Vienna. The paper was an excellent overview of the current status of food irradiation worldwide. To date, a total of 39 countries have granted clearance for food irradiation, covering a total of 219 different commodities. The paper highlighted developments in health-related fields, marketing related areas, as well as environmental

and quarantine issues that could have a marked effect on the global introduction of food irradiation.

- A series of five papers were presented by Dr. A. Du Plessis from South Africa. In the first of the series the general market and techno-economic factors affecting the introduction of radiation processing in developing countries were discussed. This was followed by a paper discussing these issues as they specifically pertain to food irradiation. In a third paper, with the use of techno-economic models, Du Plessis demonstrated the impact of irradiator choice on the cost and economic viability of food irradiation. In a fourth paper attention was given to the format and essential elements of a techno-economic feasibility study as they pertain to radiation processing in general, and to food irradiation in particular. He stressed that the aim of such a study should be to assist with financial investment decisions. In the fifth and final paper, Du Plessis discussed the nescessity of having a properly coordinated and multi-party approach to the introduction of commercial food irradiation. A case history of the South African experience in this regard was used to highlight the elements of such a steering group for marketing the technology.

- On the second day of the Workshop a total of eight short papers were presented by representatives from Algeria, Egypt, Iran, Morocco, Pakistan, Syria, Tunisia and Turkey. Three papers from regional Arab organizations reporting on the status and economic feasibility studies conducted in their respective countries were also presented. With some exceptions, it can be stated that there is ample room for improvement in both format and content of the studies presented at the Workshop. Professional assistance should be sought from local industrial development banks whose task is to assess new industrial ventures and evaluate their economic viabilities. Recommendations were made by the Workshop for preparation of future techno-economic feasibility studies and strategies for introduction of commercial food irradiation in the Region.

- On the third day of the Workshop Mr. Yves Henon from France presented four papers covering the techno-economic and operational aspects of food irradiation utilising gamma irradiators. In his first paper he discussed the underlying principles of radiation processing and the gamma irradiation facilities employed in both industrial and research applications. The various capital and operating costs of a gamma irradiator were detailed. In his second paper Henon discussed the economics of gamma radiation processing, and outlined the major factors affecting its use. Multi-purpose applications to reduce risks associated with the use of gamma radiation were emphasized. The third paper focused on the importance of sound techno-economic feasibility studies prior to making decisions on the establishment of irradiation plants. In the last paper Henon detailed the cost of establishing an irradiator and outlined the factors affecting unit costs. These factors include initial cobalt 60 lead, project financing, and irradiator utilization.

- On the fourth and last day of the Workshop, two status-papers relevant to food irradiation were presented. In the first paper the Arab Atomic Energy Agency (AAEA) addressed developments in the field of irradiation in the Arab States. In the second paper Dr. R. Molins discussed the important role continuously played by international organizations such as the IAEA, FAO and WHO in the coordination and harmonization of regulations pertaining to food irradiation. Joint activities of the three UN agencies through the International Consultative Group on Food Irradiation (ICGFI), were highlighted.

Recommendations:

On conclusion of the oral presentations, a general discussion of the topics presented at the Workshop were conducted, and the following recommendations were made:

1. Future techno-economic feasibility studies should follow the UNIDO format manual and professional assistance should be obtained from experts who are well acquainted with the assessment of industrial techno-economic feasibility studies.

2. Future pilot food irradiation facilities installed in the Region should be upgradable to full commercial scale. To that end, techno-economic feasibility studies should make provisions for biological shielding, source rack configuration and the possible automation of the product transport system.

3. Countries or institutions preparing techno-economic feasibility studies on food irradiation, should seek expert assistance in areas relevant to the type of irradiator needed, source strength, nominal and expected throughputs, and feasibility of multi-product handling.

4. To ensure the most efficient use of irradiation facilities throughout the year, both food and non-food items (i.e., pharmaceutical products, medical devices, cosmetics, packaging materials and other industrial products) should be considered in the studies. This implies that facilities should be designed for multi-purpose use. In addition, multiple users should be identified in market studies to minimize vulnerability of the projects.

5. Studies on possible public sector-sponsored food irradiation facilities designed for national programmes such as food security, should incorporate a social cost/benefit analysis which will be used as a basis for determining the feasibility of such projects.

6. In light of the successful South African experience, formation of a Steering Group in each country to facilitate introduction of commercial food irradiation was highly recommended by the Workshop. The Steering Group should include representatives from all public institutions involved in food irradiation (Agriculture, Industry, Commerce and Health Ministries and Radiation Protection Agencies), and representatives from the private sector, the food industry, Chambers of Industry and Commerce, financial institutions and consumer groups. The formation of a Steering Group should initially be the responsibility of the Atomic Energy Commission or its equivalent in each country.

7. The first task of the Steering Group recommended in (6) must be the enactment of appropriate regulations to allow commercial food irradiation in the country. Considering the importance of harmonized legislation for future international trade in irradiated foods, such legislation should be based on the principles of the Codex Alimentarius and on the Codes of Good Irradiation Practice published by the International Consultative Group on Food Irradiation (ICGFI). Furthermore, it was recommended that clearance for food irradiation be granted on the basis of groups or classes of products.

8. The Workshop strongly endorsed regional cooperation in the development of food irradiation and called upon FAO and IAEA to continue supporting such cooperation.

List of Participants

Algeria
Mr. Mohamed Mahlous
Centre de Developement des Techn. Nucleaire, P.O. Box 1017
Algiers
Tel. No. 213(2)71.14.18
Fax No. 213(2)64.33.04

Egypt
Dr. Abdalla Abdalla Mahmoud
Head of Food Irradiation Dept.
NCRRT
Cairo
Fax No. 2749298

Iran
Mr. M. Ghojaie
Head, Food Irradiation Laboratory
Gamma Irradiation Centre
Atomic Energy Organization of Iran (AEOI)
Teheran
Fax No. 8009054

Morocco
Dr. Cautar R'Kiek
Chef Station Centrale des Radioelements
Centre Regionale de la Recherche Agronomique
Tanger
Tel. No. 212-9-938033
Fax No. 212-9-936681

Pakistan
Dr. I. Khan
Head Biosciences, PAEC
Islamabad
Fax No. 92-51-221015

Syria
Dr. Mahfouz Al-Bachir
Atomic Energy Commission
Damascus
Fax. No. 249317

Dr. Mohamed Mansour
Atomic Energy Commission
Damascus
Fax No. 249317

Dr. Mahmoud Al-Ashram
Faculty of Agriculture
University of Damascus
Damascus

Dr. Gamal ElSatl
Faculty of Agriculture
University of Damascus
Damascus

Dr. Abdellatif Baroudi

Dr. Adel Mehio

Dr. Adnan AlHamd

Dr. Mohsen Eissa

Dr. Mohamed Nadaf

Ms. Maha AbdelRahim

Dr. Qusi ElHakim

Ms. Salma ElGindi

Mr. Akram ElMoussa

Dr. Ghassan AlKhaiat

Dr. Adel Sifr

Ms. Nuha Moslem

Ms. Soad Sifo

Ms. Samr Farab

Ms. Hanan Gandeel

Ms. Samira AlZabi

Tunisia
Dr. Abdelmajid Mahjoub
Ecole Superieure des Industries Alimentaire
Tunis
Fax No. 261-1-799680

Turkey
Dr. Burhan Dincer
Director
Lalahan Nuclear Research Institute in Animal Health
Ankara
Fax No. 00312-8651020

AOAD
Dr. Karam Oda
AOAD Representative
Khartoum - Sudan
Fax No. 451402

AAEA
Dr. Mahfouz Al-Bachir
AAEA Representative
Tunis, Tunisia
Fax No. 216-1-711330

MERRCAC
Dr. Y. Megahed
Director General
Cairo, Egypt
Fax No. 701082

Consultants
Mr. Yves Henon
General Manager
Gammaster Provence S.A.
Marseilles, France
Fax No. 33 (91) 028976

Dr. T. A. Du Plessis
Managing Director
Gammatron (Pty) Ltd.
Hatfield 0028, Pretoria
South Africa
Fax No. 012-45-3028

FAO/IAEA
Mr. R. Molins
Food Preservation Section
Joint FAO/IAEA Division
Vienna - Austria
Fax No. 431 234564

FAO/RNE
Dr. I.Y. Hamdan
Regional Officer (Agro-Industries and Technology) RNE, P.O. Box 2223 Cairo, Egypt Fax No. 3495981

2. General Training Course on Food Irradiation, Cairo, Egypt, 10-21 March, 1996

The Regional General Training Course on Food Irradiation was organized by the FAO Regional Office for the Near East (FAO/RNE), the Islamic Development Bank (IDB), the Arab Atomic Energy Agency (AAEA) and the National Centre for Radiation Research & Technology (NCRRT), of the Atomic Energy Authority of Egypt, in collaboration with the Joint FAO/IAEA Division on Nuclear Techniques in Food and Agriculture, Vienna. The Course was held in Cairo, Egypt, from 10-21 March, 1996 and was attended by 24 participants from 17 countries from the FAO Near East Region.

The Training Course provided the participants with basic information on radiation and radioisotopes, and on their application to various food groups to reduce post-harvest food losses, to improve on the safety of food and to enhance trade. Wholesomeness, nutritional adequacy, microbiological and radiolytical safety of irradiated foods were explained. The participants were informed that food irradiation is a physical food processing method like freezing or heating, and that no unique radiolytical product were formed in irradiated food. Various aspects related to physical, chemical and microbiological effects of irradiation on foods were explained. The role of food irradiation in disinfestation of food commodities, in reduction of post-harvest food losses, and in facilitating international trade by using this technology for quarantine treatment of food were also covered. Chemical fumigants are being phased out due to consumer safety and environmental reasons, and food irradiation has been endorsed by regional and international plant protection organizations as an alternative to such chemicals in quarantine treatment of agricultural commodities.

Food irradiation has been strongly recommended by the WHO for adoption by its member countries. It is the only available food processing method which can be used to pasteurize solid foods in ways similar to the pasteurization of milk and other liquid foods by heat. An overall absorbed dose of 10 kGy has been recommended by the Joint FAO/IAEA/WHO Expert Committee on the Wholesomeness of Irradiated Food (JECFI), and adopted by the Codex Alimentarius Commission (CAC) in its published General Standard for Irradiated Food and its Associated Code of Practice for the Operation of Irradiation Facilities. The course stressed that the incidence of foodborne disease is on the increase worldwide, and that adoption of food irradiation could play a significant role in alleviating human sufferings. However, in adopting this technology, Good Manufacturing Practices (GMP), Good Irradiation Practices (GIP) and all related national and international hygienic and technological codes have to be strictly adhered to; food irradiation should never be considered as a replacement for Good Manufacturing Practices (GMP). Food irradiation was also discussed in combination with other food processing methods. In relation to radiation-sterilization of food, it was mentioned that some countries such as USA, U.K. and Finland have approved radiation-sterilized food for hospital patients.

Participants were informed about the technological aspects of the radiation dose measurements and determination of absorbed dose in irradiated food products. Dosimetry is an integral part of radiation process control and it must be used to ensure that products under treatment receive the minimum effective dose. There are various dosimetry systems used in determination of doses in food irradiation, including Fricke, alanine, ethylene chlorobenzene, etc. Application of a particular dosimetry system depends on the dose imparted to a product. Participants were given a demonstration on how to apply dosimetry in food irradiation. It was mentioned that IAEA has an International Dose Assurance Service (IDAS) in which member states may participate.

Isotopic and machine sources are used in food irradiation. Both the gamma irradiation facilities and electron machines were introduced to the trainees and the principles behind their use were explained. Each type of facility has its advantages and limitations. Gamma rays are highly penetrating and thus could be used for irradiation of bulky products. For multipurpose use, gamma

facilities are also advocated. Electron machines are efficient and cost-effective in the treatment of free-flowing materials such as grains in thin layer, and offer the advantage that they can be turned on and off, since they function on electricity. Cobalt-60, which has a half-life of about 5.2 years, should be constantly used or it would be wasted because it decays at all times. The Codex Alimentarius Commission has recommended a limit for the use of both types of sources: gamma as well as X-rays can be used up to an energy level of 5 Mev, whereas electron accelerators should be used up to a level of 10 Mev. Both types of facilities need a shielded room to absorb the energy while they are in operation. Cobalt-60 sources, when not in use, are lowered into a water pool in which the water acts as shielding. Since electron accelerators are high technology machines, developing countries should consider installing such machines only if trained manpower for operation and maintenance of such facilities and a stable electrical supply are readily available.

Irradiation facilities are provided with safety devices to make them as fail-proof as possible. They are staffed by trained operators and managers, and licensed by the competent national authorities. Normally, international organizations will not recommend to a member state to build a commercial irradiation facility where radiation protection regulations are not in place. Irradiation facilities are cost-effective, provided proper infrastructure for their establishment are in place. The trainees were introduced to the infrastructure which is needed for the establishment of commercial irradiation facilities; the investment needed for establishment, operation and maintenance of these facilities were also discussed. A case study, including cost-benefit analysis, for food irradiation was also discussed. Various products, including non-food items which could benefit from radiation treatment were examined.

The role of international organization such as FAO, IAEA, WHO and the International Consultative Group on Food Irradiation (ICGFI), which was established under the aegis of these three international organizations were discussed. The various types of assistance provided by IAEA and FAO through its Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, headquartered in Vienna, were explained to the participants. ICGFI plays a significant role in information dissemination on various aspects of food irradiation. The trainees, through the local counterparts in their countries, could contact ICGFI and the international organizations if they need cooperation and assistance.

Although several countries in the FAO Near East Region have an active programme on food irradiation (Algeria, Egypt, Iran, Libya, Morocco, Pakistan, Saudi Arabia, Syria and Turkey), only three countries, Pakistan, Iran and Syria have food irradiation regulations. Without food irradiation regulations, even test-marketing of irradiated food for eventual commercialization is not possible. Countries which have no food irradiation programme should immediately enact food irradiation regulations to facilitate importation of irradiated foods. The Codex Alimentarius standards as well as the ICGFI guidelines should be used to ensure harmonized regulations which would facilitate international trade in irradiated food. No universal detection method for irradiated food is available. Therefore, detection methods should not be a regulatory barrier for commercial application of food irradiation.

Irradiated food must be accepted by consumers, otherwise private entrepreneurs will not be encouraged to invest in this technology. Consumers have misconception about food irradiation. They often confuse food irradiation with radioactive contamination in food. Therefore, factual information dissemination is essential and should be done alongside demonstrations of the quality and advantages of irradiated foods. Consumers have demonstrated that they will readily accept safe, nutritious, chemical residue-free food. In recent years, acceptance of food irradiation by consumers has grown, and it is anticipated that this technology will be widely accepted as a physical food processing method like canning or freezing in the near future.

After the conclusion of the lecture periods, a group discussion was organized enabling the participants to reflect their point of views concerning the future plan of action to be taken by the sponsoring Organizations. The summarized conclusions and recommendations of the trainees are given below:

1. The trainees concluded that this Training Course provided them with significant information on food irradiation. They recommended to the sponsoring Organizations to hold such training courses in the future to disseminate information on food irradiation and to further enable building a pool of trained manpower in the Region.

2. To facilitate the development of food irradiation in the region, the trainees recommended that there should be a close cooperation between the countries to share their experiences and thus accelerate the practical application of food irradiation.

3. The lack of regulatory approval and clearance of irradiated food by most of the countries in the region hamper the practical application of this technology. Therefore, the trainees strongly recommended that the regional countries should adopt food irradiation regulations in a harmonized manner following Codex standards and ICGFI guidelines. The word food irradiation should be appropriately translated into Arabic and other regional languages so that it truly reflects the process.

4. For the development of food irradiation, regional efforts are still needed. Therefore, the participants recommended that regional and international organizations should assist the regional project in supporting training and expert assistance in food irradiation.

5. Since the lack of information on food irradiation in the Region is common, the participants requested the Joint FAO/IAEA Division to provide them with publications, audio and video materials and other related documents concerning food irradiation.

6. In preparing information about food irradiation for dissemination in the countries of the Region, target groups should be identified so that such information is relevant to the role of each target group in introduction of the technology. Information for the general public should be clear and concise, and it should emphasize the benefits of irradiated products rather than the benefits of irradiation. Other important target groups that must be properly informed are the scientific community, authorities (particularly public health, food control and trade authorities), consumer representatives, media and above all, investors.

CONSULTANTS' MEETING ON THE DEVELOPMENT OF X-RAY MACHINES FOR FOOD IRRADIATION

Vienna, Austria
16-18 October 1995

EXECUTIVE SUMMARY

Food irradiation is currently accepted to be safe up to an overall average dose of 10 kGy. This is based on scientific evidence (Joint FAO/IAEA/WHO Expert Committee on the wholesomeness of irradiated food, 1980) and is recognized by an international standard to this effect (Codex Alimentarius General Standard on Food Irradiation, 1983).

Three types of radiation source are currently permitted for food irradiation processing.

(i) The radionuclides Cobalt-60 or Cesium-137. Cesium-137 is not currently available in commercial quantities.

(ii) Electrons (bremsstrahlung) generated by a machine at maximum energy of 10 million electron volts (MeV).

(iii) X-rays generated by a machine at a maximum energy of 5 MeV.

Additional radiation sources will be needed, not only to meet the expected increased demand for the radiation processing of large volumes of product in a short time, but also to provide the food industry with different options of irradiation facilities. One option could be the use of X-rays generated from machines with a maximum energy above 5 MeV. This could combine the advantages of the penetration power of cobalt-60 and the ability of machine sources to be switched on and off at will.

In considering this option, the Consultation highlighted three areas of prime importance - the process must not induce radioactivity, it must be efficient and it must be economical.

Induced radioactivity

It is accepted that there must be no measurable radioactivity induced in the food after radiation processing. (Measurable was defined as more than 1/1000 of the natural radioactivity that is found in all food). In addition, it was agreed that no radioactivity should accumulate in the components of the X-ray machine or surrounding environment (processing room, conveyor system etc.).

The Consultation reviewed theoretical and experimental data on the possible induction of radioactivity when food is processed using X-ray energies above 5 MeV. It was concluded that radiation processing with X-rays up to 7.5 MeV can be used without concern about induced radioactivity in food.

The type of material which should be used to convert electrons to X-rays (the converter) was considered in detail. The commonly used converter materials (tungsten, tantalum and gold) can produce photo-neutrons if the electron energy is raised to 10 MeV. However, limiting the energy to 7.5 MeV would prevent production of photo-neutrons in gold converters and limit the photo-neutrons produced in tungsten and tantalum converters to an insignificant number.

The Consultation also concluded that the radiation safety requirements for machines operating at 7.5 MeV would not be different from those imposed upon machines operating at lower energies.

It was also concluded that existing dosimetry methods for X-ray processing would be appropriate for machines operating at 7.5 MeV.

Efficiency

If the commercial application of radiation processing using X-rays is to be a success then the technology must be at least as efficient in utilizing energy, and so achieving throughput of product, as existing methods (primarily radionuclide facilities). The various factors which affect energy efficiency were considered (photon utilization, conversion efficiency, self-absorption) and it was concluded that an overall efficiency of approximately 8% could be achieved using 7.5 MeV compared to 4% which can be achieved using X-rays generated from machines with a maximum energy of 5 MeV. Thus, the efficiency achievable at 7.5 MeV is comparable to that achieved in radionuclide facilities.

Economics

An economic model was used to investigate how various parameters (the dose required, the beam power and the energy generated by the machine) affected the cost of the process. The use of 7.5 MeV was found to be more cost effective than using X-rays generated from machines with a maximum energy of 5 MeV. For example, at a dose of 2.5 kGy, using a beam power of 100 kW, treatment with a 5 MeV machine would cost US$ 52.5 per tonne of material, compared to US$ 35 per tonne using 7.5 MeV.

CONCLUSIONS

It was concluded that X-ray machines for food irradiation with energy up to 7.5 MeV can be used without any concern about induced radioactivity but would be a satisfactory, efficient and cost effective addition to other radiation sources available for food processing.

CONSULTANTS' MEETING ON DEVELOPMENT OF X-RAYS MACHINE FOR FOOD IRRADIATION

Vienna, 16-18 October 1995
Room A-1812

List of Participants

Consultants

Prof. Dieter A.E. **Ehlermann**
Federal Research Center for Nutrition
Engesserstrasse 20
D-76131 Karlsruhe
GERMANY

Tel: 0049 7247 82 3612
Fax: 49-7247-22820
E-mail: dieter.ehlermann@bfe.fzk.de

Dr. Ari **Brynjolfsson**
7 Bridle Path
Wayland, MA 01778
USA

Tel: 508 3581640
Fax: 508 3585518
E-mail:

Dr. M. **Washio**
Sumitomo Heavy Industry Ltd.
63-30 Yuhigaoka
Hiratsuka, Kanagawa 254
JAPAN

Tel: 81463 21 8486
Fax: 81463 21 8990
E-mail:

Dr. Ken-ichi **Mizusawa**
Director/GM Accelerator Division
Nissin-HIgh Voltage Co. Ltd.
Umezu Takasse-Cho, Ukyo-Ku
Kyoto 615
JAPAN

Tel: 0081758821520
Fax: 0081758648812
E-mail:mizusawa@nhv.nissin.co.jp

Dr. Joe **McKeown**
Director, Science & Technology
AECL Accelerators
436B Hazeldean Road
Kanata, Ontario
CANADA K2L 1T9

Tel: 6138312882
Fax:6138310108
E-mail:

Dr. Rudy **van der Veen**
Technical Manager
Philips Analytical X-Ray Tubes
Building AW, Achtseweg Noord 5
5651 GG Eindhoven
THE NETHERLANDS
Tel: 31 40 27 66086
Fax:0031402766787
E-mail:

Dr. Arnold S. **Herer**
Project Manager
Ion Beam Applications s.a.
Chemin du Cyclotron
rue J.E. Lenoir, 6
B-1348 Louvain-La-Neuve
BELGIUM
Tel:003210475859
Fax:003210 475810
E-mail:ash@iba.mhs.compuserve.com

Dr. M. Patterson, Food Microbiology
Dept. of Food Science
Agriculture and Food Science Center
The Queen's Univ. of Belfast
Newforge Lane, Belfast BT9 5PX
Northern Ireland
UNITED KINGDOM
Fax: 0044232669551

IAEA Staff

Mr. Sueo **Machi**
Deputy Director-General
Head of the Department
of Research and Isotopes
Tel: 431 2060 21600
Fax: 431 20607
E-mail:machi@ripo1.iaea.or.at

Mr. M.P. Salema
Deputy Director
Joint FAO/IAEA Division of Nuclear
Techniques in Food and Agriculture
Tel: 431 2060 21613
Fax: 431 20607
E-mail:salema@ripo1.iaea.or.at

Mr. Paisan **Loaharanu**
Head, Food Preservation Section
Tel: 431 2060 21638
Fax: 431 20607
E-mail:loaharan@ripo1.iaea.or.at

Mr. George **Giddings**
Food Preservation Section
Tel: 431 2060 21643
Fax: 431 20607
E-mail:giddings@ripo1.iaea.or.at

Ms. Margaret **Patterson**
Food Preservation Section

Tel: 431 2060 21635
Fax: 431 20607
E-mail:patterso@ripo1.iaea.or.at

Mr. Robert D. **Jarrett**
Radiation Safety Service Section

Tel: 431 2060 22734
Fax: 431 20607
E-mail:jarrett@nepo1.iaea.or.at

Mr. Vitomir **Markovic**
Indust. Appl. and Chem. Section

Tel: 431 2060 22734
Fax: 431 20607
E-mail:markovic@ripo1.iaea.or.at

Mr. Mordecai **Lapidot**
Indust. Appl. and Chem. Section

Tel: 431 2060 21703
Fax: 431 20607
E-mail:lapidot@ripo1.iaea.or.at

Mr. Kishor **Mehta**
Dosimetry Section

Tel: 431 2060 21660
Fax: 431 20607
E-mail:mehta@ripo1.iaea.or.at

LIST OF IRRADIATION FACILITIES AVAILABLE FOR FOOD PROCESSING

Countries with Irradiation Facilities Available for Commercial Food Processing (July, 1996)

Facilities with locations underlined are under construction or planned;
Countries underlined are irradiating food for commercial use

(All facilities use Co-60 as radiation source except those indicated by * which are electron beam facilities)

Country	*Location (starting date for food irradiation)*	*Products*
Algeria	Mascara	Potatoes
Argentina	Buenos Aires (1986)	Spices, spinach, cocoa powder
Bangladesh	Chittagong (1993)	Potatoes, onions, dried fish
Belgium	Fleurus (1981)	Spices, dehydrated vegetables, deep frozen foods
Brazil	Sào Paulo (1985) Piracicaba Manaus	Spices, dehydrated vegetables Fruits, vegetables, grain
Canada	Laval (1989)	Spices
Chile	Santiago (1983)	Spices, dehydrated vegetables, onions, potatoes, poultry meat

Country	*Location (starting date for food irradiation)*	*Products*
China	Chengdu (1978)	Spices and vegetable seasonings, Chinese sausage, garlic.
	Shanghai (1986)	Apple, potatoes, onions, garlic, dehydrated vegetables
	Zhengzhou (1986)	Garlic, seasonings, sauces
	Nanjing (1987)	Tomatoes
	Jinan (1987)	Not specified
	Lanzhou (1988)	Not specified
	Beijing (1988)	Not specified
	Tienjin (1988)	Not specified
	Daqing (1988)	Not specified
	Jianou (1991)	Not specified
	Beijing (1995)	Rice, garlic, spices
Croatia	Zagreb (1985)	Spices, food ingredients, dried beef noodles
Czech Rep.	Prague (1993)	Spices, dry food ingredients
Cuba	Havana (1987)	Potatoes, onions, beans
Denmark	Riso (1986)	Spices
Finland	Ilomantsi (1986)	Spices
France	Lyon (1982)	Spices
	Paris (1986)	Spices, vegetable seasonings
	Nice (1986)	Spices/herbs
	Vannes (1987)	Poultry (frozen deboned chicken)
	Marseille (1989)	Spices, vegetable seasonings, dried fruit, frozen frog legs, shrimp, poultry (frozen deboned chicken).
Hungary	Budapest (1982)	Spices, onions, wine cork, enzyme
India	Bombay	Spices
	Nashik	Onions, potatoes
	Vashi, New Bombay	Spices
Indonesia	Pasar Jumat (1988)	Spices, rice
	Cibitung (1992)	
Iran	Tehran (1991)	Spices
Israel	Yavne (1986)	Spices, condiments, dry ingredients

Country	*Location (starting date for food irradiation)*	*Products*
Japan	Shihoro (1973)	Potatoes
Korea, Rep.	Seoul (1986)	Garlic powder, spices and condiments
Mexico	Mexico City (1988)	Spices and dry food ingredients
Netherlands	Ede (1981)	Spices, frozen products, poultry, dehydrated vegetables, egg powder, packaging material
Norway	Kjeller (1982)	Spices
Poland	Warsaw (1984) Wlochy (1991) Lodz (1984)	
Peru	Lima (1996)	Spices, food additives, animal feed
South Africa	Durban (1989) Pretoria (1968) Kempton Park (1982) Cape Town (1986)	Spices Shelf-stable food Spices Fruits, spices
Thailand	Patumthani (1989)	Onions Fermented pork sausages, enzymes, spices
Ukraine	Odessa (1983)	Grain
United Kingdom	Swindon (1991)	Spices
USA	Rockaway, NJ (1984) Whippany, NJ (1984) Tustin, CA (1984) Ames, IA (1993) Mulberry, FL (1992) Schaumberg, IL Columbus, OH Morton Grove, IL Haw River, NC Salem, NJ	Spices Spices Spices Spices, poultry Fruits, vegetables, poultry, spices Spices Spices Spices, fruits Spices Spices
Yugoslavia	Belgrade (1986)	Spices

MANUFACTURERS OF IRRADIATION FACILITIES
(June, 1996)

A. Gamma Irradiators

Beijing Institute of Nuclear Engineering
P.O. Box 840
Beijing 100840
P.R. CHINA

Board of Radiation and Isotope Technology, BRIT
Dept. of Atomic Energy
V.N.P. Marg
Bombay 400 094
INDIA Tel. 5515535

Comisión Nacional de Energía Atómica, CNEA
Av. del Libertador 8250
1429 Buenos Aires
ARGENTINA Tel. 54 1 480 0696; Fax 54 1 480 0615

GAME
Reseau Eurisys
Parc d´Activité Kennedy
Avenue Henri Becquerel
33700 Mérignac
FRANCE Tel. 56 13 39 75; Fax 56 13 39 99

Gamma-Service GmbH
Bautzner Strasse 67
04347 Leipzig
GERMANY Tel. (3 41) 2 42 15 97; Fax (3 41) 2 42 16 87

GrayStar, Inc.
200 Valley Road, Suite 103
Mt. Arlington, NJ 07856
USA Tel. (201) 398-3331; Fax (201) 398-8310
e-mail Gray StarNJ@aol.com

HEPRO Cape (Pty) Ltd.
P.O. Box 141, Milnerton 7435
Cape Town
SOUTH AFRICA Tel. 27 21 551 2440; Fax 27 21 551 1766

Nordion International, Inc.
Food Irradiation Applications
447 March Road
Kanata, Ontario
CANADA K2K 1X8 Tel. (613) 592 2790; Fax (613) 592 0440

Nukem GmbH
Postfach 110080
D-6450 Hanau 11
GERMANY Tel. (061) 81581

PURIDEC Irradiation Technologies
8 Sycamore House, Chiltern Court
Asheridge Road, Chesham
Buckinghamshire HP5 2PX
England
UNITED KINGDOM — Tel. 44 (0) 1494 774959; Fax 44 (0) 1494 785912

Sultzer Brothers, Ltd.
Dept. KK/0340
CH-8401 Winterthur
SWITZERLAND — Tel. (052) 813590

Techsnabexport
Staromonetniy per. 26
109180 Moscow
RUSSIA — Tel. 095 233 48 46; Fax 095 230 2638

TRANSELEKTRO
Institute of Isotopes Co., Ltd.
H - 1051 Budapest
Nádor u. 13
HUNGARY — Tel. 361 111 1812; Fax 361 1534 827

B. Electron Beam/X-Ray Machines

AECL Accelerators
436 B Hazeldean Road
Kanata, Ontario
CANADA K2L 1T9 — Tel. (613) 831 2882; Fax (613) 831 0108

Brobeck Corporation
1235 Tenth Street
Berkeley, CA 94710-1593
USA

Electron Processing Systems, Inc.
6 Executive Park Drive
N. Billerica, MA 01862
USA — Tel. (508) 667-6366; Fax (508) 671-0122

Institute of Nuclear Studies
Experimental Establishment for Nuclear Equipment
Swierk, 05-400 Otwock
POLAND

Ion Beam Applications - IBA
Chemin du Cyclotron 2
Avenue Jean Lenoir 6
B-1348 Louvain-la-Neuve
BELGIUM — Tel. (32) 10 475859; Fax (32) 10 475810

MeV industrie SA
Parc Technologique Gémini II
Route de l'Orme
91195 St-Aubin Cedex
FRANCE
Tel. 33 1 60191329; Fax 33 1 60191032

Nissin High Voltage Co., Ltd.
47, Umezu-takase-cho, Ukyo-ku
Kyoto, 615
JAPAN
Tel. 81758648812; Fax 81758821520

Raychem Inc.
300 Constitution Drive
Menlo Park, CA 94025
USA
Tel. (415) 361 4831; Fax (415) 361 4306

RPC Industries
P.O. Box 3306
Hayward, CA 94540
USA

Shanghai Medical Nuclear Instruments Factory
65 Nan Hua Lu
Shanghai
CHINA

Sumitomo Heavy Industry, Ltd.
63-30 Yuhigaoka
Hiratsuka, Kanagawa 254
JAPAN
Tel. 81463218486; Fax 81463218990

Techsnabexport
Staromonetniy per. 26
109180 Moscow
RUSSIA
Tel. 095 233 48 46; Fax 095 230 2638

Titan Scan Systems
6750 E. 46th Avenue Drive, Suite 100
Denver, CO 80216
USA
Tel. (303) 320 6777; Fax (303) 320 4664

Varian Associates
3045 Hanover Street
Palo Alto, CA 94304-1129
USA
Tel. (415) 424 6362; Fax (415) 493 3377

VIVIRAD - High Voltage
23, Rue Principale
67117 Handschuheim
FRANCE
Tel. 33 88 69 13 25; Fax 33 88 69 16 18

CHINA

Food Irradiation Facilities

China now has more than fifty 60Coγ irradiation facilities with design capacity higher than 100 KCi of ^{60}Co. Total loading activity is more than 6 MCi. Table I shows the new ^{60}Co gamma facilities in operation in recent years.

Table I. New ^{60}Co γ facilities in China (food irradiation related)

Center	In Operation	Capacity (KCi)		Purpose
		Design	First Loading	
Kunming	1994	300	100	Food
Qingdao	1994	5000	400	Food Medical Sterilization
Changchun	1995	500	300	Food, Shrinkable Materials
Yanbian	1995	500	100	Vegetable, Fruit, Mushroom
Jining-Jinxiang	1995	300	100	Garlic
Hainan	1995	500	100	Fruit, Rubber Latex
Beijing	1995	300	100	Model Project, Rice and Others
Zhongmu	1996	500	(100)	Garlic
Tangshan	1996	1000	(200)	Meat, Others

The Yanbian Radiation Center is the China Food Industry Association Radiation Center.

The Jining-Jinxiang Radiation Center of Shandong Province and Zhongmu Radiation Center of Henan Province are special irradiation centers for garlic irradiation.

The Beijing Chinese Irradiation Center for Agriculture is the Model Project CPR/5/009 center.

The Qingdao Radiation Center was a Canadian Nordion type facility, a modernized facility.

Market Trails

In recent years, market trails on irradiated food were conducted in Shanghai, Chengdu, Hangzhou, Beijing and some other cities.

There are about 30 supermarkets in Shanghai which sold about 40,000 packages (150-200 gram/package) of instant prepared food (packaged meat products) in 1995. Consumers accept this new type food, with no negative response; the package was established with the international irradiated food logo and "this is irradiated food" in Chinese language.

In Chengdu and Sichuan province, about a thousand tonnes of irradiated foods (peppers, spirit made from sweet potato, garlic and many others) were sold out. In Chengdu department store, irradiated food market testing continues.

In Henan province (Zhengzhou, Zhongmu and others), and Shangdon Province (Jinan, Jinxiang, Taian, Qingdao), irradiated garlic has been sold out and received no negative response.

In Xian or Zhejiang, more than one hundreds tonnes irradiated food was sold out in the past one year.

In summary, China produced more than ten thousand tonnes of irradiated food in 1995.

Other information

From 29 May to 1 June 1995, the Regional Workshop on Food Irradiation Commercialization and Market Testing was convened in Beijing, China. The Institute of Application of Atomic Energy in Agriculture, Chinese Academy of Agricultural Science was the host and more than 20 experts from the Asia-Pacific Region and other areas attended. After the workshop, a training course on food irradiation commercialization was hosted by the same institute.

In July 1996, a Research Coordination Meeting on Quarantine Treatment of Food Irradiation will be held in Beijing, China. The IAEA/CAAS will be the host.

Dr. Zhu **Jiang**
Senior Engineer
Office of IAEA Affairs, Ministry of Energy
P.O.Box 2102, Sanlihe Street
Beijing China **Tel:** 86108512211
Post Code: 100822 **Fax:** 0086108513717
THE PEOPLE'S REP. OF CHINA

CROATIA

After the Regulation on food irradiation was promulgated in June 1994, the Ruđer Bošković Institute was authorized under the Regulation to perform the irradiation of foods and items of general use as of 30 January 1995. The authorization related to the ^{60}Co panoramic irradiation facility of the Radiation Chemistry and Dosimetry Laboratory.

The works on the reinstallation of the electron linear accelerator at the Ruđer Bošković Institute were continued in 1995 and included, most notably, the completion of the ventilation and air conditioning installation of the site.

The panoramic ^{60}Co irradiation facility of the Ruđer Bošković Institute continued to offer irradiation services to interested industries. During 1995 the following foods were irradiated on a commercial basis:

- instant herb tea (microbial decontamination) 1660 kg
- milled red pepper (microbial decontamination) 7000 kg
- dried mallow leaves (*Folium althaeae*) (microbial decontamination) 700 kg

A product related to food production, but not a food itself, also treated in 1995 was:

- peat (sterilization of substrate for soya propagation) 6000 kg

Contributed by:

Dr Dusan **Razem**
Ruder Boskovic Institute
Bijenicka Cesta 54
P.O. Box 1016
41000 Zagreb
CROATIA

Fax: 385-41-425497

COMMUNICATION RECEIVED

INDIA: IRRADIATED SPICES GET SPICIER

The Third World Spice Congress with the theme "Vision 2000", Cochin, India, 15-18 February 1995, was the forum where irradiated spices were highlighted. The Congress was organized by the Spices Board India and the All India Spices Exporters' Forum and was attended by 256 delegates from 25 countries, most of whom were world leaders n spice producing, exporting, processing and trade. Prominent guest speakers of the Congress included Mr. Tejendra Khanna, Secretary, Ministry of Commerce of the Government of India, Dr. M.S. Swaminathan, an internationally renowned agricultural scientist, Mr. T. Nandakumar, Chairman, Spices Board of India, Mr. Al Goetze, President, American Spice Trade association, Mr. Peter J. Knight, Chairman, International General Produce Association, Mr. Martin J. Muggenridge, European Spice Association, etc.

FAO, IAEA and ITC which have collaborated under a joint project on "Improving the safety and quality of food ingredients in trade by irradiation" following the adoption of the IAEA Resolution on "Practical Utilization of Food Irradiation in Developing Countries" in 1993, were represented at the Congress and at a special session on "Irradiation". Speakers of this session included Dr. George G. Giddings - deceased (FAO/IAEA), Mr. Fazli Husain (ITC), Mrs. Merle Eiss (FAO/IAEA Consultant), McCormick Spice Co., Mr. Jan Leemhorst (Gammaster, the Netherlands) and Dr. Paul Thomas (BARC, Bombay).

In addition to the presentations at the session on "Irradiation", the following statements with regard to irradiation of spices were made by prominent speakers at other sessions of the Congress:

1. "The sterilization of spices in South Africa is generally carried out by **irradiation** at between 4 kilogray (herbs) and 10 kilogray (chilies and pepper) depending on the typical microbial load of the individual spices..... Ethylene oxide, methyl bromide and other hazardous gasses are not recommended and can only be used with a government permit which is issued only under strict controlled circumstances"

Mr. Will B. Wallace
Purchasing Manager
Robertson (Pty.) Ltd.
South Africa

(It should be noted that Robertson (Pty.) Ltd. is the largest producer and retailer of spices in South Africa. It has invested in a commercial irradiation facility for treating mainly spices in Durban, South Africa. Irradiated spices and food containing irradiated spices are marketed widely - with clear labelling, in that country)

2. "IRRADIATION. Probably the most efficient and less destructive process but not very well accepted by consumers (mainly because of the risk in the treatment factories).

In Europe the product has to be labelled "irradiated product". No company has yet taken the risk with their brand.

ETHYLENE OXIDE. Largely used before 1990 but now banned in the EEC because of carcinogenicity of residues.

STEAM. Every large enough company has developed such a process in their factories since the banning of ETO..... almost nobody is completely satisfied with it. The microbiological results can be good but it often reduces the quality of the product as regards the colour and taste. WE WIN SAFETY, WE LOSE FLAVOUR."

Jean Marie Schouvey, Purchasing Manager
Ducros, Cedex, France.

3. "Special treatments, such as irradiation:

The European Spice Association do care a lot to have the irradiation accepted for the special processing of spices. Some European countries accept irradiation, others do not. In Europe, irradiation is expected to be allowed in the future, especially for treatment of spices and herbs. A stigma clings to only the word "irradiation".

Irradiation however, will become important and will be used for so-called "sensitive products", such as prepared meals with spices or herbs, in which for example salmonella might develop, milk products, special prepared meal products, instant products which are not boiled."

H.J. MURAU
Secretary General
German Spice Association
Germany.

The above statements were extracted from the Proceedings of the World Spice Congress, 1995, issued by the Spices Board India.

INDONESIA

1. Regulation on Food Irradiation

In February 1995 the Minister of Health of the Republic of Indonesia issued a Decree No. 152/MENKES/SK/II/1995 concerning the Amendment to the Annex of the Regulation of the Minister of Health 826/MENKES/PER/XII/1987 on irradiated Food. The Amendment contains the Ministerial decision to extend the approval of food irradiation process to a total of five categories of food.

2. Authorized Application of Food Irradiation

Based upon the existing regulation, the five groups of food mentioned above are:

1. Spices, dry herbs and seasonings with doses up to 10 kGy for insect disinfestation and reduction of microbial load;
2. Bulbs, roots and tubers (e.g. potatoes, shallots, garlics and rhyzomes) with doses up to 0.15 kGy for sprout inhibition;
3. Frozen shrimps and froglegs with doses up to 7 kGy for the elimination of pathogenic bacteria, such as *Salmonella*;
4. Dried fish with doses up to 5 kGy for shelf-life extension;
5. Grains with doses up to 5 kGy for insect disinfestation and reduction of certain pathogenic micro-organisms.

3. Commercial Activities

No new irradiation facility was constructed after "Indogamma" (1992), which is the first commercial irradiator in Indonesia. This commercial company is the only facility authorized to irradiated food products in addition to medical and cosmetic products.

During the firs eight months of 1995, about 1500 tons of food products were irradiated at Indogamma, including spices, seasonings, dry herbs, mungbeans, frozen fishery products, cocoa powder and wheat flour.

4. R & D Activities

Current R & D activities are mainly focused on the application of irradiation process to sterilize food for hospital patients and to control microorganisms in meat and meat products.

Trial runs on irradiation of frozen tuna for microbial control have been conducted at commercial level. The study is still in progress.

Contributed by:

Dr. Munsiah **Maha**
Centre for Applications of Isotopes and Radiation
National Atomic Energy Agency
Jalan Cinere Pasar Jumat Kotak Pos 7002 JKSKL
Jakarta 12070 **Tel:** 7690709
INDONESIA **Fax:** 0062217691607

PERU

IV LATIN AMERICAN CONGRESS ON FOOD MICROBIOLOGY AND HYGIENE
PERU, April 1996

1st Peruvian Symposium on Food Preservation: FOOD PRESERVATION BY IRRADIATION

The IVth Latin American Congress on Food Microbiology and Hygiene was held from 14 to 18 April 1996 in Lima, Peru. Over 650 person attended from different Latin American countries, the United States of America, Canada, Europe and Australia. More than 17 countries were represented.

As part of the congress, the 1st Peruvian Symposium on Food Preservation was held for one whole day. There were three plenary sessions, three round tables, one session of presentations and a poster exhibition. The symposium had two objectives: 1) Analyze the current and future demands and possibilities of food preservation processes; and 2) Support the development of Food Technology in Peru.

The topic of one of the round tables was "Food Preservation with Irradiation", and discussed the different aspects of this technology. It included three panel members that spoke about the different subjects; Dr. Conrado Seminario Arce (from Peru), who is the Director of the Peruvian Atomic Energy Committee; was the Moderator and his topic was "General Requirements for Food Irradiation". He referred to the properties of ionizing radiation, the equipment (pilot and industrial) used for irradiation and the required infrastructure to guarantee and favour the process. Lastly, he touched on the types of processes involved in ionizing radiation (radurization, radicidation and radappertization).

Dr. Terence Roberts, President of the International Commission on Microbiological Specifications for Foods, referred to the Applications of Gamma Radiation on Foods and discussed the effects of ionizing radiation on microorganisms, bacteria, fungi and viruses, and explained the changes which occur and determine the survival or death of the agents. He concluded his presentation mentioning how this technology can be applied to different food products.

Dr. Jorge Lasta, Director of the Food Technology Institute of INTA from Argentina, referred to Helping Food Hygiene with Gamma Radiation. He discussed the effects of radiation on safety and nutritional aspects of food products. Lastly, he referred to the use of ionizing radiation in combination with other processes (heat, pH, etc).

There was also a question and answer session and the number of questions greatly exceeded the time assigned, so many were answered privately. If grouped by topics, the questions mainly referred to: a) necessary equipment and infrastructure for different situations; b) molecular effects on microorganisms; c) treated food products and safety; and d) effects on organoleptic characteristics and oxidative processes in foods.

The response perceived by the organisers of the Symposium indicated that there is interest in this subject.

Together with the IV Congress and 1st Symposium, the First Peruvian Demonstration Irradiator was inaugurated.

Contributed by :

Dr. Jorge A. **Lasta**
Director
Inst. De Technologia de Carnes
CC 77 (1708) Moron
ARGENTINA

Tel: 6210446/0457/2012
Fax: 5414812985

SWITZERLAND FEDERAL FOOD ORDINANCE (as of 1 March 1995)

Article Field of application

1. The provisions of this ordinance shall apply to:
   a. The production, processing, storage, transport and supply of foodstuffs;
   b. The identification and promotion of foodstuffs;
   c. Agricultural production in so far as it related to the production of foodstuffs.

2. For tobacco, tobacco products and tobacco substitutes, the Tobacco Ordinance of 1 March 1995 shall apply[1].

Article 2 General requirements

1. Foodstuffs may contain substance and organisms only to the extent that these do not endanger human health.

2. Foodstuffs may not be spoiled, contaminated or otherwise diminished in value.

Article 14 Other types of physical processing

1. Authorization is required from the Federal Office for the processing of foodstuffs with the following:

   a. Ionizing radiation;
   b. New physical processes which demonstrably alter the physiological properties or material composition of the foodstuffs in question.

2. Authorization will be granted if, according to the current level of scientific knowledge, any risk to health can be ruled out.
3. These authorizations are published periodically by the Federal Office in the Swiss Official Trade Gazette.

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[1] SR 817.06; AS 1995 1659

USA Food Irradiation Education Workshops Held in Hawaii

In May and June of 1996, four one-day workshops on Food Irradiation Education were held on the islands of Oahu, Kauai, Hawaii, and Maui. The purpose of the workshops was to present factual, up-to-date information on food irradiation technology to the public in the State of Hawaii so that information can be further shared with their friends and colleagues. Cooperative extension agents, growers, wholesalers, marketing specialists and processors of fruits, vegetables, and ornamentals, and people connected with state and federal quarantine office were invited to attend these workshops. The public was also invited to attend.

Successful test-marketing of Hawaii-grown, irradiated tropical fruits such as papayas, rambutans, atemoyas, carambolas, and lychees in the Midwest of the United States since April 1995 indicates an increase in consumer acceptance of irradiated foods on the U.S. mainland. Under a special, limited permit issued to the Hawaii Department of Agriculture by the USDA-APHIS, un-treated, inspected Hawaiian fruits were air-freighted on direct flights to Chicago, inspected at the airport by quarantine inspectors, then trucked to the Isomedix irradiator facility at Morton Grove, Illinois for irradiation as a quarantine treatment at a minimum dose of 0.25 kGy. The fruits were then distributed to Carrot Top market and 20 other grocery stores in Illinois, Ohio and Indiana. These activities allow people working on the shipping studies to gain experience and collect data on the efficacy of the quarantine treatment. ARS scientist Dr. Thomas Phillips participated in the studies by irradiating live fruit fly eggs and larvae in sealed containers to determine radiation effectiveness.

After welcoming remarks by Director H. Yamamoto of the Hawaii Institute of Tropical Agriculture and Human Resources, participants listed to talks by various speakers (in parenthesis): USDA quarantine regulations (Hinsdale, Tamiya, Pang-Ching); recent experience in test marketing of irradiated Hawaiian fruits (Wong); what food irradiation is (Moy); radiation sources and facilities (Moy); what happens when an insect, food, or plant is irradiated (Moy and Paull); purposes and applications of food irradiation (Moy); approval process and foods approved by the U.S. FDA (Moy); safety issues of irradiated foods (Moy); consumer acceptance of irradiated foods (Hodgson); international food irradiation developments (Moy), some on-going research (Phillips).

A total of 105 people attended the four workshops including the speakers. Several question- and-answer sessions intertwined with talks so that participants had plenty of opportunity to ask questions or express opinion. A high degree of interests and enthusiasm were exhibited by the participants as judged by the questions they asked. The prevailing feeling was that growers of tropical fruits, unique vegetables, fresh herbs, and specialty ornamentals, all of which need an efficacious quarantine treatment method, are among many who would benefit from an irradiation facility. Availability of irradiation technology could help determine what crops to plant on lands no longer in sugarcane and pineapple in the state. Thus, a commercial irradiator in Hawaii could significantly expand the potential of Hawaii's diversified agriculture.

The workshops were organized and offered by the Cooperative Extension Service, College of Tropical Agriculture and Human Resources, University of Hawaii, and the Hawaii Department of Agriculture, in cooperation with the ARS and APHIS of the U.S. Department of Agriculture in Hawaii.

Contributed by :

Dr. James H. **Moy**
Hawaii Institute of Tropical Agriculture
and Human Resources, Food Science and Human Nutrition
University of Hawaii, 1920 Edmondson Road
Honolulu 96822 **Tel**: 0018089563853
U.S.A. Fax: 0018089569663

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Contact: Brian Norris (301) 504-6778

SECOND FOOD IRRADIATION CD-ROM AVAILABLE FROM NAL

BELTSVILLE, MD, A second CD-ROM on food irradiation is now available from the National Agricultural Library (NAL).

The disc, *Food Irradiation 2*, contains 11,000 pages of government research conducted in the 1950s and 60s on the "wholesomeness of irradiated foods." Information on the disc is in the form of searchable bibliographic records plus actual-page images from reports and articles.

The disc was produced as part of the National Agricultural Text Digitizing Program (NATDP) with assistance from NAL's Food and Nutrition Information Center (FNIC). Another disc, *Food Irradiation 1*, was produced by NAL in 1993. NAL produced both discs in response to growing international need for access to food irradiation research materials.

"Food irradiation is approved and used in 38 countries and endorsed by the Food and Agricultural Organization of the United Nations," said FNIC Coordinator Sandy Facinoli. "Prior to the food irradiation discs, some of the research material was available only in paper form at NAL. *Food Irradiation 1* and *2* make this material more accessible and assist scientists in studying the research and literature on the subject."

The research materials on the latest disc include progress, pathology, and clinical reports, raw data and journal articles. Most of the materials are from research conducted by the Department of the Army. According to Facinoli, at the time the research was being conducted, a General Accounting Office study put the value of the research at $80 million.

(more)

add 1111--Food Irradiation

Facinoli said FNIC worked closely with Dr. Ari Brynjolfsson, the former director of the International Facility for Food Irradiation Technology in The Netherlands, in evaluating and organizing materials for the new disc.

Copies of *Food Irradiation 2* are available by contacting:

Food and Nutrition Information Center
National Agricultural Library
Room 304
10301 Baltimore Blvd.
Beltsville, MD 20705-2351
telephone: (301) 504-5619
telefax: (301) 504-6409
e-mail: fnic@nalusda.gov

Through the National Agricultural Text Digitizing Program, NAL produces CD-ROMs containing sections of the NAL collection related to specific agricultural subjects. NAL distributes the discs to land-grant university libraries and other organizations. Other NATDP ---discs cover agronomy, aquaculture, acid rain, Agent Orange, food and agricultural sciences, and the research of George Washington Carver.

NAL is part of the Agricultural Research Service of the U.S. Department of Agriculture. It is the largest agricultural library in the world and one of four national libraries of the United States with the Library of Congress, the National Library of Medicine and the National Library of Education.

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ADDITIONAL CLEARANCES OF IRRADIATED FOOD

A major error was discovered after the printing of the List of Clearances of Irradiated Food in the Supplement issue of the Newsletter Vol. 19, No. 2 (October 1995), i.e. the clearance of irradiated food in Chile was omitted. The Food Preservation Section sincerely regrets this error and is printing the clearance below. It is the intention of the Section to update the List annually.

CLEARANCE OF ITEM BY COUNTRY *09-Jul-96*

COUNTRY	ITEM NAME	CODE	TYPE OF CLEARANCE	DATE O	DOSE MAX (kGy)
CHILE					
	CHICKEN	3	UNCONDITIONAL	*12/29/82*	7
	COCOA BEANS	2,3	UNCONDITIONAL	*12/29/82*	5
	CONDIMENTS	3	UNCONDITIONAL	*12/29/82*	10
	DATES	1	UNCONDITIONAL	*12/29/82*	1
	FISH	3,5	UNCONDITIONAL	*12/29/82*	2.2
	FISH (DRIED)	2	UNCONDITIONAL	*12/29/82*	1
	FISH PRODUCTS	3,5	UNCONDITIONAL	*12/29/82*	2.2
	MANGO	2	UNCONDITIONAL	*12/29/82*	1
	ONIONS	6	UNCONDITIONAL	*12/29/82*	0.15
	PAPAYA	2	UNCONDITIONAL	*12/29/82*	1
	POTATO	6	UNCONDITIONAL	*12/29/82*	0.15
	PULSES	2	UNCONDITIONAL	*12/29/82*	1
	RICE	2	UNCONDITIONAL	*12/29/82*	1
	SPICES	3	UNCONDITIONAL	*12/29/82*	10
	STRAWBERRY	5	UNCONDITIONAL	*12/29/82*	3
	WHEAT	2	UNCONDITIONAL	*12/29/82*	1
	WHEAT PRODUCTS	2	UNCONDITIONAL	*12/29/82*	1

Explanations for Codes: 1. Delay ripening/physiological growth, 2. Disinfestation, 3. Microbial control, 4. Quarantine treatment, 5. Shelf-life extension, 6. Sprouting inhibition, 7. Trichina/parasite control, 8. Sterile meals for hospital patients, 9. Sterilization, 10. Unstated.

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IN MEMORIAM: DR. GEORGE G. GIDDINGS

Dr. George G. Giddings passed away unexpectedly from an acute heart attack on 24 December 1995 while spending Christmas holiday with his family in New Jersey. He was 58 years old.

Dr. Giddings was an outstanding scientist dedicated to his profession. Borne in the USA in 1937, he obtained a Bachelor degree in Food Science at the University of Massachusetts in 1963. In the same year he joined the staff of the U.S. Army Natick Laboratory and there, did his first work on food irradiation. He then went to Michigan State University to earn both M.Sc. and Ph.D. in Food Science (with major in food irradiation) in 1969 and 1972, respectively.

George's wide professional experience included a position as faculty member at North Carolina State University from 1972 to 1977; Manager, Marine Resource Division, ITT- Fundacion Chile from 1977 to 1980; and senior advisor to the Directorate of the ITT-Fundacion Chile until 1981. He returned to the USA to join Radiation Technology, Inc. as Director, Food Applications between 1981 and 1983; Director, Food Irradiation Services, Isomedix, Inc., the world's largest service gamma irradiator from 1983 to 1987. He became an independent consultant, often to implement FAO/IAEA food irradiation programmes in developing countries between 1987 and 1990. His wide experience on food irradiation was recognized by the Food Preservation Section of the Joint FAO/IAEA Division, Vienna which recruited him as a regional expert on food irradiation between 1990 and 1991. George returned to the Section as a full time staff member to implement various activities of the Section from August 1994 until the time of his death.

George made an effective contribution to the work of the Food Preservation Section by co-ordinating activities in this field in many advanced and developing countries. A testimony to his outstanding work was the recognition of one of his country projects in China as a Model Technical Co-operation Project of the IAEA. As a result, a semi-commercial food irradiator has been built in Beijing to process rice and other foodstuffs.

Unquestionably, George was one of the most qualified scientists in the USA active in the field of food irradiation. Just prior to rejoining the Food Preservation Section in August 1994, he prepared and submitted a petition to the U.S. Food and Drug Administration for a regulation permitting irradiation of red meat to control microbial pathogens. An approval of this petition appears to be imminent and the meat industry in the USA is ready to utilize this effective technology to ensure microbiological safety of its products.

George's untimely death is a great loss to the progress of food irradiation and to all who knew him. His knowledge and persistence has advanced food irradiation from a little known technology to one which is being widely accepted and applied as a branch of food science. His name will always be associated with food irradiation both in the USA and worldwide.

George was survived by his wife, Gertraud, and his children, Thomas and Erica.

NEW PUBLICATIONS

The following publications have become available from the IAEA or the ICGFI or came to the attention of the Food Preservation Section during the past year:

1. ASEAN/ICGFI Seminar on Food Irradiation, Proceedings of a seminar jointly organized by the ASEAN Secretariat and the ICGFI, Jakarta, 12-16 June 1995. ICGFI Document No. 22, IAEA, Vienna (1995).

2. New Methods of Food Preservation (including a chapter on Food Irradiation). Ed. G.W.Gould. Blackie Academic & Professional, Wester Cleddens Road, Bishopbriggs, Glasgow G64 2NZ, UK (1995).

3. Shelf-Stable Foods through Irradiation Processing. IAEA-TECDOC-843, IAEA, Vienna (1995).

4. Food Irradiation - A Sourcebook. Ed. E.A. Murano. Iowa State University Press, Ames, Iowa 50014, USA (1995).

5. Food Irradiation - A Guidebook (2nd Edition). Morton Satin. Technomic Publishing Company, Inc. 851 New Holland Ave., Box 3535, Lancaster, PA 17604, USA (1996).

6. Food Irradiation with Emphasis on Process Control and Acceptance in Asia. IAEA-TECDOC - 871. IAEA, Vienna (1996).

7. Food Irradiation - A Reference Guide. V.M.Wilkinson and G.W.Gould. Butterworth Heinemann, Linacre House,Jordan Hill, Oxford OX2 8DP, UK (1996).

COMING EVENTS

1. Second FAO/IAEA Research Co-ordination Meeting on Standardized Methods to Verify Absorbed Doses of Dried Fruits and Tree Nuts, Karlsruhe, Germany, 5-9 August 1996.

2. FAO/IAEA/RCA Training Course on Irradiation as a Quarantine Treatment of Fresh Fruits and Vegetables, Bangkok, Thailand, 13-23 August 1996.

3. International Congress on Entomology (including a Symposium on Quarantine Treatments), Florence, Italy, 26-30 August 1996.

4 First FAO/IAEA Research Co-ordination Meeting on Assessment of Safe, Shelf-Stable and Ready-to-Eat Food through High-Dose Radiation Processing, Belfast, Northern Ireland, 9-13 September 1996.

5 Second FAO/IAEA/WHO(PAHO) Co-ordination Meeting on Irradiation as a Public Health Intervention Measure to Control Foodborne Diseases in Latin America, Buenos Aires, Argentina, 7-11 October 1996.

6. FAO/IAEA/AFRA Workshop for adapting and preparing harmonized legislation on Food Irradiation, Accra, Ghana, 21-25 October 1996.

7. 13th Annual Meeting of the ICGFI, Cascais (near Lisbon), Portugal, 5-7 Noveember 1996.

8. Joint FAO/IAEA/WHO Study Group on the Wholesomeness of Food Irradiated with Doses above 10 kGy, Geneva, Switzerland, 21-28 April 1997 (Tentative).

9. Second FAO/IAEA Research Co-ordination Meeting on the Study of the Impact of Food Irradiation to Prevent Food Losses in Africa, April 1997 (Tentative).

FOOD IRRADIATION ON LINE

The Food preservation is pleased to announce that the updated version of our popular brochure "Facts about Food Irradiation"is now available on Internet under Web site:

http://www.iaea.or.at/worldatom/inforesource/other/food/

In addition, the USDA Animal Plant Health Inspection Service (APHIS) published on 15 May 1996 a Notice of Policy on "The Application of Irradiation to Phytosanitary Problems" for review and comment at Web site:

http://www.aphis.usda.gov/ppd/irrad/policy.txt

The USDA has also established a Web site for additional background information on food irradiation to link **to other sites concerning radiation and the irradiation of products under Web site:**

http://www.aphis.usda.gov:80/ppd/irrad/

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