FOOD AND ENVIRONMENTAL PROTECTION NEWSLETTER

Joint FAO/IAEA Division
of Nuclear Techniques
in Food and Agriculture
and FAO/IAEA Agriculture and
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TO THE READER

Dear Colleague,

This issue reports a number of important developments of the work of the Food and Environmental Protection Section during the past six months.

Of special significance was the outcome of the FAO/IAEA/WHO International Conference on Ensuring the Safety and Quality of Food through Radiation Processing, held in Antalya, Turkey, 19-22 October 1999. The Conference had as its main objectives to evaluate progress and achievements on food irradiation during the 20th century and to identify key issues in further development of this technology to enhance food safety, security and trade for the next century. The Summary Report of this Conference is included in this issue. The Conference was followed by the 16th Annual Meeting of the International Consultative Group on Food Irradiation (ICGFI) which was held at the same venue from 25 to27 October 1999. The future of ICGFI beyond the current mandate which will expire in May 2002 was considered in the light of positive development of food irradiation in the USA and in several Asian countries. The plan to amend the current Codex General Standard for Irradiated Foods to remove the maximum dose limit of 10 kGy was developed for considering by the next session of the Codex Committee on Food Additives and Contaminants, Beijing, China, 20-24 March 2000. The excerpts of the ICGFI Meeting and its adopted Programme of Work and Budget for 2000 are included in this issue.

The FAO/IAEA Training Workshop on the Application of Quality Control/Quality Assurance in Pesticide Residue Analysis, Seibersdorf, Austria, 20 July - 28 August 1999 was a great success. The Workshop was attended by 24 senior food analytical officials (out of some 150 applicants) who are in charge of such analysis in their countries. The success of this Workshop prompted the Section through its FAO/IAEA Training and Reference Centre for Food and Pesticide Control to consider another Workshop to be held in 2000.

With the departure of a few staff members during the last six months, the Section had to manage with the same work load with less manpower. We are recruiting two professional staff members for the Section (a mycotoxin specialist and a food microbiologist), who should join us before middle of 2000. At the same time , we are recruiting a junior professional officer and a laboratory technician for the Agrochemicals Unit to strengthen the activities of the lab on analytical methods of food contaminants, especially pesticide residues and mycotoxins.

The staff members of the Food and Environmental Protection Section wish our readers a Happy and Healthy New Year. We look forward to continue our collaboration with all of you next year.

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B. FORTHCOMING EVENTS

Second FAO/IAEA Research Co-ordination Meeting on Validation of Alternative Methods to Gas and High Performance Liquid Chromatography for Pesticide Residue Analysis in Grains

The second Research Co-ordination Meeting (RCM) on this subject is planned to be held in College, Laguna, Philippines, from 8-12 February 2000. It will be hosted by the National Crop Protection Center, University of the Philippines, College of Agriculture. Fourteen scientists from Argentina, Bangladesh, China, Croatia, Cyprus, Hungary, India, Niger, Pakistan, Panama, South Africa, Tunisia and Turkey who hold research contracts will be invited to attend.

Final FAO/IAEA Research Co-ordination Meeting on Production of Safe, Shelf-Stable and Ready-to-Eat Foods through Radiation Processing

The final Research Co-ordination Meeting (RCM) on this subject is tentatively planned for Montreal Canada, 10-14 July 2000. It is expected to be hosted by the Food Research and Development Centre, St. Hyacinth, Quebec. Fifteen research contract and agreement holders from Argentina, Canada, China, Ghana, India, Indonesia, Portugal, Thailand, UK and USA who have collaborated under the scope of this research project will be invited to attend.

Second FAO/IAEA Research Co-ordination Meeting on Determination of Profiles of Human Pathogens in Food for Export by Introduction of Quality-Assured Microbiological Assays

The second Research Co-ordination Meeting (RCM) on this subject is tentatively planned for Bogor, Indonesia, 11-15 September 2000. It is expected to be hosted by the Bogor Agricultural University, Bogor, Indonesia. Fifteen scientists from food control laboratories in Austria, Australia, Brazil, China, Chile, Ghana, India, Indonesia, the Republic of Korea, Mexico, Nigeria, Paraguay, the Philippines, South Africa and Thailand, who have research contracts and agreements under this research project will be invited to attend.

Final FAO/IAEA Research Co-ordination Meeting on TLC Screening Methods for Pesticide Residue Analysis in Vegetable Crops

The Final RCM on this subject is tentatively planned to be held in Bangkok, Thailand, 4-8 September 2000. It is expected to be hosted by the FAO Regional Office for Asia and the Pacific, Bangkok, in co-operation with the Department of Agriculture, Thailand. Twelve research contract and agreement holders under this research project from Argentina, Brazil, Belarus, Ghana, Lithuania, Myanmar, Romania, Sweden and Thailand will be invited to attend.

Second FAO/IAEA Research Co-ordination Meeting on Irradiation as a Phytosanitary Treatment of Food and Agricultural Commodities

The second Research Co-ordination Meeting (RCM) on this subject is tentatively planned for Fresno, California, USA, 13-17 November 2000. It is expected to be hosted by USDA Horticultural Crop Research Laboratories, USDA/ARS, Fresno, California. Fourteen research contract and agreement holders under this project from Chile, China, India, Iran, Japan, Malaysia, the Philippines, Poland, Syria, Thailand, Turkey and the USA will be invited to attend.

C. PAST EVENTS

Final FAO/IAEA Research Co-ordination Meeting on Impact of long-term pesticide usage on soil properties using radiotracer techniques, Hangzhou, China, 24-28 May 1999

The third and final RCM was held in Hangzhou, China, 24-28 May 1999. The meeting was attended by Research Contract holders from Brazil, China, Egypt, India, Pakistan, Philippines and Thailand with Research Agreement holders from Germany and USA. Several staff members of the Institute of Nuclear Agricultural Sciences also attended. Lively discussions took place following the presentations dealing with the impact of heavy, repeated, long-term (up to 4 years) applications of pesticides on the fate and impact of pesticides on soil properties.

Results indicated that soil bacterial populations were inhibited by organophosphorus (OP) and carbamate insecticides. On the other hand, pyrethroid insecticides stimulated bacterial populations. Atrazine, organochlorine (OC) compounds or mixtures of pesticides used had no significant or conclusive effect on bacteria. Fungal populations were stimulated by OP and OC compounds and inhibited by atrazine, carbamates and pyrethroids. In each case, the microbial populations recovered to the initial level. At recommended rates repeated long-term use of pesticides generally has no lasting effect on the bacterial and fungal populations in the soil.

Repeated applications of pesticides inhibited and/or stimulated various biochemical processes in soils. There was no significant or conclusive effect on basal respiration, except for the carbamate insecticides, which inhibited respiration. Substrate-induced respiration was, however, inhibited by atrazine, carbamates and OPs as well as mixtures of pesticides. Mixed results were observed for the effect of pesticides on soil nitrification. Atrazine and OC compounds had an inhibitory effect on this parameter; whereas, the effect of OPs was both stimulatory or inhibitory. The activity of the enzyme dehydrogenase was stimulated by atrazine and OCs, but inhibited by the other classes of pesticides applied individually or as mixtures. Arginine deaminase was stimulated with the application of pyrethroid insecticides but inhibited by the other pesticides used. Iron (Fe-III) reduction was stimulated by pyrethroids but inhibited by carbamate insecticides. The effect of other pesticides on this parameter was inconclusive.

Study of the effect of applications of pesticides to soil on bound residues showed that pesticides became bound to the soil and the amount of total bound residues increased with time. All studies showed that with repeated application of other pesticides to the soil the amount of soil-bound residue of a pesticide decreased in the upper soil zone and increased in the lower zone. The initially applied pesticide is displaced with those applied later and it moves down into the deeper soil zones, creating a risk for groundwater contamination. This study was made possible by the use of radiotracer techniques.

Mineralization of ^{14}C-labelled pesticides was observed in control soil (previously untreated with pesticides) as well as soil repeatedly treated with pesticides. However, mineralization of radiolabelled 2,4-D, pirimiphos methyl and carbofuran was reduced in soils receiving repeated applications of other pesticides.

It was difficult to arrive at a definitive conclusion since field studies are known to generate data which are spatially variable. However, certain trends were observed, which could be regarded as useful indicators for predicting the effect of certain pesticides or classes of pesticides on the properties of specific soils.

FAO/IAEA (RCA) Project Co-ordination Meeting on Irradiation as a Sanitary and Phytosanitary Treatment of Foods, Dalian, China, 1-3 September 1999

The meeting was hosted by the Bureau of International Co-operation, China Atomic Energy Authority in co-operation with the Dalian Fuan Radiation New Technology Co. Ltd. The Project Co-ordinators' Meeting (PCM) was organised to review progress on the implementation of national regulations on food irradiation and its application as a sanitary and phytosanitary treatment of food and agricultural commodities, both for domestic and export market. The purpose of the meeting included preparing of an action plan for use of irradiation as a sanitary and phytosanitary treatment of food to overcome barriers in international trade.

The Meeting was attended by food irradiation project co-ordinators from Bangladesh, China, India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand and Vietnam. Australia was represented at the meeting as an observer. Two observers from the Republic of Korea also attended the meeting.

Food irradiation is one of the active projects of RCA and countries in Asia and the Pacific region have made substantial contributions to date. Most of the RCA countries have active food irradiation programmes and a number of countries have been operating commercial irradiation facilities for quite some time. The People's Republic of China as the RCA Lead Country had made significant progress in commercial application of food irradiation followed by Thailand and Republic of Korea. China established more than 50 large gamma irradiation facilities with 12.5 million curies Co-60. In 1998, China produced more than 50,000 metric tons irradiated foods of which 39,000 t were garlic. Thailand has been producing irradiated fermented pork sausage for quite a few years and super market shops in Bangkok are popularly retailing such irradiated Nham sausages regularly. South Korea's Greenpia irradiation plant has been in capacity utilisation on different food products for local markets.

Commercial/demonstration irradiation facilities are in operation in Bangladesh, Pakistan, India, Indonesia, Malaysia, the Philippines and Vietnam for treating food. Sri Lanka is now engaged in developing an active food irradiation programme to curtail its huge food losses. Most of these countries have food irradiation regulations in place. A harmonized regulatory framework is now being implemented in most RCA countries especially in ASEAN, Bangladesh, China, and Pakistan to facilitate trade in irradiated food. Other countries are expected to adopt the harmonised version by April, 2000. ASEAN countries' Agriculture Ministers in their meeting in Ho Chi Minh city earlier this year instructed its member states to adopt harmonised regulations on food irradiation. A harmonised protocol to use irradiation as a quarantine treatment has been adopted at a workshop in Manila early this year under this project and RCA member states are expected to apply the protocol to treat fresh fruits and vegetables for export satisfying the quarantine requirement. Regional trade in irradiated food within RCA region is expected to be forthcoming.

Final FAO/IAEA Research Co-ordination Meeting on Impact of Food Irradiation to Reduce Post-Harvest Food Losses in Africa, Pretoria, South Africa, 20-24 September 1999

The final RCM of the CRP was hosted by the Department of Food Science, University of Pretoria, South Africa. The objective of this CRP was to assist institutions in the Africa region in conducting pilot-scale studies on food irradiation, test marketing , and economic studies to determine the feasibility of food irradiation on its impact in preventing food losses in Africa. The RCM was attended by research agreement and contract holders from Egypt, Cote d'Ivoire, France, Ghana, Morocco, South Africa, Nigeria and Zambia.

It has been gathered that although some countries in the continent such as South Africa, Ghana, Nigeria, Egypt have technological know how and made substantial progress in the infrastructural aspects of the technology, many other African nations are still lagging far behind on research and development of this technology. The meeting prepared an up-to-date status of food irradiation in participating African countries. Further activities related to market development and industrial participation on practical application of the irradiation processing should be undertaken in the African countries. Future collaboration with respect to the use of irradiation in the development of traditional African weaning food has been thought to be a very important and pertinent area to work with. Participants agreed on a need to organise specific training course for African countries on the implementation of irradiation as a sanitary and phytosanitary treatment.

A visit to the commercial irradiation facilities, Isoster, in Croydon, South Africa was made to familiarize the participants with the operation and management aspects of the irradiation plant dealing with food and non-food items. This irradiation company has been in operation since the late seventies.

FAO/IAEA/WHO International Conference on Ensuring the Safety and Quality of Food through Radiation Processing, Antalya, Turkey, 19-22 October 1999.

This major Conference of FAO, IAEA and WHO was hosted by the Turkish Atomic Energy Authorities and held at Hotel Merit Limra, Antalya, 19-22 October 1999. It was attended by 144 designated participants from 46 Member States including 16 observers from 5 inter-governmental organizations.

The specific goals of the Conference were:

- to assess the past achievements in the practical application of food irradiation processing;
- to identify key issues in further development of food irradiation to ensure food safety, quality and security; facilitate international trade in agricultural commodities; and,
- to develop an agenda for its wider application in the next century.

For details of the outcome of this Conference, please visit the section on the Conference in this Newsletter.

Sixteenth Annual Meeting of the International Consultative Group on Food Irradiation, Antalya, Turkey, 25-27 October 1999.

The 16th Annual Meeting of the International Consultative Group on Food Irradiation (ICGFI) was hosted by the Turkish Atomic Energy Authority (TAEA) and held at the Merit Limra Hotel, Kiris Kemer, Antalya , Turkey, 25-27 October 1999. It was attended by 32 designated experts from 22 member governments and representatives from 4 non-governmental organisations along with an observer from UK.

For details of the outcome of the Meeting, please visit the section on ICGFI in this Newsletter.

D. STATUS OF EXISTING CO-ORDINATED RESEARCH PROJECTS (CRPs)

Validation of Thin Layer Chromatographic Screening Methods for Pesticide Residue Analysis in Vegetables

Ten Research Contract Holders, one Research Agreement holder and an observer attended the second Research Coordination Meeting in Vienna, Austria 16-20 November 1998. The participants presented the results of their research for the last two years. For some pesticides, the participants reported Rf, RRf and MDQ values which were different than those in the "Contract Report". However, in general most of the procedures reported in the "Contract Report" were validated by a majority of the participants. The results indicated that it is possible to validate the TLC screening methods in individual laboratories. However, before this can be accomplished the precision (%CV) of analysis has to be improved. This applies particularly for the determination of the Rf and RRf values for pesticides on TLC plates. The participants reported problems with GPC clean up of the pesticide solution extracted from fruits and vegetables. The supplier of the GPC agreed to provide to all participants, free of charge, Teflon septa and tubings and other parts needed for appropriate operation of the equipment. Difficulties were reported with the fungal spore plate bioassay for the detection of fungicides. Again the problem was overcome and an SOP is now available. The participants considered the CRP very important and relevant to the problems of developing countries where sophisticated analytical instruments such as GC and HPLC cannot be adequately maintained and used due to power interruption and unavailability of spare parts, gases and solvents of high purity. They considered the RCM very successful as it afforded the participants the opportunity to discuss problems that they faced during the method validation exercise and find solutions.

Validation of Alternative Methods to Gas and High Performance Liquid Chromatography for Pesticide Residue Analysis in Grains

The implementation of the programme of the project was continued, though the obstructions in the delivery of some chemicals delayed the activities of several participants. The interim reports were submitted by most of the participants. The findings and results will be discussed during the 2nd Research Coordination Meeting, which will be held at Laguna, Philippines between February 5-12, 2000.

Production of Safe, Shelf-Stable and Ready-to-Eat Food through Radiation Processing

The objective of this CRP is to use medium (1-10 kGy) and high (10-50 kGy) doses of irradiation for the production of wholesome food with long shelf-life, especially composite, semi-preserved foods and prepared meals to be stored either under refrigeration or ambient temperature. It has 8 Research Contracts and 8 Research Agreements. The First RCM was held in Belfast, Northern Ireland from 9-13 September, 1996. The progress of work was reported at the Second RCM held in Beijing, China 4-8 May, 1998, which may be summarised as follows:

1. Irradiation with doses between 1 and 3 kGy can ensure microbiological safety of pre-packed, prepared vegetables and of chilled prepared meals stored under refrigeration. Irradiation within this dose range can also extend shelf life of the latter product as well as sliced ham left under refrigeration.

2. Shelf-stable ethnic dishes such as marinated fish in Indonesia (known locally as *pepes*) and meat kebabs in India could be prepared through a combination of heat treatment and high-dose irradiation (45 kGy). Such products could be kept for many months at ambient temperature in these countries.

3. Through inoculated pack studies using *C. sporogenes* spores, microbiological safety of shelf-stable high moisture meat and poultry dishes developed in South Africa was demonstrated.

4. Irradiation with doses up to 10 kGy together with other hurdles (low pH, low water activity, salt additives) improved microbiological quality and shelf-stability of intermediate moisture fish from Ghana; semi-dried pork from Thailand and intermediate moisture meat and chicken from India.

5. A number of packaging materials required for high-dose irradiation of food were evaluated with regard to their safety and integrity. Quality assurance guidelines were prepared for producing such packaging materials and packages for irradiated food. Effects of irradiation on edible (dairy protein based) packaging materials for some ready-to-eat food were evaluated. The third and final RCM is tentatively planned for Montreal, Canada, July, 2000.

Evaluation of Methods of Analysis for Determining Mycotoxin Contamination of Food and Feed

The main objective of this CRP is to strengthen the analytical capabilities of laboratories in developing countries in order to enable them to effectively monitor the mycotoxin content of food in trade to overcome the non-tariff barriers based on the Agreement on Application of Sanitary and Phytosanitary Measures of the World Trade Organization in view of the strict regulations recently enacted.

There is a need to develop research data on the effectiveness of the various analytical methods, including radioimmunoassays, used by food control laboratories to monitor mycotoxin contamination in order to select and recommend cost-effective validated procedures.

It was decided that instead of individual research carried out by each participant as originally proposed in the contracts and agreements, workgroups would be defined to study jointly a selected method/ mycotoxin/commodities combination with defined tasks and areas of coordination and cooperation between researchers.

The following seven workgroups were created**:**

Workgroup 1: Aflatoxin in maize and peanut butter
Participating contract/agreement holders: UK (NRI), China, Egypt, Indonesia, Cuba, Uruguay, Argentina, UK (MAFF), USA. for initial development trials and all CRP participants for collaborative trials.
Coordinator: UK (NRI/MAFF)

Workgroup 2: Fumonisin B1 in maize
Participating contract/agreement holders : Egypt, Indonesia, Cuba, Malaysia, Australia, China, UK (NRI), Philippines, Uruguay, USA, Canada (Scott), South Africa, Argentina, Italy.
Coordinator: South Africa

Workgroup 3: Aflatoxin M1 in milk
Participating contract/agreement holders: Argentina, UK (MAFF), Uruguay, Brazil, Philippines, Malaysia, China..
Coordinator: Argentina

Workgroup 4: Ochratoxin A in coffee
Participating contract/agreement holders: Brazil, Italy, Canada (Scott), USA.
Coordinator: Brazil

Workgroup 5: Feasibility study of ELISA technology for mycotoxins in developing countries
Participating TC, contract/agreement holders: Australia, China, Indonesia, Egypt, Cuba.
Coordinator: Australia

Workgroup 6: Preparation of radiolabelled fumonisin for disposition studies in naturally contaminated corn
Participating TC contract/agreement holders: Canada (Miller), Italy.
Coordinator: Canada (Miller)

Workgroup 7: Multiple trichothecenes in wheat and corn
Participating contract/agreement holders: Argentina, Italy, USA, UK (MAFF), South Africa, Cuba, Egypt, Brazil, Uruguay.
Coordinator: Uruguay

A complete time frame for the whole CRP for the next two years including the tasks for each contract/agreement holder was agreed by the participants.

Irradiation as a Phytosanitary Treatment of Food and Agricultural Commodities

The objective of this CRP is to demonstrate the efficacy of irradiation as a phytosanitary treatment of fresh and stored food and horticultural commodities based on an "international research protocol" developed for this purpose. Special emphasis will be given to research on irradiation as an alternative to methyl bromide fumigation and on select pest/commodity which represent major trade problems and have a realistic opportunity to implement the use of this technology in the near term.

The first RCM of this CRP was held in Bangkok, Thailand, 29 March - 2 April 1999 and was attended by 13 scientists from 12 countries, most of whom are from the leading producers and exporters of important commodities such as grapes, pistachios, several types of dried fruits and nuts, orchids, etc. These participants were searching for alternative to fumigation by methyl bromide which is being phased out globally under the Montreal Protocol.

The participants agreed that the criteria for efficacy testing on irradiation as a phytosanitary treatment against mites and insects other than fruit flies should not be based on Probit 9 mortality. Rather they agreed that criteria such as inability to reproduce (sterility), non-completion of pest life stage, or non-emergence of adults, were more appropriate as well as meeting the principles of plant quarantine. Research plans to be carried our during the tenure of this CRP were agreed. They requested a database on Radiation Insect Disinfestation International Database (RID-ID), to be accessible through the Internet, be developed to assist research scientists and regulatory authorities in gaining a better understanding and approval on the use of irradiation as a phytosanitary treatment.

Quality Control of Pesticide Products (NEW CRP)

This **new CRP** has just been approved for implementation during 2000. Scientists who are interested in collaborating with us under the scope of this CRP described below are invited to contact us URGENTLY.

Agricultural pesticides are essential in supplying the food requirements of the world's ever growing population. However, sustaining high levels of agricultural production depends on the judicious use of pesticides. The benefits consist not only in increased yields but also in increased quality of produce in trade.

Adoption of integrated pest management (IPM) and low use rates depend on good quality pesticide formulations. An FAO survey has indicated that up to 50% pesticide products available in developing countries are sub-standard. The use of sub-standard formulations can result in not only ineffective pest control operation, but also lead to several other problems. It may result in the development of pest resistance and related problems. Sub-standard formulations may contain chemicals, which can enhance the toxicity of the pesticides to humans and other non-target species. They may also contain degradation products, some of which are known to be more toxic than parent compounds. These chemicals may find their way into the food chain and the environment. Pesticide product adulteration, is another serious problem in developing countries, where pesticides use is on the increase. In many developing countries the use of sub-standard and/or adulterated pesticide products results in field failures, leading to a cycle of increasing application rates, higher cost, and compounding human health and environmental problems.

One of the objectives of FAO's International Code of Conduct on the Distribution and Use of Pesticides is to promote practices which ensure efficient and safe use (of pesticides) while minimizing health and environmental concerns. The Code calls upon international organizations to encourage responsible and accepted trade practices in countries by assisting them in regulation of the quality and suitability of pesticide products, ensuring that pesticides are used effectively, providing information and guidance on methods of analysis, training personnel, and assisting in the establishment of analytical laboratories.

E. FAO/IAEA/WHO International Conference on Ensuring the Safety and Quality of Food Through Radiation Processing, Antalya, Turkey, 19-22 October 1999

Summary of the Conference and its Conclusions

OBJECTIVES

The specific goals of the Conference were -:

- to assess the past achievements in the practical application of food irradiation processing;
- to identify key issues in further development of food irradiation to ensure food safety, quality and security; facilitate international trade in agricultural commodities; and,
- to develop an agenda for its wider application in the next century.

The Conference was attended by 144 designated participants from 46 Member States including 16 observers from 5 inter-governmental organizations.

The Conference included discussions on the contribution of the technology in ensuring microbial safety of food; enhancing food quality, security and international trade; marketing and consumer acceptance; economics; and regulatory aspects.

BACKGROUND

As the world enters the new Millennium, the provision of safe and nutritionally adequate diets for the world's population will increasingly become a major challenge for governments and the food industry. Many countries at different stages of development are experiencing rapid changes in their health and social environments, where governments are faced with decreasing public sector spending. The strain on limited resources will be further compounded by demographic changes, such as expanding urbanization, the increased dependence on stored and processed foods, and insufficient access to safe water and essential facilities for safe food preparation.

The intensification of food production and the consolidation of the food industries present opportunities for foodborne pathogens to infect large numbers of consumers. In recent years, a number of extremely serious outbreaks of foodborne diseases have occurred on virtually every continent, demonstrating both the public health and social significance of foodborne diseases. In spite of great efforts at the national and international levels, progress in combating foodborne diseases has largely been offset by other global trends, including growing consumer demand for foods of animal origin, longer food distribution networks and many basic changes in the way food is produced, transported, processed, prepared and consumed, Globalization of food trade presents a transnational challenge to food safety control agencies to ensure that imported food is safe consistent with consumer and, in some cases, the environmental protection, but are not unduly restrictive of trade.

To meet these challenges, governments, industry and consumers must join together to assure safe and nutritionally adequate food supplies for present and future generations. This includes the use of all safe and appropriate technologies for improving and extending the availability of food. Seen from this perspective, radiation processing will have an important role to play in ensuring the safety and quality of food in the new Millennium.

The 20th Century has witnessed several advances in the technology of food preservation and processing. These include controlled and modified atmospheres (usually in conjunction with refrigeration), high pressure, high electric field pulse, pulsed light, ohmic heating , oscillating magnetic fields, microwave and extrusion cooking. Some of these technologies are now routinely applied commercially while some others are still in the developmental stages. However, no single technology has such diverse applications as radiation processing. Research and development work in the last five decades have demonstrated that radiation processing can contribute to food safety, food security and trade. Proven practical applications include -:

- destruction of pathogenic bacteria and parasites of public health significance in raw and minimally processed foods;
- microbial decontamination of spices and dried vegetable seasonings;

- insect disinfestation of grains and other stored products;
- inhibition of sprouting in bulb, tuber and root crops;
- shelf-life extension of fruits and vegetables by delaying maturation, ripening and microbial spoilage;
- control of insect pests in fresh fruits and vegetables for quarantine purposes;
- enhancement of the refrigerated shelf-life of meat, poultry, seafood and fresh fruit and vegetables by reduction of spoilage causing microorganisms.

The Conference took place at a time when there is increasing acceptance and application of irradiation as a sanitary and phytosanitary treatment as influenced by-:

- Regulations on food irradiation in several countries and regions either have been or are being harmonized based on the Codex General Standard for Irradiated Foods and relevant recommendations of the International Consultative Group on Food Irradiation (ICGFI);
- The Sanitary and Phytosanitary Agreement of the World Trade Organisation requires that any measures to protect human, animal and plant health must be based on the standards and recommendations of the recognised international authorities. Such authorities include the Codex Alimentarius Commission;
- Irradiation as a method to ensure the hygienic quality of food, especially those of animal origin, as a quarantine treatment of fresh horticultural commodities, and as a substitute for fumigants has been given fresh impetus, especially in the U.S.A., through the regulatory environment, the positive attitude of several major industry and trade organisations and commercial initiatives;
- In 1997 an FAO/IAEA/WHO Study Group on High Dose Irradiation concluded that foods treated with doses greater than 10 kGy can be considered safe and nutritionally adequate when produced under Good Manufacturing Practice. The Codex Alimentarius Commission has already initiated steps to amend the Codex General Standard for Irradiated Foods accordingly;
- Specialised or multi-purpose irradiation facilities are available for treating food in increasing numbers and many more are under construction or are being planned;
- Consumers are receiving accurate information regarding the benefits of food irradiation and as a result are more positive towards its acceptance.

IRRADIATION AND SAFE FOOD

a) Safety of the Process

The Conference agreed that the safety and nutritional adequacy of irradiated foods produced under conditions of Good Manufacturing Practice is no longer in question. The findings of the 1980 JECFI on the safety of any food irradiated up to an overall average dose of 10 kGy were reinforced by an Expert Group convened by the WHO and which reported in 1994. More recently, an FAO/IAEA/WHO Study Group met in 1997 to examine the results of safety studies carried out on foods irradiated with doses higher than 10 kGy. Their 1999 report stated that food irradiated to any dose appropriate to achieve the technological objective is both safe and nutritionally adequate. The Conference endorsed the conclusion of the Study Group that no upper dose limit need be imposed from a food safety standpoint. Similar to other physical food processes, the technical requirements to provide a product that meets technical objectives and has sensory properties acceptable to consumers can determine the upper dose applied to a food.

b) Role of Irradiation as a Sanitary Treatment

The Conference stressed that irradiation is an effective control measure for eliminating pathogenic bacteria and parasites from solid food, especially those eaten raw or minimally processed, of both plant and animal origin without substantial increases in temperature and without causing any significant physical or chemical changes. The need for applying irradiation as a cold pasteurization/decontamination treatment, as an essential step in the Hazard Analysis Critical Control Point (HACCP) based approach, becomes necessary in ensuring their safety. The role of irradiation in combination with other processes and packaging technologies to ensure the hygienic quality of ready-to-eat food, composite food and prepared meals as well as improving shelf-stability of many food products is also likely to increase in the near future.

The widespread and increasing incidence of foodborne illness caused by pathogenic bacteria and parasites and the consequent social and economic impact on the human population have brought food safety to the forefront of public health concerns. Hundreds of millions of people worldwide are affected by diseases caused by contaminated food and the toll in terms of human life and suffering is enormous, particularly among infants and young children, the elderly and other vulnerable groups. At present, food borne disease and the use of irradiation to assist in its control is a focus mainly in developed countries. However, as developing countries become more industrialised, the importance of food borne disease and irradiation will increase further.

Reliable statistics on foodborne diseases are available from very few countries and there is severe under-reporting especially in most developing countries. According to WHO the growing incidence of foodborne diseases already affects between 5-10% of the population each year in industrialized countries. Epidemics of emerging foodborne pathogens such as *Escherichia coli* O157 and *Campylobacter jejuni* in Australia, Japan, Europe and the United states of America, have claimed thousands of victims and caused many deaths. The Conference heard about an improved, active surveillance system (FoodNet) for food borne disease in the USA. Estimates for foodborne illnesses in that country have been revised to about 76 million cases in 1998 amounting to some 30% of the population with about 5,000 deaths.

Outbreaks of foodborne diseases in many industrialized countries are frequently attributed to raw or minimally processed foodstuffs. The young, elderly and immune-suppressed are particularly at risk. Raw foodstuffs including poultry, meat and meat products, seafoods, fruits and vegetables are frequently contaminated with one or several types of food borne bacterial pathogens such as *Salmonella*, *Campylobacter*, *Yersinia*, *Listeria*, *Shigella*, *Vibrio*, *E.coli* O157, and parasites such as protozoa, nematodes and trematodes. These contaminations can result in severe, chronic or fatal health consequences apart from the reduced economic productivity. Government sources in the United States of America estimate the cost of human illness of seven foodborne pathogens to be between US$5.6 to 9.4 billion. The pathogens also pose a liability risk to food companies as shown by massive recalls of some 10,000 tonnes of ground beef in the U.S.A in 1997 because of contamination with *E.coli* O157:H7 and some 7,000 tonnes of ready-to-eat meat contaminated with *Listeria monocytogenes* in late 1998 and early 1999. These recalls have resulted in severe economic losses (estimated to be US$1-3 billions) from destroyed products, liability as well as decreased consumer confidence. Other serious outbreaks of *E.coli* O157:H7 in meats and other minimally processed foods have also occurred in Australia, Japan and Scotland.

c) Role of Irradiation as a Phytosanitary (Quarantine) Treatment of Fresh Fruits and Vegetables

The effectiveness of irradiation as a broad spectrum quarantine treatment of fresh fruits and vegetables is gaining acceptance and application following the endorsement in 1992 by regional plant protection organizations which operate under the framework of the International Plant Protection Convention (IPPC). These organizations include the North American Plant Protection Organization (NAPPO), European Plant Protection Organization (EPPO), Asia and the Pacific Plant Protection Commission (APPPC), Comite de Sanidad Vegetal del Cono Sur (COSAVE), Organism International Regional de Sanidad Agropecuria (OIRSA) etc.

The International Consultative Group on Food Irradiation (ICGFI) has recommended specific treatment schedules for fruit flies of the tephritidae family and other arthropod pests since 1991. The USDA/APHIS issued a policy in 1996 to set a framework for the use of irradiation as a phytosanitary treatment to control 10 species of fruit flies in fresh fruits and vegetables. A large number of countries in Asia and the Pacific agreed in 1999 to implement a harmonized protocol for this purpose. Small scale commercial application of irradiation of tropical fruits to control fruit flies from Hawaii has been successfully implemented in the USA since 1995. A recently concluded international Co-ordinated Research Programme on Use of Irradiation as a Quarantine Treatment of Mites, Nematodes and Insects other than Fruit Flies under the sponsorship of the International Atomic Energy Agency and the Food and Agricultural Organization has shown the potential of irradiation as a phytosanitary treatment for fruits, vegetables, cut flowers and ornamental foliage plants.

The importance of irradiation as an environmentally-friendly phytosanitary treatment is gathering momentum as part of a world-wide trend to reduce chemical treatments of foodstuffs. Ethylene dibromide (EDB) was banned as a fumigant for phytosanitary applications and to control insects in stored food and agricultural commodities in the USA in 1984. Several other countries (e.g., Japan, Germany and other EU countries) also banned EDB. The major fumigant for post-harvest disinfestation is now methyl bromide (MB). The global

phase-out of MB in advanced countries by 2005 and in developing countries by 2015 under the Montreal Protocol because of its ozone depleting property, has prompted increasing interest in the use of irradiation as an alternative to MB for insect control in food and agricultural commodities in recent years. The use of MB for quarantine and pre-shipment purposes is exempted from the Montreal Protocol, however.

d) Enhancing Food Security Through Irradiation

Estimates of the amount of post-harvest storage losses of food vary widely, but are known to be unacceptably high (perhaps as high as 30-50%, especially in fruits and vegetables in some developing countries). Insect infestation is the major cause of post-harvest loss in grains, the staple food of most countries. Satisfactory long-term storage of staple crops may be at risk as the traditional fumigant methyl bromide is being phased out and because of the increasing resistance developed by a number of stored product pests to phosphine, the only other major post harvest fumigant used worldwide. Irradiation can contribute significantly to alleviate the post-production losses in staple grain crops caused by insect pests and has several advantages over the traditional post-harvest fumigants as it is a sustainable and environment friendly technology. Irradiation can also reduce post-harvest losses in tuber and bulb crops by inhibiting sprouting in storage under environmental conditions where chemical sprout inhibitors are not effective.

e) Irradiation and International Food Trade

Irradiation of food has considerable potential to increase international trade in agricultural commodities. This presents an opportunity particularly for developing countries as they seek to improve their economies through trade with markets in developed countries. The ability of irradiation to reduce food borne pathogens, to meet quarantine requirements and to extend shelf (or transport) life can all assist in increasing trade.

For example, health authorities in many countries have imposed stricter hygienic standards in food trade. Such standards may require zero tolerance of pathogens such as *Salmonella* and *Vibrio cholera* in imported food products such as seafoods. US authorities have already introduced zero tolerance for *Listeria monocytogenes* in ready to eat food in trade and reclassified *E.coli* O157:H7 as an adulterant of raw ground beef and other non-intact meat. Following the ban on ethylene oxide in the EU and Japan, irradiation has provided an effective alternate decontamination process for spices and dried seasonings. In 1998 some 70,000 tons of these products were irradiated worldwide and this is expected to increase in volume in the coming years. In addition, irradiation provides the most versatile treatment for fresh horticultural commodities to overcome quarantine barriers.

REGULATORY ISSUES

The Conference agreed that national regulations -:

- had no need to regulate for maximum dose limits from a toxicological and nutritional perspective provided that Good Manufacturing and Irradiation Practices are maintained;
- should concentrate not on dose limits per se but on the production of microbiologically safe products that meet the stated technical purpose; this may require the imposition of specific conditions of dose or storage in certain situations, for example for phytosanitary uses or where there could be a risk of botulism;
- should provide appropriate flexibility for processors;
- should be in conformity with Codex and take into account the implications of the WTO Agreements.

The Codex General Standard on Food Irradiation recognizes that irradiation is a food process and should be regulated in the same way as other physical processes of foods. However, most countries still regulate on the basis of a case-by-case assessment and as if the treatment is a chemical additive. This is a major cause of variability (non-harmonisation) between national regulations and is a potential barrier to trade.

The Conference was informed of considerable progress towards harmonised regulations in a number of countries and regions, particularly ASEAN. These harmonised regulations are based on the ICGFI Guidelines for the Authorisation of Food Irradiation Generally or by Classes of Food that is itself based on the Codex General Standard. The Harmonised Regulation for Asia and the Pacific is noteworthy for providing only Advisory Technological Dose Limits, not mandatory limits. The Conference also noted that under the WTO Agreements, especially the Sanitary and Phytosanitary (SPS) Agreement, governments which have import regulations stricter than recognized international standards, guidelines and recommendations, may be requested to furnish justifications based on scientific grounds to the WTO. The recognised international standards etc. are those of

the Codex Alimentarius Commission, the International Plant Protection Convention and the International Office of Epizootics. Thus, non-tariff barriers to foods by importing countries solely because of an irradiation treatment are no longer justified and may be subject to challenge under the WTO procedures.

FACILITIES AND ECONOMICS

Current trends indicate that both isotopic and machine sources will be used to process food products. There is a wide variety of irradiator designs with varying throughput capacities and capital and operating costs. New developments include -:

- the design of the horizontal Cobalt-60 source concept for efficient processing of meat and poultry products;
- electron accelerators producing energies up to 10 MeV with beam up to 200 kW for treatment of thin products with high throughput rates;
- the availability of high-power electron beam machines permitting the production of X-rays at dose rates and with throughput comparable to radionuclide sources; and,
- low energy electron irradiation for surface treatment of foods for microbial decontamination of grains and seeds; a prototype irradiator is under construction in Japan.

The economics of isotopic and machine sources have been shown to be comparable for specific processing requirements. New commercial scale facilities available for treatment of foods are under construction or about to be commissioned in Brazil, India, Thailand and U.S.A. An electron beam facility for commercial scale food irradiation, being constructed in Sioux City, Iowa, USA, will be able to pasteurize up to 100,000 tonnes of chicken, ground beef or other products per year. The Conference heard that the leading US producer of chicken had entered into an agreement to utilise the EB facility and that another major food consortium were ready to irradiate other meats and meat products. In addition, sales of irradiated chicken treated by a cobalt-60 facility are increasing to both the retail and food service industries due to a successful local educational campaign and collaboration with the State Department of Health in Florida. A nationwide chain has committed to marketing irradiated beef as soon as regulations permit its sale. The availability of irradiation facilities and radiation sources to meet the increasing demand of the food industry on a global scale in the foreseeable future was assured by the suppliers.

CONSUMER ACCEPTANCE AND INDUSTRY INTEREST

Market experience in several countries show that consumers are willing to purchase irradiated food whenever it has been available once they understand the benefit. Numerous consumer acceptance studies and market tests worldwide indicate that majority of the consumers are ignorant about irradiated foods and acceptance increases when consumers are provided with information about the safety and benefit of the process. Consumer information and awareness have shown an upward trend in the recent times through the efforts made by National Governments, food and health professionals, ICGFI, and a responsible media.

Experience in the USA and several Asian countries has indicated that acceptance will increase with increased consumer education and with public endorsements by health professionals. A 1999 survey in USA revealed that a majority of supermarket shoppers are “very/somewhat likely” to purchase food products like strawberries, poultry, pork or beef if they had been irradiated to kill germs and keep it safe.

Despite this evidence, there is still reluctance within the food industry in many countries to adopt the technology. This is due to several reasons that include a perceived consumer resistance, or an unwillingness either to upset the status quo or to be the first to promote a technology that is often regarded as controversial. The recent initiative from the Coalition on Food Irradiation, represented by major food industry and trade associations, co-ordinated by the National Food Processors Association in the USA in petitioning to the Food and Drug Administration (FDA) for approval of irradiation for a variety of fresh, minimally processed and ready to eat foods of both plant and animal origin points to the changing industry interest in food irradiation processing. The Conference agreed that this change needs to be accelerated by the provision of more and better prepared information to leading industry executives.

As the commercial use increases, further research will be required to assist industry address specific issues for particular products such as the phytotoxic effects of radiation on fresh, cut vegetables and the suitability of packaging materials.

CONCLUSIONS

- The Conference agreed that the safety and nutritional adequacy of foods irradiated below and above 10 kGy and produced under Good Manufacturing Practice is now well established.

- Food irradiation is beginning to play an important role in contributing to improved food safety and security and to increased trade as a proven sanitary, phytosanitary and preservation method. This role will be even more important in the new Millennium in view of the increasing awareness of the risk of food-borne pathogens and global trade in food commodities.

- The rapid increase in the global population from 6 billion in 1999 to an expected 9 billion by 2040, a significant proportion of whom will be immuno-compromised, will require a new food safety and security strategy to meet the demand on the food supply of this population increase. As governments have the responsibility to ensure the safety and nutrition of food supplies to their population, it is of critical importance that they adhere to international agreements and standards to improve food availability, safety and trade based on the provisions of the SPS and TBT Agreements of the WTO especially relevant Codex Standards and recommendations of the IPPC.

- Major food importing countries (EU, Japan, USA) are keys to the economy of developing countries which need to export their food supplies to generate foreign exchange. Based on the Codex General Standard for Irradiated Foods and the endorsement of irradiation as a phytosanitary treatment of fresh horticultural commodities by regional plant protection organizations which operate within the framework of the IPPC, trade barriers against food treated by irradiation, still imposed by some major importing countries, are no longer justified and may be subjected to challenge. The Conference urged all governments, especially those from major importing countries, to ensure that their regulations are based on the principle of the Codex General Standard for Irradiated Foods and the relevant recommendations of the International Consultative Group on Food Irradiation, to overcome trade barriers and to encourage the acceptance of food irradiation alongside other food technologies at the earliest opportunity.

The Conference also considered a number of specific issues, and reached the following recommendations by consensus.

1. Food safety regulations should concentrate on production of microbiologically safe products that meet the stated technical purpose rather than on dose limits, and provide appropriate flexibility for processors to provide a quality product. Irradiation should be considered as an integral component of HACCP to ensure microbiological safety of solid foods, especially those eaten raw or minimally processed, equivalent to thermal pasteurization of liquid foods, and to prevent cross contamination during food preparation;

2. Regulations should be in conformity with the Standards, Guidelines and Recommendations of the international authorities recognised by the SPS Agreement of the WTO, and in particular with the Codex General Standard for Irradiated Foods and the recommendations of the IPPC;

3. Irradiation is established as a versatile, environmentally-friendly treatment of foods for sanitary, phytosanitary and shelf-life extension purposes that can contribute to better food safety, phytosanitary and food security, to reduced use of chemical treatments and to increased trade;

4. Market trials indicate that in many countries a majority of consumers are willing to purchase irradiated products; there is, however, a significant barrier to adoption of the technology from the food industry that either perceives significant consumer resistance or has concerns about being seen as the leader in a technology often perceived as controversial;

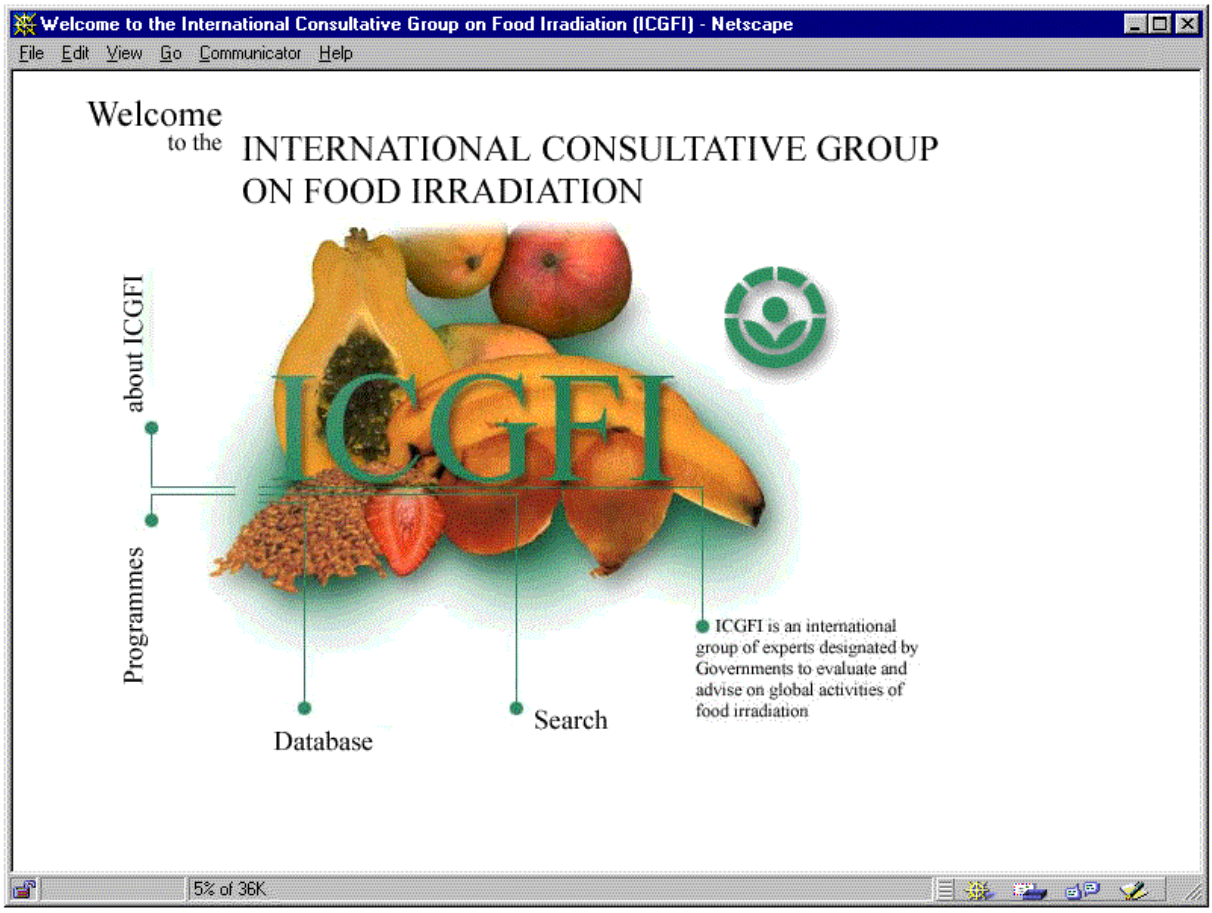
5. Scientists and public health officials have a responsibility to ensure that factual information is continuously generated and presented to key government officials, media and consumer organisations etc., and to influential decision makers in the food trade;

6. As specific commercial applications are developed, there will be a need for further research to adapt the treatment to be efficient and effective; examples requiring further research may include the radiation tolerance of irradiation on fresh, cut vegetables and on packaging materials;

7. Wherever feasible, new market trials of irradiated foods should be carried out in regions where there is a well established database on existing foodborne disease in order to provide evidence for the effect of irradiation on disease incidence.

F. INTERNATIONAL CONSULTATIVE GROUP ON FOOD IRRADIATION (ICGFI)

Visit us at http://www.iaea.org/icgfi/



The 16th ICGFI Meeting was hosted by the Turkish Atomic Energy Authority and held at Hotel Merit Limra, Antalya, Turkey, 25-27 October 1999, following the conclusion of the FAO/IAEA/WHO International Conference on Ensuring the Safety and Quality of Food through Radiation Processing, held at the same venue, 19-22 October 1999. The 16th ICGFI Meeting was attended by 32 designated experts from 22 member governments and representatives from 4 non-governmental organisations along with an observer from UK.

Highlights of the 16th Meeting

1. <u>The Future of ICGFI</u>

The government designated experts to the 16th ICGFI Meeting strongly endorsed the view to reconsider the future of ICGFI beyond the current mandate which will end in May 2002. This was based on recent development especially in the USA and several countries in Asia and the Pacific, which have either implemented food irradiation on a commercial scale or plan to do so in the immediate future. The major food industry and trade especially in the USA which were reluctant to get involved in marketing irradiated food in the past has become an active promoter through a **Coalition on Food Irradiation** established under the co-ordination of the National Food Processors Association, Washington, D.C. This Coalition submitted a petition to the US-FDA in August 1999 to approve the use of irradiation for many types of ready-to-eat food, both of animal and plant origin, to rid them of various food-borne pathogens which contaminate these products and which caused many illnesses and deaths in recent years. In addition, international trade in irradiated food appears to be imminent with irradiation playing an active role as a sanitary and phytosanitary treatment of many commodities. The first

commercial EB/X-ray machine dedicated to food irradiation in the USA (Sioux City, Iowa) was commissioned in late October this year with another X-ray machine, under construction in Hilo, Hawaii for phytosanitary treatment, expected to be in operation by April 2000. The details of these developments were reported at the Conference held during the preceding week.

While some donor governments were reluctant to continue supporting ICGFI beyond 2002, the Meeting decided to explore the active participation and funding from the private sector to ensure the continuation of this successful international co-operation under the aegis of FAO, IAEA and WHO. The 17th ICGFI Meeting, tentatively planned for Geneva, Switzerland, 1-3 November 2000, will consider the future of ICGFI on a more definite basis.

2. Proposed Amendment to the Codex General Standard for Irradiated Foods

The Codex Alimentarius Commission through its Committee on Food Additives and Contaminants (CCFAC) decided to accept the request of ICGFI to amend the Codex Standard in light of the conclusions of the Joint FAO/IAEA/WHO Study Group on High-Dose Irradiation of Food convened in 1997. The text of the proposed amendment was approved by ICGFI at the 16th Meeting and forwarded to the Codex Secretariat for elaboration under the Codex procedures at the forthcoming Session of the CCFAC to be held in Beijing, China, 20-24 March 2000. (The Codex Secretariat has meanwhile sent the proposed amendment to Codex Contact Points for comments by 15 January 2000).

3. Programme of Work and Budget for 2000

The 16th Meeting approved the following Programme of Work and Budget for 2000:

	Programme of Work		***Estimated Budget (US$)***
i)	***International Trade***		
	a)	Seminar on Trade Opportunities for Irradiated Foods for Asia and the Pacific	45,000
	b)	FIPCOS for Operators of Irradiation Facilities and Food Inspectors	25,000
	c)	Workshop on Facilitating Trade in Irradiated Food with the EU	10,000
ii)	***Legislation***		
	a)	Amendments to Codex General Standard for Irradiated Foods (through the Codex Committee on Food Additives and Contaminants)	5,000
	b)	Proposed Amendment to the Labelling Provisions on Irradiated Foods (through the Codex Committee on Food Labelling)	3,000
	c)	Publication of revised ICGFI Codes of GIP	in-kind
iii)	***Information Transfer***		
	a)	Publication of Brochure on Application of "High-Dose Irradiation of Food"	in-kind
	b)	Preparation of Education Materials on F. I.	5,000

iv) ***Database***

a)	Revise database on list of clearance of irradiated food	no-cost
b)	update current databases: national regulations, food irradiation facilities, authorized packaging materials, trainees, etc.	no-cost

v) ***Administration***

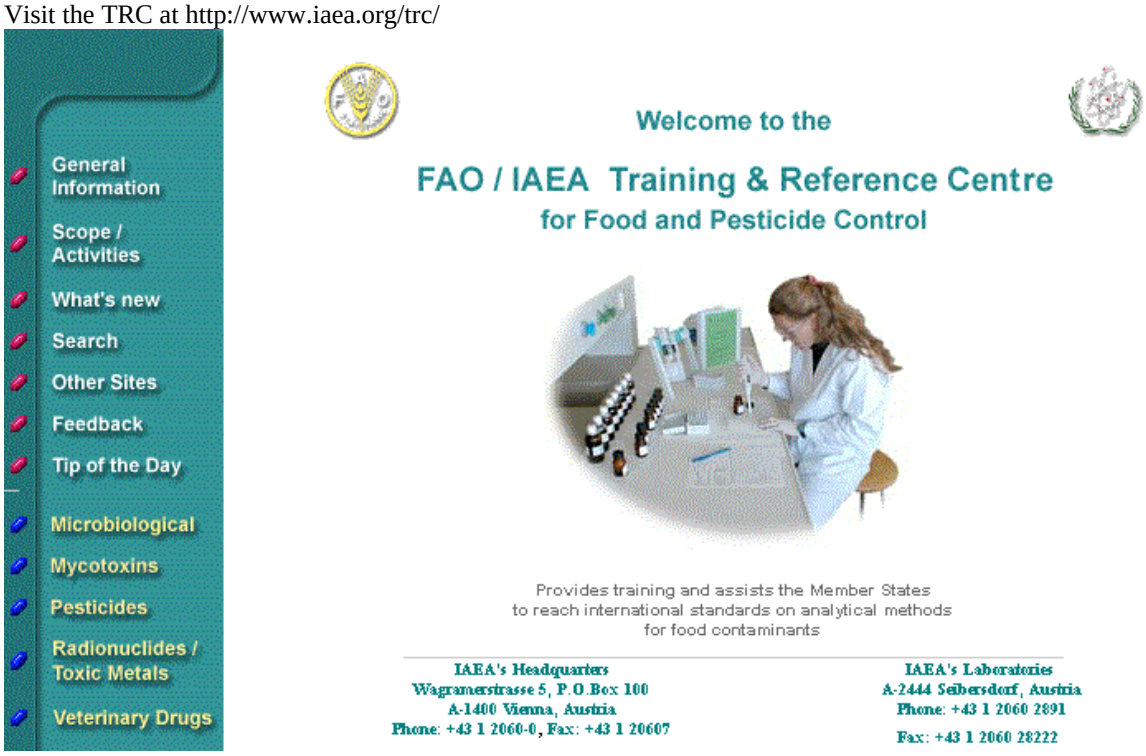
a)	One professional staff (part-time)	45,000
b)	One support staff	60,000
c)	Travel	10,000
d)	Miscellaneous (telephone, shipping, etc.)	5,000
	Total (cash)	**213,000**

4. ICGFI Web Page

The ICGFI Web Page was recently updated and expanded. In particular, a complete revision of the database on Clearance of Irradiated Food was made in the Web Page to reflect accurately the actual approval of various types of irradiated food in different countries. The ICGFI designated experts and those involved in the field of food irradiation were encouraged to visit the Web Page on a regular basis and to inform the Secretariat of any changes related to the databases maintained by the Secretariat as soon as they happen.

G. The FAO/IAEA Training and Reference Centre for Food and Pesticide Control (TRC)

Visit the TRC at http://www.iaea.org/trc/



The following activities were carried out by the TRC over the past six months:

1. FAO/IAEA Training Workshop on Introduction of Quality Control/Assurance Measures in Pesticide Residue Analysis

The FAO/IAEA Training and Reference Centre for Food and Pesticide Control (TRC) was established in 1998. The first Training Workshop organised within the TRC was held at the Seibersdorf Laboratory from 20 July to 27 August 1999. Member countries were requested through their Permanent Representatives to FAO and IAEA to submit nominations. Twenty five participants were selected from over 150 nominations and represented 25 countries-- Africa (6), Asia (5), Europe (9) and Latin America (5).

The training comprised 107 hours of lectures and 110 hours of practical exercises. Topics included:

- *Principles and practice, and estimation of uncertainty of basic laboratory operations* and safety, sample preparation, extraction, clean-up, gas, high pressure liquid and thin layer chromatography, qualitative and quantitative determination and confirmation, GC-MS, LC-MS;
- *Optimisation of laboratory procedures*, validation of methods, evaluation of results and relevant statistical tools;
- *Establishing QA/QC system for pesticide residue analysis*, introduction to ISO 17025 and OECD GLP principles, application of GLP to field studies, preparation of a Quality Manual and Study Plans, documentation of laboratory work, quality control in analytical laboratories, testing the performance of laboratories, proficiency tests;
- *Elements of Good Agriculture Practice* including the new procedure for the development of FAO-Specifications; pesticide formulation technologies; application techniques for pesticides;
- *Safety assessment of pesticides* covering the significance of impurities, estimation of chronic and acute dietary intake;
- *International trade* and the importance of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures and the role of Codex Alimentarius and its Subsidiary Bodies; Uncertainty of residue data particularly legal implications;

Laboratory exercises and *case studies on selected subjects*: complemented the lectures and covered interpretation of QA/QC principles; planning experimental programmes; preparation of SOPs; audit of reports; presentation and discussion of Study Plans.

All participants successfully completed the intensive training programme and obtained a certificate. To facilitate information transfer, the TRC provided detailed training manuals to participants in hard copy, and the preparation of CD-ROM. It is expected that follow-on workshops will be organised within Member countries so that the participants can promote the methods and skills learnt at Seibersdorf in other food control laboratories.

The training on QA/QC in residue analysis will continue in 2000. The participants of the next Training Workshop will be selected from those well-qualified candidates who could not be enrolled for the first Training Workshop, and who confirmed his/her continuing interest in receiving training.

The date and programme of the Training Workshop will be announced on the TRC Home Page.

Further enquiries and nominations may be sent to
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2. AOAC-FAO-IAEA-IUPAC International Workshop on Principles and Practices of Method Validation, 4 - 6 November 1999, Budapest, Hungary

As a follow up of the FAO/IAEA Expert Consultation on 'Validation of analytical methods for food control' , held in Vienna in 1997, this Workshop was organised to bring together analytical chemists and representatives of agencies, governments, standard organisations and accreditation bodies involved in method validation in general, and specifically for residue analysis of pesticides, veterinary drugs and mycotoxins. The major objectives of the workshop were to:

- present practical results and experience gained during the past years;.
- define minimum data requirements for cost effective characterisation of the analytical procedures;
- identify areas where the available information is limited and further work is needed to ensure reliability of the results;
- recommend practical approach for validation of pesticide and veterinary drug residue analytical methods;
- assist analytical laboratories to check compliance of food with Codex and national MRLs with methods validated according to internationally agreed criteria.

The Workshop was attended by over 130 participants from 28 countries around the world. The participants recognized the concerns regarding validation of methods expressed by the Vienna consultation. It endorsed the need for guidance on validation of methods within a single laboratory, whether for use only within that laboratory or as a precursor to an inter-laboratory validation.

The Report of the Workshop is available on the Home Page of the TRC. The presentations made at the Workshop and the proposed Guidelines for method validation will be published by the Royal Chemical Society UK in May 2000.

3. AOAC/FAO/IAEA/IUPAC Expert Consultation on Single-laboratory Validation of Analytical Methods for Trace-level Concentrations of Organic Chemicals

The consultation was held at the Plant Health and Soil Conservation Station, Miskolc, Hungary, from 7-11 November, 1999. The Consultation's objective was to build on the framework laid down by the Joint FAO/IAEA Expert Consultation on Validation of Analytical Methods for Food Control[1], by elaborating a guidance document for single laboratory validation of methods for the analysis of trace organic compounds.

The Consultants elaborated Guidelines on minimum requirements of method validation in a single laboratory. The document, which incorporates the modifications suggested by the participants of the Workshop, is intended to provide useful guidance to those involved in, or who assess the results of method validation. This includes analysts, regulators and accreditors in national, regional and international organisations.

The Guidelines are available on the Home Page of the TRC.

4. International Food Contaminant and Residue Information System (INFOCRIS)

INternational FOod Contaminant and Residue Information System taps the interactive potential of the WWW by establishing a "knowledge commons" for food contaminants and analytical methodology in support of CODEX and the SPS Agreement. The concept was pioneered by GPPIS (http://pppis.fao.org/) and EcoPort (http://www.ecoport.org/). INFOCRIS employs dynamic real-time publishing where a world-wide group of authors (editors) share a common vision and work together to improve food safety and quality in world trade. Like journals and books, INFOCRIS has a supervisor and editors to build-up the record content. INFOCRIS has critical readers, who provide peer review on a global scale to maintain the quality of the information. However, individual pieces of information are not bought or sold. INFOCRIS data and source code remain in the public domain and not copy righted. The collected knowledge belongs to everybody because the task of providing data and keeping the information current and accurate is distributed globally. Every time an individual user contributes their time and knowledge, he or she gains access to a virtual library method validation data and a suite of training and editing tools.

INFOCRIS acquires and processes information and does not require regular reprinting of new editions. Rather it establishes a set of standard protocols for data collection, presentation and maintenance under password-protection and time date stamping. This creates a dynamic framework for collecting and retrieving information. The authoritative version of INFOCRIS on the Internet (http://www-infocris.iaea.org/). Yet analysts without reliable or cheap access to the WWW may obtain a CD-ROM version in the second half of 2000.

In November 1999 new functionalities were added to INFOCRIS including:

- ◊ Record time date stamping for QA purposes;
- ◊ Bacteria profiler to simplify record selection;
- ◊ Record export functionality as a backup and device to enable indexing of all INFOCRIS records by Web search engines;

◊ DocMaster a global editing environment to tackle harmonization issues related to analytical chemistry and quality assurance;
◊ Method Validation Reporting Service to locate method validation data by analyte matrix and laboratory.

INFOCRIS becomes one of the first of the Agency's multilingual system by providing full support for Spanish. The system was successfully mounted on the Internet on November 19, 1999. It is expected to become fully operational in the first quarter of 2000. Test records are now being built up by editors in microbiology, mycotoxins, pesticide and veterinary drugs. If you would like to become a sponsor or editor of a record in your area of expertise contact Paisan Loaharanu (P.Loaharanu@iaea.org).

Website for the FAO/IAEA Training and Reference Centre for Food and Pesticide Control (http://www.iaea.org/trc/)

The TRC website is being used increasingly to distribute news and training material. Here are a few tips to help you use the site more effectively. Check the "What's new" for the latest information about positions, conferences and CRP opportunities. There are several ways of finding information on the TRC websites. Click "Search" and enter relevant keywords. Make sure you click the keywords button before running your search. You can also browse training, meetings, research and other sites under food contaminants. Feedback is the TRC's message board on current analytical issues. If you have an inquiry try here. Or share a tip with your colleagues.

There have been several important changes to the TRC website that are not apparent. The Division of Scientific and Technical Information indexed the TRC website through WorldAtom's search engine. As a consequence, some 37157 kbytes of request (roughly equivalent to pages) were serviced in October 1999. The most requested pages were those related to the International Conference on Principles of Method Validation followed by "What's new".

H. ACTIVITIES OF THE AGROCHEMICALS UNIT, SEIBERSDORF

The Agrochemicals Unit was fully involved in the organisation and performance of the Training Workshop.

During the second part of 1999, three analysts received 2 to 6 months training at the Unit.

In addition, the programme on the systematic study of sources of variability of residue data was continued. Part of the results was presented at the International Workshop on Method Validation. The results will also provide information on the expected uncertainty of the residue analytical data.

I. PUBLICATIONS

Use of nuclear and related techniques in studies of agroecological effects resulting from the use of persistent pesticides in Central America, Report of the final Research Co-ordination Meeting organized by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Panama City, Panama, 20-24 April 1998. IAEA.TECDOC-1116.

The International Consultative Group on Food Irradiation (ICGFI) issued the following documents:

- Facts about Food Irradiation, 2nd Edition
- Safeguard our Harvest: Role of Food Irradiation
- Irradiation and Trade in Food and Agricultural Commodities
- Enhancing Food Safety through Irradiation
- Consumer Attitudes and Market Response to Irradiated Food
- Safety of Poultry Meat: from Farm to Table.

ICGFI documents are available upon request by writing to Head, Food and Environmental Protection Section.

J. FLASH NEWS

USDA Approves Irradiation of Meat to Help Improve Food Safety

Release No. 0486.99

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USDA APPROVES IRRADIATION OF MEAT TO HELP IMPROVE FOOD SAFETY

WASHINGTON, Dec. 14, 1999 Industry will soon be able to irradiate raw meat and meat products such as ground beef, steaks, and pork chops to reduce significantly or eliminate E. coli O157:H7 and other hazardous microorganisms, Agriculture Secretary Dan Glickman announced today.

"While there is no single silver bullet to cure all food safety problems, irradiation has been shown to be both safe and effective,.." said Glickman. "USDA is committed to approving new technologies that offer industry additional tools to help produce even safer food."

Food irradiation is the process of exposing food to high levels of radiant energy to reduce or eliminate potentially dangerous microorganisms on meat and poultry. The Food and Drug Administration (FDA), which approves food additives such as irradiation, determined in December 1997 that irradiation of raw meat is safe.

Irradiation is currently the only known method to eliminate deadly E. coli O157:H7 bacteria in raw meat. The technology also significantly reduces levels of Listeria, Salmonella, and Campylobacter on raw product. However, consumers need to continue to handle and prepare irradiated meat and poultry as they would other raw products because some bacteria, especially spoilage organisms, are not destroyed by irradiation, and bacteria from other foods can cross-contaminate irradiated foods.

Under USDA's plan, which will be published in the Federal Register in the next week, and will take effect 60 days after publication, radiation will be permitted to treat refrigerated or frozen raw meat and meat products. As with other antimicrobial interventions USDA has approved for meat and poultry, irradiated products must still meet all other food safety requirements, including sanitation and pathogen reduction standards.

Ensuring consumer choice, USDA is requiring that irradiated meat and meat products bear the radura international symbol for irradiation, which appears below, and a statement that the product was treated by irradiation. Irradiated meat used in other products such as sausages and bologna also must be labeled. For unpackaged meat products that do not have labels, the statement and logo must be displayed at the point of sale to consumers. These labeling requirements do not apply to products purchased through foodservice operations, such as restaurants.

In a related action, USDA is streamlining the approval process for food additives by ending the requirement that food additives be approved separately by both FDA and USDA. Currently, once FDA approves a food additive, USDA must conduct separate rulemaking in order for it to be approved for use in meat or poultry. This regulatory reform effort will pave the way for the use of irradiation on ready-to-eat products such as luncheon meat. On August 23, 1999, a consortium of industry organizations petitioned FDA to approve irradiation for processed meat and poultry products.

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