FOOD AND ENVIRONMENTAL PROTECTION NEWSLETTER

Joint FAO/IAEA Division
of Nuclear Techniques
in Food and Agriculture
and FAO/IAEA Agriculture and
Biotechnology Laboratory, Seibersdorf
International Atomic Energy Agency
Vienna

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TO THE READER

Dear Colleague,

Some exciting developments will soon occur with regard to the work of Food and Environmental Protection Section. A Training Workshop on "**Application of Quality Control/Assurance in Pesticide Residue Analysis"**, scheduled for Seibersdorf, Austria, 20 July - 28 August 1999. The Workshop is be attended by 24 participants from national food control laboratories in developing countries.

In the USA, irradiation has emerged as a promising sanitary and phytosanitary treatment of food and agricultural commodities. Following several food-borne disease outbreaks and massive recalls due to *E. coli* 0157:H7 contamination in ground meat and other food products, and *Listeria monocytogenes* in ready-to-eat food products, the food industry in the USA is beginning to embrace the use of irradiation to combat these organisms. The reader will be interested in reading an excerpt of the Conference on ***"Food Irradiation ' 99 - The Solution to Food Safety Crisis"*** held in Washington, D.C., 12-14 April 1999. A commercial electron beam machine is under construction to treat meat products at Sioux City, Iowa. A similar promising situation exits on the use of irradiation as a phytosanitary treatment of fresh fruits from Hawaii against fruit flies. The success in marketing such irradiated fruits has prompted two companies to announce the construction of commercial irradiators for fruits in Hawaii.

Positive developments on food irradiation also occurred in Asia and the Pacific. Through a regional Workshop held in Manila, the Philippines, 7-9 April 1999, representatives of governments which are parties to the Regional Co-operative Agreement on Research, Development and Training on Nuclear Science and Technology (RCA) adopted a regional Guideline on Irradiation as a Phytosanitary Treatment, with a specific time schedule to implement it in their national regulations within two years.

The FAO/IAEA/WHO International Conference on Irradiation to Ensure the Safety and Quality of Food, Antalya, Turkey, 19-22 October 1999, is attracting wide interest from governments. Over 150 participants have been nominated to attend by their governments. More up-to-date information about this Conference including the Participation and Paper Presentation Forms are included in this newsletter.

The Section is bidding farewell to three able and dedicated staff members who are either retiring or departing the Section for other assignments. The first to leave at the end of May 1999 was Ms. S. Espiritu who covered all secretarial work of the International Consultative Group on Food Irradiation in the past twelve years. She will take up a more permanent position in the Division of Personnel of the IAEA. Ricardo Molins left at the end of July to take over the post of Director, Food Chemical Codex, US National Academy of Science, Washington, D.C. starting 1 September 1999. Manzoor Hussain decided to take an early retirement starting end of August 1999 and will return to New Jersey, USA.

The Food and Environmental Protection Section has benefited from their excellent services of all three departing staff members. The Section certainly loses valuable staff members and they will be greatly missed by colleagues in this Section and others both at the IAEA, FAO and elsewhere. We wish them all the best in your new assignments or retirement.

P. Loaharanu
Head,
Food and Environmental
Protection Section

A. STAFF

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B. FORTHCOMING EVENTS

FAO/IAEA Training Workshop on Introduction to Quality Assurance/Quality Control Measures in Pesticide Residue Analytical Laboratories, Seibersdorf, Austria, 20 July-28 August 1999.

This Workshop provides the introduction and detailed explanation of QA/QC principles relevant to pesticide residue analysis. Practical examples will be used to demonstrate the application of the general principles outlined in ISO Guide 25 and GLP Guidelines. Twenty four analysts from Member Countries of FAO or IAEA who come from laboratories authorised by Governments to perform official control of pesticide residues in food commodities to facilitate their international trade and safe food supply at national level, are attending.

FAO/IAEA (RCA) Project Co-ordinators' Meeting on "Irradiation as a Sanitary and Phytosanitary Treatment of Foods", Dalian (Liaoring Province), People's Republic of China, 1-3 September, 1999.

FAO/ IAEA in co-operation with the Government of the People Republic of China through the Bureau of International Co-operation, China Atomic Energy Authority will organise the RCA Project Co-ordinators' Meeting in the field of food irradiation, Dalian (Liaoring Province), People's Republic of China, 1-3 September, 1999. The national project co-ordinator on food irradiation from each RCA country with experience/knowledge in use of irradiation as a sanitary and phytosanitary treatment of food is expected to participate at the meeting. The meeting will review progress on implementation of national regulations on food irradiation and their application as a sanitary and phytosanitary treatment of food and agricultural commodities, both for domestic and export market. Also, to develop action plans with regard to the use of irradiation as a sanitary and phytosanitary treatment of food to overcome trade barriers in international trade. Scopes and infrastructural situations with respect to commercial application of irradiation as a sanitary and phytosanitary treatment of foods in each country will be reviewed locally for subsequent discussion at the Meeting. The practical aspects of using irradiation as an effective alternative to methyl bromide for treatment of fruits and vegetables will be reviewed in the light of the phasing out of this widely used fumigant under the provisions of the Montreal Protocol.

Final Research Co-ordination Meeting of the Co-ordinated Research Programme on "The Impact of Food Irradiation to Reduce Post-Harvest Food Losses in Africa," Pretoria, South Africa, 20-24 September 1999.

The Final Research Co-ordination Meeting (RCM) of the Co-ordinated Research Programme (CRP) on "Study of the Impact of Food Irradiation to Reduce Post-Harvest Food Losses in Africa" will take place in Pretoria, South Africa, 20-24 September, 1999. It will be hosted by the South African Government in collaboration with the Department of Food Science, Faculty of Biological and Agricultural Sciences, University of Pretoria. Holders of active Research Contracts from Algeria, Côte D´Ivoire, Egypt, Ghana, Morocco, Nigeria, South Africa and Zambia, and a Research Agreement Holder from France will attend. Research topics in this CRP include the application of radiation processing to reduce a) post-harvest losses of onions, potatoes, and yams due to sprouting; b) post-harvest losses of maize, cocoa beans, lentils, and dates due to insect infestation, and c) losses of stored dried, smoked fish due to insect infestation, and of traditional African meals based on meat and fish due to microbial spoilage.

FAO/IAEA/WHO International Conference on "Irradiation to Ensure the Safety and Quality of Foods", Antalya, Turkey, 19-22 October 1999.

This major international conference will review achievements on food irradiation during the 20th century with a view of formulate action plans for the 21st century. It has already attracted wide interest of governments and food industry to send representatives to attend.
For details of this conference including its Provisional Agenda, Participation Form and Paper Submission Form, please see the Section on this subject in this newsletter.

16th Annual Meeting of the International Consultative Group on Food Irradiation, Antalya, Turkey, 25-27 October 1999.

The 16th ICGFI Meeting will be held in Antalya in conjunction with the Conference mentioned above. It will be

the first meeting of the ICGFI after the recent extension of its mandate for another 3 years, i.e. until May 2002. Among other things, the Meeting will review activities carried out during this year and will consider the ICGFI programme of work and budget for 2000.

For details of ICGFI activities, please visit the ICGFI Home Page at ***<www.iaea.org/icgfi>***.

C. PAST EVENTS

First Research Co-ordination Meeting of the Co-ordinated Research Programme on "Determination of Profiles of Human Bacterial Pathogens in Foods for Export by Introduction of Quality-Assured Microbiological Assays", Vienna, 2-6 November, 1998

The meeting was hosted by the International Atomic Energy Agency, and held at its headquarters in Vienna, Austria, 2-6 November, 1998. It was attended by Research Contract Holders from the People´s Republic of China, Chile, Ghana, Paraguay, Philippines, South Africa, and Thailand, and by Research Agreement Holders from Australia, Austria, and France. Research Contract Holders from Brazil, Indonesia, Korea, Mexico and Nigeria could not attend as their contracts were approved just prior to the RCM.

RCM participants deliberated on the differences that exist in the quality assurance level of the laboratories involved in the CRP, on the need to upgrade quality assurance in all laboratories to accreditation or equivalent levels, and on the proposals put forth by the various Research Contracts and Agreements. Food product groups selected for study within the CRP include poultry, beef, pork, and fish and seafood. Pathogenic bacteria to be monitored range from *Salmonella* spp. to *Escherichia coli* O157:H7, *Staphylococcus aureus*, *Listeria monocytogenes* and members of the *Vibrionaceae* such as *V. cholerae* and *V. vulnificus.*

Common problems and aspects of interest were noted, and recommendations were made. Among these, the participants agreed to use only standard methods in the research (e.g. USFDA-BAM, EU norms, ISO norms, Australian norms, etc.) regardless of origin, as long as equivalence between the standard methods used for the same food group and microorganism by all participants can be shown. It was also recommended that rapid microbiological methods should be used in this CRP only in parallel to standard, conventional ones. Moreover, it was agreed that selection of such rapid methods should be limited to those that have already been validated or are at an advanced stage of validation by recognized institutions such as AOAC.

Another important recommendation emanating from the meeting was that participating laboratories should take immediate steps to lay the basis for a gradual but rapid upgrading of their quality assurance level, so as to achieve accreditation or an equivalent level (when funding may not permit accreditation). As part of this initiative, it was requested from the FAO/IAEA Training and Reference Centre for Food and Pesticide Control to promptly establish a programme to assist laboratories participating in the CRP achieve accreditation or equivalent quality assurance levels by providing expert services. This could serve also as a test programme for the Centre which, in addition, was asked to establish and fund a proficiency testing programme for the laboratories participating in the CRP.

First Project Co-ordinators Meeting of the Project ARCAL XXXIII (RLA/5/043), "Harmonization of Regulations for Quarantine Radiation Treatment of Fruits," Havana, Cuba, 22-26 February, 1999

The Meeting was hosted by the Cuban Government in collaboration with the Instituto de Investigaciones para la Industria de Alimentos, and held at its headquarters in Guatao, near Havana. ARCAL XXXIII Project Co-ordinators from Argentina, Brazil, Chile, Cuba, Mexico and Venezuela were present. The meeting decided to accept a request made by Peru to join the project, thus bringing the number of participating Latin American and Caribbean countries to seven.
The project was approved by ARCAL - the Regional Co-operative Agreements for Promotion of Nuclear Science and Technology in Latin America and the Caribbean - for implementation during the 1999-2000 biennium, as a response to the renewed attention being given irradiation of fresh fruits and vegetables as an alternative, efficient and non-residual quarantine treatment to chemical fumigants that have already been banned because of human health considerations, or that are being phased out because of environmental damage (e.g., methyl bromide).

The general objective of the project is "to facilitate marketing of fruits having quarantine restrictions through the

application of irradiation as a quarantine treatment and through compliance with a harmonized system for research and treatment certification." Specific objectives of the project are: a) To prepare a harmonized model for conducting research on the efficacy of radiation quarantine treatments that can be applied to each specific pest of quarantine importance in regional and international commerce; and b) To prepare a model control protocol for certification of radiation quarantine treatments.

First FAO/IAEA Research Co-ordination Meeting on "Irradiation as a Phytosanitary Treatment of Food and Agricultural Commodities", Bangkok, Thailand, 29 March-2 April 1999.

The first RCM of this CRP was attended by 13 participants from China, Chile, India, Iran, Japan, Malaysia, the Philippines, Poland, Syria, Thailand and the USA plus one observer each from Australia and Turkey. Most of the participants are from the leading producers and exporters of important commodities such as grapes, pistachios, several types of dried fruits and nuts, orchids, etc. and are 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 should not be based on Probit 9 mortality as in the case of fruit flies. Rather, they agreed that criteria such as inability to reproduce (sterility), non-completion of pest life stages, or non-emergence of adults, were more appropriate as well as meeting the principles of plant quarantine. In the absence of clear and precise efficacy requirements, they agreed that a "Research Protocol on Irradiation as a Quarantine Treatment of Commodities including Fresh Fruits, Cut-Flowers and Durables against Insects and other Arthropod Pests" developed by two consultants of FAO/IAEA, was suitable for work to be carried out under the scope of this CRP. They also requested the FAO/IAEA should develop a Radiation Insect Disinfestation International Database (RIDID), accessible through the Internet, to assist research workers and regulatory authorities, especially from developing countries, on the effect of irradiation on different species of insects.

FAO/IAEA(RCA) Workshop on "Development of a Harmonized Protocol on Irradiation as a Quarantine Treatment of Fresh Horticultural Commodities", Manila, the Philippines, 7-9 April 1999.

The Workshop was attended by 21 representatives of governments of China, India, Indonesia, Myanmar, New Zealand, Philippines, Singapore, Sri Lanka, Thailand and Vietnam which are parties to the Regional Co-operative Agreement on Research, Development and Training related to Nuclear Science and Technology in Asia and the Pacific (RCA). Most of the participants were senior officials responsible for plant protection and quarantine in their countries.

The Workshop considered whether the protocol on Irradiation as a Quarantine Treatment of Fresh Fruits and Vegetables, already adopted by ASEAN countries, could be acceptable to other countries in Asia and the Pacific. From the discussion, it became clear that China, Australia, and New Zealand have already accepted irradiation as a quarantine treatment, although the last two countries could use it only for non-food products pending the acceptance of irradiated food by their governments.

Most national plant protection authorities in RCA countries have necessary infrastructures to implement phytosanitary treatment by irradiation in accordance with their national regulations. Representatives of RCA governments therefore decided to expand the scope of the ASEAN Protocol to include other commodities such as cut-flowers, stored products and forestry products which are not only important to the economy of the region but would benefit from irradiation treatment. They then decided to adopt unanimously a Harmonized Protocol on Irradiation as a Phytosanitary Treatment for Asia and the Pacific which was revised to fit the format of the International Plant Protection Convention. They also requested that a regional standard on this subject be developed through the Asia and Pacific Plant Protection Commission (APPPC) at its forthcoming Session to be held in Indonesia in July 1999.

Report on the Results of the Joint FAO/IAEA/PAHO Co-ordinated Research Programme on "Irradiation as a Public Health Intervention Measure to Control Foodborne Diseases (Cysticercosis/Taeniasis and Vibrio Infections) in Latin America and the Caribbean" to the XI Inter-American Meeting at the Ministerial Level on Animal Health (RIMSA XI) of the Pan American Health Organization (PAHO/WHO); Washington, D.C., United State of America, April 13-15, 1999

The RIMSA XI meeting took place at the PAHO headquarters in Washington, D.C., United States of America, with the attendance of some 33 Ministers and/or Vice-Ministers of Agriculture and Public Health. High officials of the animal health control agencies of all the countries in the Americas, as well as of observers from various European and Asian countries and many international organizations, including FAO, as well as several United States agencies involved in food safety such as the United States Department of Agriculture Food Safety and Inspection Service (USDA/FSIS), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA), were also present.

The results of the Co-ordinated Research Programme jointly sponsored by the IAEA through the Food and Environmental Protection Section, Joint FAO/IAEA Division, and by the Pan American Health Organization (PAHO) through the Veterinary Public Health Programme, were presented to the Meeting by Dr. Ricardo Molins and received with great interest. Other speakers had earlier made reference to the potential role of food irradiation in enhancing the hygienic quality of food at the national as well as international market levels. Therefore, the report on the results of the CRP provided practical information on potential applications of the technology to help alleviate serious foodborne disease problems in the Americas: a) cysticercosis/taeniasis from consumption of undercooked pork, one of the main causative agents of neurological disorders in Latin America, and b) infections caused by contamination of seafood with bacteria belonging to the *Vibrio* genus, such as the causative agent of cholera (*Vibrio cholerae*) or other pathogenic members of the group that have devastated entire oyster and clam industries in the Caribbean and the United States (i.e., *Vibrio vulnificus* and *Vibrio parahaemolyticus*). Although 15 scientists from various Latin American countries and the United States participated in the research program throughout the five-year period, seven participants from Brazil, Chile, Cuba, Mexico, Peru, Uruguay, and the United States completed the research and reported their results. Interest was also expressed by the audience concerning plans for applying the results of the CRP to actual food irradiation demonstration projects jointly sponsored by the Joint FAO/IAEA Division and PAHO/WHO.

The Meeting was of special relevance to the plan of action of the FAO/IAEA Training and Reference Centre for Food and Pesticide Control (TRC), created in 1997 within the Food and Environmental Protection Section of Joint FAO/IAEA Division. Among the topics covered at the meeting were various sessions on "International Cooperation in Food Protection: From the Farm to the Table;" "Food Safety in the International Livestock Trade;" "International Arbitration in the Food Trade", "Economic Cooperation of the World Bank on Projects on Food Security and Food Safety," and on "The Impact of Foodborne Diseases on Public Health and Trade."

The strong focus of this important meeting at the Ministerial level almost exclusively on topics related to food safety was but one more manifestation of the increasing global concern about foodborne diseases, their causes, cost, and available or potential control measures, as well as on the serious impact that food contamination is already having or will have on international food trade in the future. It also reaffirmed the urgent need of developing countries to: a) establish appropriate epidemiological surveillance systems for foodborne diseases that could help determine the critical points in the food production, processing and distribution chain where preventive or corrective measures must be introduced to control contaminants, especially biological contaminants; and b) establish and/or strengthen food control procedures and institutions through appropriate legislation, training in analytical methodologies, and training/implementation of the Hazard Analysis Critical Control Point (HACCP) system, the modern method of preventive food safety control. Activities designed to respond to these needs are envisaged by the TRC.

FAO/IAEA(RCA) Training Course on "Development of Quality Assurance for Mycotoxin Analysis in Food", Manila, the Philippines, 12-23 April 1999.

This regional training course was attended by 18 participants from China, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Sri Lanka, Thailand and Vietnam, as part of the activities on a Technical Co-operation Project on "Sanitary and Phytosanitary of Food". All participants were from national laboratories responsible for analysing food contaminants, especially mycotoxin contamination of food/feed. It provided the participants with detailed information and guidance on the establishment and implementation of an analytical quality system complying with Guide ISO/IEC 17025 (former 25) for their mycotoxin laboratories and in preparing for accreditation.

The following major subject areas were covered by the course:

- Introduction to Quality Assurance principles
- Standards and Guides ISO 25, 17025, 9000 and Good Laboratory Practice
- Laboratory requirements for ISA 25 accreditation; documents, method validation, equipment, installation and personnel
- Introduction to mycotoxin regulations and international agreements
- Accreditation procedures
- The audit process.

First FAO/IAEA Research Co-ordination Meeting on "Evaluation of Methods of Analysis for Determining Mycotoxin Contamination of Food and Feed", Kuala Lumpur, Malaysia, 26-30 April 1999.

This first RCM was attended by all contract and agreement holders from 15 countries to determine the scope of research work to be carried out during the tenure of this CRP. The following were the results obtained:

1. The work to be carried out by all the participants were considered and evaluated in the context of the whole CRP.
2. Suitable mycotoxin/commodities combinations and analytical methods for experimental trials were selected.
3. Proposed methodology and implementation programme for each selected mycotoxin/commodities combination and method were discussed and agreed upon. 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 methods/mycotoxin/commodities combination with defined tasks and areas of co-ordination and co-operation between researchers.
4. Validation/performance criteria were set for all collaborative and ring trials according tot he International Harmonized Protocol: A minimum of 8 data sets with 3 levels of naturally contaminated materials, as blind duplicates and two pairs of blanks (one pair to be spiked) would be used. The Horrat ratio should be less than 2.
5. A complete timeframe for the whole CRP for the next two years including the tasks for each contract/agreement holder was approved.

First Research Co-ordination of the FAO/IAEA CRP on the "Classification of Soil Systems on the basis of Transfer Factors of Radionuclides from Soil to Reference Plants", Yzmir, Turkey, 12-16 April, 1999

This RCM was officially opened by Professor G. Yener, Director, Institute of Nuclear Sciences, the Ege University. She spoke highly about the proposed program involving participants from five continents and of her own interests in the study from her background in nuclear science.

The range of uptake values of radionuclides is enormous. This variability is caused by differences of soil properties, types of radionuclides and crops. So far it has been hardly possible to reduce these high uncertainties. Recent studies -among which is the earlier CRP on transfer parameters in subtropical and tropical countries showed that a classification of soil ecosystems might be a way to reduce uncertainties. The current CRP is, therefore, focused on a classification of soil ecosystems on the basis of specified radionuclides (Sr and Cs), and specified soil types and crops (cereals and broad leafed crops as cabbage).

Each of the participant's work plan and recent work was discussed in detail. All work plans are consistent with the goals outlined in the CRP. Final adjustments were made to the proposed plans as a result of participant's discussions. The FAO/IAEA/IUR protocol, that was revised in September 1998 at the ESNA/IUR meeting, was reviewed in detail by all participants and a few adjustments were made. For the most part the protocols proved to be a solid foundation from which to proceed. The IUR data sheet was also reviewed by all participants and was modified to include the needs of current CRP researchers.

The importance of a Quality Control (QC) program was discussed and all agreed that, at a minimum,

intercalibration standards for ^{137}Cs and ^{90}Sr in both soil and vegetation should be submitted to each participant for analysis once each year for the duration of the CRP. Additional split-sample analyses will be performed among participants on a voluntary and mutually agreed upon basis. The results from such split-sample analyses also will be included in the final CRP report.

Conference on "Food Irradiation '99 - the Solution to the Food Safety Crisis", Washington, D.C., 12-14 May 1999

The Conference was organized by InterTech Inc. in response to the increasing awareness of the risk from microbiological contamination of food and the current regulation on "zero tolerance" of certain pathogens (*E. coli* 0157:H7 in ground meat, *Listeria monocytogenes* in ready-to-eat meat), the recent major recalls of such contaminated foods and the risk of lawsuits from those who are injured from consuming such contaminated foods.

The Conference consisted of Workshops for participants to obtain more detailed information about food irradiation (held on 12 May) and the actual conference consisted of a series of lectures by invited speakers who are prominent scientists/officials dealing with this technology. The programme of the Conference is attached as Annex. The Workshops were attended by some 40 participants and the overall conference was attended by about 130 participants. Unlike most of the conferences on food irradiation held in the past, this Conference attracted wide participation of members of the food industry, most of whom were from major food processing, distribution, food services and entrepreneurs.

The increasing awareness of the problem on microbiological safety of food in the USA and the need to use appropriate technologies to ensure the hygienic quality of food, both of animal and plant origins, was stressed throughout the Conference. The following statements were made by various speakers of the Conference to highlight the need to use irradiation to ensure microbiological safety of food in the USA:

1. The Center for Disease Control and Prevention "*supports implementation of irradiation as an effective food safety strategy. Irradiation, like pasteurization and retort canning, can be an important definitive processing step. It should be applied as part of overall improvement on food safety".* (Dr. Robert Tauxe, Chief, Foodborne Disease Branch, CDC, Atlanta.

2. *"Although some consumers will never accept irradiated food, most consumers would like chicken free of Salmonella and Campylobacter and meat free of E. coli 0157:H7. Consumer demand for pathogen free products can be met through irradiation".* Dr. Christine Bruhn, Director, Center for Consumer Research, University of California, Davis, CA.

3. According to the SPS Agreement of the World Trade Organization, *"governments which are members of the WTO could be required to furnish justifications for food import restrictions based on national regulations that are stricter than recognized international standards, guidelines and recommendations. Such justifications must be based on sound science and proper risk assessment".* Paisan Loaharanu, Head, Food and Environmental Protection Section, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Vienna.

4. *"The US Congress should reclassify irradiation from food additive to a process by exempting it from the Delaney Amendment".* John Masefield, Chairman and CEO, STERIS-Isomedix Service, Whippany, New Jersey.

5. Recent research findings of the International Food Information Council (IFIC) showed that "*Consumers are willing to provide irradiated foods to their families, including children. Consumers saw benefit to irradiated foods for home use, fast food establishments, as well as restaurants. With regard to label disclosure, "cold pasteurization" was seen as the best alternative term to irradiation. Consumer would accept Cold Pasteurization (irradiation)*". Robert Earl, Director of Public Health, IFIC, Washington, D.C.

6. *In December, 1998, the National Restaurant Association (NRA) Board of Directors approved a resolution on the cold pasteurization (irradiation) of foods. NRA will use term "cold pasteurization (irradiation) in restaurant business to conduct educational campaign on irradiated food among its members".* Steven

Grover, Vice President, Technical Service, Public Health and Safety, National Restaurant Association, Washington, D.C.

In addition to a number of positive statements made according to the above, there were a number of entrepreneur companies which want to start businesses on food irradiation in the audience. These companies could provide additional strength to the introduction of food irradiation on a commercial scale in the USA and world-wide.

This Conference demonstrated that (i) there is a serious effort by government, food industry and trade associations, radiation processing companies, and the media in the USA to introduce food irradiation on a commercial scale and inform the public of the benefit of irradiation to ensure microbiological safety of food. It is likely that such an effort will lead to a widespread application of food irradiation to ensure the hygienic quality of more solid food (meat, poultry, seafood, spices, fresh fruits and vegetables, etc.) in the same manner as pasteurization has done for liquid foods (milk, fruit juices, etc.) in the past century; and (ii) .International trade in irradiated foods appears to be imminent as this technology is increasingly accepted as a legitimate sanitary and phytosanitary treatment, based on the SPS Agreement of the WTO.

D. STATUS OF EXISTING COORDINATED RESEARCH PROJECTS

Impact of Long-Term Pesticide Usage on Soil Properties Using Radiotracer Techniques

In order to evaluate the effects of repeated, heavy applications of insecticides over many years on the biological activity of the soil and soil fertility, plots have been established by participants in fields with a long history of a monoculture, usually cotton but in some countries maize or potato. Control plots have been sited in the nearest practicable areas that have a history of low or zero pesticide use. A range of soil parameters is being measured including respiration quotient/biomass; capacity for Fe-III reduction; nitrification; capacity to mineralise (C-14 labelled) aromatic molecules; dehydrogenase activity; arginine deaminase activity; rates of binding and release of C-14 labelled molecules; ATP; and some assessments of bacterial and fungal populations.

The results reviewed at the second RCM held in Bangkok during 22 - 26 September 1997 have indicated that repeated applications of pesticides to cotton field plots over a period of two years result in initial effects on soil properties, particularly on soil biomass and populations of soil bacteria and fungi, but recovery occurs soon thereafter. It is too early to draw definite conclusions as the objective is to study the effect over at least 4-5 year period. The third and final RCM of the CRP was held in Hangzhou, China, 24-28 May, 1999.

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

The main purpose of this CRP, which has 10 Research Contracts and one Agreement, is to validate relatively cheap procedures based on thin layer chromatography (TLC) that can be used to screen food and environmental samples for pesticide residues to reduce the number that must be analysed by more elaborate nuclear and related techniques.

Through a Technical Contract, procedures were developed for extraction, clean-up and TLC analysis for screening cabbage, green peas, orange and tomatoes for 118 pesticide active ingredients and metabolites. The basic procedure involves gel permeation chromatographic cleanup and the use of a number of TLC detection methods based on the use of chemical and biochemical reagents. One or other of these reagents will allow most organophosphate, urea and triazine compounds to be detected at around 0.002 mg/kg and most others at 0.05 - 0.2 mg/kg. Only organochlorine and pyrethroid insecticides and sulfonylurea herbicides were not detected at *Codex Alimentarius* Extraneous Residue Limits.

The first RCM held in Hungary in early 1997 was used as a training workshop for participants, with method validation proceeding through interlaboratory comparisons with a range of matrices and pesticides. The second RCM was held in Vienna, Austria, 16 - 20 November 1998. The work plan for the CRP has been divided in to two parts. Work has been completed on most parts of the first part of the work plan and considerable data were presented at the RCM by the participants. These data indicated that all participants were able to validate most of the methods for the detection of pesticides on TLC plates. The 'coefficient of variation' (CV%) were mostly low, indicating good repeatability of analyses. However, problems were faced in the use and application of gel

permeation chromatograph (GPC) supplied to each participant. A visit to the IAEA Laboratories, Seibersdorf was organized for the RCM participants and they were able to see the functioning of a GPC of the same make. It is expected that now the GPC procedure will be validated and the participants will be able to start part-2 of the work plan which will involve the actual method validation.

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

The objective of the CRP is to assist national monitoring laboratories to adopt and validate low cost procedures which can be used without sophisticated instrumentation for screening pesticide residues in samples of food grains for checking their compliance with Codes Maximum Residue Limits.

This CRP focuses on the application of thin layer chromatography in combination with bioassay detection methods for the determination of pesticide residues in grain corps. The advantage of the method is that it does not require continuous electric supply and can be used with limited laboratory equipment. Notwithstanding its simplicity, if TLC is applied by experienced analysts the results may comply with the ISO 25 quality requirements. The programme has 10 Research Contracts and one Research Agreement. Additional laboratories have expressed interest to join the programme in 1999. The first Research Co-ordination Meeting was held in Miskolc, Hungary, 30 March - 3 April 1998 in combination with an inter-regional Training Workshop on the Implementation of Quality Assurance and Quality Control Measures in Residue Analytical Laboratories. The contract holders also attended the training workshop, which gave them excellent opportunity to get acquainted with or upgrade their knowledge on the current requirements of quality control of analytical procedures. Consequently, during the RCM most of the time was spent on practising the TLC detection methods. The participants gained hands on experience in the application of the five recommended detection methods, which will be adapted and expanded in their laboratories during the first 1.5 years of the project.

The work programme for the participating laboratories was finalised during the meeting. The implementation of the laboratory activities will start during the second part of 1999.

The progamme includes:

- adaptation and validation of a multi residue procedure based on ethyl acetate extraction, gel permeation chromatographic cleanup and determination of the residues with three (optionally with additional two) detection methods;
- checking the reproducibility of RRf values of pesticide compounds;
- verification of the applicability of the procedure by inter-laboratory study;
- expansion of the list of detectable pesticides to cover those active ingredients which are authorised in the countries of participating laboratories;

The results of the inter-laboratory study will be evaluated and the experience of the participants will be exchanged during the second Research Co-ordination Meeting planned for early 2000. The programme will be completed by the end of 2001 with the evaluation of its results and findings during the third Research Co-ordination Meeting.

Production of Shelf Stable and Ready-to-eat Foods through High Dose Irradiation 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.

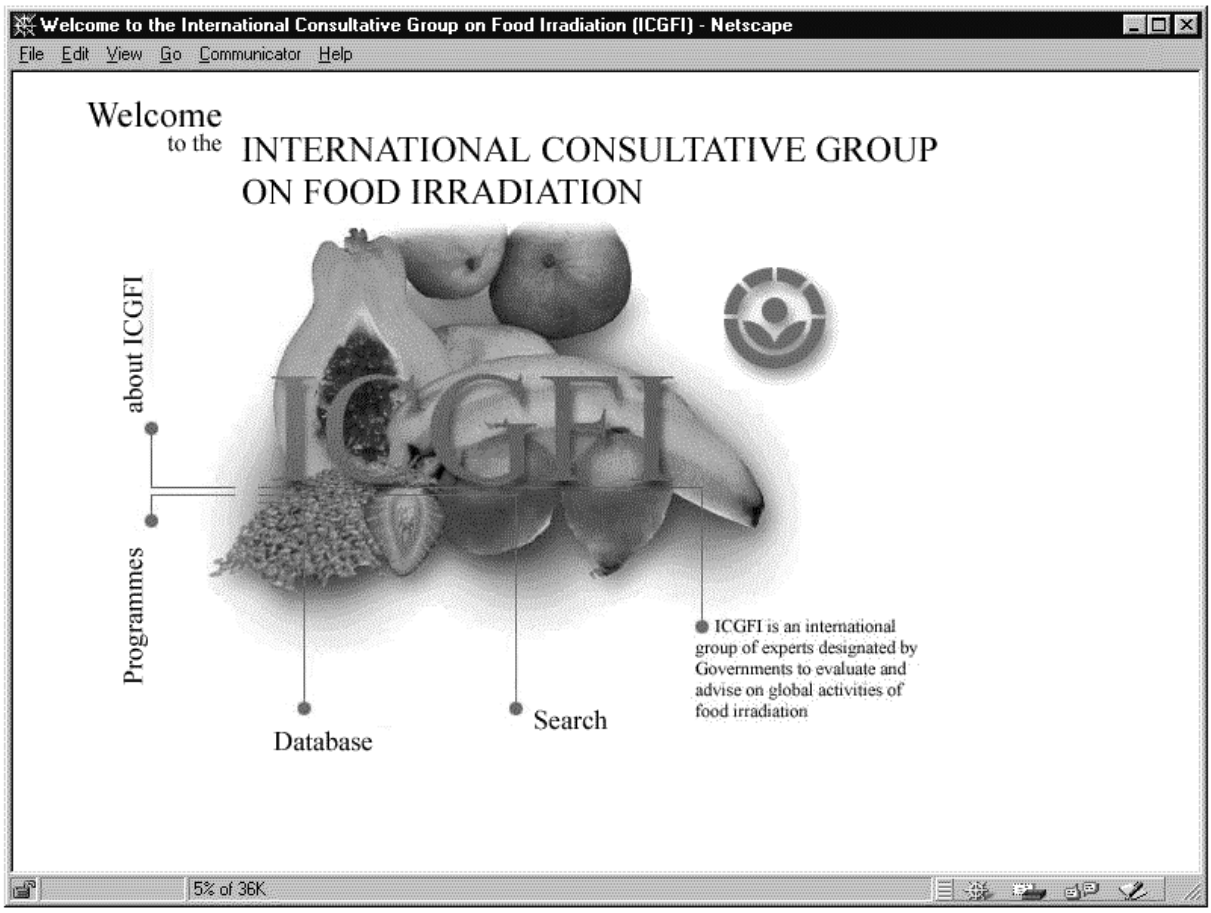
Evaluation of Methods of Analysis for Determining Mycotoxin Contamination of Food and Feed

This CRP plans to develop research data on analytical methods commonly employed by different laboratories involved in export-import food control. It will complement the work of the FAO/IAEA Training and Reference Centre for Food and Pesticide Control with regard to analytical methods for mycotoxin contamination of food and feed. Institutions in Argentina, Australia, Brazil, Canada, China, Cuba, Egypt, Indonesia, Italy, Philippines, South Africa, UK, Uruguay, and USA are participating in this CRP. The first RCM was held in Kuala Lumpur, Malaysia, 26-30 April, 1999, at which priority was given to methods used to detect and quantify mycotoxins in commodities which represent trade problems and are the object of present or planned regulatory activities. Research emphasis will also be in time and cost efficient methods with good performance characteristics (validation and quality assurance parameters) which have a realistic opportunity of being implemented in developing countries.

It is expected that research within this CRP will contribute to identification of high risk commodities and mycotoxins, improve understanding of analytical assays used for detecting mycotoxin contamination. It should also enable food control laboratories in developing countries to effectively monitor the mycotoxin content in imports and exports by establishing a portfolio of appropriate validated analytical methods.

E. INTERNATIONAL CONSULTATIVE GROUP ON FOOD IRRADIATION (ICGFI)

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



Following the decision of the 15th ICGFI Meeting to extend the mandate of ICGFI for another three years, i.e. until May 2002, the following governments have confirmed their agreement to the extension either through their designated experts to the 15th ICGFI Meeting or in writing after the Meeting:

Argentina, Belgium, Brazil, Canada, Chile, China, Costa Rica, Croatia, Czech Republic, Egypt, Germany, Ghana, Hungary, India, Indonesia, Israel, Italy, Republic of Korea, Morocco, Mexico, New Zealand, Pakistan, Philippines, Poland, Portugal, South Africa, Syria, Tunisia, Thailand, Turkey, United Kingdom, USA and Vietnam.

Only one government (the Netherlands) did not wish to extend the mandate.

As a total of 33 governments have confirmed their agreement, the mandate of ICGFI was considered officially extended for another three years, i.e. until May 2002.

The 16th ICGFI Meeting is scheduled to be held at Merit Limra Hotel, Antalya, Turkey, Tel: 0242-824-5300; Fax: 0242-824-7778 or 79 ,25-27 October 1999 following the conclusions of the FAO/IAEA/WHO International Conference on Irradiation to Ensure the Safety and Quality of Food, to be held at the same hotel, 19-22 October, 1999.

The ICGFI Home Page is constantly updated.

FAO/IAEA/WHO INTERNATIONAL CONFERENCE ON ENSURING THE SAFETY AND QUALITY OF FOOD THROUGH RADIATION PROCESSING

Background: With the next millennium about to begin, will food irradiation play a vital role in the quality, safety of and trade in our food supplies for the next century? The answer to this question and many others will be discussed at an FAO/IAEA/WHO International Conference organised for this purpose, scheduled to be held in Antalya, Turkey, 19-22 October 1999.

Significant developments on the acceptance and application of food irradiation as a method to ensure food safety and quality and to facilitate food trade have occurred in recent years. Regulations on food irradiation in many countries either have been or are being harmonised based on the Codex General Standard for Irradiated Foods and relevant recommendations of the ICGFI. The number of irradiation facilities for treating food is increasing and many more are under construction or being planned. Consumers are getting accurate information and are beginning to appreciate the benefit of irradiated foods. Indeed, irradiated foods are being produced in increasing volume both for the food processing industry and retail sale. The potential of 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 realised. Irradiation is being considered as a legitimate sanitary and phytosanitary treatment of food and agricultural commodities based on the provisions of the Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization. Thus, the prospects for food irradiation are very bright.

Objectives: This conference aims to bring together regulatory authorities, food scientists, food manufacturers, retailers, radiation processing industry and consumer organisations to assess recent developments and the role of food irradiation to ensure the safety and quality of food for the next century. The specific goals of the conference are to:

- assess the future role of irradiation to ensure hygienic quality of food (for food of both animal and plant origin);
- assess the future role of irradiation as a substitute for fumigation and to facilitate international trade in food and agricultural commodities;
- examine current regulatory practices in approving and controlling the application of food irradiation;
- discuss communication strategies for consumers and the food industry to expand the acceptance and application of this technology;
- identify key issues in further development of food irradiation to ensure safety and quality of food; and
- develop an agenda for research, development and application of food irradiation for the next century.

Participants: The conference will be of interest to food scientists, regulatory officials, policy makers in governments, food industry, and consumer organisations who deal with food safety, quality and trade.

FAO/IAEA/WHO International Conference on Ensuring the Safety and Quality of Food through Radiation Processing

Antalya, Turkey
19-22 October 1999

Provisional Agenda

(as of 10 June 99)

1st Day: Opening
9.00-

9.30-12.00 Session I: Past Achievements & Future Opportunities

Achievements of food irradiation in 20th Century
(J.F. Diehl, Germany)

Challenges and opportunities for F.I. in the next Century
(L. Crawford, USA)

13.30 Session II: Regulatory Aspects

Provisions of SPS (Codex) and TBT Agreements in relation to trade in irradiated foods.
(G. Orriss - FAO?)

Harmonization of regulations on food irradiation
(P. Roberts, NZ)

Approximation of law on food irradiation in the EU
(D. Ehlermann, Germany)

Irradiation as an alternative treatment to methyl bromide fumigation for insect control (R. Ross - USA)

16.30 Panel Discussion: This is an opportunity for participants to ask additional questions and discuss issues that most interest/concern them regarding today's presentations.

2nd Day

9.00-12.30 Session III: Ensuring Hygienic Quality of Food

Epidemiology of food-borne diseases - role of food irradiation
(R. Tauxe, CDC, USA?)

Irradiation as a critical control point of HACCP to ensure food safety
(Fritz Kaferstein, USA?)

Role of irradiation in a multiple-hurdle approach to food safety
(M. Patterson, UK)

Safety of food irradiated with doses above 10 kGy
(G. Moy, WHO)

14.00 Session IV: Enhance Food Quality and Security-Economics
16.30

Irradiation as an alternative post-harvest treatment
(M. Satin, FAO)

Control of post-harvest loss of grain, fruits & veget.
(Paul Thomas, India)

Low energy electron irradiation of food for microbial control
(T. Hayashi - Japan)

Economics of gamma irradiator for food
(P. Kunstadt - Canada)

Economics of machine source for irradiation of food
(A. Herer, IBA, Belgium)

16.30 Panel discussion:

3rd Day
9.00- Session V: Current and Future Applications
12.30

Global production of and trade in irradiated spices
(M. Eiss, ASTA)

Prospects of irradiation as a phytosanitary treatment of Chilean grapes
(T. Rubio - Chile)

Prospects of irradiation as a substitution of methyl bromide fumigation of dried fruits and nuts
(A. Antindisli/S.Bulbul, Turkey)

Prospects for commercial application of radiation sterilized ready-to-eat meals and shelf-stable food
(I. de Bruyn, S. Africa)

14.00- Session VI: Poster Session
16.30

4th Day

9.00- Session VII: Marketing Irradiated Foods
12.30

Consumer choice on irradiated food? (C. Bruhn, USA)

Consumer acceptance of irradiated food in Asia (A.O. Lustre - Philippines)

View of National Restaurant Association on irradiation to ensure the safety of food and its action plan on consumer information (……)

Commercial irradiation of meat in the USA - Action Plan (G. Rey, USA)

14.00-16.30 Session VI: Panel Discussion: Role of Food Irradiation for the next Millennium

CLOSING

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
INTERNATIONAL ATOMIC ENERGY AGENCY
WORLD HEALTH ORGANIZATION

International Conference on Irradiation to Ensure Safety and Quality of Food
Antalya, Turkey
19 - 22 October 1999

To be sent to competent official authority (Ministry of Agriculture, Ministry of Foreign Affairs, Ministry of Health, national atomic energy authority) for transmission to the International Atomic Energy Agency, Vienna International Centre, Wagramer Strasse 5, P.O. Box 100, A-1400 Vienna, Austria, [Telefax no. +43-1-26007]

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International Conference on Irradiation to Ensure Safety and Quality of Food
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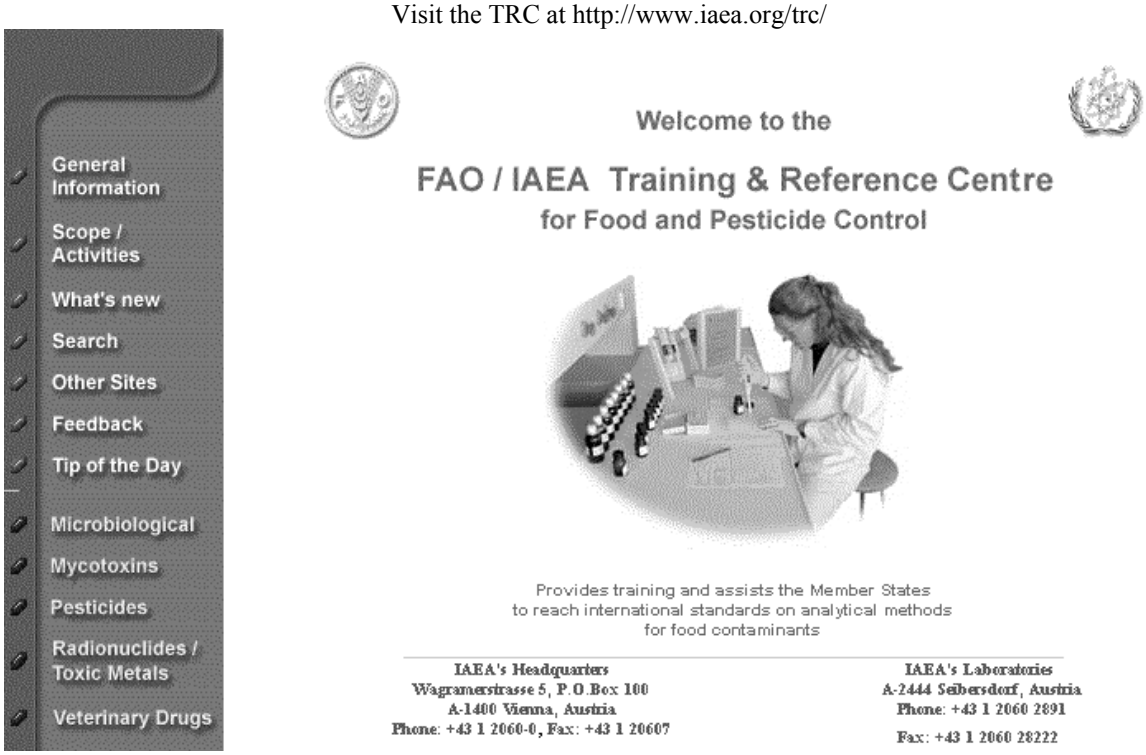
F. The FAO/IAEA Training and Reference Centre for Food and Pesticides (TRC)

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



The TRC site focuses on food contaminants and residues. A navigation bar (left) guides users to relevant background information. "What's new", "Search" and "Tip of the Day" advise users how to find relevant information. "FeedBack" is an on-line message board and provides analysts an opportunity to share their experiences with one another.

"Microbiological", "Mycotoxins", "Pesticides", "Radionuclides", and "Veterinary Drugs" delves into the relevance to trade and opens a button bar that includes:

- training—fellowship and group training courses;
- research—CRPs and ongoing projects;
- meetings—what, where, when and who to contact; quality assurance—guidelines, standards, inter-laboratory comparisons and reference materials;
- bibliography—a list of annotated links by subject; other sites—currently over 500 annotated links to other organisational, governmental, educational and commercial links dealing with food safety and analytical methodology.

Additional buttons such as "HACCP" and "Risk analysis" are unique to the microbiological pages while "Pesticides" hosts a discussion group on method validation of concern to all laboratories. Method Validation is moderated by Dr. A. Ambrus and draws on a field of 30 international experts.

The TRC provides a rich resource base for the researchers, students, decision makers or those seeking information about food safety issues. Set a bookmark to the TRC and watch for future developments such as a food contaminant and residue database and interactive tutorials.

Training Courses/Workshops

FAO/IAEA Training Workshop on Introduction of quality assurance / quality control measures in pesticide residue analytical laboratories July 20 August 27, 1999

As expected, there is an urgent need for and great interest in participating in training on quality assurance quality control measures in the analysis of pesticide residues and other food contaminants. Until the end of May over 70 nominations were received. Since the maximum number of analysts in one workshop is twenty, the participants of the workshop were selected based on the principles outlined in the announcement.

> "The course is open to analysts from Member Countries of FAO or IAEA. These analysts should come from laboratories authorised by Governments to perform official control of pesticide residues in food commodities to facilitate their international trade and safe food supply at national level."

The nomination of those qualified analysts, who could not be selected for the first training, will be kept on records. They will be informed about the next training possibilities, and selected if they interest in training remain.

Future training activities

Interested institutes and analysts may apply for training in advance. Within the available funds, the courses will be scheduled taking into account the actual need of the Member States

The **training workshops** comprise of:

- basic and advanced level courses for 4 - 6 weeks on introduction of quality control-quality assurance measures in analysis of pesticide residues, mycotoxins and veterinary drugs, and quality control of pesticide products;
    - ⇒ Basic course on analysis of pesticide residues in food
    - ⇒ Basic course on testing the quality of commercial pesticide products
    - ⇒ Introduction of quality assurance, quality control measures in residue analytical laboratories
    - ⇒ Introduction of quality assurance, quality control measures in pesticide formulation control laboratories
    - ⇒ Basic analytical techniques for the determination of mycotoxins in food and feed
    - ⇒ Advanced analytical techniques for the determination of mycotoxins in food and feed

- short courses (5 -10 days) to address specific subjects, and
    - ⇒ Basic course on planning and implementation of analytical control activities
    - ⇒ Introduction of ISO Guide 25 and principles of GLP
    - ⇒ Training of Quality Assurance Officers and Laboratory Inspectors

- discussion meetings/workshops for "high level decision making" government officials to provide a general overview on the food safety-related activities, increase awareness and show practical examples for effective food control measures.

The Training and Reference Centre has only limited funds to cover the cost of attendance of participants. Therefore the nominating countries/institutes are expected to contribute to the cost of training by covering the travel and living expenses of their participants

Free training can be provided for analysts mainly from least developed countries with limited economic resources. Applications for grants can be considered only if they are submitted through official channels to the FAO Country Representatives/National FAO Committees, Ministries of Foreign Affairs, or National Atomic Energy Authority for onward transmission to the Secretariat.

However, there are other possibilities for obtaining financial support for training.

(a) Countries within a region may apply for support through the technical cooperation programmes of IAEA and FAO, and request training on specified areas. In such cases regional training workshops can be organised, which enables the participation of larger number of analysts.

(b) Application may be submitted for individual fellowship through the FAO Country Representatives/National FAO Committees, or National Atomic Energy Authority. The fellowships can be combined with participation in a Training Workshops and practical study in an appropriate laboratory.

TRC Web Site

The TRC Web Site was recently revised as recommended by external referees and WorldAtom. Apart from improving the layout and navigation, the TRC site now provides ready access to the wealth of information on the World Wide Web related to food safety and analytical methodology. Check out "What's new" for updates on our forthcoming information system, meetings, research and training courses. Information is also being added about funding opportunities under the relevance contaminant and residue sections. Regular features such as site of the month have been retained to help build up your virtual library. Visit us at **http://www.iaea.org/trc/** or E-Mail Ian Ferris (I.G.Ferris@iaea.org) for a free screen saver giving a guided tour of the TRC site and INFOCRIS.

INternational FOod Contaminant and Residue Information System (INFOCRIS)

INFOCRIS aims to empower Clients and editors in Member States with relevant information and the latest publishing technology. The TRC Web site will deliver the information in a timely convenient way. Thus, INFOCRIS 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 (FAO's Global Plant and Pest Information System). Where possible, INFOCRIS has used the code and control structures of GPPIS to fast track development. INFOCRIS is 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 will also 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 laboratory and statistical reporting system.

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. This creates a dynamic framework for collecting and retrieving information. The TRC Web site will host the authoritative version of INFOCIS. Yet analysts without reliable or cheap access to the WWW may obtain a CD-ROM version. The CD-ROM is cross-platform compatible and includes the INFOCRIS database at the time of production together with a free run-time search engine for establishing a local Intranet. The first release is planned for the second half of 2000.

Analytes causing most food detentions will be given priority. Record access statistics will be used to prioritize translation from English into Spanish. The prototype of INFOCRIS will be demonstrated at the 23rd Session of the FAO/WHO Codex Alimentarius Commission to be held in June 1999. To date the system is hosted behind the IAEA firewall to where the training of the editors and fine-tuning of the record structure for contaminants and residues is underway. Sponsorship or in-kind contributions from affiliates are welcome. Those interested should contact Mr. Paisan Loaharanu (P.Loaharanu@iaea.org).

G. Update on the activities of the Agrochemicals Unit

The staff of the unit provides the support for the laboratory component of the programme of the TRC. Its main task over the past months was the preparation for the Training Workshop. Besides that the laboratory work to provide essential information for the elaboration of practical approach for method validation has continued.
Two members of the Unit presented papers at international workshops. The abstracts are attached for information. Analysts interested in the subjects may request further information from the authors.

A Co-Ordinated Research Project (CRP) To Evaluate A DDT/DDE ELISA For Developing Countries

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As part of a CRP on "the use of nuclear and immunochemical methods for pesticide analysis", the FAO/IAEA Agriculture and Biotechnology Laboratory and CSIRO collaborated to determine the suitability of a DDT/DDE ELISA for Developing Countries. An inter-laboratory comparison was conducted involving 19 laboratories located in 11 countries, mostly from sub-tropical region. In February 1998, a pre-trial commenced on soil samples spiked with different levels of DDT. The goal was to introduce a quality assurance program for participating laboratories while generating a common understanding about ELISA amongst participating laboratories. Participants became more aware of assuring and controlling the conditions of the test, but continued to experience difficulties in controlling critical steps. The results were analyzed using Youden plots. Weak points were calibration of equipment, pipetting errors, control of temperatures and time, transcription/calculation errors and insufficient training of the staff conducting the assay.

A second inter-laboratory trial was conducted to determine the performance of both participating laboratories and a commercial DDT/DDE ELISA (EnviroLogix, Portland, ME, USA) using unknown samples spiked with different levels of DDT and Youden pairs. Data were analyzed for repeatability and reproducibility and average recoveries for each spiking level. Over the working range of the assay, the mean recovery was 113%. Typical between-laboratory imprecision (RSD_R) averaged about 50 % for DDT concentrations near the high and low detection limits and about 35% near the center of the standard curve. Corresponding within-laboratory imprecision (RSD_r) values were 50% and 20%. The commercial ELISA kit performed very well especially considering that several kits had delivery problems and were held in customs for up to several weeks and stored at uncontrolled (ambient) temperatures, including in tropical countries.

The DDT/DDE ELISA proved a valuable tool for screening of soil samples above 0.05 mg/kg residue level, and it offers advantages over chromatographic methods in terms of speed, personnel and equipment requirements. However laboratories must make sure that they have adequately trained staff to perform the assay. In addition, they must respect good analytical practices by establishing appropriate quality assurance measures.

Measurement Of Uncertainty In Pesticide Residue Analysis: Implications In Legal Limits

ÁRPÁD AMBRUS

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The pesticide residue content is often the reason for rejection of a shipment, which may have further consequences on the future export potential of a country. The agreement between two or more analytical results

depends on the accuracy and precision (uncertainty) of measurements, which are influenced by systematic and random errors. Understanding the nature, source and significance of the errors, and taking the appropriate preventive measures are the key elements of obtaining reliable results and making correct decisions.

The objectives of this presentation are to:

(i) identify the major sources of errors of pesticide residue data, estimate the inevitable uncertainty (variability) of the results, recommend actions to reduce the uncertainty;

(ii) discuss the practical consequences of inevitable variation of the results in the certification of residue content.

The residue data are obtained through three main steps: sampling, sample preparation and analysis. Each step can be further divided into several procedures. Sampling and sample preparation can be the major source of systematic errors, nevertheless this fact is often disregarded when the laboratories are declaring the precision of their results based on within laboratory repeatability measurements. The proficiency check sample programmes do not reveal information on the overall uncertainty of residue data either.
The systematic errors of sampling and sample preparation cannot be quantified, and they can only be eliminated or minimised by the disciplined and responsible actions of well trained personnel being aware of the severe consequences of any deviation from the written protocols.

The inevitable random error of sampling of a single lot of fruits and vegetables according to the current Codex Sampling Procedure is around 30% and 40% for the sample sizes of 10 (medium size crops) and 5 (large crops), respectively. The uncertainty of sampling of commodities derived from several sites and mixed is much larger (80-140%). As the distribution of the residues in multi site samples is not normal, special care is needed to interpret these results.

Using a kitchen blender in a usual manner for obtaining 5, 30 or 50 g analytical portions of apples the random error of sample preparation can be up to 56%, 23% and 18%, respectively. This error can be reduced below 10%, for instance, by applying dry ice.

The within laboratory variability of analysis can be expected, based on Horwitz equation, in the range of 10 to 25% depending on the concentration of the analyte.

The combined uncertainty of residue content of samples of medium size fruits and vegetables is expected to be in the range of 33%-45%. Consequently, the compliance of the residue content of an export shipment with an MRL cannot be certified based on the analysis of one or two samples. Since the between field variability of residues is 2 to 3 times higher, than the within field variation, and their distribution is not normal, sampling mixed products of different origin should be avoided. The practical possibilities of certifying residue content of shipments will be discussed in detail.

H. PUBLICATIONS

Irradiation as a quarantine treatment of anthropod pests, Proceedings of a final Research Coordination Meeting organised by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and held in Honolulu, Hawaii, 3-7 November 1997. IAEA-TECDOC-1082.

Ambrus A., Quality of Residue Data, in Brooks G.T. & Roberts T.R. eds: Pesticide Chemistry and Bioscience Food and Environment Challenge, Royal Chemical Society, 339-350, 1999.

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