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Nuclear Techniques in Food and Agriculture

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To the Reader

The Food and Environmental Protection Subprogramme continues to strengthen our joint efforts to protect human health and facilitate international agricultural trade by providing technical support and training for the development and application of international standards. These activities are primarily related to the use of ionizing radiation, the implementation of traceability systems and analytical techniques to control food contaminants and improve food safety, and the management of nuclear and radiological emergencies affecting food and agriculture.

These efforts include on-going activities initiated by the Joint FAO/IAEA Division in relation to the Japanese nuclear emergency, including the dissemination of information on food monitoring and food restrictions, the consideration of agricultural countermeasures and remediation strategies to mitigate immediate and longer term effects arising from radionuclide contamination, and the interpretation of standards related to radiological protection of the public.

These activities are carried out within the context of the FAO's obligations as a full party to the IAEA Early Notification and Assistance Conventions, and under the FAO co-sponsored Joint Radiation Emergency Management Plan of the International Organizations (EPR JPLAN 2010), which provides the management tools for coordinating international organization arrangements in preparing for, and responding to, nuclear or radiological emergencies. Additional details are provided in the Past Events section of this Newsletter.

IAEA International Atomic Energy Agency

The Joint Division also continues to strengthen other joint efforts with FAO sister divisions and the IAEA to ensure food safety and facilitate international agricultural trade through activities related to the use of ionizing radiation and the implementation of traceability systems and analytical techniques to control food contaminants and improve food safety.

In the area of food contamination control, our Feature Article highlights our Regional Training Course on QuEChERS and LC-MS that was held from 27 June–8 July 2011 in Lima, Peru. The objective of the training course was to revise and discuss practical details of the multi-residue QuEChERS (quick easy cheap effective rugged safe) method, transfer a new sample preparation technique for the analysis of pesticides in soil using ultrasonication, resolve any open issues with gas chromatography coupled to mass spectrometry (GC-MS), and provide training on how to use and maintain high performance liquid-chromatography coupled to tandem mass spectrometry (LC-MS/MS) for the analysis and confirmation of pesticide residues in agricultural produce, soil and water.

Other initiatives related to food contamination control include the coordination, organization and implementation of training courses on Pesticide Residue Analysis (Belize, 30 May–10 June 2011 and Beijing, China, 18–21 October 2011), Biomonitoring (Santiago, Chile, 7–11 November 2011), Bioassays and Bio-indicators (São Paulo, Brazil, 22–26 November 2011) and Quality Assurance – Implementation and Monitoring of Internal Audits (Managua, Nicaragua, 12–16 December 2011).

We also look forward to holding the fourth and final RCM of the CRP on Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Management Practices at the Catchment Scale that is scheduled to be held in Guanacaste, Costa Rica, from 5–9 December 2011. The meeting will discuss sampling and field measurements, analytical methodologies, biomonitoring and the modelling and interpretation of good agricultural practices, as well as the conclusions and recommendations arising from the analogous IAEA Regional Technical Cooperation Project on Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean Region. More importantly, the RCM will be finalizing Generic Guidelines on Integrated Analytical Approaches to Assess Indicators of Pesticide Management Practices at a Catchment Scale, a document that will surely be useful for farmers and regulators in both FAO and IAEA Member States that are interested in improving pesticide management practices to ensure food safety through an integrated approach to food control.

In the area of food irradiation, subprogramme research activities are continuing under our CRP on Irradiated Foods for Immuno-compromised Patients and other Potential Target Groups. The most recent second RCM under the CRP was held in Manila, the Philippines, from 21–25 November 2011. This project will research and ultimately foster the application of food irradiation to increase the range and variety of foods available for those with impaired immune systems (e.g. neutropenic patients) or patients who require other special foods, e.g. blended (nasogastric) hospital diets. This and other training activities related to food irradiation, including our participation at the International Meeting on Radiation Processing (Montreal, Canada, 13–16 June 2011), the National Food Irradiation Forum (Montevideo, Uruguay, 18–22 July 2011), and the 7th International Conference on Isotopes (Moscow, Russian Federation, 6 September 2011), are summarized in our Past Events section of this newsletter.

In closing, we all extend our warmest welcome to our new staff members who will be taking up their posts at IAEA Headquarters in January 2011, including our Food Safety Specialist (Traceability) Mr Russell Frew and our Food Safety Specialist (Veterinary Drug Residues) Mr James Sasanya. In addition, we warmly welcome our Analytical Chemist Ms Zora Jandrić, laboratory technicians Mr Aiman Abrahim and Ms Marivil Islam, and interns Ms Malia Galluccio and Mr Wolfgang Dieter Werner, who have recently joined the Food and Environmental Protection Laboratory in Seibersdorf.

Best wishes to you and your families for a happy, healthy and prosperous New Year.

Sincerely,

David H. Byron

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Feature Article

Regional Training Course on QuEChERS and LC-MS; Lima, Peru; 27 June–8 July 2011

Technical Officer: Britt Maestroni

The Food and Environmental Protection Laboratory continues to strengthen their efforts to ensure food safety and facilitate international agricultural trade through training activities related to the implementation of analytical techniques to detect, monitor and control food contaminants and residues throughout the food production chain.

An example of these efforts is the recently held FAO/IAEA Regional Training Course on QuEChERS and LC-MS held under the IAEA Technical Cooperation Project on Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean Region (RLA/5/053). The Training Course was held in Lima, Peru, from 27 June–8 July 2011 at the laboratory of the Centro de Control de Insumos y Residuos Tóxicos, Servicio Nacional de Sanidad Agraria (SENASA), under the direction of Mr. Orlando Lucas. The training course was attended by twelve scientists and technicians from Argentina, Brazil, Costa Rica, Chile, Colombia, Cuba, Ecuador, El Salvador, Jamaica, Panama, Venezuela and Uruguay, as well as 6 local participants from Peru.

The technical officer coordinated, organized and implemented the course, chaired a scientific forum on mass spectrometry and multi-residue procedures, coordinated the laboratory exercises, and assisted participating laboratories with issues related to RLA/5/053, especially in the development of guidelines for integrated monitoring.

The objective of the training course was to revise and discuss practical details of the multi-residue QuEChERS method, transfer a new sample preparation technique for the analysis of pesticides in soil using ultra sonication, resolve any open issues with gas chromatography coupled to mass spectrometry (GC-MS), and provide training on how to use and maintain high performance liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) for the analysis and confirmation of pesticide residues in agricultural produce, soil and water.

The opening ceremony was hosted by Mr. Orlando Lucas at the SENASA auditorium. An official speech was given by Mr. Oscar Dominguez Falcon, Director of SENASA, who welcomed the participants and discussed the importance of analytical laboratories in providing services for testing and controlling contaminants and residues with a view towards ensuring food safety. Ms. Maestroni also gave introductory remarks focusing on the importance of knowledge transfer and experiences acquired during the training course to other colleagues and fellows back at their home institutes, i.e. a train the trainers approach.

The two week training course followed through on participants' knowledge gained in theoretical sessions by means of practical exercises. During the theoretical sessions substantial scientific discussions took place to consolidate the theoretical concepts, to exchange new ideas, and to identify current quality assurance and quality control measures and good working practices in the participating laboratories. All fellows felt that these discussions substantially added to their knowledge and interpretation of laboratory procedures, including involving participants with a review of their experiences as well as opportunities to moderate the sessions.

Theoretical lectures were mainly presented by the expert Dr. Jose Luis Tadeo in the following areas:

- Sample preparation and analysis for soil samples.
- Report on the Latin American Pesticide Residue Conference.
- Multi-residue methods for pesticide residues in foods, including QuEChERS.
- Basics of HPLC.
- Introduction to LC-MS/MS.
- The triple quadruple mass analyser: theory and calibration.
- Determination of pesticides by LCMS/MS: practical examples.
- Quantitation and use of internal standards.
- Maintenance and troubleshooting of LC-MS/MS.
- Routine maintenance.
- Confirmatory criteria in mass spectrometry for pesticide residue analysis in food.
- Data analysis and reporting.

Mr. Eddie Fonseca from Costa Rica and Ms. Maestroni also assisted local staff in the conduct of the practical training sessions. These covered:

- Soil sample preparation by ultra sonication and food matrix preparation by QuEChERS.
- Preparation of calibrator standards in solvent and matrix matched.
- Introduction to LC-MS/MS software.
- Introduction and Forum on GC-MS software and questions and answers related to GC-MS.
- Infusion of pesticides into LC-MS/MS, including setup of ionization parameters.

- Set up and optimization of selected ion monitoring (SIM) parameters in GC-MS.
- Preparation of calibration curves by LC-MS/MS and GC-MS, including evaluation of matrix effects.
- Questions and answer forum on LC-MS/MS.
- Injection of extracts and use of sample list for sample introduction by LC-MS/MS.
- Injection of extracts and use of software for sample introduction by GC-MS.
- Manual and automatic integration of chromatograms by LC-MS/MS.
- Integration of chromatograms by GC-MS.
- Confirmation of residues using LC-MS/MS and GC-MS.

In addition to the scheduled lectures, participants were also asked to prepare four additional reports covering:

- Requirements for the establishment of a pesticide residue laboratory.
- Requirements for the procurement of a LC-MS/MS.
- Requirements for training and capacity building.
- Current methodologies for pesticide residue analysis, as well as a future vision.

Participants were divided into four groups to conduct internal group discussions and to present reports during the last two days of the training course.

SENASA also organized an external activity about 200 km south of Lima. The participants met with the local SENASA staff and farmer associations to discuss sampling issues and the importance of the analytical laboratory in providing farmers with results that can help ensure good agricultural practices (GAP) while at the same time 'certifying' compliance with maximum residue limits to ensure that food can be exported or consumed nationally. The local farmers confirmed that they would collaborate with SENASA in the future. The group also visited an agricultural field planted with asparagus and a practical demonstration was given to the farmers on how to carry out random soil sampling for pesticide residues analysis. As part of the training activity the group also visited a private asparagus processing plant to learn about the processing and conditioning of asparagus intended for export.

On the last day of the course Mr. Lucas demonstrated the local laboratory management information system (LIMS) specifically developed for SENASA.

The mission to Peru enabled effective coordination and implementation of the training course as well as good representation of FAO and IAEA at the farmers meeting with respect to promoting the new role of the analytical laboratory to ensure compliance with food safety standards. It was an excellent opportunity to meet with farmers, especially in view of future collaboration in the region on food safety issues. The training course was a successful example of effective training in that all open questions on mass spectrometry and the implementation of multi-residue procedures were clarified, laboratory exercises were carried out in a smooth manner, and all trainees were enthusiastic and participated very actively in the discussions and practical sessions. Feedback from a post-course questionnaire also indicated that the participants were very satisfied with the training provided.

Past Events

FAO Technical Meeting on Preparedness and Response to Nuclear and Radiological Emergencies Affecting Food and Agriculture, including the Application of Agricultural Countermeasures and Remediation Strategies; FAO Headquarters, Rome, Italy; 14–18 November 2011

Technical Officer: David H. Byron

The FAO Technical Meeting on Preparedness and Response to Nuclear and Radiological Emergencies Affecting Food and Agriculture, including the Application of Agricultural Countermeasures and Remediation Strategies, was held from 14–18 November 2011 at FAO Headquarters in Rome, Italy. The meeting was held under the leadership of the Joint FAO/IAEA Division on Nuclear Techniques in Food and Agriculture (AGE), with the active representation and contributions of key FAO divisions and frameworks in the organization, coordination, preparation and implementation of the meeting.

The objective of the meeting was to enhance FAO capacities in meeting its obligations under international conventions and agreements in assisting Member States for preparedness and response to nuclear and radiological emergencies affecting food, agriculture, fisheries and forestry based on existing information and potential future activities required.

The meeting was opened and participants were welcomed by Qu Liang, Director, AGE, on behalf of Modibo Traore, Assistant Director-General of the FAO Agriculture and Consumer Protection Department. He highlighted the important operational and technical capacities of FAO to prevent, mitigate and respond to food related emergencies, including preparedness and response to nuclear and radiological emergencies affecting food and agriculture. It was noted that these FAO activities were mandated under various international conventions and

inter-agency agreements encompassing the application of FAO capabilities as a critical counterpart in defining and implementing agricultural countermeasures and remediation strategies in response to such events.

The meeting was informed that the concept note for the proceedings was developed by a FAO meeting on Internal Coordination – Preparedness and Response to Nuclear and Radiological Emergencies, which was held at IAEA Headquarters in Vienna, Austria, from 30–31 May 2011 (see Past Events below). It was noted that the concept note included background information and reasoning for the convening of the Technical Meeting, including the structure, objectives, expected outputs and outcomes.

The meeting agreed on the formation of three working groups related to (i) crop production and livestock, (ii) fisheries and aquaculture, and (iii) forestry and wildlife, with the understanding that each working group would formulate both general, as well as specific (where relevant) conclusions and recommendations related to the strengthening of FAO preparedness and response. It was further agreed that food safety would be considered as a crosscutting issue applicable to all three working groups.

The Technical Meeting agreed on general and specific conclusions and recommendations related to preparedness and response arising from the working group discussions under (i) Session C: Emergency Response, (ii) Session D: Countermeasures and Remediation, (iii) Session E: Preparedness and, (iv) Session F: Strengthening Assistance to FAO Member States.

It is anticipated that the conclusions and recommendations concerning the strengthening of FAO preparedness and response to nuclear and radiological emergencies affecting food and agriculture will be considered by the Joint Division and relevant FAO divisions in the near future.

5th International Symposium on Recent Advances in Food Analysis; Prague, Czech Republic; 1–4 November 2011

Technical Officer: Zora Jandrić

The International Symposium on Recent Advances in Food Analysis (RAFA) is the leading international meeting in this field, held every two years in Prague, Czech Republic. The 5th symposium focused on recent advances in analytical and bioanalytical technologies and emerging food-related applications in various areas.

The RAFA 2011 comprised presentations and discussions in plenary meetings and parallel sessions, poster presentations, and spotlight presentations covering a range of topics, including authenticity, traceability and fraud; food contaminants and emerging persistent organic pollutants (POPs); mycotoxins, marine and plant toxins; analysis of nanoparticles in food; rapid methods in food analysis; and food allergens. The symposium was attended by more than 700 participants from more than 50 countries.

Ms. Zora Jandrić presented two posters at the symposium. Some of the key topics of importance to the Food and Environmental Protection (FEP) subprogramme are summarised below.

The conference was opened with an oral session on food traceability, authenticity and fraud. The presenters showed that traceability is an essential tool to enhance trader and consumer confidence in the safety, quality and authenticity of food. It also helps the regulatory authorities to detect fraud and dangerous substances in foods. Analytical methodods to provide information on the provenance of foods are important to verify and underpin food traceability systems. Key criteria, such as appropriate sampling plans, sampling preparation procedures, full protocol validation and suitable expression of results of proposed analytical methods are necessary in order to effectively address traceability and authentication issues. Stable isotope and multi-element analysis and chromatography, together with mass spectrometry, are essential analytical tools in food fingerprinting/profiling. Ambient mass spectrometry employing DART (direct analysis in real time) and/or ASAP (atmospheric solids analysis probe) coupled with (ultra) high resolution mass spectrometry (MS) can be used for characterization of various markers. Advanced chemometrics strategies, including linear discrimination analysis (LDA) and principal component analysis (PCA), are used for processing of generated data and quality markers identification.

Ms. Jandrić presented a poster on the FEP coordinated research project (CRP) on the Implementation of Nuclear Techniques to Improve Food Traceability, which is in line with the presentations given during this session, using many of the techniques presented to tackle food traceability, authenticity and safety issues.

Dr. Stefan Weigel (RIKILT) gave a presentation on the importance of nanoparticles in food and the new challenges in the development of methods of analysis for nanoparticles. Many new applications of nanotechnology for the food sector are currently being investigated and developed. A number of nanomaterials are already in use as food addditives or in food contact materials. At the same time, limited knowledge is available on the potential impact of engineered nanoparticles (ENP) on consumers' health. A prerequisite for toxicological, toxicokinetic migration and exposure assesment studies is the availability of analytical tools for the detection and characterisation of ENP in complex matrices such as food. In particular, ICP-MS is the method of choice for the rapid screening of inorganic ENP (e.g. Ag, SiO2, TiO2) in complex food matrices after minimal sample preparation. Radio and stable isotope labelling has a potential role to play in research into the distribution and fate of nanoparticles and in the development of methodology for the detection and control of such particles in food, and this is a proposed research topic for a future CRP.

Some of the challenges in the analysis of new POPs and important contamination sources were presented by Prof. Jef Focant (University of Liege, Belgium). Risks for human health from PCBs and dioxins are mainly related to the consumption of food of animal origin. During the last decade, repeated cases of contamination of feedstuffs have highlighted the importance of feed as a potential contamination medium. Reducing POPs uptake by humans is thus highly dependent on actions taken to minimize the contamination of all feed materials, not only raw materials, but also recycled products and ingredients. A more proactive and exhaustive approach is needed to more appropriately ensure a high level of food quality, including the development of analytical approaches that would allow an expansion of the list of target compounds to more (un)suspected molecules.

Several rapid methods for detection of a wide range of chemical contaminants (e.g. pesticides, PCBs perfluorinated compounds, mycotoxins, marine toxins) in food and feed commodities were presented as part of the European Community's 7th Framework Programme. A balanced mix of novel multiplex technologies have been utilized, including lateral flow devices, flow cytometry with functionalized beads, optical and electrochemical biosensors, metabolomics-like comprehensive profiling, and ambient MS and near infra-red (NIR) hyperspectral imaging. These methods will not only save precious time in fast production cycles, but will also permit more food/feed samples to be monitored due to the lower costs per test. FEP has played an important advisory role in guiding the development of many of the methods presented through the participation of the Laboratory Head in the Advisory Boards of the major EU projects "CONffIDENCE" and "BIOCOP".

Under this topic, Ms. Jandrić presented a poster on applied research done in the Food and Environmental Protection Laboratory (FEPL) at Seibersdorf on the uptake of ^{14}C-atropine from soil by wheat and its translocation to shoots to provide risk assessment data and transferable methodology for the detection and control of natural plant toxins in food. Atropine is a tropane alkaloid and natural toxin produced by the Solanaceae family, comprising over 3000 plant species found worldwide. Atropine can be found in all parts of the plant and may remain in the soil for many years. A study was done in FEPL to trace the possible contamination of wheat by uptake of toxins from the soil, which could present a risk to the consumer. Both radio- and stable isotopes were employed to elaborate this route of food and feed chain contamination. A full paper is in preparation and will shortly be submitted to a peer-reviewed journal for consideration for publication.

Participants showed an interest in both FEP posters. The presentations were followed by extended discussions with several symposium participants, both in the poster sessions and afterwards in the following break-out sessions. The opportunity was taken to discuss with some participants issues relevant to the work of FEP and the current food traceability CRP.

The symposium provided an effective forum for creating awareness of the activities of the IAEA in food safety and consumer protection and for the exchange of information and ideas. The poster presentations were well received and created interest amongst many participants. Some of the conference participants were interested in collaborating with IAEA in this field, using the unique advantages and opportunities afforded by the use of nuclear and other complementary techniques to control food and feed safety, especially in developing countries.

Overall, participation in this event was of benefit to the work of FEP and, ultimately, to IAEA member states. Continuous research is needed to identify and evaluate those new rapid testing technologies that would be applicable and would benefit developing countries in food safety regulatory testing.

Exchange of new information in the fields of food and feed analysis and regulations was very important and useful for the IAEA's work in these fields. The event provided an opportunity for updating of information and making new contacts to enlarge current networks.

7th International Conference on Isotopes (7ICI); Moscow, Russian Federation; 6 September 2011

Technical Officer: Carl Blackburn

The Seventh International Conference on Isotopes (7ICI) was held from 4–8 September 2011 at the Moscow World Trade Centre. Key representatives of the world isotope industry and over 600 leading scientists and business people from 38 countries discussed important issues of production and application of isotopes in different technical areas and economic sectors. The 7ICI was supported by the IAEA and hosted jointly by ROSATOM (the State Atomic Energy Corporation of the Russian Federation), the Russian Academy of Sciences (the preeminent scientific organization in the Russian Federation and a national centre of fundamental research) and the Joint Stock Company Isotope (a wholly owned subsidiary of ROSATOM responsible for the sale and distribution of isotope products, radiation generating devices and equipment, and equipment for general and medical purposes).

Much of the conference focused on medical related areas, particularly those related to nuclear medicine. However, industrial and agricultural applications were also included in the conference programme and the technical officer gave an invited presentation on recent global trends in food irradiation. He also participated in a round table discussion on irradiation technologies for food applications, remediation of environmental pollutants and material modifications. This round table event was part of a business programme as a separate and special feature of the 7ICI and a departure from the usual conference

format. The business programme, which was attended by 50 delegates, aimed to encourage dialogue between the science and business communities as a means of ensuring that there is continued innovation and development in radiation processing and isotope production technologies. There was a good deal of interest in food irradiation and international standards related to food irradiation.

The International Conference on Isotopes serves as a forum for presentations on research, development and prospective views across the field of isotope production and related nuclear applications. The conference programme encourages thorough discussion and debate. Although the focus was mainly on reactor and cyclotron production of medical isotopes, there is interest in other applications, including the application of food irradiation as a post-harvest treatment. Non-medical applications are also regarded as a potential area for business growth and expansion.

The International Conference on Isotopes is held every three years and has been hosted by a number of countries since 1995. The next conference will take place in Chicago, USA, in 2014.

Joint WHO/FAO/IAEA International Experts Working Panel; WHO Headquarters, Geneva, Switzerland; 5 September 2011

Technical Officer: Carl Blackburn

Following the 11 March 2011 Great East Japan earthquake and tsunami, the Fukushima Dai-ichi nuclear power station was severely damaged and radioactive material was released into the environment.

The WHO convened a special expert panel meeting to assist in gathering information to help inform Member States of public health actions. This is an on-going exercise and part of an initiative that aims to initially assess the possible range of absorbed radiation doses that could have been received by members of the public within and outside Japan.

The International Expert Panel comprised independent scientific experts and representatives from the World Health Organisation (WHO), the International Atomic Energy Agency (IAEA) and the Food and Agriculture Organization of the United Nations (FAO). The participation of technical staff from these three international organizations was essential, given the relevance of the proposed assessment regarding their respective roles, mandates and expertise. This is being taken forward in collaboration with the Government of Japan and relevant Japanese institutions, which is essential for the successful completion of the work. A representative from the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) participated in the Panel as an observer. UNSCEAR has initiated a two year assessment of the exposure levels and effects and its main scientific report will be presented on a longer time scale.

Joint WHO/FAO/IAEA International Experts Working Panel in Geneva

The Meeting was chaired by Jane Simmonds and the rapporteur was Stephanie Haywood (both of the Health Protection Agency, UK). Following a welcome address by Dr Maria Neira, Director of the Department of Public Health (PHE) and Environment, and an introduction of all of the participants, Dr Maria Perez from PHE summarised the key aims of the project and how it forms one part of the overall programme of work being carried out by the World Health Organisation (WHO).

The technical officer provided expertise in radiological dose assessments, including the assessment of radioactivity in food, and in nuclear emergency response. He was nominated by the Joint IAEA/FAO Division to serve as the FAO member of the panel and his role was to provide technical input in the development of assumptions and scenarios relevant for food assessments, to participate in the dose assessments and to participate in joint reviews of the results.

Alpbach Technology Forum - European Alpbach Forum Working Group on Food Security and Distributive Justice; Alpbach, Austria; 26 August 2011

Technical Officer: David H. Byron

The technical officer was invited by the Austrian Federal Ministry of Science and Research to participate and present remarks at the European Alpbach Forum Working Group Six on Food Security and Distributive Justice. The working group meeting was hosted by this Ministry as well as the Austrian Agency for Health and Food Safety, University of Veterinary Medicine in Vienna and the Austrian Institute of Technology. Remarks on Nuclear Applications for Food Security were presented under the working group topic related to the Science of Food Security. Other subjects covered at the working group included Global Food Security in the 21st Century, Keys to

Ethically Acceptable Food Production and Distribution, and Traditional Knowledge and Knowledge Transfer: Teaching Food Science in Developing Countries.

Working group discussions focused on the availability and accessibility, as well as the equitable distribution of foodstuffs within the overall context of food security. The contributing factors to food security, including malnutrition (over and under nourished populations), population growth, agricultural research, crop diversification and climate change were also discussed as were the influence of international standards on agricultural trade, the use of innovative food processing technologies and the analytical capabilities of food control laboratories.

The technical officer presented remarks on the contributions of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture related to food security in the areas of food safety, plant production (soil and water management), plant mutation, animal production and insect pest control. The presentation included a summary of its efforts to improve agricultural production through coordinated research projects, technical cooperation projects, laboratory support and training, and research and development in food and agriculture.

The workshop strongly supported several conclusions and recommendations related to the Joint Division, including the need to establish and strengthen global and regional partnerships in the area of food production and control, the need to explore optimized and flexible delivery mechanisms (e.g. counterpart training through collaborating centres) and the need to explore effective mechanisms to strengthen and increase investments in research and development for food and agriculture.

Forum on Industrial Applications of Irradiation Technology; Montevideo, Uruguay; 19–20 July 2011

Technical Officer: Carl Blackburn

The Technical Cooperation Project URU 5027 on Preparing for the Introduction of Irradiation Techniques is being undertaken at the Technological Laboratory of Uruguay (LATU) and involves the introduction of irradiation technology into the country. A demonstration (semi-commercial scale) irradiation facility has been constructed and is operational at LATU. The project is now entering its second phase that involves working with industry in order to transfer the technology to the commercial sector.

The forum was coordinated by LATU, and was held in order to provide information, stimulate discussions and promote the capabilities of the irradiation centre. This activity, under TC project URU5027, aimed to publicize the availability of the technology and to demonstrate the potential of radiation processing to the food industry, medical industry and research communities within Uruguay.

Dr. Rodolfo Silveira, president of LATU, welcomed participants and the opening address was provided by the Director General de Secretaría Ministerio De Industria, Energia y Mineria, Esc. Gustavo Fernández Di Maggio. The IAEA's main counterpart for this project is Mr Anibal Victor Abreu Castillo and he informed the meeting of the work undertaken to introduce irradiation technology into Uruguay. Expert speakers from over seven different countries gave this forum a truly international flavour and LATU have made the full list of experts and their presentations available on their web-site[1].

Panel of experts at the LATU

The technical officer presented an introductory opening lecture on food irradiation, including global developments and the use of irradiation as a quarantine treatment. He also took part in the round table discussion with meeting participants, including local media representatives. A tour of the new irradiation centre at LATU was very informative and provided an opportunity to hold informal discussions on food irradiation with members of the public, local food producers and exporters. The first official session of the National Irradiation Committee was held after the close of the forum during the afternoon of 20 July.

This was a successful meeting that generated much interest in the subject of food irradiation. It also afforded the opportunity to disseminate information on irradiation technology and help dispel fears that irradiated food could be radioactive, i.e. the audience were very mindful of the recent nuclear emergency in Japan and the panel of experts were able to explain the differences between 'food irradiation' and 'radioactive contamination of food'.

Blueberry exporters are interested in utilizing irradiation as a quarantine treatment in order to provide a cost effective means of ensuring these fruits are free from quarantine pests when exported to the USA. A representative from the United States Department of Agriculture Plant Health Inspection Service was present and was able to present detailed information on the requirements of the USA for acceptance of irradiated produce.

1 http://www.latu.org.uy/es/index.php?option=com_content&view=article&id=1268:foro-de-aplicaciones-en-la-industria-de-la-tecnologia-de-irradiacion&catid=35:noticias-de-latu&Itemid=263

The LATU are also interested in participating in the IAEA Coordinated Research Projects involving food irradiation and were particularly interested in participating in CRP D62008 on the development of generic irradiation doses for quarantine treatments. Media participation and the subsequent publication of the event in El Pais newspaper also helped to promote the work of LATU and their irradiation centre.

34th Session of the Joint FAO/WHO Codex Alimentarius Commission; Geneva, Switzerland; 4–9 July 2011

Technical Officer: David H. Byron

The technical officer represented the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture at the 34th Session of the Joint FAO/WHO Codex Alimentarius Commission to report on matters of interest to Codex. The Session was attended by 625 delegates from 145 Member Countries and 1 Member Organization and 34 international governmental and non-governmental organizations, including UN agencies.

The technical officer presented a statement on Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Relevant to Codex Work (see document CAC/34 INF/7), including the control of food contaminants, the use of ionizing radiation and the management of nuclear and radiological emergencies.

In relation to the Japanese nuclear emergency, the representative noted the various activities of FAO divisions working in partnership with the IAEA through the Joint FAO/IAEA Division in preparing for and responding to nuclear or radiological emergencies affecting food and agriculture, including the application of FAO capabilities as a critical counterpart in defining and implementing agricultural countermeasures and remediation strategies in response to such events.

The presentation also included a summary of activities regarding Coordinated Research Projects on the Implementation of Nuclear Techniques to Improve Food Traceability, on the Development of Irradiated Foods for Immuno-compromised Patients and Other Potential Target Groups, on the Development of Radiometric and Allied Analytical Methods to Strengthen National Residue Control Programs for Antibiotic and Anthelmintic Veterinary Drug Residues, on the Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Practices and on the Development of Generic Irradiation Doses for Quarantine Treatments.

In the latter project, it was noted that research activities have led to the adoption of fourteen post-harvest phytosanitary irradiation treatments for quarantined insect pests by the International Plant Protection Convention (IPPC) for inclusion in the IPPC Standard on Phytosanitary Treatments for Regulated Pests.

The Joint FAO/IAEA Division representative also offered its continued cooperation with the Codex Committees on Pesticide Residues and on Veterinary Drug Residues in Foods on issues related to methods of analysis and sampling for contaminants, including the inclusion of validated analytical methods provided by national authorities on the Joint FAO/IAEA Division webpages.

In relation to the control of mycotoxins in foods, it was also noted that the Joint FAO/IAEA Division is cooperating with FAO and WFP on requirements and a possible structure for an on-line tool and database to help design sampling schemes to detect mycotoxin contamination in various commodities for specific mycotoxins in diverse regions and environments.

In view of on-going work of the Joint FAO/IAEA Division directly related to activities of the Codex Alimentarius Commission, it is anticipated that a representative of the Joint Division will attend the next 35th Session (July 2012) of the Joint FAO/WHO Codex Alimentarius Commission to present a progress report on matters of interest to Codex.

30th Meeting of the Radiation Safety Standards Committee (RASSC); IAEA Headquarters; Vienna, Austria; 27–30 June 2011

Technical Officer: David H. Byron

The Radiation Safety Standards Committee (RASSC) is a standing body of senior experts in radiation safety, established by the IAEA Deputy Director General of the Department of Nuclear Safety and Security. RASSC advises the Deputy Director General on the overall programme for the development, review and revision of standards relating to radiation safety. Its objective is to achieve consensus, quality, coherence and consistency in the development of international standards for radiation safety.

The functions of RASSC are:

- To advise on the approach to the development of the radiation safety standards issued in the IAEA Safety Standards Series, covering Safety Fundamentals, Safety Requirements and Safety Guides, both thematic and practice specific, and to advise on priorities.
- To review proposals for the development of new standards relating to radiation safety and to approve the relevant document preparation profiles (DPPs) prior to their submission to the Commission on IAEA Safety Standards.
- To review draft radiation safety standards, considering, throughout the preparation and review process, the value of each draft standard and the needs of users of the standards.
- To approve the text of draft radiation safety standards prior to their submission to Member States for comment and again prior to their submission to the

Commission, in accordance with the established procedure.

- To ensure broad international input in the preparation and review of radiation safety standards.
- To advise on radiation safety standards, relevant regulatory issues and activities supporting the use and application of IAEA Safety Standards.

At the 30th RASSC meeting, the technical officer noted that subsequent to the 29th RASSC meeting in December 2010, a representative of the Joint FAO/IAEA Division attended the 16th meeting of the Interagency Committee on Radiation Safety (IACRS) at ILO Headquarters in Geneva from 12–13 May 2011 (see July 2011 FEP Newsletter). Within the IACRS framework, the FAO also participates in the Sponsoring Organisations Joint Secretariat for the preparation of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources.

In discussing international organization activities related to the revised International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS) at the 16th IACRS, the FAO confirmed the BSS provisions related to food and agriculture, including references to the Codex Guideline Levels for Radionuclides in Foods.

The technical officer further noted that the strengthening of international standard provisions related to food and agriculture was also discussed, including the importance of the potential review and revision of the Codex guideline levels as the new ICRP dose coefficients might necessitate recalculations in the Standard. This review might also include the need for strengthened Codex provisions concerning the control of radioactive contamination of food and agricultural products with specific radioisotopes as well as the potential inclusion of such provisions within the IAEA Safety Standards.

The 30th RASSC was also informed that the FAO works in close partnership with IAEA through the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (Vienna) in preparing for and responding to nuclear or radiological emergencies affecting food and agriculture, including the application of FAO capabilities as a critical counterpart in defining and implementing agricultural countermeasures and remediation strategies in response to such events.

Recent and on-going activities of the Joint FAO/IAEA Division related to the Fukushima nuclear emergency included the following:

- As the focal point for the IAEA Incident and Emergency Centre (IEC) in Vienna, the Joint FAO/IAEA Division has continually manned the FAO Desk in the IAEA IEC, which includes the preparation and presentation of briefing texts and information on food contamination monitoring data and restrictions on food distribution and/or consumption to Member State Board meetings, press conferences and postings on the IAEA website.
- Participated in video/teleconferences through the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) to ensure a unified approach in addressing issues related to food and agriculture.
- Prepared joint FAO/IAEA/WHO ‘questions and answers’ related to food safety and the application of international standards, including the dissemination of information on the interpretation and application of the Codex Guideline Levels for Radionuclides in Foods.
- Participated in a Joint FAO/IAEA Food Safety Assessment Mission to Japan and initiated follow-up activities to strengthen future capabilities for emergency preparedness and response to nuclear and radiological events affecting food and agriculture.
- Promoted knowledge and information sharing on radioactive contamination affecting food and agriculture, including the mechanisms and persistence of such contamination, radionuclide transfer rates and international standards.

The Joint FAO/IAEA Division looks forward to its continued collaboration with the RASSC in assisting governments to effectively respond to nuclear and radiological emergencies through the provision of training and support and the development, coordination and implementation of standards, management procedures and emergency preparedness and response mechanisms related to food and agriculture.

The Saskatoon International Workshop on Validation and Regulatory Analysis; Saskatoon, Canada; 19–22 June 2011

Technical Officer: Britt Maestroni

The 2nd Saskatoon International Workshop on Validation and Regulatory Analysis (SaskVal II) was held in Saskatoon, Canada, from 19–22 June 2011. Mr. Andrew Cannavan, Head of the Food and Environmental Protection Laboratory (FEPL) was a member of the workshop’s Scientific and Publication Committees. Ms. Britt Maestroni (FEPL) participated in the workshop as an invited oral and poster presenter and chaired a plenary session on risk assessment and risk management for residue control programmes.

The objective of the Saskatoon workshop was to provide a forum for laboratory analysts and regulators to discuss the validation of analytical methods used in residue control programs and the subsequent use and acceptance of the results if challenged by producers or courts of law. The workshop was attended by about 80 participants from several countries worldwide. On the first evening of the conference, Ms. Maestroni participated in a satellite Codex Committee on Residues of Veterinary Drugs in

Foods (CCRVDF) working group meeting to revise the content of guidelines for the development of performance characteristics for multi-residue analysis of veterinary drug residues, which will form an annex to the recently published Codex Guidelines for the Design and Implementation of National Regulatory Food Safety Assurance Programmes Associated with the Use of Veterinary Drugs in Food Producing Animals (CAC/GL 71-2009).

Ms. Maestroni also gave an oral presentation at the session on current international (global) initiatives. The presentation, prepared together with Mr. Cannavan, discussed the importance of establishing harmonized food safety standards to facilitate international trade and meet consumer demands, while ensuring equivalence of food safety measures through the implementation of integrated 'farm to table' food safety systems. The presentation covered examples of the harmonization of analytical methodology and validation approaches of the current FAO/IAEA research projects and other backstopping to both IAEA and FAO capacity building projects in developing countries. The presentation generated very good feedback from the audience on the relevance of such projects in developing national sustainability and capacity. Ms. Maestroni also presented a poster produced by Zora Jandric *et al* (FEPL) on the Uptake of 14C Atropine from Soil by Wheat and its Translocation to Shoots. Ms. Maestroni also chaired the last session of the conference on risk assessment and risk management for residue control programmes.

Participation in SaskVal II enabled effective representation of FAO and IAEA on the international scene with respect to method validation and regulatory analysis, including the participation in the satellite CCRVDF working group to revise the content of guidelines for the development of performance characteristics for the multi-residue analysis of veterinary drug residues. It was an excellent opportunity to meet new researchers and regulators, especially in view of future collaboration on food safety issues in the region, including the suggested need to address method validation and regulation of food contaminants on an inter-regional basis.

International Meeting of Radiation Processors (IMRP); Montreal, Canada, 13–16 June 2011

Technical Officer: Carl Blackburn

Industry leaders, policy makers, technical experts and scientists came from around the world to the International Meeting of Radiation Processors (IMRP) held in Montreal, Canada from 13–16 June 2011. The IMRP is held every two years and serves as the global forum of the international radiation processing community. Lectures from senior scientists, policy makers and industry executives provided broad perspectives on current applications and future trends, including an invited paper presented by the technical officer on Food Irradiation and the Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture.

Mr Carl Blackburn addressing the IMRP

The 16th IMRP was organized by the Industrial Irradiation Association (iiA), held in cooperation with the IAEA and sponsored by nineteen different companies and organisations from the radiation processing sector. The IMRP was attended by over 500 people from 39 different countries. The conference theme of Where Science and Business Connect was fully supported by a busy programme including presentations and poster sessions covering developments in food irradiation, health care, advanced materials, and evolving areas such as the remediation of polluted water and air.

Exhibitor's stands comprised twenty nine companies and institutions dealing with radiation sources, dosimetry, irradiator design, construction and related equipment and services, including applications such as food, cosmetics and medical products. The venue was particularly well suited to hosting such a large event, with main conference halls, poster session areas and exhibitors being located in adjacent areas under one roof at the Hilton Montréal Bonaventure. The excellent organization of the meeting together with input from the participants, and the discussions inspired by lectures, scientific poster presentations and exhibitor's mini-events, contributed to the overall success of the conference as an information sharing event.

Presentations and posters included recent work by researchers involved with the two current IAEA Coordinated Research Projects (CRPs) on food irradiation to develop generic irradiation doses for quarantine treatments and to develop irradiated foods for immuno-compromised patients and other specific target groups. A conference session concentrated on standards and the global perspective relating to food irradiation that was chaired by Monique Lacroix (Institut National de la Recherche Scientifique, Armarnd-Frappier) and two sessions were devoted to irradiation as a phytosanitary treatment of food produce and these were chaired by Richard Wiens (Nordion Inc.) and Vikram Kalia (MICROTROL Sterilisation Services). A further session

chaired by John Masefield (STERIS Isomedix) focused on food irradiation for food safety. The IMRP series of meetings continues to offer an excellent forum for scientists and technologists to show-case their work to a broad audience. It was very interesting to note the continuing interest and growth in the application of irradiation as an agricultural quarantine measure which is an important and expanding use of food irradiation that helps prevent the spread of invasive pests and provides market access for food producers who would otherwise be unable to participate in international trade.

It was a pleasure to represent the Food and Environmental Protection Section of the Joint Division and to take part and contribute to the IMRP, which is regarded as one of the largest and most important meetings dedicated to the dissemination and advancement of radiation processing applications. The meeting has been held on a regular basis since 1976, the main objective being to gather together leaders in the field of irradiation in order to discuss and present perspectives on the current status and future trends in the utilization of electron beam, X ray and gamma beam technologies.

FAO Meeting on Internal Coordination - Preparedness and Response to Nuclear and Radiological Emergencies; IAEA Headquarters, Vienna, Austria; 30–31 May 2011

Technical Officer: David H. Byron

An internal FAO coordination meeting was held from 30–31 May 2011 at IAEA headquarters in Vienna, Austria, under the leadership of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (AGE), to discuss intra-agency coordination, preparedness and response to nuclear and radiological emergencies and to provide conclusions and recommendations on the following issues, including in the context of lessons learned from the Japanese nuclear emergency:

a) Coordinated nuclear emergency preparedness and response of FAO technical divisions.

b) Preparation of a technical meeting on emergency preparedness, response, agriculture countermeasures and remediation strategies.

c) Possible actions or assistance FAO might offer to Japan.

Key FAO divisions were represented at the meeting.

The Joint Division provided a briefing on its actions taken in response to the on-going nuclear emergency in Fukushima, including information on the Joint Division mandate, major programmatic activities related to legal frameworks, research and development projects, technical assistance projects, and on-going efforts for preparedness and response to nuclear and radiological emergencies. This was followed by a discussion and briefings on actions taken by other FAO divisions.

The ensuing discussions covered initial lessons learned and insights gained during the early stages of the nuclear emergency in Japan, with particular emphasis on coordination within FAO and the level of preparedness and response of the organization for nuclear and radiological emergencies that could affect food, agriculture, fisheries and forestry (both national and trans-boundary).

Discussions on the second day of the meeting focused on what FAO can or should provide and how the organization could improve its preparedness and response to nuclear and radiological emergencies, including discussions on internal FAO coordination through various technical divisions. These discussions also covered preparations for the technical meeting on emergency preparedness and response, agriculture countermeasures and remediation strategies (see Past Events). The final session of the meeting considered possible actions or assistance FAO could offer to Japan, should Japan request assistance in the future.

The meeting concluded its discussions by agreeing on conclusions and recommendations for further work related to the strengthening of (i) internal FAO coordination, (ii) preparations for the Technical Meeting on Preparedness and Response to Nuclear and Radiological Emergencies Affecting Food and Agriculture, including the Application of Agricultural Countermeasures and Remediation Strategies, and (iii) the provision of assistance to Japan if requested.

Coordinated Research Projects

Second Research Coordination Meeting of the Coordinated Research Project on the Development of Irradiated Foods for Immuno-Compromised Patients and other Potential Target Groups (D6.20.09); Manila, Philippines; 21–25 November 2011

Technical Officer: Carl Blackburn

The 2nd Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on the Development of Irradiated Foods for Immuno-Compromised Patients and other Potential Target Groups met in Manila, the Philippines, from 20–25 November 2011. It was attended by forty-one people from fifteen different countries. The purpose of the meeting was to review mid-term research achievements with a consideration of the strengths and weaknesses of the project and the progress made towards achieving the CRP objectives to utilize irradiation technology to increase the variety, availability and acceptability of foods for immuno-compromised patients and other target groups with special dietary needs.

This project involves participants working in collaboration with representatives of specific target groups (for example the healthcare community) to research appropriate foods, including irradiated fresh produce (fruits, vegetables, salads) and ready to eat meals (ethnic or locally produced). An allied objective is to generate data on the acceptability of irradiated foods in terms of both quantitative factors (microbiological safety, nutritional and organoleptic properties) and qualitative properties (psychological well-being, quality of life). Secondary objectives include the development of microbiological criteria for foods intended for different target groups of patients based on the microorganisms of importance and dietary requirements.

The meeting was chaired jointly by Suresh Pillai and Zeny De Guzman, with Arun Sharma as the rapporteur and the technical officer as scientific secretary. It was formally opened by Dr. Alumanda dela Rosa, Director of the Philippine Nuclear Research Institute (PNRI). She welcomed the participants, summarized the role and work of the PNRI and highlighted the irradiation facility and food irradiation research carried out in the Philippines. The research area of the CRP is particular helpful to PNRI as it is helping the institute to forge new links with the medical community. Dr Aileen Riego-Javier, Executive Director of the National Kidney and Transplant Institute (NKTI) of the Philippines, also gave a formal statement and welcomed meeting participants. She outlined the medical expertise at NKTI and introduced Ms Socorro Balderamos as the officer in charge of Nutrition and Dietetics Division at the NKTI and collaborating partner for the PNRI research work in the Philippines.

Carl Blackburn, IAEA/FAO food irradiation specialist and CRP technical officer, informed the meeting of initiatives related to applications of food irradiation, including activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (NAFA). He thanked the PNRI, and particularly Ms. Zeny de Guzman and her team, for the excellent arrangements in place for hosting the meeting. In response, Ms. Zeny de Guzman thanked the IAEA for their assistance and in particular Mr Nima Mashayekhi Tabrizi of the IAEA for being so efficient and diligent in arranging travel and other necessary particulars for the meeting participants.

Participants of the 2nd RCM at the Philippines Nuclear Research Institute

Carl Blackburn gave a presentation on the background of the CRP, the objectives of the meeting, the action plan, and the expected outputs and outcomes. He also introduced new entrants to the CRP from Bulgaria, China and Portugal. In the second part of his presentation, he reminded participants of the conclusions and recommendations of the First Research Coordination meeting held in Vienna from 23–27 August 2010.

The co-chair, Zeny de Guzman, invited participants to share their experiences of working with the medical community and building collaborative relationships during the course of the CRP. She also invited comments from the medical consultants and hospital dieticians from the Philippines during the discussion session. It was pointed out that for hospital foods it is important to ensure that the responsible medical person needs to be consulted on the nutritional and psychological requirements of the immune compromised patients, and that working with patients requires their permission and involvement. There was a discussion on the potential ways to engage with the medical community and the possible questions on irradiated foods they would be most eager to have answered. The means to provide information and educate the medical community on the technology, as well as the safety and wholesomeness of irradiated foods, was also discussed. The participants felt that specific informative material needs to be developed for educational / outreach

purposes, both in English and other languages, for use in different countries.

During the meeting, each participant gave a detailed presentation on their research and produced a short written summary that included information on their progress, their collaborating partners, and summaries of what has gone well and what was not as successful as they had hoped, as well as an outline of their plans for the next research phase. The CRP research protocol (produced at the first RCM and included in the first RCM meeting report) was reviewed and modified slightly to include guidance on sensory trials and to make other necessary minor amendments. The foods to be researched were reviewed and were summarized, project outputs were discussed and the participants also reviewed the perceived strengths, weaknesses, opportunities and threats related to the research activities.

Tour of the irradiation facility at the Philippines Nuclear Research Institute (1/2)

Institutes participating in the CRP have worked in collaboration with 35 different hospitals. In addition, participants who are developing food rations for emergency situations have started collaborating with their appropriate national agencies. It was felt that participants should continue to expand and strengthen their collaboration and should also engage with commercial food suppliers. This will help to further the adoption and integration of irradiated foods into food supply chains and will help promote commercialization of the technology.

Based on interactions with the medical community and representatives of other target groups, there was a reaffirmation of the need for the CRP and the significance of this research work. The importance of providing information was recognized and participants agreed to continue to develop appropriate outreach and education materials for target audiences including family members, private investors, community groups, NGOs and other official agencies. The use of social networking media was discussed and it was agreed to investigate the use of social networking internet sites such as Facebook, Twitter and other similar sites. Participants also agreed to continue using more traditional avenues to highlight their work, for example by making presentations to promote the CRP whenever possible to the target groups, including the CRP activities and goals.

A wide range of different foods for immuno-compromised patients and other target groups have been selected for this research. Foods have been chosen in collaboration with medical professionals and appropriate stakeholders. Laboratory and pilot scale studies have been undertaken on the microbiological, physical, chemical and sensory aspects of radiation processing and also on packaging materials necessary to protect the food. Based on research findings to date, the participants concluded that irradiation technologies can meet the microbiological and other criteria established by the CRP at its first RCM and research is being taken forward in order to meet the needs of patients and other target groups.

The importance of following appropriate local and national ethical clearance and consent approvals to perform the pilot scale studies was discussed at length and participants agreed to share hospital questionnaires as well as their experience with ethical clearance and consent approval forms. Participants concluded that pilot scale studies (involving patients and other target groups) can be performed within the scope of the CRP as necessary steps to support this development work. Since the numbers of patients in sensory studies or clinical trials are often limited, the participants should take care to refer to these studies as 'pilot scale studies'. This terminology will assist in the publication of results in peer reviewed journals and also facilitate the necessary institutional ethical clearances and approvals.

Tour of the irradiation facility at the Philippines Nuclear Research Institute (2/2)

The participants have already generated a significant number of work outputs, including journal articles, conference abstracts and presentations and are maintaining records of their research outputs and achievements. A large amount of information on current practices on preparing foods for hospitals has been collected and this provides an overview of the global status of such foods. It was thought that these data on the status of hospital foods for immuno-compromised patients should be published in the open literature, and a publication should highlight the microbiological criteria developed under the CRP, the accruing benefits, the types of foods being

studied, as well as provide examples of current practices. It was thought that a similar article targeting emergency foods could also be prepared for submission to an appropriate journal.

A Report of the meeting can be found on the FEP website (http://www-naweb.iaea.org/nafa/fep/crp/fep-irradiated-foods-for-ICP.html). The third RCM will be held in 2013, and Dr J. W. Lee agreed in principle to host the meeting in the Republic of Korea.

Technical Cooperation Projects

Project Number	Title and Project Objectives	Technical Officer
BEN5004	**Regulatory Control and Monitoring of Mycotoxins to Facilitate Trade** To establish laboratory capacities and analytical procedures for mycotoxin control.	**Maestroni, Britt Marianna (NAFA)** **Byron, David Henry (NAFA)**
BGD5027	**Establishing a Veterinary Drug Residue Laboratory** To establish a laboratory complying with international standards for surveillance of veterinary drug residues and prohibited substances in food of animal origin.	**Cannavan, Andrew (NAFA)** **Sasanya, James Jacob (NAFA)**
BZE5003	**Providing Technical Assistance and Training for the Control of Chemical Residues in Food** To help ensure that the food placed on the market for consumers from national or imported sources is free from harmful chemical contaminants by supporting and strengthening the development of a national chemical contaminant residue monitoring programme, and to further increase the technical capacity (in the area of residue testing) of the competent authority in Belize responsible for agricultural health and food safety.	**Maestroni, Britt Marianna (NAFA)**
CPR5018	**Building Technological Capacity for Food Traceability and Testing of Pesticide Residues in Food** To provide the technical and regulatory basis for food origin traceability and for monitoring residues of pesticides, in order to ensure food safety and consumer confidence.	**Cannavan, Andrew (NAFA)**
ISR5016	**Supporting a Feasibility Study for Using Irradiation as a Quarantine Treatment** To investigate the technical feasibility of using irradiation as a quarantine treatment on key export commodities.	**Byron, David Henry (NAFA)** **Blackburn, Carl Michael (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
LEB5014	**Upgrading the Environmental and Food Analysis Laboratory at the National Council for Scientific Research** To upgrade the laboratory of environment and food analysis in order to extend analytical capabilities for the analysis of thermo fragile organic compounds.	**Maestroni, Britt Marianna (NAFA)**
MNE5002	**Upgrading Capabilities to Establish Effective Monitoring Systems for Residues in Food and Air Quality** To establish an effective monitoring system for residues in food and air quality in Montenegro by enhancing analytical capabilities and establishing a network of air quality monitoring stations.	**Jandrić, Zora (NAFA)**
NIR5034	**Feasibility Study on the Optimal Use of an Industrial Gamma Irradiation Facility** To conduct a feasibility study on the optimal use of the new gamma irradiation facility for industrial applications in Nigeria.	**Sabharwal, Sunil (NAPC)** **Blackburn, Carl Michael (NAFA)**
RAS5046	**Novel Applications of Food Irradiation Technology for Improving Socioeconomic Development (RCA)** To focus on the application of technologies related to new uses of irradiation for sanitary and phytosanitary purposes, including technology transfer to participating RCA Member States.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
RAS5050	**Enhancing Sanitary and Phytosanitary Treatment of Regional Products for Export by Irradiation (RCA)** To enhance the treatment of and trade in irradiated products of economic importance in the Asia Pacific region.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
RLA5053	**Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean (LAC) Region (ARCAL CII)** To apply a diagnosis and assesment system for evaluating the impact of pesticide contamination in food and environmental compartments.	**Dercon, Gerd (NAFA)** **Maestroni, Britt Marianna (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
RLA5055	**Establishing a South American Regional Network of National and Reference Laboratories for Pharmacologically Active Substances and Contaminants in Food of Animal Origin Through Implementation of Approved Nuclear & Conventional Analytical Techniques (ARCAL CIV)** To establish a network of Latin American National Laboratories and Centres of Excellence by introducing harmonized procedures for the analysis of pharmacologically active substances and contaminants in food of animal origin.	**Sasanya, James Jacob (NAFA)** **Cannavan, Andrew (NAFA)**
SRL8019	**Technical Support for the Establishment and Operation of a Multi-Purpose Gamma Irradiation Facility** To provide technical assistance for the establishment of a multi-purpose gamma irradiation facility (MGIF) in Sri Lanka to sterilize medical products, to develop health care products, and to improve the quality and safety of food and other agricultural products.	**Sabharwal, Sunil (NAPC)** **Blackburn, Carl Michael (NAFA)**
TAD5004	**Improving Laboratory Capacity for Food Safety** To provide assistance in the establishment of a central laboratory for the analysis of contaminants and residues in food and agricultural products and satellite laboratories at the border with neighbouring countries.	**Fesenko, Sergey (NAFA)** **Maestroni, Britt Marianna (NAFA)**
URU5025	**Determining Pesticide and Antibiotic Residues in Food for Local and Export Consumption** To improve the capability to determine pesticide residues in fresh fruit and vegetables, to introduce the Quecher procedure to analyse pesticide residues and to introduce the use of 14C-labelled pesticides.	**Maestroni, Britt Marianna (NAFA)**
URU5027	**Preparing for the Introduction of Irradiation Techniques** To introduce irradiation technology in Uruguay as a health and plant protection measure that will contribute to stimulating production and improving its quality for both local and external markets.	**Blackburn, Carl Michael (NAFA)**

Food and Environmental Protection Laboratory, Seibersdorf

Regional Training Course on Advanced Bioassays and Bioindicators; Valdivia, Chile; 7–11 November 2011

Technical Officer: Britt Maestroni

The FAO/IAEA Regional Training Course on Advanced Bioassays and Bioindicators, organised under Technical Cooperation Project RLA/5/053, was held in Valdivia, Chile, from 7–11 November 2011 under the direction of Mr. Rodolfo Medina, SAG Region de los Rios, Chile, and Mr Pedro Enriquez, SAG Santiago, Chile. The training course was attended by ten scientists from Argentina, Brazil, Costa Rica, Chile, El Salvador, Paraguay, Venezuela and Uruguay and two participants from Chile. Ms. Britt Maestroni (food scientist, FEPL) coordinated the course and a forum on sampling for water quality, assisted regional experts in discussing validation guidelines for monitoring water quality, and chaired a round table discussion on progress made by the bioassay/biomonitoring working groups in 2011. Individual and regional work plans for 2012–2013 were also discussed.

The objective of the training course was to revise and discuss practical details of the biomonitoring and bioassay methodologies and resolve any open issues with the application of biomonitoring and bioassays for the evaluation of the environmental impact from pesticides in surface water bodies. The agenda for the training course can be downloaded from the project website.

The training started with an official introduction by the Chilean Authorities. Ms. Vanessa Max Kraus highlighted the importance of working on biomonitoring and conveyed the appreciation of the local authorities for the training being organized in Valdivia. Thereafter Ms. Maestroni gave an introduction to current and future initiatives of FAO/IAEA in developing countries and described the upcoming ARCAL TC Projects RLA/5/060 and RLA/5/061 as opportunities for regional laboratories to develop regional capacity and technology. Prof. Bert Kohlman, from EARTH University, Costa Rica, gave a talk on the role of bioindicators in the evaluation of water quality. Dr. Rodrigo Palma, from the local authority for agriculture (SAG) discussed the role of Chilean regulations in protecting the water resources and the environment. Dr. Francisca Bown, from the Southern Scientific Studies Center (CECS), summarized the condition of the water resources in the glaciers in the area surrounding Valdivia. The training continued with presentations from the participants explaining the work carried out during 2010–2011.

With respect to the bioassay work, challenges were mainly related to the laboratory cultivation of algae (C. Selenastrum) as a nutrient for the Daphnias (D. Magna, D. Pulex). In several cases the cultivations died over a short period of time, and difficulties were encountered in starting the new populations. It was noted that the general protocols prepared for the 2010 Sao Paulo training were not detailed enough, and it was agreed that a revision to all the protocols will be made by the end of 2011 to include all minor details that are frequently left to each individual laboratory.

For the biomonitoring work, challenges were related to the lack of training in recognising the local species and also to the calculation of the water quality indices. Extensive discussions were undertaken to solve all the open issues and short training was given in taxonomy to enhance the macroinvertebrate identification skills. The issue of validation triggered a series of discussions.

In relation to biomonitoring it was agreed that the sampling design would encompass at least three within site and between site replicates, and the methodology should be as standardized as possible. For the bioassays it was agreed that each laboratory would utilize control charts and use the same control toxic substance to monitor the sensitivity of the biological agent (Daphnia) for acute and chronic toxicity testing.

Prof. Kohlman from EARTH University discussing the use of bioindicators in the evaluation of water quality

Question and answer sessions were the most useful tool in this training event and by the end of the week all open questions and issues were addressed in a very pragmatic way with the help of the lecturers and other experienced colleagues. An afternoon was spent at the Universidad Austral of Chile where there was an interchange of experiences with the local limnologists and soil-water scientists. Additional issues such as the use of nuclear techniques to understand the pesticide-soil-water-air relationships were addressed. A biomonitoring exercise was carried out in a wetland near Valdivia. All participants felt that additional training in taxonomy is required to be able to recognise autochthonous species. To this end, it was recommended that two books on macroinvertebrates should be purchased, one focusing on the wider Latin

American region and one specifically addressing the tropical region.

The training was evaluated as successful by all participants.

The bioassay team discussing future work plans

The biomonitoring team observing one local species of macroinvertebrate

Training Course on Mass Spectrometric Techniques for the Control of Pesticide Residues in Food; Hangzhou, China; 17–21 October 2011

Technical Officer: Andrew Cannavan

A two week national training course on the application of mass spectrometric techniques for the control of pesticide residues in food was organised in China Jiliang University under Technical Cooperation Project CPR/5/018. The Head of the Food and Environmental Protection Laboratory (FEPL) participated in the first week of the training course, accompanied by an IAEA funded external expert, Dr. Perihan Aysal Adun.

The training course was attended by approximately seventy scientists and technicians representing eleven institutes in various provinces of China.

The FEPL Head gave the opening address for the training course on the afternoon of 17 October and on the morning of 18 October presented the opening lecture, entitled 'Integrated Analytical Approaches for Food Safety and Integrity', which focused on the important role of pesticide residue laboratories, employing nuclear and complementary methods, within holistic food safety systems. This was followed by a series of lectures by Dr. Aysal Adun on pesticide groups, analytical methods for pesticide residues in food and sample preparation techniques for pesticide residue analysis. All participants were involved in discussion sessions following the lectures. The course participants were very motivated and interacted well with the lecturers, with many pertinent questions and discussion topics.

On 19 October, a laboratory practical session was held, led by Dr. Aysal Adun, for the technical participants (approximately 25 persons). The hands-on session focused on extraction and cleanup for pesticide residues analysis of fruit and vegetables by the QuEChERS method, with various adaptations for different matrices and analytical instruments.

Further lectures were given by Dr. Aysal Adun on 20 and 21 October to complete the first week of the training course. On the afternoon of 20 October, the group visited a local pesticide residue testing centre to experience and discuss some of the procedures discussed in the lectures in a working laboratory.

During the training course meetings were also held with the CPR/5/018 counterparts, Dr. Pan Jairong, Prof. Zhu Cheng, Dean of the College of Life Sciences, Dr. Chen Jianguo, Deputy Director of the university's International Exchange and Cooperation Division, and several other university personnel and industry representatives with a stake in food safety testing systems. Prof. Cheng was appreciative of the role played by the IAEA in helping to develop effective food safety systems in the fields of contaminants analysis and nuclear techniques to support and

verify food traceability mechanisms, and was keen to foster further interactions with the Agency after the closure of CPR/5/018.

A meeting was held on the morning of 20 October to finalise plans for the remaining TC fellowships and scientific visits under the project. Despite some initial problems in identifying host laboratories willing to provide the necessary training, all activities in the work plan should be successfully implemented by early 2012.

The IAEA input to the training course, which focused on modern sample preparation techniques and gas chromatography-mass spectrometric analysis, employing stable isotope labelled compounds, was well received and successful. Training course participants, as well as the project counterpart and staff of China Jiliang University, were appreciative of the IAEA's role in fostering the development of holistic food safety systems through the use of nuclear and related techniques, both in terms of the current project (CPR/5/018) and in a more generic sense.

The final activities of CPR/5/018 should be implemented in late 2011 or early 2012 to bring the project to a successful conclusion.

Training in Pesticide Residue Analysis; Belize City, Belize; 30 May–10 June 2011

Technical Officer: Nasir Rathor

As an activity under Technical Cooperation Project BZE/5/003, Mr. Nasir Rathor (FEPL) travelled to Belize to provide training and advice to the staff of the Belize Agricultural Health Authority's Central Investigation Laboratory (CIL) on pesticide residue analysis in fruits, vegetables, soil and fish products, including the use of radiotracer techniques. The training included the setup and calibration of analytical instruments and equipment, an introduction to multi-residue chromatographic methods for pesticide residues analysis, and laboratory quality assurance/quality control procedures.

CIL staff training in sample cleanup procedures

Mr. Rathor provided both theoretical and practical exercises during the two week visit on a number of topics, including the use of radiotracer techniques in pesticide residues analysis, calculation of the activities of radiotracer solutions and how to express them in different units (CPM/ DPM; mCi and Bq), basic liquid scintillation theory, safety of laboratory operations, sampling of fresh fruit and vegetables, sample extraction and cleanup procedures, and the operation and maintenance of the gas chromatography/mass spectrometry (GC/MS) instrument. The main practical training focused on the QuEChERS method for the determination of pesticide residues in bananas, soil and fish.

Advice and guidance were also provided on future needs for the development of the laboratory, including aspects such as the disposal of hazardous chemical waste, and on the regulatory framework needed to implement an effective monitoring programme for chemical residues in food.

Mr. Rathor (centre) with the CIL staff

The Food and Environmental Protection Laboratory will continue to provide assistance with technology transfer and other relevant advice and guidance in future capacity building activities with the CIL in Belize.

Development and Validation of a GC-ECD Method for the Determination of Dieldrin in Fish Samples

Technical Officer: Zora Jandrić

Dieldrin is an insecticide that was widely used throughout the world from the 1950s to the early 1970s for cotton and maize farming and other pest control purposes (e.g. locust and mosquito control). Dieldrin is a persistent organic pollutant, highly resistant to biodegradation and abiotic degradation, and is known to biomagnify along the food chain. Long term exposure is toxic to a wide range of animals, including humans, producing carcinogenic and teratogenic effects. For this reason dieldrin is now banned for agricultural use in most of the world, but still has some restricted applications in various countries.

In agricultural areas, cultivated fields can be located very close to water streams, increasing the possibility of pesticide contamination of the environment on a large scale. Incorrect use of pesticides can also contribute to their dissemination. Dieldrin may also occur in the environment through the oxidation, under normal environmental conditions, of aldrin, which is also an insecticide. Dieldrin sorbs to the soil and sediments, and may be distributed in water sources and accumulate in biota.

A study was undertaken in the Food and Environmental Protetion Laboratory (FEPL), in collaboration with the Insect Pest Control Laboratory, to develop a simple and inexpensive method using gas chromatography coupled with an electron capture detector (GC-ECD), a technique readily available in many Member States, to identify and quantify residues of dieldrin at low contamination levels in different fish species. The isolation of the compound of interest from the fatty fish matrix is problematic because fish lipids and proteins are typically co-extracted, causing significant matrix effects that make identification and quantification difficult, and contaminating the analytical column and detector. Appropriate sample/extract cleanup steps are essential.

The extraction method developed in FEPL employs a very simple and fast procedure in which the fish samples were homogenized before being diluted with water and extracted using dispersive solid phase extraction (DSPE) with acetonitrile and a mixture of cleanup salts. The method is linear over the concentration range 2–20 ng/g (r^2=0.998), accurate, with recoveries ranging between 87.5 and 105.8% and precise (CV< 6.6%) (Table 1), and was demonstrated to be applicable to the detection of dieldrin with a limit of quantitation of 2 ng/g (Figure 1).

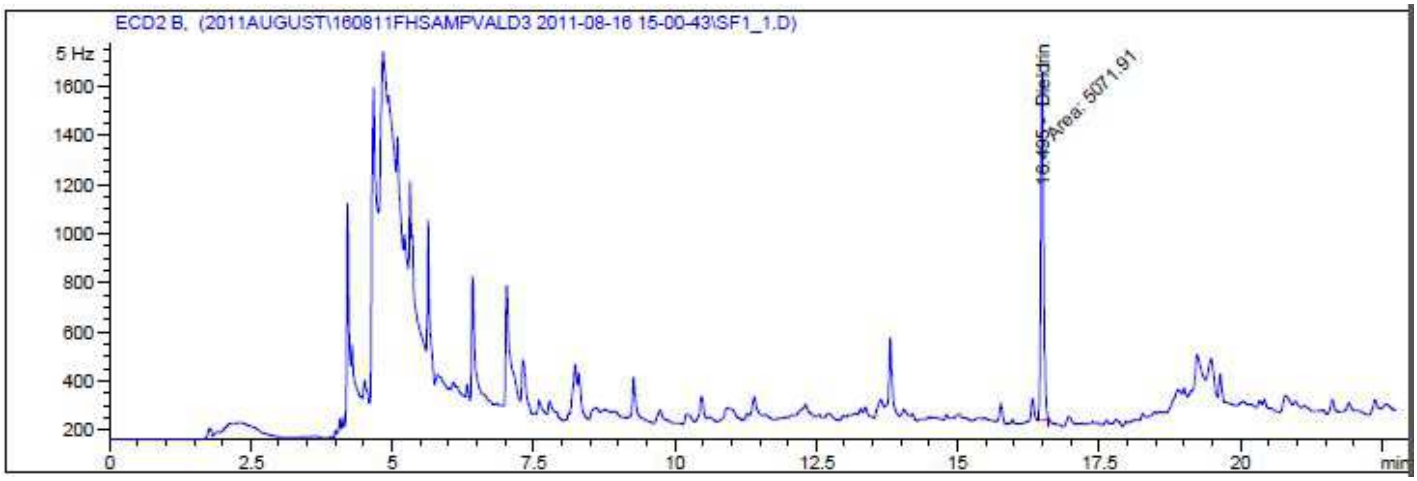

Figure 1 GC-ECD chromatogram of fish tissue extracted using DSPE

The method is suitable for application in Member State laboratories. Investigation of the distribution of dieldrin in different fish species from streams and rivers, especially in developing countries where dieldrin may still be available for restricted use, would provide valuable information on the presence of this contaminant in the aquatic ecosystem and in freshwater fish used as foods, and on the possible risks for local population.

Spiking level ng/g		***Dieldrine***		
		2.5	**12.5**	**25**
Day 1	R_A (%)	105.76	102.21	97.79
	CV (%)	4.86	3.43	5.16
Day 2	R_A (%)	95.73	107.80	101.15
	CV (%)	5.22	4.95	3.68
Day 3	R_A (%)	87.91	94.97	98.82
	CV (%)	6.62	2.14	3.90

Table 1 Overview of average recoveries (R) for dieldrine on 3 validation days and coefficient of variation (CV)

Fellows and Interns

Malia Galluccio and Wolfgang Dieter Werner, from EARTH University, Costa Rica, commenced internships in the Food and Environmental Protection Laboratory (FEPL) in September. Malia and Wolfgang are working with FEPL staff on the development of bioassays and biomonitoring techniques as indicators of the effectiveness of pesticide application regimes and good agricultural practices in ensuring food safety whilst maintaining environmental sustainability. The protocols for the methods produced will be transferred to Member States through a number of regional and national TCPs.

Malia and Wolfgang from EARTH University developing biomonitoring protocols during their internship in FEPL

Mr. Khaled El-Hawari commenced a 4 month TC fellowship in FEPL in October. Khaled is working on the development of methods for the traceability of food and feeds using stable isotope ratio analysis, primarily focusing on the analysis of water extracted from agricultural commodities and analysed for δ^2H and $\delta^{18}O$ using cavity ring down laser spectroscopy. Khaled is a previous trainee in FEPL in the field of pesticide residues analysis, and his return to train and contribute to our work on stable isotope analysis reflects the widening scope and success of his home institute, the Laboratory for the Analysis Of Pesticides and Organic Pollutants of the National Council for Scientific Research, Lebanese Atomic Energy Commission, with assistance under the IAEA Technical Cooperation programme.

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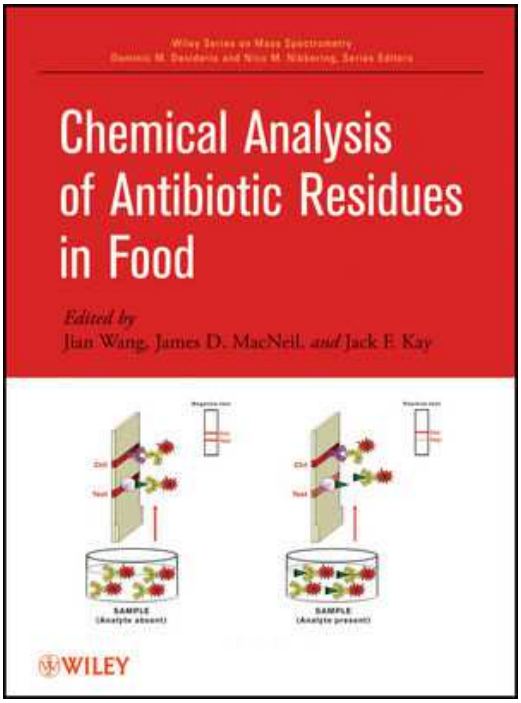

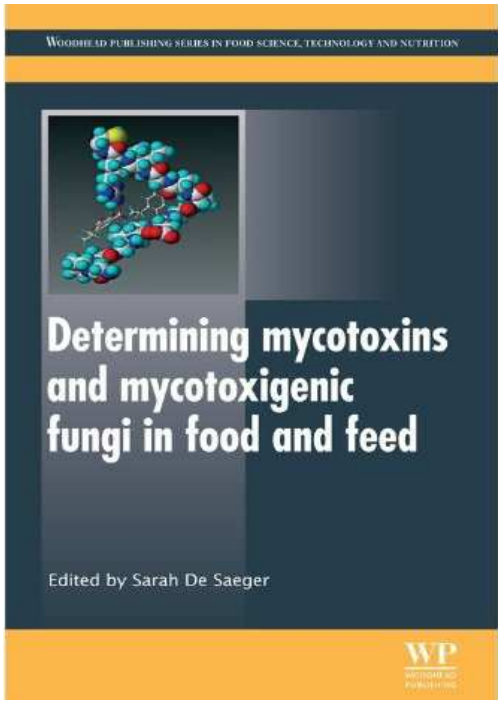

Recent publications include contributions to two chapters of the book Chemical Analysis of Antibiotic Residues in Food published by Wiley, New Jersey, USA and a chapter in Determining Mycotoxins and Mycotoxigenic Fungi in Food and Feed, published by Woodhead, Cambridge, UK.

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