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Nuclear Techniques in Food and Agriculture

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To the Reader

The Food and Environmental Protection Section (Vienna) and the Agrochemicals Unit of the Agriculture and Biotechnology Laboratory (Seibersdorf) have greatly strengthened our joint efforts to protect human health and facilitate trans-boundary 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 control of pesticide and veterinary drug residues and the management of nuclear and radiological emergencies affecting food and agriculture.

In particular, this most recent edition of our newsletter highlights our intensive efforts over the last six months in implementing activities to improve food safety and enhance international trade through our Food and Environmental Protection Subprogramme. In addition to the holding of two research coordination meetings, the subprogramme has also conducted three training courses and one workshop with a total of 129 meeting participants.

In the area of food contamination, the subprogramme has successfully commenced a Co-ordinated Research Project on the Development of Radiometric Analytical Methods for the Control of Antibiotic and Anthelmintic Veterinary Drug Residues (D5.20.36). In addition to considering the results of our partnership with the EU FP6 project on ProSafe-Beef related to the development and validation of multi-residue isotope dilution assay for 38 anthelmentic drugs, the CRP will also study the utilization of isotopic techniques for pharmacokinetic studies, residue screening and confirmatory methods; will provide new tools to understand and assess the environmental impact of veterinary drugs, and; will assess the impact of naturally occurring antimicrobial compounds on veterinary drug regulations.

Our collaboration with other international bodies such as the Joint FAO/WHO Codex Alimentarius Commission has also led to the successful inclusion of data on cadmium arising from the IAEA Coordinated Research Project (CRP) on Applications of Radiotracer and Radioassay Technologies to Seafood Safety Risk Analysis (K4.10.10) for evaluation by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and eventual consideration in the establishment of maximum levels for cadmium in seafood by the Joint FAO/WHO Codex Alimentarius Commission. This strengthened inter-agency collaboration has also resulted in the inclusion of data on fumonisins arising from an IAEA study undertaken in collaboration with the Nigerian National Agency for Food and Drug Administration and Control (NAFDAC) for evaluation by the Codex Committee on Food Contaminants and JECFA.

In the area of food irradiation, the subprogramme has successfully initiated a Coordinated Research Project on the Development of Generic Irradiation Doses for Quarantine Treatments (D6.20.08) that will develop generic and specific doses for pests and pest groups of quarantine importance (29 insect species from 13 arthropod families) for consideration through the International Plant Protection Convention. The CRP will also consider six additional treatments that were temporarily withheld from adoption pending the resolution of additional technical issues through the IPPC Commission on Phytosanitary Measures (ISPM) for inclusion in the ISPM Standard No. 28 on Phytosanitary Treatments for Regulated Pests. This is in addition to the successful adoption of eight irradiation treatments for pests of quarantine importance developed by the IAEA through the IPPC Commission on Phytosanitary Measures in July 2009.

Within the context of FAO obligations related to food and agriculture as a full party to the IAEA Early Notification and Assistance Conventions, and in collaboration with our FAO colleagues in Rome, the subprogramme has also successfully finalized its contributions to the revised 2009 version of the Joint Radiation Emergency Management Plan of the International Organizations, the purpose of which is to coordinate international organization arrangements in preparing for, and responding to, nuclear or radiological emergencies. These activities are in addition to our long-standing collaboration with the Inter-Agency Secretariat to Coordinate the Revision of the BSS (BSS Secretariat) and the IAEA Radiation Safety Standards Committee (RASSC) to ensure the successful review and revision of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS).

In closing, we convey our thanks and best wishes for the future to Ms. Rola Bou Khozam, who worked as a consultant on method development for food contaminants and laboratory quality assurance/quality control in the Agrochemicals Unit at Seibersdorf from October 2008 to July 2009. Rola has now returned to her home institute, the Lebanese Atomic Energy Commission, but will maintain contact and future collaboration with the subprogramme.

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

Food Traceability and Authenticity through the Application of Isotope Ratio Techniques

Technical Officers: Josef Brodesser and Andrew Cannavan

Agriculture is a dominant component of the global economy, and pressures to produce abundant, available and safe high quality foods for the world's ever growing population has had a worldwide impact on agricultural practices. The ability to detect contaminated food and animal feeds, and to trace their origin, is of major concern to regulatory authorities, trading partners and the food industry due to the rapid increase in cross-border trading of food commodities. Recent examples of food safety related incidents include dioxin contaminated animal feed, BSE, the use of Sudan Red food colouring in curry powder, and melamine added to milk powder. The complexity of supply chains in today's global marketplace makes traceability a challenging task, requiring the successful integration of both electronic 'paper trails', including effective labelling systems and technologies such as radio-frequency identification (RFID), and analytical techniques for product/component testing.

Since the occurrence of chemical residues and chemical and biological contaminants in food commodities can have significant economic implications as well as presenting risks to human health, it is of vital importance that consignments of contaminated food can be traced to their origin. This ensures that appropriate measures can be taken to monitor and determine the cause of the problem and to instigate corrective actions. It also ensures that any potential financial and/or trade barrier penalties are targeted to the correct parties. Risks can be reduced by implementing the targeted withdrawal and recall of contaminated products, resulting in reduced liability, a demonstration of due diligence and enhanced consumer confidence in both the product and the food safety system. The central drivers for traceability-related technologies are legislative requirements in the areas of quality and risk management with respect to food safety, traceability and authenticity and supply chain management, including protection of the environment or of endangered species, e.g., fish populations[1] in different marine fishing harvesting areas.

A combination of technologies for detecting potentially harmful contaminants in food and for tracing the origin of contaminated products would provide a powerful tool for the implementation of integrated farm-to-fork food safety systems. Even in countries where food safety does not appear to be a primary issue of concern, the capability to establish food origin/authenticity is of significant economic importance to many exporters. This establishment of food authenticity is of emerging importance as there is considerable added value to various commodities produced in specific regions. Depending on the geographic origin, some products are permitted to be marketed using PDO (Protected Designation of Origin) or PGI (Protected Geographical Indication) labels that are based on standards of identity or composition related to a specific production area. As the marketing of such products can be severely affected by fraudulent practices, current growth in world trade and increasing demands for a complete chain-of-custody will lead to an increasing need for technical tools capable of meeting traceability and authenticity requirements in the future.

Various modern methods have been applied for specific aspects of food authentication and traceability, such as polymerase chain reaction (PCR) and DNA techniques; enzyme immunoassays; proteomics and metabolomics analysis; near infra-red (NIR), mid infra-red (MIR) and FT-Raman data; nuclear magnetic resonance (NMR) spectroscopy; chromatographic techniques; in-line sensors; and, chemometrics in data analysis.

Elemental analysis for the determination of major and trace elements, such as calcium, copper, magnesium, manganese, barium, gallium and iodine by atomic absorption spectrometry (AAS) and inductively-coupled plasma mass spectrometry (ICP-MS), can provide comparative information on the area of production of some food commodities.

One of the most powerful and appropriate techniques for the determination of the origin of food products is the measurement of stable isotope ratios. Originally introduced for the determination of isotope ratios in the environment, the application of isotope ratio measurements to food traceability is a relatively new concept that has many advantages over the other techniques cited above and which opens new horizons for laboratories and for the application of food control measures by food safety authorities. Isotope ratio mass spectrometry (IRMS) has been demonstrated to be robust, precise and transferable, and other stable isotope ratio measurement techniques are emerging, such as cavity ring-down spectroscopy, which is simpler and more affordable and shows great promise for application in this field. With further research related to the application of these techniques to food traceability, this format could be applied as a powerful profiling and mapping technique for many classes of food commodities.

The application of isotope ratio measurements as a tool for the traceability of food has already been demonstrated. For example, results have been published dem-

1 U. Schröder. Challenges in the Traceability of Seafood. J. Verbr. Lebensm. 3 (2008): 45 – 48.

onstrating the proof of the origin of rice[2,3] with differentiation of rice grown in the Basmati rice region in India, in the USA or in Europe based on the isotope ratios of certain elements measured in the commodity. Naturally occurring isotopes of elements such as strontium (Sr) have also proved to be suitable markers for detecting trends in soil-vegetation systems and for tracing the origin of a variety of food products[4]. The relative abundance of Sr isotopes in terrestrial vegetation are governed by the isotopic composition of Sr in the environment in which the product is grown. Therefore, the Sr isotope ratios of products can provide 'fingerprints' of the geological conditions of the place of origin. This has been demonstrated for both plant (for example, asparagus[5]) and animal products (the Sr isotope profile in milk is related to the locale where the cattle producing the milk grazed[6]). Other isotope ratios, such as $^{1}H/^{2}D/^{3}T$, $^{14}N/^{15}N$, $^{13}C/^{12}C$, $^{18}O/^{16}O$, can be used in the same way, or to provide complementary data.

In addition to the traceability of food commodities and animal feeds, nuclear technologies may provide a possible means of tracing certain contaminants to their origin. This is an important issue; for example, there are many instances of the detection of residues of the antibiotic chloramphenicol (banned in many countries for use in food producing animals because of its toxicity) in foods, where there is no indication or evidence of illegal use of the drug in the animal production system. This has been a major cause of trade disruption, rejection of import consignments and increasingly stringent testing requirements in recent years. There are many unlicensed or counterfeit products containing chloramphenicol on the market. It has also been claimed that contamination with this substance may be due to its natural occurrence in the animal production environment. The ability to trace the detected compound or the counterfeit products to their origin would be an important step in the control and management of the problem. There are many other similar cases where tracing chemical contaminants would enhance food safety and trade. Isotope ratio measurements in conjunction with techniques such as site-specific nuclear isotopic fractionation-nuclear magnetic resonance spectroscopy (SNIF-^{2}H-NMR) provide a possible analytical tool for these purposes.

Thus, the concept behind novel isotope ratio methodologies and applications for the traceability of foods for food safety and authenticity has the potential to be applied in many countries.

Recognizing the importance of this topic, a number of research institutes have already volunteered to collaborate with the Agency in this field, including, the Institute for the Application of Atomic Energy, Chinese Academy of Agricultural Sciences (CAAS); the Institute of Agro-Food Science and Technology, CAAS; the Nuclear Chemistry Research Division, Republic of Korea Atomic Energy Research Institute; the Centre for Food, ASsured SafE and Traceable (Food ASSET) Centre, Queens University Belfast, UK; the Institute of Chemical Technology, Prague, Czech Republic; the European Commission Joint Research Centre; the Federal Institute for Risk Assessment, Berlin, Germany; the Institute of Food Research, Norwich, UK; Teagasc (Ireland's Agriculture and Food Development Agency) and the Austrian Institute of Technology.

Within this framework, a consultant's meeting will be held by the Food and Environmental Protection Subprogramme in early 2010. The meeting will elaborate and refine the direction of a new coordinated research project (CRP) on 'Food Traceability and Authenticity through Isotope Ratio Techniques', which is planned to commence in late 2010 or 2011. The project will bring together research institutes in up to 10 developing countries, with several developed countries acting as advisors. The objective is to develop and validate methods for determining the geographical and production origin of food products based on isotopic ratio determination in conjunction with chemometric techniques and existing baseline data. This would be applicable across a wide range of commodities, taking into account the relationship between tracers (isotopes and trace elements) occurring in the food with those in the local environment (geology and groundwater). The project will also include the development of complementary profiling methods using conventional analytical techniques to permit participating countries to build databases and facilitate the trace-back of food products to their origin as part of an integrated farm-to-fork approach to food safety.

2 S. Kelly et al. The application of isotopic and elemental analysis to determine the geographical origin of premium long grain rice. European Food Research and Technology DOI 10.1007/s002170100400.

3 Y. Suzuki et al. Geographical origin of polished rice based on multiple element and stable isotope analyses. Food Chemistry 109 (2008) 470–475.

4 G. Fortunato et al. Application of strontium isotope abundance ratios measured by MC-ICP-MS for food authentication. J . Anal. At. Spectrom., 2004, 19, 227 – 234.

5 G. Bowen et al. Global application of stable hydrogen and oxygen isotopes to wildlife forensics. Oecologia (2005) 143: 337-348.

6 G. Bowen et al. Global application of stable hydrogen and oxygen isotopes to wildlife forensics. Oecologia (2005) 143: 337-348.

Past Events

27th Meeting of the Radiation Safety Standards Committee (RASSC); IAEA Headquarters; Vienna, Austria; 16-19 November 2009

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

Specialized international organizations and relevant non-governmental bodies may be invited by the IAEA Deputy Director General to attend the RASSC meetings and in this regard, the reporting officer represented FAO at the most recent 27th Meeting of the RASSC. The reporting officer noted that FAO has statutory functions, within its constitutional mandate to monitor and evaluate the world food security situation, that are relevant in preparing for, responding to, and providing assistance in the event of a nuclear or radiological emergency. These statutory functions are implemented in the context of FAO obligations as a full party to the Early Notification and Assistance Conventions. Specifically, the FAO is mandated to provide prompt notification and technical assistance in the event of nuclear or radiological emergency affecting food and agriculture, which includes the application of agricultural countermeasures to alleviate adverse affects arising from these events.

RASSC Participants

In this regard, the reporting officer indicated that subsequent to the 26th Meeting of the Radiation Safety Standards Committee in July 2009, the FAO has finalized its contributions to the revised 2009 version of the Joint Radiation Emergency Management Plan of the International Organizations, which is scheduled to be published by the IAEA at the end of this year. This activity is undertaken in the context of FAO membership in the Interagency Committee on Radiological and Nuclear Emergencies (IACRNE), whose purpose is to coordinate international organization arrangements in preparing for, and responding to, nuclear or radiological emergencies, including in the application of the newly revised 2009 edition of the Joint Plan.

The FAO representative also participated in RASSC discussions concerning the review and revision of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS) as a cosponsoring organization, particularly in regard to the development of emergency preparedness and response procedures for nuclear and radiological emergencies affecting food and agriculture. These FAO activities are undertaken through our continued collaboration and participation in the Inter-Agency Secretariat to Coordinate the Revision of the Basic Safety Standards (BSS Secretariat) that is respon-

sible for coordinating the revision of the Basic Safety Standards.

FAO/IAEA Regional Workshop on Integrated Analytical Approaches to Monitor Indicators of the Effectiveness of Pesticide Management Practices and Compliance with Maximum Residue Limits; São Paulo, Brazil; 13 to 16 November 2009

Technical Officer: Ian Ferris

Experts in agrochemicals, analytical methodologies and invited speakers participated in an FAO/IAEA Regional Workshop on Integrated Analytical Approaches to Monitor Indicators of the Effectiveness of Pesticide Management Practices and Compliance with Maximum Residue Limits in São Paulo, Brazil from 13 to 16 November 2009.

Thirty-seven participants from Argentina, Austria, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, El Salvador, Ecuador, Hungary, Jamaica, Panama, Peru, Uruguay, USA and Venezuela participated in the workshop.

The workshop participants recognized the importance of agrochemicals in achieving the United Nations Millennium Development Goals, specifically the fundamental rights of everyone to be free from hunger and to consume safe food and that climate as well as rapid socio-economic changes pose severe challenges to food security, health and environmental sustainability.

The workshop identified three specific goals where science and technology can make a contribution through the analytical laboratory:

- identifying and providing indicators of better laboratory and pest management practices (BMPs)
- promoting risk assessment, communication and a more sustainable catchment management approach in which, at a minimum, no-one loses and, if possible, everyone gains over time
- reducing adverse human and environmental impacts from agrochemicals

To attain these goals, the participants agreed to work together as a laboratory network to harmonize approaches and apply them in cooperation with like-minded international and regional organizations, national and local bodies, and especially land managers and their representatives.

Specifically, the workshop proposed:

- accelerating capacity building especially in the areas of integrated chemical and biological monitoring and analytical quality assurance;
- improving locally monitoring capabilities to foster BMPs and market awareness/acceptability of such products and services; and
- strengthening the laboratory network by exchanging knowledge between all stakeholders.

Fourth (Parma, Italy; 8 September 2009) and Fifth (Barcelona, Spain; 22-23 October 2009) Meetings of the European Food Safety Authority (EFSA) Panel on Biological Hazards (BIOHAZ) Working Group on Irradiation of Food (Efficacy and Microbiological Safety)

Technical Officer: David H. Byron

The technical officer served as an expert at the fourth (Parma, Italy; 8 September 2009) and fifth (Barcelona, Spain; 22-23 October 2009) Meetings of the European Food Safety Authority (EFSA) Panel on Biological Hazards (BIOHAZ) Working Group on Irradiation of Food (Efficacy and Microbiological Safety).

In 1986, 1992 and 1998, the European Commission Scientific Committee for Food (EC/SCF) had expressed scientific opinions on the safety of the irradiation of a series of foods and food ingredients, which led, at the EU level, to the establishment of a list of specific classes of foods authorized for treatment with ionizing radiation, including the maximum safe doses applied (Directives 1999/2/EC and 1993/3/EC).

In recently considering different options and proposals for completing the list of food and food ingredients legally authorized for treatment with ionizing radiation, the European Commission asked EFSA to issue an opinion on the safety of the irradiation of certain food products in order to establish whether the food classes and doses specified in the previous SCF opinions are still up-to-date to ensure consumer safety. The BIOHAZ Working Group on Irradiation of Food (Efficacy and Microbiological Safety) was therefore formed by the EFSA BIOHAZ Panel to draft such an opinion with regard to microbiological issues.

The WG noted that the main tasks of the WG meeting were to consider the contents and the structure of the draft Scientific Opinion on Irradiation of Food (Efficacy and Microbiological Safety). The WG was also informed of the coordination of work being undertaken by the EFSA Scientific Panel on Food Contact Materials, Flavourings, Enzymes and Processing Aids (CEF), which is responsible for delivering an opinion on the chemical safety of irradiated foods.

Discussions were also held on the draft conclusions and recommendations contained within the draft Scientific Opinion of the Working Group on Irradiation of Food (Efficacy and Microbiological Safety). In order to have both scientific opinions (i.e. from the EFSA BIOHAZ and CEF Panels) distributed at the same time, it was noted that the European Commission had extended the deadline for the publication of both BIOHAZ and CEF opinions until December 2010.

A new meeting might follow around mid 2010 in order to analyse possible further scientific information on efficacy and microbiological safety of food irradiation and in order to discuss the draft opinion in light of the outcome of the work of the CEF WG/Panel.

Meeting on Nuclear Applications (ENAN), International Nuclear Atlantic Conference (INAC); Rio de Janeiro, Brazil; 29 September – 2 October 2009

Technical Officer: Carl Blackburn

The technical officer presented an invited lecture entitled 'Irradiation as a sanitary and phytosanitary treatment for food and agricultural commodities destined for international trade'. This keynote lecture was given on the morning of Thursday 1 October and opened the session on nuclear technology industrial applications.

It was an extremely interesting conference because many different areas of nuclear technology were covered (food irradiation, waste water and sewage sludge treatments, nuclear imaging of industrial processes, nanotechnology and more). The food science technical session was chaired by Anna Lucia Villavicencio of the Institute for Energetic and Nuclear Research (IPEN) in Brazil. The session on nuclear applications in agricultural processes was chaired by Susy Frei Sabato, also of IPEN. Food irradiation lectures included the detection of irradiated food, irradiation as a food processing technique, dosimetry associated with irradiation and both sanitary and phytosanitary applications. It was encouraging to meet researchers new to food irradiation, and the technical officer particularly enjoyed taking part in the many stimulating discussions on research findings, there was full participation from both recognized experts and those who are beginning their research careers.

It was a productive meeting, with additional work taking place in the margins of the conference. For example, Anna Lucia Villavicencio convened a meeting of leading irradiation specialists to discuss early plans for an E-Beam / X-ray irradiation workshop which is hoped to be held in San Paulo in late 2010 at IPEN. Also, a visit to a commercial electron beam irradiation facility was arranged; Carlos Eduardo Souza and Gabriel Alo hosted a tour of the Aceletron Industrial Irradiation facility where two 10 MeV electron beams were in operation.

This conference was an excellent forum to disseminate information on the Food and Environmental Protection (FEP) Subprogramme work activities on food irradiation. These activities include; a proposed Coordinated Research Project (CRP) on the Use of Irradiation for Sterilized Shelf Stable Foods for Immuno-compromised Patients and other Specific Target Groups; work to up-date the FAO/IAEA food irradiation clearances database and food irradiation facilities database, and; a current CRP on the Development of Generic Irradiation Doses for Quarantine Treatments. This latter CRP is to develop standards that will facilitate international trade in irradiated fruits and vegetables. Delegates showed considerable interest in the International Standards on Phytosanitary Measures (ISPMs) which, under the International Plant Protection Convention, provide the phytosanitary (quarantine) framework for international trade.

Fourth Session of the International Plant Protection Convention (IPPC) Commission on Phytosanitary Measures (CPM); FAO Headquarters; Rome, 30 Mar - 3 Apr 2009

Technical Officer: David H. Byron

At the Fourth Session of the International Plant Protection Convention (IPPC) Commission on Phytosanitary Measures (CPM), the IPPC Secretariat presented 14 draft irradiation treatment standards (including fruit flies) and informed the CPM that formal objections had been received from Japan and the Republic of Korea on six draft irradiation treatments for *Conotrachelus nenuphar, Cylas formicarius elegantulus, Euscepes postfasciatus, Grapholita molesta, G. molesta under hypoxia, and Omphisa anastomosalis.*

The Korean objection related to the presence of live intact adult insects which could be introduced and released and might therefore be detected in survey traps in the importing country. Furthermore, the presence of (albeit sterile) F1 adults was a thought to be a complicating factor which could jeopardise the status of a pest free area. The formal objection by Japan concerned irradiation treatments for *Grapholita molesta* and *G. molesta* under hypoxia because the proposed irradiation treatments were not considered to be consistent with published scientific evidence and therefore, their objection recommended a revised effective absorbed dose for *G. molesta* of 232 Gy, rather than 200 Gy. These six formal objections were discussed at the IPPC Standards Committee (SC) in early May 2009, and the TPPT is currently working to progress them, with a view to address some, if not all, of the objections by November 2009.

As a result of the above discussions, the following eight irradiation treatments have been adopted and included in ISPM 28 on Phytosanitary Treatments for Regulated Pests:

Annex 1 Irradiation treatment for *Anastrepha ludens*

Annex 2 Irradiation treatment for *Anastrepha obliqua*

Annex 3 Irradiation treatment for *Anastrepha serpentina*

Annex 4 Irradiation treatment for *Bactrocera jarvisi*

Annex 5 Irradiation treatment for *Bactrocera tryoni*

Annex 6 Irradiation treatment for *Cydia pomonella*

Annex 7 Irradiation treatment for fruit flies of the family Tephritidae (generic)

Annex 8 Irradiation treatment for *Rhagoletis pomonella*

Fourth (Rio de Janeiro, Brazil; 22-26 June 2009), Fifth (Stockholm, Sweden; 21-25 September 2009) and Sixth (IAEA Headquarters; Vienna, Austria; 9-13 November 2009) Meetings of the Work Group on Long Term Sustainability of Emergency Preparedness and Response Programmes (WG-EPR)

Technical Officer: David H. Byron

In July 2007, the 4th Meeting of Competent Authorities under the Early Notification and Assistance Conventions agreed that the Secretariat should establish a Work Group (WG) on sustainable infrastructure, identified in the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies. To respond to this suggestion, the Deputy Director General, Department of Nuclear Safety and Security, initiated the establishment of the *IEC Work Group on Long Term Sustainability of Emergency Preparedness and Response Programmes* (WG-EPR) to monitor and facilitate the Action Plan implementation and develop recommendations to ensure harmonization and long term sustainability of emergency preparedness and response programmes amongst Member States, the Secretariat and relevant international organizations.

The technical officer participated as the FAO and International Organization Representative at the Fourth (Rio de Janeiro, Brazil, 22-26 June 2009) and Fifth (Stockholm, Sweden, 21-25 September 2009) Meetings of the Work Group on Long Term Sustainability of Emergency Preparedness and Response Programmes (WG-EPR). Within the WG-EPR plenary, the meeting reviewed and approved the previous WG-EPR Meeting Minutes; revised the WG work plan task list and schedule of activities and reached agreement on future tasks and schedules for both sub-groups SG-I (implementation) and SG-F (follow-up), and; discussed the outcome of the Competent Authorities Meeting held in July 2009.

The WG-EPR also discussed and reviewed proposed creation of the Senior Emergency Preparedness and Response Policy Group (SEPRAG) and the status of the IAEA Incident and Emergency Centere (IEC) evaluation and documentation. The majority of the WG-EPR meeting was devoted to the elaboration and revision of the Final Report of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies.

Tasks identified under the Work Group on Assistance of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies will be implemented under the WG-EPR, including the further consideration of forming a Senior Emergency Preparedness and Response Advisory Group and the elaboration and revision of the Final Report of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies.

32nd Session of the Joint FAO/WHO Codex Alimentarius Commission; FAO Headquarters; Rome, Italy; 29 June – 4 July 2009

Technical Officer: David H. Byron

The technical officer represented IAEA and the Joint Division at the 32nd Session of the Joint FAO/WHO Codex Alimentarius Commission (Rome, Italy, 29 June – 4 July 2009) to report on matters arising from the Food and Environmental Subprogramme of interest to Codex. The Session was attended by 463 delegates from 125 member countries and 1 member organization, 2 observer countries and 33 international governmental and non-governmental organizations, including UN agencies.

In addition to the activities of the Joint FAO/IAEA Programme presented under document CAC/32 INF/6 (Report on Activities of the International Atomic Energy Agency Relevant to Codex Work, see ftp://ftp.fao.org/codex/CAC/CAC32/if32_06e.pdf), the Reporting Officer also presented a statement on activities of the Food and Environmental Protection subprogramme related to food safety, including the use of ionizing radiation, the control of pesticide and veterinary drug residues and radiological contamination of foods.

It was reported that the IAEA attended the most recent 3rd Session of the Codex Committee on Contaminants in Foods (see July 2009 FEP Newsletter), and provided

information on the generation of research and data related to seafood safety risk analysis and offered to provide these data to JECFA for the potential evaluation of cadmium in seafood. Likewise, the IAEA offered to provide the full results of studies on fumonisin B1 contamination in corn so as to establish maximum levels and sampling plans for these commodities.

The IAEA representative also offered its continued cooperation with the Codex Committee on Pesticide Residues on issues related to methods of analysis and sampling for pesticides, including the continued Chairmanship of their in-session Working Group on Methods of Analysis.

In relation to the Codex Committee on Residues of Veterinary Drugs in Foods, the IAEA representative noted the commencement of a Coordinated Research Project on the Development of Radiometric Analytical Methods for the Control of Antibiotic and Anthelmintic Veterinary Drug Residues, as well as a joint project with the FAO Animal Health Service and the International Federation for Animal Health to develop standards and protocols for the quality control of trypanocidal drugs used in animal production.

The Commission expressed its thanks to the Representative of the IAEA for the useful information provided at the present session and their continued cooperation with the Codex Alimentarius Commission in the future. The Commission noted that the results of these projects would be available to JECFA and/or the relevant subsidiary bodies of Codex as appropriate.

In view of ongoing work of the IAEA directly related to activities of the Codex Alimentarius Commission, it is anticipated that an IAEA representative will attend the next 33rd Session (2010) of the Joint FAO/WHO Codex Alimentarius Commission to present a progress report on these IAEA initiatives.

Forthcoming Events

Agricultural biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change (ABDC-10), Guadalajara, Mexico, 1-4 March 2010

This FAO international technical conference is co-organized by FAO and the Government of Mexico, and co-sponsored by the International Fund for Agricultural Development (IFAD). The Consultative Group on International Agricultural Research (CGIAR), the World Bank and the International Centre for Genetic Engineering and Biotechnology (ICGEB) are major partners in this initiative. Participation at the conference is by invitation only.

Impetus for the conference comes from the need for concrete steps to be taken to move beyond the 'business-as-usual' approach and to respond to the growing food insecurity in developing countries, particularly in light of climate change that will worsen the living conditions of farmers, fishers and forest-dependent people who are already vulnerable and food insecure. The conference encompasses the crop, forestry, livestock, fishery and agro-industry sectors, as well as the entire range of agricultural biotechnologies currently available.

For more information visit: http://www.fao.org/biotech/abdc/conference-home/en/

Status of Coordinated Research Projects

The First Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on Development of Radiometric and Allied Analytical Methods to Strengthen National Residue Control Programmes for Antibiotic and Anthelmintic Veterinary Drug Residues; Vienna, Austria; 19-23 October 2009

Technical Officer: Rajendra Patel

As reported in our previous newsletter, this CRP was initiated following a consultants meeting in September 2008 and approval from the IAEA Research Committee. Applications to participate were invited and received from 22 countries and after a rigorous selection process 11 Research Contracts were awarded in May 2009 to participants from Brazil (2), China (2), Kenya, Republic of Korea, Mongolia, Peru, Sri Lanka, Thailand and Tunisia. Additionally 4 Agreement Holders from Austria, Belgium, Germany and UK and 2 Consultants from the Netherlands and USA were invited to join the project.

RCM Participants at the IAEA

The 1st RCM brought together the contract and agreement holders, consultants and staff of the Food and Environmental Protection Subprogramme to review plans and work done to date by the participants. Based on this, existing plans were refined in view of priority areas identified by the Consultant's meeting. Two days were spent in formal presentations, followed by discussions over three days to formulate priorities and research plans. One afternoon consisted of a joint session with the FAO/IAEA Train-the-Trainers Workshop on Screening/Post-screening Techniques for Veterinary Drug Residues held at the Agency's Laboratories, Seibersdorf, Austria, from 12 to 23 October 2009. During this session, presentations were made by the Agreement Holders in their areas of expertise.

The RCM agreed that the main purpose of the CRP was to assist National Reference Laboratories of FAO and IAEA member states in meeting the need for effective and appropriate monitoring methods for residues of selected antibiotic and anthelmintic veterinary medicines through the development and application of screening methods that exploit the advantages (robustness, sensitivity, transferability) of radiotracer detection methods, in conjunction with confirmatory techniques using stable-isotope labelled molecules with research outputs providing knowledge on:

1. pharmacokinetics of veterinary drugs in aquaculture fish species previously not investigated
2. improved screening and confirmatory methods fit for use in National Residue Control Programs
3. sources of natural antimicrobial compounds likely to impact the regulatory framework for veterinary drug residues
4. and provide new tools to understand and assess the environmental impact of the use of veterinary medicines.

The meeting recognized importance of exchange and sharing of research materials and technology. To facilitate this, Agreement Holder Prof Hubert De Brabander has set up a dedicated section for the CRP on the website of the Faculty of Veterinary Medicine, University of Gent, Belgium.

The meeting concluded that the use of radionuclides is vital to generate new knowledge, especially in aquaculture veterinary drug pharmacokinetics, to underpin effective control programmes and that the project results should be disseminated through scientific publications and presentation to a wide range of stake holders (scientific and regulatory communities). Additionally the need for additional agreement holders to facilitate the research activities has also been recognized.

This CRP forms a unique and global network of scientific expertise addressing complex and important food safety challenges and its successful implementation will result in improved food and feed quality and safety in FAO/IAEA Member States and further help developing countries to access major global food markets. Results of the selected projects will assist regulators in the development of new guidelines and regulations pertaining to food safety and the environmental impact of veterinary drugs.

Coordinated Research Project on the Development of Generic Irradiation Doses for Quarantine Treatments; First Research Coordination Meeting; Vienna, Austria; 5-9 October 2009

Technical Officer: Carl Blackburn

The first Research Coordination Meeting (RCM) of the Research Coordination Project (CRP) on the Development of Generic Irradiation Doses for Quarantine Treatments met at the IAEA Headquarters in Vienna, Austria from 5-9 October 2009.

The CRP aims to establish validated irradiation doses for non fruit fly species of quarantine significance. The CRP results will strengthen existing irradiation standards developed under the International Plant Protection Convention (IPPC), thereby allowing international trade for various fruits and vegetables through the use of generic irradiation doses for a wide range of quarantined pests.

The meeting was attended by sixteen people from twelve countries and included two observers. The purpose of the meeting was to review the current work of the participants and to agree on standardized protocols and future coordinated work plans.

Background

Regulatory authorities and scientists from many internationally recognized institutions have generated research data on the effectiveness of irradiation as a quarantine treatment against a range of insect pests infesting various fruits and vegetables. These authorities have concluded that the development of generic irradiation doses for phytosanitary treatments are both feasible and desirable as they could negate the need to develop or validate specific irradiation doses tailored to individual arthropod species.

The use of gamma ray, electron beam and X-ray irradiation as a quarantine treatment has expanded rapidly in recent years. This application of irradiation technology is especially important for both developed and developing countries due to uncertainties on the future availability and increasing price of methyl bromide, a fumigant facing increasing restrictions under the Montreal Protocol, but still widely used as a quarantine and pre-shipment treatment for pests of quarantine significance. There is a need for validated alternative post-harvest pest control methods, and the time is right for applied research leading to the development of irradiation treatments.

Since 1981, the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture has been supporting research, education and cooperation in the use of ionising radiation as a post harvest phytosanitary treatment. In this regard, the Food and Environmental Sub-programme has implemented four coordinated research projects in the area of phytosanitary applications of irradiation. These projects established the basis for developing national and international standards on the use of irradiation as a phytosanitary treatment. Specifically, in 2003 the International Plant Protection Convention (IPPC) approved the International Standard for Phytosanitary Measures (ISPM) Guidelines for the Use of Irradiation as a Phytosanitary Measure (ISPM 18), which facilitated international trade in irradiated fresh fruit. In 2009, the IPPC also adopted eight irradiation treatments for various insect pests, including a generic treatment for fruit flies of the family Tephritidae, for inclusion in ISPM 28 on Phytosanitary Treatments for Regulated Pests.

The New Coordinated Research Project on 'Generic Dose Treatments'

Despite successes in developing international standards, important gaps in knowledge still remain, and there are a number of other critical pests of quarantine significance where comparatively little research on their susceptibility to irradiation has been performed. Such pests include mites, thrips, mealybugs, weevils, leaf miners, aphids and scale insects.

RCM Participants at the Vienna International Centre (VIC)

Before the CRP commenced, a Consultant's Meeting held at the IAEA Headquarters from 3 - 7 November 2008 considered these gaps in knowledge. This Consultants Meeting recommended that:

i. A set of guidelines should be developed during the first RCM on the application and reporting of dosimetry to ensure consistency.

ii. Research protocols should be developed during the 1st RCM that include, among other things, definitions of the measure of efficacy for irradiation as a phytosanitary option, for all the arthropod groups that will be studied under the CRP.

iii. The CRP outcomes should facilitate the finalization of IPPC treatments and standards that deal with phytosanitary applications of irradiation.

iv. A high priority should be given to develop a generic dose for all phytophagous mites.

v. A generic dose for all weevils should also be developed.

vi. Reducing the generic dose of 400 gray for all Insecta (except pupae and adults of Lepidoptera) should be investigated.

vii. The CRP framework should consider the outputs of previous CRP and synergies with related TC country and regional irradiation projects.

viii. Large scale testing up to 30000 insects should be considered in confirming that the selected dose is efficacious.

The first Research Coordination Meeting addressed these recommendations and noted that three could not be fully met, namely:

- Recommendation (iv): Although the research will start to establish a body of work that could eventually result in a generic dose for the quarantine treatment of all mites, the CRP only includes work on two types of phytophagous mites, and it is unlikely that a generic dose could be agreed upon based on limited results for two species.
- Recommendation (v) cannot be addressed as none of the CRP participants are studying weevils.
- Recommendation (vi): In making this recommendation, it was assumed that the 400 Gy generic dose for all insecta (excluding pupae and adults of Lepidoptera) would be accepted by the IPPC. However, this specific treatment remains one of the six irradiation quarantine treatments that are currently undergoing further review and consideration by the IPPC for future adoption.

The overall objective of the CRP is to validate generic treatment doses for groups of arthropod pests of quarantine significance in international trade. Secondary objectives include an examination of the effects of low oxygen commodity storage and dose rate on efficacy and commodity tolerances.

Research will assist in the development of a generic dose treatment for Insecta (except for pupae and adults of Lepidoptera). The work will also assist in setting doses for the quarantine treatment of phylum Arthropoda (and a few subgroups within that phylum) as well as directly establish minimum doses that will provide quarantine security against specific pests in various commodities.

Research on specific non-fruit fly pest species or groups will be conducted at different locations by researchers using practices that are adequate for phytosanitary applications of irradiation, such as accurate, traceable dosimetry, acceptable pest-rearing methods and precise determinations of efficacy. Efficacy under commercial conditions of oxygen stress, whether intentional or passive, will be tested for certain applications. Tolerances of specific commodities under various commercial conditions will also be studied.

The meeting emphasized the critical importance of adopting a common approach to the application and reporting of absorbed radiation dose to ensure that the results of the research are reliable and repeatable and that the work will be accepted by the IPPC for setting new plant health standards. The necessary components of a dosimetry system were presented and the details of each participant dosimetry systems were discussed. All participants have access to dosimetry and irradiation units, but in some instances dosimetry is provided by an irradiation facility as part of the service and is outside the researcher's direct control. It was agreed that a dose intercomparison execrice would be useful and the Dose Comparison Scheme already established by the Agency's Entomology Unit was offered to the participants.

This first RCM was successful, the plans and proposed research of individual participants was discussed; the meeting helped to facilitate a broader understanding of the relationship each participant has to the overall objectives of the Coordinated Research Project as a whole; it promoted interaction between the participants, and prepared recommendations and protocols to facilitate project tasks. The RCM provided a full understanding of the CRP's objectives, and was a forum where participants discussed and agreed a common approach and way forward.

The proposed work is an ambitious effort that addresses 29 species from 13 arthropod families, including several quarantine pest families for which no data is currently available. The proposed research will enable the development of generic and specific doses for pests and pest groups of quarantine importance, thereby reducing technical barriers and facilitating international trade in agricultural produce. It was recognized that it is necessary to investigate factors beyond absorbed dose that may affect efficacy and which have not been previously addressed. The meeting also developed a research protocol, in recognition of the importance of common procedures in research and dosimetry.

A member of the IPPC Technical Panel on Phytosanitary Treatments (TPPT) attended the RCM. It was concluded that TPPT representation was critical to the CRP in providing valuable feedback on IPPC operations and in facilitating the consideration of irradiation treatments in the development of further ISPM standards. It was also concluded that increasing utilisation of irradiation technology will require further training of quarantine inspectors and regulatory authorities.

Recommendations from the meeting

1. The meeting strongly recommended continued close collaboration and cooperation with the TPPT in order to

address issues raised by Member States and to further facilitate the application of irradiation for phytosanitary purposes, including the development of international standards.

2. Immediate and continuing liaison with the IPPC Secretariat is necessary to facilitate the adoption of the 6 withheld irradiation treatments and to coordinate the submission of the additional irradiation treatments developed under this coordinated research project.

3. The use of the IDIDAS (International Database on Insect Disinfestation and Sterilisation) database to collate published information relating to irradiation treatments of pests is strongly encouraged.

4. It was strongly recommended that Agreement holders should collaborate and assist contract holders in order to facilitate the efficient and thorough generation of data, especially between participants studying similar pests.

5. The meeting encouraged international organization funding and implementation of training courses related to the application of international standards, the operation of irradiation facilities and quarantine inspection and regulatory control.

Current Technical Cooperation Projects

Project Number	Title and Project Objectives	Technical Officer
ALG5025	**Strengthening Capabilities to Control Veterinary Drug Residues in Foodstuffs** To improve consumer protection and facilitate trade through increased capacity in the determination of veterinary drug residues in foods.	**Patel, Rajendra Kumar P. (NAFA)** **Cannavan, Andrew (NAAL)**
ARG5011	**The Use of Ionizing Radiation for the Phytosanitary Treatment of Fresh Fruit** To strengthen the national technological capacity for the establishment of irradiation services for phytosanitary treatment.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
BEN5004	**Regulatory Control and Monitoring of Mycotoxins to Facilitate Trade** To establish laboratory capacities and analytical procedures for mycotoxin control.	**Brodesser, Peter Josef (NAFA)** **Byron, David Henry (NAFA)**
BGD5024	**Phytosanitary Treatment for Insect Pests Infesting Fresh Fruits and Vegetables** To strengthen the national capacity in applying irradiation as a quarantine treatment for insect pest infestations in fresh fruits and vegetables.	**Blackburn, Carl Michael (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 (NAAL)** **Patel, Rajendra Kumar P. (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
BOL5017	**Capacity for Monitoring Pesticide Residues for Compliance with Minimum Risk Levels and Good Agricultural Practice According to ISO 17025** To improve food safety and environmental quality in Bolivia and the competitiveness of Bolivian farmers.	**Ferris, Ian Glen (NAFA)** **Maestroni, Britt Marianna (NAFA)**
BRA5058	**Applying Ionizing Radiation for Food Security and Healthcare** To train specialized personnel capable of processing food and blood with radiation, taking into consideration the variety of foodstuffs, storage facilities and climatic conditions in the country.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (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)** **Ferris, Ian Glen (NAFA)**
CHI5046	**Certification of Exported Animal Products Using Nuclear and Other Analytical Techniques** To strengthen the analytical capabilities of laboratories authorized to certify exported animal products to support the national programme on control of chemical residues, in order to comply with international standards, harmonize measurement results and promote mutual recognition agreements on product certification.	**Cannavan, Andrew (NAAL)** **Patel, Rajendra Kumar P. (NAFA)**
CHI5048	**Integrated Watershed Management for the Sustainability of Agricultural Lands** To develop a management model for sustainable agricultural systems through nuclear and chemical diagnosis of the impacts of anthropogenic practices.	**Ferris, Ian Glen (NAFA)** **Mabit, Lionel (NAAL)**
CMR5014	**Creation of a Nuclear Analysis Laboratory in CATEN for Food Safety** Improving the assessment of good agricultural practices at a catchment scale using laboratory analytical support.	**Brodesser, Peter Josef (NAFA)** **Ferris, Ian Glen (NAFA)** **Padilla Alvarez, Roman (NAAL)** **Kis-Benedek, Gyula (NAAL)**

Project Number	Title and Project Objectives	Technical Officer
COL5021	**Cost Benefit Assessment for the Modernization of an Irradiator in Colombia** To develop a proposal for the sustainable operation of a pilot irradiator (100 000 Ci, cobalt-60), through the realization of a cost benefit analysis	**Blackburn, Carl Michael (NAFA)** **Sampa, Maria Helena de O. (NAPC)** **Pacheco Jimenez, Ronald Enrique (NSRW)**
COL5022	**Assessment of the Impact of Pesticide Use in Colombia** To identify sources of agrochemical pollution; to determine the pesticide transport mechanism, the risk of pollution from agrochemicals applied to the area of the project and the environmental impact and risk to human health; to upgrade the pesticide residue analysis laboratory for monitoring and analysis of pollution in water resources.	**Ferris, Ian Glen (NAFA)** **Maestroni, Britt Marianna (NAFA)**
COS5026	**Management and Appropriate Use of Insecticide-nematicides** To reduce the adverse impact of insecticide-nematicides through the application of water management and nuclear techniques.	**Ferris, Ian Glen (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.	**Brodesser, Peter Josef (NAFA)**
ERI5005	**Zoonotic (diseases that can be transmitted from animals to humans) Disease Control and Analysis of Veterinary Residues in Foods** The objective of the project is to determine the epidemiological prevalence of brucellosis and tuberculosis in the major dairy producing areas and to develop baseline data on veterinary drug residues in milk and meat products.	**Cannavan, Andrew (NAAL)** **Unger, Hermann (NAFA)** **Patel, Rajendra Kumar P. (NAFA)**
GUA5015	**Establishing a Food Irradiation Plant** To enhance national capabilities to apply suitable agricultural practices and nuclear techniques to increase crop productivity to meet the national requirements for food security.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
HAI5003	**Enhancing Crop Productivity through the Application of Isotope Nuclear Techniques** To enhance national capabilities to apply suitable agricultural practices and nuclear techniques to increase crop productivity to meet the national requirements for food security.	**Sakadevan, Karuppan (NAFA)** **Ferris, Ian Glen (NAFA)**
INS5033	**Enhancement of Quality Assurance for the Analysis of Veterinary Drug Residues** To enhance the national capacity to ensure the safety of food products of animal origin.	**Patel, Rajendra Kumar P. (NAFA)** **Cannavan, Andrew (NAAL)**
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.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
IVC5027	**Upgrading of Food Safety System** To establish a sustainable capacity for control and monitoring of pesticide residues in food products.	**Brodesser, Peter Josef (NAFA)** **Maestroni, Britt Marianna (NAFA)**
JAM5011	**Supporting Food Irradiation of Selected Economically Important Crops** To increase the efficiency and productivity of farmers and/or agro-processors in Jamaica in the marketability of selected highly perishable and economically important foods/food products.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
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.	**Brodesser, Peter Josef (NAFA)**
MAK5005	**Upgrading of Food Safety System** To improve the food safety system in the country.	**Brodesser, Peter Josef (NAFA)** **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 (i) residues in food and (ii) air quality in Montenegro by enhancing analytical capabilities and establishing a network of air quality monitoring stations.	**Brodesser, Peter Josef (NAFA)** **Wegrzynek, Dariusz (NAAL)**

Project Number	Title and Project Objectives	Technical Officer
MNE8002	**Upgrading a Persistent Organic Pollutant Laboratory towards Accreditation for Environmental Monitoring** To upgrade capacities in Montenegro and renovate the existing laboratory equipment at CETI through the provision of a new GCMS system required for POP control, especially for the presence of polychlorinated dibenzo-dioxins (PCDD) and polychlorinated dibenzo-furans (PCDF) and other POPs in the air, water and human food so as to protect the health of Montenegrin population.	**Safrany, Agnes (NAPC)** **Brodesser, Peter Josef (NAFA)**
MOR5024	**Industrial Application of Irradiation** To reduce staple food losses, increase the microbiological safety of foods, and facilitate food trade through the use of irradiation technology.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
MOR5029	**Conserving and Improving the Quality of Aromatic and Medicinal Plants through Irradiation, and Transfer of this Procedure on an Industrial Scale** To help promote aromatic and medicinal plants in Morocco and to improve the income of those who grow, produce and sell the products.	**Blackburn, Carl Michael (NAFA)** **Sampa, Maria Helena de O. (NAPC)**
NIC5007	**Determining Drug Residues in Bovine Meat Exports** To determine veterinary medicine residues and growth promoters through nuclear and complementary techniques to improve production, product quality and diagnostic techniques.	**Cannavan, Andrew (NAAL)** **Brodesser, Peter Josef (NAFA)** **Patel, Rajendra Kumar P. (NAFA)**
NIR5033	**Improvement of Quality Management and Food Safety Monitoring Using Isotope Techniques** To improve the safety and quality of food, and to provide up-to-date information on methods of regulatory control in order to strengthen the technical capability to perform pesticide residue analysis in foodstuffs. To improve capacities and procedures for mycotoxin control for compliance with international standards.	**Brodesser, Peter Josef (NAFA)** **Byron, David Henry (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 application in Nigeria.	**Sampa, Maria Helena de O. (NAPC)** **Blackburn, Carl Michael (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
PAN5017	**Monitoring Pesticide Residues in the Production of Tropical Fruit (Pineapples and Melons) and Controlling Analytical Quality with the Aid of Nuclear Techniques** To improve food safety in the production of tropical fruits in Panama.	**Ferris, Ian Glen (NAFA)** **Maestroni, Britt Marianna (NAFA)**
PAN5019	**Supporting the Accreditation of a Pesticides Residue Laboratory** To establish an accredited laboratory according to ISO 17025.	**Maestroni, Britt Marianna (NAFA)** **Ferris, Ian Glen (NAFA)**
PHI5030	**Upgrading the Gamma Irradiation Facility** To upgrade and increase the throughput of the pilot-scale gamma irradiation facility at the Philippine Nuclear Research Institute (PNRI) to a semi-commercial one.	**Sampa, Maria Helena de O. (NAPC)** **Haji-Saeid, Seyed Mohammad (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 treatment of and trade in irradiated products of economic importance in the Asia Pacific region.	**Blackburn, Carl Michael (NAFA)** **Byron, David Henry (NAFA)**
RLA5050	**Strengthening Laboratory Capacity to Assess the Implementation of Good Agricultural Practices in the Production of Fruit and Vegetables in Latin America** To improve the assessment of good agricultural practices, with the support of analytical laboratories.	**Ferris, Ian Glen (NAFA)** **Dercon, Gerd (NAFA)** **Maestroni, Britt Marianna (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.	**Ferris, Ian Glen (NAFA)** **Maestroni, Britt Marianna (NAFA)** **Dercon, Gerd (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
RLA5055	**stablishing 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.	**Patel, Rajendra Kumar P. (NAFA)** **Cannavan, Andrew (NAAL)**
ROK5034	**Nutrient Efficient Crops and Safe Use of Pesticides in Sustainable Crop Production** To analyze the behaviour of pesticides and evaluate their persistence in vegetables grown under greenhouse conditions, and to investigate the ability of crops to access nutrient reserves, with special reference to phosphorus.	**Ferris, Ian Glen (NAFA)**
SLO5002	**Protecting Groundwater and Soil against Pollutants Using Nuclear Techniques** To improve the capability of counterpart institutes in addressing nitrate and pesticide in drinking water by calibrating and applying relevant risk management approaches at benchmark sites in Slovenian catchments.	**Adu-Gyamfi, Joseph Jackson (NAAL)** **Ferris, Ian Glen (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.	**Sampa, Maria Helena de O. (NAPC)** **Blackburn, Carl Michael (NAFA)**
SYR5020	**Implementation of Quality Assurance and Quality Control Procedures in Pesticide Residue Analysis Laboratories** To improve the national pesticide residue monitoring programme and introduce analytical quality assurance and validated risk management technologies, which will lead to more sustainable cropping systems.	**Brodesser, Peter Josef (NAFA)** **Byron, David Henry (NAFA)**

Project Number	Title and Project Objectives	Technical Officer
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.	**Fesenko, Sergey (NAAL)** **Ferris, Ian Glen (NAFA)** **Maestroni, Britt Marianna (NAFA)**
URT5024	**Nuclear Techniques for the Monitoring of the Food Quality in the United Republic Of Tanzania** To improve consumer protection and facilitate trade.	**Brodesser, Peter Josef (NAFA)** **Byron, David Henry (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)** **Ferris, Ian Glen (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)**

Agrochemicals Unit, FAO/IAEA Agriculture & Biotechnology Laboratory, Seibersdorf

European Food Science Day: bringing results back to consumers; Brussels, Belgium; 18 November 2009

Technical Officer: Britt Maestroni

Managers responsible for dissemination and/or communication in EU framework (FP6) projects focused on food quality and safety formed a network in 2005, called CommNet, to improve their communication skills and to assist each other in the diseemination of information. CommNet realized that results of EU research projects are not properly reaching Europe's policy makers, consumers and the food industry, and that there is a need for a platform to provide European citizens, via authorities and the media, with reliable food advice. As a joint effort ten research networks within CommNet (http://www.commnet.eu) organized an event called the 'European Food Science Day', held in Brussels on 18 November 2009.

The partcipants at the European food science day

The goal of this one day event was to further spread the important scientific knowledge generated under the EU projects to a wider audience, including communication experts, responsible policy makers, European Parliamentarians, consumer representatives and EU scientists.

A welcome address was given by Mr Antonio Di Giulio, Head of the Food, Health and Well-being Unit in the European Commission, Directorate-General for Research. A short statement was then given by EU member of Parliament Ms. Lena Ek, who reminded the audience about the importance of communicating information to the five hundred million people living in Europe. Mr Roland Poms, MoniQa coordinator, set the scene and outlined the working day, emphasizing that the European consumer is interested in having a choice, including the possibility to target healthier foods, and the importance of maintaining the consumers' trust and confidence in European food industry and research. To this end, it is fundamental to share knowledge and to effectively communicate it to the wider public.

Ms Catherine Geslain Laneelle, Executive Director of The European Food Safety Authority, stated that EFSA also has a great interest in communication. EFSA deals daily with risk assessment, and shares the task of risk communication with the European Parliament, the European Commission and the member states. It was noted that risk assessment is difficult to communicate to consumers and proper mechanisms are needed.

Ms. Beate Kettlitz, Director of Scientific and Regulatory Affairs at the Confederation of the Food and Drinks Industries of the EU (CIAA), presented the European technology platform 'food for life' as a way to promote innovation in Europe (http://etp.ciaa.be/asp/home/welcome.asp).

Ms. Britt Maestroni, from the Joint FAO/IAEA Division introduced the perspective of the developing countries that are food producers. She highlighted the support that international organizations (FAO and IAEA) are giving to developing countries in strengthening national food control systems and promoting international trade. She also urged the EU Commission to ensure that legislation is science based rather than technology driven, in order to avoid creating barriers to trade.

The last presentation of the morning session was given by Ms. Rhonda Smith, Director of Minerva, who introduced what CommNet was about and the ways in which food science can be communicated to consumers. She gave an example of a major communication event called 'TAPAS' that attracted the attention of over 500 journalists from around the world, exhibitors, delegates and visitors that participated at the 2008 Euroscience open forum in Barcelona. Visitors to the booth were challenged to choose Tapas first accordingly simply to taste, but then to consider the potential health issues such as the supply, delivery, preparation and consumption for themselves and their families. Over 200 people completed their questionnaires and this allowed the people manning the booths to draw their attention to the work of EC funded projects under which this initiative took place and their potential for improving the health of EC citizens.

Leading European food scientists presented their latest results in the field of food quality, food safety and nutrition in parallel sessions during the remainder of the morning, and in the afternoon each session moderator

presented to the audience the summaries of the breakout groups.

In the afternoon Ms. Maive Rute, Director, DG Research, gave a speech on the EC view on food communication. There was concern that FP6 results are difficult to access by the general as the web sites are mainly a frame for communication amongst scientists, and are not updated after project closure. She mentioned that only one third of the EC projects addressed messages to the consumers via the newspapers, and that only 12% had achieved outreach via television. Ms. Rute stressed the importance of communicating food science results in a clear way, and mentioned that funding should be available for European scientists to be trained in communication, knowledge management and knowledge transfer. In the vision of bio-economy, the idea of bio-literacy is to establish a better presence on the web, to make project outputs more visible, and to encourage more interaction between projects themselves. It is the intention of the DG Research in 2010 to establish a database of project results. This will increase shared learning and encourage more scientists in the knowledge management field.

The morning panel (from left): Mr. A.di Giulio , Ms. L. Ek, Mr R.Poms, Ms. C. Geslain Laneelle, Ms. B. Maestroni, Ms. R. Smith

Ms. Willemien Bax, from the European Consumers Association (BEUC), reiterated for the importance of the EU consumer having confidence in the food chain.

A question and answer session followed with Ms Marit Paulsen, a member of the European Parliament. Ms. Paulsen described a survey that she had carried out in Scandinavian countries, including Sweden, Denmark and Norway, on food. One conclusion was that people do not believe in science anymore. In the context of lack of trust and confidence, she posed the question to the audience, 'how to give people correct, transparent, certified, scientific evidence and knowledge about what to eat?'

A lively discussion on effective communication followed.

Mr. Ingemar Pongratz vice coordinator of Cascade, concluded the day with some final remarks. He commented that good communication to the consumer must be balanced, addressing both risks and benefits, that there is a need to produce more information, and a need to educate scientists on knowledge management and communication. Among future challenges mentioned was improved food traceability with a view to food safety.

4th International Symposium on Recent Advances in Food Analysis; Prague, Czech Republic; 4-6 November 2009

Technical Officer: Andrew Cannavan

The International Symposium on Recent Advances in Food Analysis is a biennial event, held in Prague, Czech Republic. The 4th symposium, in line with previous events, focused on recent advances in analytical and bio-analytical technologies and emerging food-related applications in various areas. The main areas of interest to the Food and Environmental Protection Subprogramme (FEP) of the Joint FAO/IAEA Programme were residues and contaminants; authenticity, traceability and fraud; mycotoxins, marine and plant toxins; nanoparticles, and; QA/QC and chemometrics in food analysis. The symposium was attended by more than 500 participants from more than 40 countries.

The Agrochemicals Unit Head gave a keynote presentation on 'The current state of analytical methodology for food safety and traceability in developing countries'. Key messages in the presentation were that the increasing pace of technological development in the field of analytical instrumentation and methodology in the developed world has made it impossible for developing countries, or those in transition, to keep pace; increased effort must be focused upon optimising the use of existing technologies in developing countries to establish food safety equivalence with trading partners and to protect the consumer; care must be exercised in identifying and evaluating those new technologies that would be applicable and would benefit developing countries in food safety regulatory testing, rather than those that are best utilized as research tools for upstream food safety work, and; because of the pace of technological development, food safety legislation, regulations and guidelines require constant revision, but the texts should always be based on sound risk assessment rather than on available technological capabilities. The presentation was well received and led to extended discussion with several participants both immediately afterwards and in the following break sessions.

The Unit Head took the opportunity to discuss with delegates many issues relevant to the work of the FEP, and also participated as a member of the scientific poster award committee in evaluating more than 400 posters within the various sessions of the symposium.

The Unit Head was also invited to join a meeting headed by Prof. Jana Hajslova (Institute of Chemical Technology, Prague) in her capacity as the coordinator of a proposed EU 7th Framework Integrated Project which is at an advanced stage of planning. The project would involve 14 partners in Europe, including eastern European countries not currently part of the European Union. At the meeting, the Unit Head was asked to head the Advisory Board for this new project. This invitation will be taken under consideration and discussed with colleagues and management within the FAO/IAEA Joint programme.

The information exchange in the field of food analysis and regulations at the symposium was extremely useful. The participants included key figures in the relevant fields, and several individuals who had previous or current interactions with the Agency through TCPs, CRPs, or as participants in training workshops were also present. The event provided an opportunity for mutual updating of information and maintenance and extension of contact networks.

Train-the-Trainers Workshop on Screening/Post-screening Techniques for Veterinary Drug Residues; Seibersdorf, Austria; 12-23 October 2009

Technical Officers: Andrew Cannavan, Britt Maestroni

The issue of veterinary drug residues in foods of animal origin (meat, milk, eggs) has become increasingly important world-wide, including in developing countries. Concerns over veterinary drug usage and residues are primarily related to food safety, human health and the need to meet requirements for international trade. Food safety is impacted by global trends and agricultural practices throughout the food production chain. Along with climate change, changes in the structure of livestock production, breeding and husbandry practices, and international trade in animals and animal products will also increase the prevalence and transmission of animal and zoonotic diseases, requiring an increased use of antibiotics and other veterinary drugs.

Sample preparation practical session

The control of veterinary drug residues is achieved through the regulation of veterinary pharmaceuticals and the application of good farming/production practices, in combination with effective surveillance systems and follow-up strategies. Analytical laboratories play an important role in the verification of the quality of the food commodity, in feeding back information on the effectiveness of control programmes and in the provision of information services to farmers and producers, either directly or through extension services.

Current international guidelines and regulations require that countries intending to export foods of animal origin must have programmes in place to ensure that food products do not contain residues of banned drugs, or concentrations of legally used drugs exceeding national or international maximum residue limits, and that the laboratories certifying compliance with regulatory levels must implement appropriate quality control and quality assurance systems. These programmes are important not only with regard to international trade, but also to guarantee the safety, quality and security of domestic food supplies.

In order to effectively implement surveillance programmes, laboratory staff must be familiar with the appropriate screening and quantitative techniques, as well as with the principles of ISO Standard 17025.

To assist IAEA and FAO member states in addressing these issues, a ‘train-the-trainers’ workshop on screening and post-screening techniques for veterinary drug residues was held in the FAO/IAEA Training and Reference Centre for Food and Pesticide Control in October 2009. The objectives were to provide information and strengthen the awareness of scientists and laboratory middle-management of the relevant guidelines and regulations and the theoretical and technical aspects of screening and post-screening techniques for the detection of veterinary drug residues; including radio-assay, microbial inhibition, immunological, thin layer chromatographic (TLC) and high-performance liquid chromatographic (HPLC) techniques; to introduce the quality assurance/quality control principles according to ISO Standard 17025 that are relevant to veterinary drug residue analysis; and to discuss the various possible roles of quality assured laboratories in monitoring the effectiveness of good farming practices. Information and training material was provided to facilitate further training by the workshop participants of personnel in their home countries.

The workshop programme comprised lectures and laboratory practical sessions and demontrations in the following subjects:

- Codex standards, guidelines and recommended international codes of practice for the control of the use of veterinary drugs
- Veterinary drug residue testing in the context of food safety
- Sample preparation
- Screening techniques (radio-assay, microbial inhibition tests, immunoassay)
- Chromatographic theory and practical applications of TLC & HPLC
- Statistical treatment and interpretation of analytical results
- Screening applications of hyphenated mass spectrometric techniques
- Quality assurance systems and quality assurance/quality control measures in analytical laboratories

- Laboratory accreditation and mutual recognition
- Method validation and principles of estimation of uncertainty of results
- The role of analytical laboratories related to good farming practices.

Train-the-trainers workshop lecture

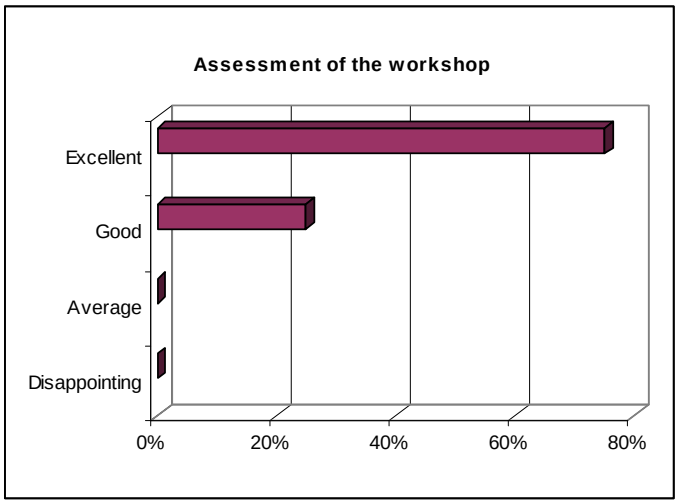
The workshop had 22 participants, including two TC fellows and one intern, from 20 developing countries. Lectures and practical sessions were given by Agrochemicals Unit staff, staff of the Food and Environmental protection section and several external lecturers. Significant contributions were made by Dr. Iris Lange, from the Bavarian Health and Food Safety Authority, and Ing. Thomas Kuhn and colleagues from the Austrian Health and Food Safety Agency, which provided lectures at Seibersdorf and training demonstration sessions on radio-receptor binding assay and immunoassay procedures in the AGES laboratories.

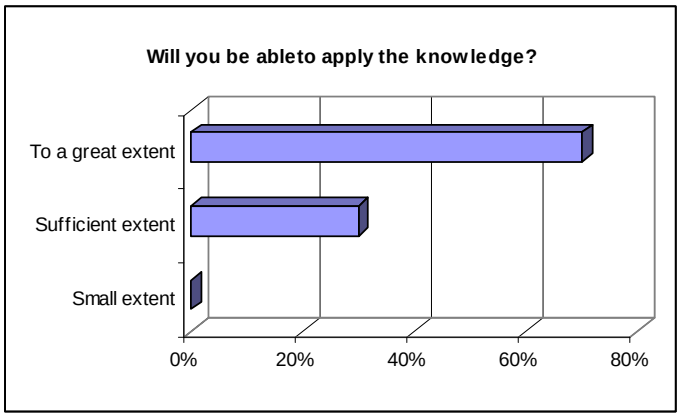
One afternoon of the workshop was held as a joint session with the participants in a Research Coordination meeting for the CRP 'Development of Radiometric and Allied Analytical Methods to Strengthen National Residue Control Programs for Antibiotic and Anthelmintic Veterinary Drug Residues' (D5.20.36). In the joint session, CRP research agreement holders gave presentations for the combined audience of approximately 45 people.

Training in isotope dilution screening technique

From immediate feedback, the train-the-trainers approach appeared to have been very successful, with various training activities planned by the workshop participants in their home countries. A vital element of all the training activities carried out by the subprogramme is the enhancement and maintenance of networks of institutes, and once again this was judged to be successful. Good working and personal relationships were forged amongst the participants during the workshop and shared problems (and solutions) and experiences were discussed at length.

Some results extracted from a workshop evaluation questionnaire are given graphically below. The responses indicate that the objectives of the workshop were fully achieved. All participants also indicated that the FAO/IAEA Training and Reference Centre was the appropriate location to hold this and similar, workshops.





Symposium on Food Safety, Traceability and Authenticity: Opportunities and Challenges for the Agri-Food Industries; Belfast, UK; 29 September 2009

Technical Officer: Andrew Cannavan

The symposium 'Food Safety, Traceability and Authenticity: Opportunities and Challenges for the Agri-Food Industries' was held to mark the opening of a new research centre, the Centre for Food, ASsured SafE and Traceable (Food ASSET), within the Institute of Agri-food and Land Use, at Queen's University Belfast, UK. The objective of the centre is to harness scientific knowledge and develop evidence based approaches for assessing risks and hazards associated with agri-food supply chains. The Centre will use this knowledge to develop innovative ways to enhance food safety and traceability that will support the future economic development of the agri-food sector. A key focus of ASSET is the formation of strategic linkages with an array of agri-food industries, multi-national retailers and international research groups to ensure sustainability and recognition as a global centre of excellence in food safety and traceability.

The symposium had approximately 90 participants from academia, the private sector and regulatory authorities from UK and Ireland.

The Agrochemicals Unit Head presented a keynote lecture entitled 'Food Traceability and Authenticity – Global Issues'. The presentation introduced the new and planned work of the Joint FAO/IAEA Programme in food traceability and gave an overview of the need for effective traceability systems on an international scale, with examples of recent food safety incidents and issues world-wide due to lack of effective traceability systems. The key focus was on the development of analytical technologies for the verification of paper-trail traceability systems and to address the traceability of food commodities and contaminants internationally where records are insufficient or where accidental or fraudulent misrepresentation of goods is a problem. The measurement of stable isotopes provides a unique and powerful tool for this purpose, facilitating direct traceability of the actual product regardless of the labeling or record trail.

A second presentation by Mr. Paul Brereton, Head of FERA International, focused on food authenticity issues, and led to discussions on collaborations between the Joint Programme and the partners in an EU 6th Framework integrated project, 'TRACE'. To follow this up, a meeting was arranged between Joint Division staff and Mr. Brereton in Vienna to further discuss collaborative activities in this field.

The international issues with respect to food traceability raised a lot of interest with the symposium participants, reflecting the global nature of the food supply chain in today's market and the recent development of international regulations and guidelines for traceability systems to facilitate trade.

Discussions were held with Prof. Chris Elliott, Director of the Institute of Agri-Food and Land Use and Dr. Luc Rock, Head of the isotope ratio mass spectrometry laboratory in the ASSET Centre. The Centre in general is well financed, well equipped, addresses various technical and supply chain management aspects of food traceability and safety and has good support from the private sector. Prof. Elliott expressed his keen interest in working with the Agency as a Collaborating Centre and affirmed the commitment of the centre to contribute to traceability research and capacity building projects on an international basis. In this regard, he also offered to host research coordination meetings or consultant's meetings related to the Agency's projects at the ASSET Centre.

Food traceability and authenticity has become an important issue worldwide. Most of the effort to establish traceability systems has focused on developing electronic 'paper-trail' and labelling strategies. Research on the development of technologies to verify these systems, or to provide direct information on the geographical origin of food commodities to combat fraud, is currently fractionated at best. The Agency is well recognised in the field of stable isotope measurements largely due to the use of reference materials produced by the Isotope Hydrology laboratory, and amongst the researchers at the symposium it was both expected and welcomed that the Agency would take a lead role in the coordination of activities to develop stable isotope techniques for food traceability applications.

The ASSET centre is a well equipped, dynamic research centre with strong links to industry and to other research centres world wide and would make an excellent Collaborating Centre for work in the field of traceability for food safety.

ICC Expert Summit on Food Security; Vienna, Austria; 29-30 June 2009

Technical Officer: B. Maestroni

The International Association for Cereal Science and Technology (ICC) invited the Joint FAO/IAEA Division to participate at and contribute to the ICC Expert Summit on Food Security held in Vienna on 29-30 June 2009.

The aim of the summit was to bring together a group of experts in grains, foods and feeds, agriculture and socio-economics, scientists and technologists, and governmental representatives from across the world to determine critical research and development project needs and related funding schemes in grain and crop related areas in response to the world's staple food crisis. The summit was attended by over 60 ICC delegates and invited experts from 28 countries. A key objective was to develop internationally funded research and development projects to address the issue of safe, sustainable and sufficient food and feed supply.

Ms. Maestroni addressing the meeting

The meeting started with a series of short introductory presentations, including a presentation by Ms. Maestroni on 'FAO/IAEA food safety and food security programmes: research and development needs'. The delegates then split into three working parties to consider different elements of food security and to develop ideas which could form the basis of suitable research proposals. The working groups dealt with staple food security for all in an age of climate change; food and feed safety for all; and nutrition and health for all. All working groups discussed the potential impact of climate change in terms of the challenges to the availability and the nutritional quality of staple foods. The participants also recognized that responses to particular food security needs must be tailored and delivered in manners appropriate to the relevant regions and ethnic backgrounds around the world. The group discussions highlighted the use of crop science and technology to improve quality and increase yields of staple foods, i.e. by finding solutions to reducing both pre- and post-harvest losses including the development of new, rapid, robust and inexpensive testing methods to identify contaminated crops and therefore help to deliver food safety and security.

ICC delegates and invited speakers

At the end of the ICC Expert Summit the various outputs were collated and summarized to form a draft of an agreed 'Declaration' on food security which can be accessed at:

http://www.icc.or.at/ICC-Expert-Summit-Declaration-Final-2009-08-05.pdf

National Training on 'Sampling of fresh fruits and vegetables for compliance with Codex MRLs'; Al Ain, UAE; 21-25 June 2009

Technical Officer: B. Maestroni

In April 2009 the IAEA received a request from the United Arab Emirates (UAE) to support a national workshop on 'Principle and Practice of sampling for Pesticide Residues Analysis'. The Agrochemicals Unit was invited to prepare a programme and identify suitable consultants for the national workshop. Dr. Perihan Aysal and Dr. Kettner agreed to undertake an expert mission to the laboratories of the Ministry of Environment and Water-Sector of Technical Affairs-Directorate of Laboratories (MOEW) to lecture at the national workshop in Al Ain, UAE, from 21 to 25 June, 2009.

The workshop was attended by approximately 52 participants composed of directors, food inspectors and scientists from different laboratories of MOEW, i.e. Al Ain MOEW Central Lab, Dubai Central Laboratory Department–Food and Environment Section, Fujairah Environment Research Center, Abu Dhabi Food Control Authority and Sharjah Central Food Lab. The topics covered included:

* food safety, the role of Codex Alimentarius and requirements of trading food for developing countries
* principles of sampling for the determination of trace organic contaminants
* maximum residue limits (MRL)
* methodologies of sampling fresh fruits and vegetables for compliance with Codex MRLs
* representative and non-representative samples
* statistical methods and error minimization
* sources of uncertainty of the analytical procedure
* sample storage and transportation to the laboratory
* sample preparation and sample processing
* pesticide stability
* sampling tools
* sampling from different fields (airports, seaports, shopping malls, retail markets, supermarkets)
* transportation of the samples to the laboratory

The workshop also included practical sessions on sampling. On the 4th day of the workshop the participants travelled to the Dubai Fruit and Vegetables Market were

pre-sampling procedures and representative sampling protocols were demonstrated while three different trucks were unloading various vegetables and fruits. The instructors demonstrated how representative samples should be taken from the trucks. The participants also visited the Dubai Flower Center where imported flowers, fruits and vegetables are stored in a cold warehouse. Instructions were given on how to properly sample packages coming from different countries. The participants also visited a supermarket in Dubai City Centre, where strategies for the sampling of retail packages were explained. On the 5th day of the workshop, the participants visited several orchards and fields where mango, date palm, aubergine, tomato, banana, flowers and water melon are grown and field sampling (pre-harvest) was demonstrated.

Dr. Aysal (3rd from left) and Dr. Kettner (2nd from right) with UAE authorities and workshop participants

The final session of the workshop was held at the Al Ain MOEW Central Laboratory where sample registration and sample preparation procedures were demonstrated using pears and dry ice for the preparation of the analytical sample.

Questions and answer sessions were held each day to give participants the possibility to clarify any issues that may have been unclear.

The knowledge transferred through this workshop will help to harmonize techniques for sampling and sample processing and to minimize errors in pesticide residue analysis, thereby helping to produce reliable and comparable results.

At the end of the workshop a questionnaire was distributed to all participants. The analysis of the questionnaire revealed that the participants found the workshop quite useful and were satisfied since they learnt new techniques and updated their knowledge. Both experts recommended to keep the momentum, and to organize a second module on the use of LC-MS/MS and QuEChERS type methods for the determination of pesticide residues in different matrices including water.

Sampling practice from a truck at the Dubai Fruit and Vegetables Market

Training on radiotracer techniques in residues analysis; Panama City, Panama; 15-26 June 2009

Technical Officer: Mr. Nasir Rathor

Mr. Nasir Rathor, an Agrochemicals Unit staff member, undertook a two week expert mission to the Ministerio de Desarrollo Agropecuario Direction National de Sanidad Vegetal (MIDA) in Panama from 15-26 June 2009. The objective was to provide training to the MIDA staff in the use of radiotracer techniques for the determination of contaminants and residues in fruits and vegetables using ^{14}C -labeled compounds under TC project PAN/5/019.

Mr. Rathor gave presentations and demonstrations on the theory and practical aspects of:

- Preparation of ^{14}C -stock and working solutions,
- Calculation of the activity of the solutions and how to express it in different units (CPM / DPM, mCi and Bq),
- Calculation of the amount of cold compound in the ^{14}C labeled standard,
- Basic liquid scintillation theory,
- Counting efficiency and effect of different quenching on the recovery of the ^{14}C method,
- Correction of colour quenching
- Use of Berthold LB 124 bench Geiger Mueller detector,
- Calculation of the uncertainty of the analytical procedure,
- Maintenance and troubleshooting of a liquid scintillation counter (LSC)
- Maintenance of the gas chromatograph-mass spectrometer (GC-MS),
- Operation of GC-MS using scan and selected ion monitoring (SIM) modes SIM,

- Retention time locking (RTL),
- QuEChERs methods using ^{14}C chlorpyrifos.

Mr. Rathor training MIDA staff in radiotracer technique

Laboratory experiments were performed to demonstrate the use of radiotracer techniques for the processing of pineapple samples. The uncertainty of sample processing was studied using two different sample choppers and ^{14}C-chlorpyrifos as radiotracer. The application and usefulness of radiotracer techniques for method validation studies was also demonstrated. Pineapple samples were fortified with a mixture of 4 pesticides and ^{14}C-chlorpyrifos. The QuEChERS method was used for sample preparation and the recovery of the target pesticides was calculated after the extraction stage, after the cleanup stage and after evaporation by counting the activity in a LSC. The extracts were also analysed by GC-MS. Practical training was also provided on the operation and maintenance of the GC-MS instrument.

Method validation study at MIDA using ^{14}C-chlorpyriphos

Mr. Rathor noted that the MIDA laboratory has developed remarkably since the previous training mission in February 2007, both in the quality system and in building the capacity of the staff who are young, very enthusiastic, willing to learn and very dedicated to their work. He made several recommendations to the management to assist in the further development of the laboratory and the services that it provides through the IAEA technical cooperation project PAN/5/019.

A radiotracer - lysimeter experiment to evaluate the behaviour of anthelmintic drugs applied in animal manure in a soil-plant-water system

Technical Officer: Marivil D. Islam

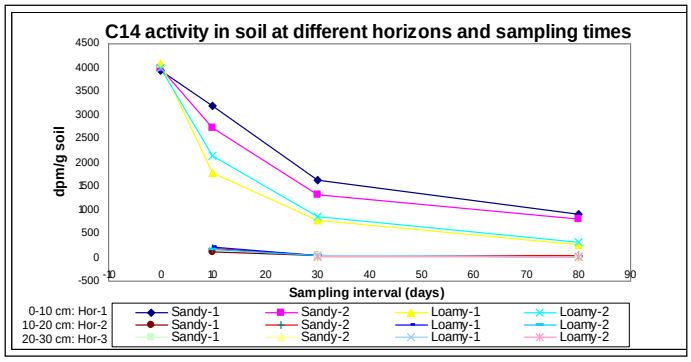
The use of anthelmintics as veterinary drugs to protect/treat animals against parasitic infections in food producing animals is often essential to sustainable animal production. Administered drugs may find their way into the ecological system through their excretion in animal faeces, either in natural droppings or through the application of manure to the land. Animal excrement and sludges from farms are considered a good choice for organic agriculture because they improve the soil's structure by maintaining the soil humidity, ventilation and supplying organic ingredients to the soil. Investigation of the translocation of substances contained in the manure into the different environmental compartments is required to assess where they can be found in significant amounts. Determination of the concentrations and characterization of the behaviour of these drugs as trace contaminants in crops, soil, and the aquatic system would provide very useful information for risk assessment and for the future evaluation of the impact of these drugs on the environment.

The field experiments were performed in the lysimeter facilities of the Austrian Institute of Technology at Seibersdorf. Circular metal rings with 14.1 cm internal grids were fabricated and fitted into the five 1.13m diameter cleaned lysimeters (2 replicates with sandy soil, 2 replicates with loamy soil and 1 control with sandy soil) as a guide for the application of the target compounds and for soil sampling. C14-labeled levamisole and cold fenbendazole and eprinomectin were well mixed into cow slurry and calculated amounts were manually applied to each of the grid as homogeneously as possible. Soil (sandy and loamy) samples were collected from day-0 application and at 3 sampling times, after 10 days, 30 days and 80 days. The soil samples were air-dried, processed and analysed using a method based on the QuEChERS extraction/clean-up principle. Seepage water collected from the bottom of lysimeters due to natural precipitation was analysed by a solid phase extraction/concentration method. Samples of alfalfa grass (for 1st and 2nd vegetation) growing on the lysimeters were collected, processed and stored in deep freezer for later analysis. For C14 determinations of soil and water, extracts were analyzed using a liquid scintillation counter (LSC) while non-labeled analytes were analyzed by liquid chromatography tandem mass spectrometry (LC-MSMS).

To date, only the results of the C14 analyses on soil samples have been compiled. Ten days after application, 75% of the C-14 component based on the day-0 findings could

be quantified in sandy soil and 49% in loamy soil at a depth of 0-10 cm. After 30 days, levels had declined to 37% (for sandy) and 20% (for loamy) while after 80 days, 22% and 7% were found in sandy and loamy soil, respectively (at the same depth level). For the 2nd horizon (10-20cm) and on the same sampling regime, 4-5% was found for both types of soil after one week, 0.9-1% after 30 days and 0.6% after 80 days.

In conclusion, the extractable residue of labeled levamisole was shown to be greater in sandy than in loamy soil at all sampling times. C-14 compound had declined to almost half of the original activity ten days after application in the loamy soil while only 25% decline was observed in the sandy soil. The lower activity measured from the loamy soil extract as compared with sandy suggests that anthelmintic compounds are more strongly bound/adsorbed in the loamy soil. This was confirmed by the fact that there was no seepage water collected from the two lysimeters containing the loamy soil hence no possible leaching of analytes could occur. Current results will be compared with values obtained from an adsorption-desorption study carried out in controlled conditions.



Application of slurry containing ^{14}C -labeled levamisole and other anthelmintics

Lysimeter facilities showing the application/sampling grid

Analysis of the Antiviral Drugs Acyclovir and Valacyclovir – Hydrochloride in Tse-tse Flies (Glossina pallidipes) Using LC-MSMS

Technical Officer: James Sasanya

The Agrochemicals Unit (ACU) currently supports ongoing research on Tse–tse flies (*Glossina pallidipes*) in the Entomology Unit (ENT) of the IAEA laboratories in Seibersdorf through the application of liquid chromatography–tandem mass spectrometry (LC–MSMS). Under the thematic plan for Sterile Insect Technique (SIT), ENT is studying use of the anitiviral drugs acyclovir and valacyclovir-HCl in Tse-tse flies in order to treat a syndrome known as *Glossina pallidipes* Salivary Gland Hypertrophy. As the name suggests, the syndrome is associated with hypertrophy of the fly's salivary glands but most significantly, reduced fecundity and subsequently sterility in infected flies. If not addressed, the syndrome presents a major drawback to mass rearing of Tse-tse flies, which is a prerequisite for SIT. It is important to find a suitable therapeutic remedy to this syndrome, given SIT's success stories such as the eradication of Tse-tse flies in Zanzibar, Tanzania. SIT remains an important component of integrated pest management in many countries.

One way to mitigate this drawback is to use the antiviral drugs acyclovir or valacyclovir. These drugs are commonly used in humans (and animals) to treat herpes viral infections. The *Glossina pallidipes* Salivary Gland Hypertrophy virus and the herpes virus exhibit genetic resemblance. The pharmacokinetics/bioavailability of these drugs in vertebrates is well documented. For example valacyclovir, a known pro-drug of acyclovir is almost completely converted to acyclovir when administered orally. However, the pharmacology of these drugs in invertebrates such as Tse-tse fly vectors is not known. This information, and thus the efficacy of these drugs for the *Glossina pallidipes* Salivary Gland Hypertrophy syndrome could be obtained by orally feeding Tse-tse flies with a blood meal containing the drugs, followed by analytical chemistry to assess the drug profiles. This is a novel area of study that requires ACU expertise.

Therefore, the objectives of the ACU were: 1) to develop an analytical method for the two antivirals, acyclovir and valacyclovir-HCl, in Tse-tse flies, using acyclovir and valacyclovir-HCl technical material as analytical standards; 2) to determine limits of detection and quantification for the two drugs; 3) to develop a suitable sample preparation regime to facilitate analysis of the two drugs in Tse-tse flies and; 4) to analyze samples prepared using the protocol developed for the presence of acyclovir and valacyclovir-HCl in Tse-tse flies that were previously fed blood containing the two drugs.

A liquid chromatography-tandem mass spectrometry method for the detection and quantitation of the antivirals was successfully developed and validated. The fitness-for-purpose of the method was demonstrated by its application to detect acyclovir in sets of flies fed with blood meals containing either acyclovir or valacyclovir-HCl). Valacyclovir was not detected in either group of flies at the analytical limits. These early observations are consistent with literature indicating that valacyclovir is a pro-drug of acyclovir, and that valacyclovir is usually converted extensively and almost completely to the active drug acyclovir. The findings provide a rationale for the drug of choice needed to address the challenges presented by *Glossina pallidipes* Salivary Gland Hypertrophy syndrome to SIT. This collaborative work is ongoing.

'ProSafeBeef' project

Technical Officer: James Sasanya

A multiresidue isotope-dilution liquid chromatography mass spectrometry method for the analysis of residues of 38 anthelmintic veterinary drugs in meat, including both internal (wormers) and external (acaricides) anti-parasitic compounds, has been developed and validated in the Unit in collaboration with Ashtown Food Research Centre Dublin, Ireland, under the EU 6th Framework Project 'ProSafeBeef'. The validated method has now been transferred to Microbioticos laboratories, a partner laboratory in Brazil.

The isotope dilution format used 10 deuterated compounds as internal standards for quantitation to improve precision and accuracy and enable the method to be used for the simultaneous detection and quantitation of 38 different anthelmintic compounds.

A scientist from Microbioticos laboratories was trained at the Unit for a period of 2 months in the use of isotope-dilution liquid chromatography mass spectrometry technology and participated in the method validation process (see the Fellows and Interns section below). Subsequently, the method will be transferred from Microbioticos laboratories to contract holders under CRP D5.20.36, 'Development of radiometric and allied analytical methods to strengthen national residue control programmes for antibiotics and anthelmintic veterinary drug residues' and to TCP counterparts under the project RLA/5/055, (ARCAL CIV), '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 and conventional analytical techniques'. Plans are underway to transfer the method to several other IAEA and FAO Member States.

Fellows and Interns

Ms. Amanda Caputti Caleffi, from Microbioticos Analises Laboratoriais Ltda, Campinas, Brazil, undertook a 2-month internship in the Agrochemicals Unit, from 22 June – 21 August 2009. Ms. Caleffi was trained in a liquid chromatographic-tandem mass spectrometric (LC-MSMS) isotope dilution method for the simultaneous

detection and quantitation of 38 anthelmintic compounds in meat (bovine muscle). The training included the set-up, calibration and optimisation of the LC-MSMS instrument, the use of stable isotopically labelled internal standards, sample preparation (extraction, clean-up and concentration), sample analysis, data acquisition and processing and data interpretation. After attaining proficiency in the method, Ms. Caleffi was involved in its validation, generating data to characterise the intra-laboratory reproducibility.

Ms. Caleffi's internship was funded by the EU 6th Framework Integrated Project 'ProSafeBeef', in which both Microbioticos and the Agrochemicals Unit are research partners. Upon return to her home institute, Ms. Caleffi will implement and validate the method for use in risk assessment surveys and screening for anthelmintic residues in beef. The data generated will be forwarded for compilation and evaluation by other members of the ProSafeBeef consortium working under the 'Chemical Residues' work package.

It is intended that Microbioticos will attain ISO17025 accreditation for the method and will also act as a regional hub of training for Latin America, primarily for technology transfer under TCP RLA/5/055.

Ms. Carolina Sheng Whei Miaw, from the Department of Food Engineering, University Centre of Belo Horizonte, Brazil, commenced a 5-month fellowship in the Agrochemicals Unit on 20 July 2009. Ms. Miaw was trained in the operation, maintenance and troubleshooting of gas chromatographic - mass spectrometric instrumentation in applications for the analysis of pesticide residues in environmental samples, including water and soil. Ms. Miaw also participated in the FAO/IAEA train-the-trainers workshop 'Screening/post-screening techniques for veterinary drug residues'. She is currently adapting and validating a multi contaminants method for meat and meat products using the QuEChERS method.

Mr. Rachmat Firmansyah, from the Department of Toxicology of the Research Institute for Veterinary Science (BALITVET), Bogor, Indonesia commenced a 6-week fellowship in connection with TCP INS/5/055, 'Enhancement of quality assurance for the analysis of veterinary drug residues'. Mr. Firmansyah participated in the FAO/IAEA train-the-trainers workshop 'Screening/post-screening techniques for veterinary drug residues' and undertook follow-up training in the Agrochemicals Unit in the operation, maintenance and troubleshooting of analytical instrumentation, and its application to the analysis of residues in food.

Ms. Van Nguyen Thi Thuy from the Centre for Nuclear Techniques, Ho Chi Minh City, Vietnam, commenced a 3-month fellowship in the Agrochemicals Unit on 2 November 2009. Ms. Nguyen Thi Thuy will be trained in the operation and maintenance and troubleshooting of chromatographic instrumentation, including basic training on hyphenated mass spectrometric techniques for pesticide residue analysis.

Mr. Muhammed Alamgir Zaman Chowdhury, of the Institute of Food and Radiation Biology, Bangladesh Atomic Energy Commisiion, Dhaka, who was undertaking fellowship training at the Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH (AGES) under TCP BGD/5/027, 'Establishing a Veterinary Drug Residue Laboratory', spent two weeks of his fellowship with the Agrochemicals Unit as a participant at the FAO/IAEA train-the-trainers workshop 'Screening/post-screening techniques for veterinary drug residues', 12-23 October 2009

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Technical Publication (IAEA-TECDOC-1612) Publication on Quality Control of Pesticide Products

Technical Officer: Josef Brodesser

The use of pesticides in agriculture over the last several decades has played an important role in enhancement of agricultural production and protection of the health of humans and animals. There is an increase in the amount of pesticide active ingredients used annually in spite of the fact that recently very effective active substances requiring only a few grams per hectare were introduced.

Two thirds of the plant protection products belong to the group of off-patent or generic pesticides. These are manufactured and formulated in many countries in countless establishments of varying size. Their production is not monitored by rigorous quality control programmes, and the estimated proportion of products of inferior quality amounts to about 25-45% in some countries. Furthermore, there are indications of an increasing number of counterfeit goods, which may significantly damage the crops and results in large losses in yield.

Registration requirements of pesticides may differ from country to country, but there is a general tendency to include data related to impurities of toxicological significance of the technical material in the registration documents. The new procedure for the development of FAO pesticide specifications requires, for the initial evaluation of a particular active ingredient, the 'data profile' for the technical material, i.e. the provision of reference to impurity, toxicology and ecotoxicology profiles. The minimum data package requires maximum limits for the content of impurities present at or above 0.1% m/m, and also maximum limits for relevant impurities present less than 0.1% m/m supported by batch analytical data.

The FAO specification outlined in the respective FAO Manual is a good starting point if other information is not available. However, those specifications are valid only for the named products and not generally applicable, because the nature and level of impurities depend on the manufacturing process. Some impurities may multiply the acute toxicity of the pure active substance. To check the impurities detailed information on the composition of the technical active ingredient should also be available to regulatory agencies and laboratories performing regulatory control.

The safety of pesticide products is an issue of great concern. Impurities in the technical active substances or in the materials used for preparing the formulations may multiply the acute toxicity of the pesticide, and may have other undesirable health and environmental effects. The products of inferior quality may include imported and locally produced pesticides, especially those containing so-called generic active ingredients, as

well as degraded, expired and smuggled products. Consequently, the quality of pesticide products should be regularly checked before and during they are placed on the market.

The regular quality control of pesticides marketed in a country is necessary to facilitate the safe and efficient use of pesticides for increasing the productivity of agriculture and protecting the environment at the same time. The quality control for the very large number of pesticide products can only be implemented in well-equipped laboratories, operated by trained and experienced staff applying analytical methods suitable for the serial analysis of various pesticides in a reliable and economical way. This goal cannot be achieved by the current standard methods, which are optimised and validated only for a particular formulated product.

The FAO specifications generally require collaboratively tested methods elaborated through the Collaborative International Pesticides Analytical Council (CIPAC) or the Association of Official Analytical Chemists (AOAC International). Most of the CIPAC/AOAC methods of analysis for pesticide formulations were validated for the analysis of individual pesticides. There are only a few official CIPAC/AOAC methods of analysis which can be characterized as 'multi analyte' methods.

In principle, any of these methods are only valid for those particular formulations for which they were validated. As the materials used for the formulation of another (generic) pesticide may be quite different from those used by the original manufacturer, the applicability of CIPAC, or any other, methods should be tested, modified if necessary, and validated for the particular formulation before use. Methods for the determination of one single compound are basically not applicable to mixtures (formulations with two or more active ingredients) of that compound with other pesticides. The same applies to the use of a method for the determination of a chemical in another type of formulation. Extreme precaution should be taken when applying a method to formulations or mixtures for other product(s) than it was originally developed for.

As a result of their independent development, the CIPAC and AOAC methods are based on numerous different chemicals, chromatographic columns and internal standards, which make their consistent application in regulatory laboratories, where several hundred different pesticide products should be analysed, practically impossible. Consequently, laboratories alter the critical parameters of the procedures without proper validation, and still claim that the CIPAC method is used, which may adversely affect the validity of the results.

Recognizing the need of regulatory laboratories, a coordinated research project (CRP) was initiated within the Joint Programme of FAO and IAEA for developing methods which are suitable for the analysis of various types of pesticides with the same instrument setup, and to verify the practical applicability of the principles under different laboratory conditions. The aim was to assist national pesticide control agencies to assure the quality of pesticide products and hence support legislation concerned with food quality and environmental protection, by:

- Developing the principles of elaboration and validation of pesticide formulation control multi methods.
- Testing the repeatability and reproducibility of the individual processes in the participating laboratories.
- Elaborating/adapting chromatographic methods which are suitable for the determination of the active ingredient(s) of several classes of pesticide formulations.
- Validating analytical methods for quality control of pesticides of local importance.
- Demonstrating the practical applicability of the multi pesticide formulation control methods.

The CRP was implemented from 2001 to 2006. The resulting IAEA-TECDOC summarizes the results in four main chapters including:

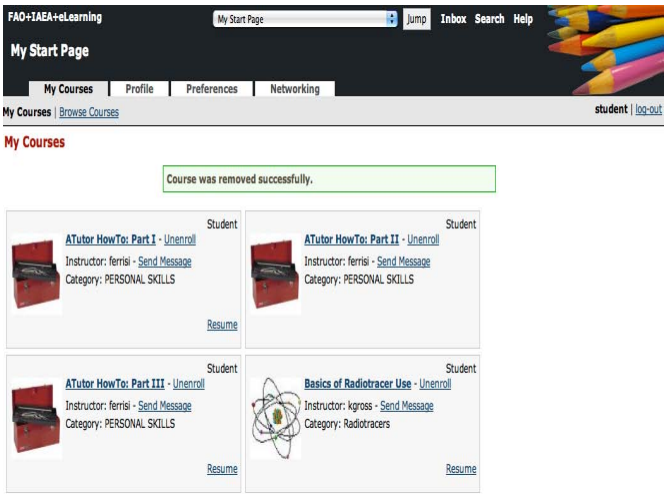
- General documents aiming to provide guidance to analysts wishing to perform single laboratory validation of methods for pesticide formulation or technical active substance control.
- Summary of results of optimisation of chromatographic conditions for determination of various active substances of pesticides obtained by the participants.
- Pesticide multi methods developed, which illustrate the practical applicability of the principles elaborated.
- Synthesis, identification and determination of impurities in technical products.

The results of the project reported in the recently released IAEA-TECDOC-1612 provide guidance for developing 'Multi Pesticide Methods', MPM, and examples for the analysis of particular products. By describing the underlying principles in detail it may also serve as a training manual for the staff of respective laboratories.

New FAO/IAEA eLearning Server and Infrastructure (Max Falcinelli, Ian Ferris, Britt Maestroni, and Mani Yadav)

Since 2004, IAEA's Division of Information Technology (MTIT) has hosted FAO/IAEA eLearning providing a mechanism to accelerate capacity building in developing countries related to food and environmental protection. ATutor provides the overarching Web-based Learning Content Management System to link to com-

mon database resources such as glossary terms, references and multimedia as well as slide shows and eArticles. However, information and communications technologies have undergone dramatic changes in the last five years creating new opportunities and threats. To keep pace, MTIT implemented a three-pronged strategy: updating server hardware; revising the infrastructure; and updating ATutor. Work started in early 2009 with the installation of new server hardware capable of transmitting Ethernet frames at a rate of a gigabit per second. A virtual machine was created to duplicate the machine hardware in an isolated environment that included all the dependencies required for the most recent ATutor version. By June 2009 all infrastructure was in place to enable migration to the latest ATutor. Testing by course instructors identified a large number of issues including legacy issues. These were all addressed before the old server was decommissioned on 28 August 2009. The stepwise migration ensured that interruptions to Clients were minimized with a drop in bug counts (mainly service interruptions) from an average of about 350/month to zero.



The ATutor upgrade added many features. One of the most important was OpenSocial based on the Google OpenSocial standard (http://www.opensocial.org/page/building-opensocial-apps). Applications are based on the Widget or Gadget part of the OpenSocial standard. Gadgets are available for a wide range of purposes, from simply network task list to laboratory utilities such as solution thus addressing real world problems. ATutor Social is a social networking module that allows ATutor users to connect with each other. They can gather contacts, create a public profile, track network activity, create and join groups, and customize the environment with any of the thousands of OpenSocial gadgets available all over the Web. ATutor Social can be used alone as a social networking application, or it can be used with the ATutor Learning Management System to create a social learning environment.

This major ATutor upgrade brings many new features to the learners such as:

- **Accessibility (My Start Page > Preferences):** AccessForAll support allows learners to configure the environment and content to their specific needs. Tabs include: ATutor Settings (the old preference settings, for controlling key ATutor related functionality); Display Settings (visual display characteristics such as text size, font type, and colour as well as a preview window); Content Settings (control over display of adapted content including visual, audio, textual adaptations with options to replace or supplement original content, choosing a preferred language for adapted resources); Tool Settings (learning scaffolds displayed, such as a dictionary, calculator, or encyclopedia and note taking); and the very important Control Settings (tables of contents, sequence links display of breadcrumbs or navigation path).
- **Security:** Login passwords are encrypted. Forgotten passwords must be reset, rather than retrieved by email, removing the possibility they might be intercepted when being sent over the Internet.
- **My Courses:** Instructors and students can manage the ATutor courses they teach and/or are enrolled in. When a student registers they are automatically logged into My Courses.
- **Inbox/Messaging:** All users on an ATutor system have an Inbox, through which they can send and receive private messages from other users. Messages sent are saved to Sent Messages, which remain for a set period before being deleted. Messages can be exported and saved externally.
- **Student Profile:** Students can add personal information about themselves for other to see, and include a profile picture, which is also displayed with forum posts.
- **Adaptive Navigation:** Learners can move through ATutor content using global, hierarchical, or sequential navigation tools. Navigation elements can be displayed as text, icons, or both text and icons, and they can be hidden to simplify the environment.
- **Work Groups:** Learners can collaborate with others on course projects, communicate as a group through the forums share resources using the File Storage, and work together authoring project documents. Exercises or assignments can be submitted to the group leader, or course instructor.
- **File Storage:** All users on an ATutor system have their own file storage utility. File storage areas can also be shared across groups, or an

entire course. Version control can be enabled to keep track of drafts or changes to documents.

- **Group Blog:** Each group has access to their own blog, to which they can post public messages, available to all course member, or private messages, available only to group members and instructors. LaTeX formatted mathematical notation and multimedia objects may be inserted into blog postings.
- **Feedback:** Following an action (such as saving preference settings, or posting a message), feedback is given on the status of the operation. This could be a success message, warnings to consider, or errors to fix.
- **Preference Settings:** Learners can control ATutor features and the theme ATutor is presented in.
- **Communication Tools:** Learners can communicate with others using ATutor's private mail, the discussion forums, the chat rooms, or the 'User's Online' tool. Threads and messages can be sorted in a variety of ways. Students can communicate with those in other courses through shared forum, or a community forum. Subscribe to forums or topic threads to have forum messages sent by email. Students can edit their forum posts for a specified number of minutes. Students can search through forum messages in the current course, enrolled courses, or all available courses.
- **Content Package Viewer:** Learners can export content from ATutor as Content Packages that can be viewed offline in the accompanying viewer.
- **Content Tracker:** Learners can keep track of the content pages they have visited.
- **Test Manager:** Learners can take tests, review test results, and keep track of their scores. Course Guests can take practice tests. Students can return to a test previous started but not completed, and begin where they left off.
- **Links Database:** Each course, and groups within courses, has a tool for collecting links to Web-based information. Both students and instructors can add links. Instructors can manage course links, and students can manage group links.
- **Course Search:** A search engine allows learners to search course content. Search for courses in the course catalogue.

Many more features have been added for instructors, administrators and developers. A full description can be obtained from http://www-naweb.iaea.org/nafa/fep/elearning/news.pdf

In conclusion, the new server architecture has improved system security, reliability and accessibility as well as added important features to FAO/IAEA eLearning needed to accelerate capacity building. If you have not done so already, create a free account and start networking by visiting (http://eLearning.iaea.org).

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