Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Food & Environmental Protection Newsletter

Vol. 15, No. 2 July 2012

http://www-naweb.iaea.org/nafa/index.html
http://www.fao.org/ag/portal/index_en.html

ISSN 1020-6671

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To the Reader

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

In the area of food contamination, we are pleased to report that our recently obtained extra-budgetary funding under the US Peaceful Uses Initiative (PUI) will go a long way towards filling our financial and human resource needs for this project in the coming biennium. More specifically, our approved and funded PUI project on the Sustainability of Capacity Building Activities to Improve Food Safety and Quality through Nuclear Technology and Networking, which targets countries in Africa, Asia and South America, aims to build infrastructure for the intervention of donor organizations (regionally and internationally) to implement food control systems and ultimately to contribute to enhanced food safety and quality. The project will follow a modular approach by applying successful tactics adopted in other countries and coordinating donor resources to accelerate the commissioning of laboratories and state of the art analytical equipment.

IAEA International Atomic Energy Agency

Train-the-trainer and other capacity development activities under PUI funding will be undertaken in part through cooperation in the 2012-2013 biennium with our newly re-designated IAEA Collaborating Centre on eLearning and Accelerated Capacity Building for Food and Environmental Protection under the Centro de Investigación en Contaminación Ambiental (CICA) at the University of Costa Rica. While expressing our gratitude for the contributions that CICA has made to our activities and the benefits that our collaboration has brought to the IAEA Member States, we also look forward to the joint execution of our activities to improve the sustainability of food controls through the enhancement of laboratory capabilities, practices and methodologies that promote food safety and quality worldwide.

In the area of food irradiation, we are also pleased to report that the Advanced Radiation Technology Institute (ARTI) of the Korea Atomic Energy Research Institute (KAERI) was newly designated as an IAEA Collaborating Centre for Radiation Processing for Environmental Remediation, Advanced Materials and Food Irradiation in May 2012. Our jointly developed four year Collaborating Centre work plan will assist the IAEA in research and capacity building in irradiation processes and technologies leading to the development of safe, high quality and wholesome foodstuffs and will undertake activities related to industrial applications of radiation technologies in the areas of food science, biotechnology and agriculture.

These collaborating centers will bring further strength and benefits to our efforts dedicated to peaceful uses of nuclear sciences and applications in our Member States, and will assist the IAEA in meeting the United Nations Millennium Development Goals through the use of nuclear technologies where these bring unique advantages.

Our Feature Article in this issue provides a creative overview of the experiences of our intern, Mr Sorivan Chhem-Kieth, who recently completed his duties with the Food and Environmental Protection Laboratory in Seibersdorf. As many of you are aware, the IAEA accepts a limited number of interns each year who are studying toward a university degree or have recently received a degree. Internships normally range from one month to one year in duration, and provide an excellent opportunity to gain practical experience in an international environment. Sorivan relates his personal experiences and opportunities through his immersion in different disciplines, training courses and regional coordination programmes.

Last but not least, the IAEA Scientific Forum on 'Food for the Future: Meeting the Challenges with Nuclear Applications', will be held from 18-19 September 2012 during the 56th Session of the IAEA General Conference. The Scientific Forum, which will include three separate sessions on Increasing Food Production, Ensuring Food Protection and Enhancing Food Safety, will discuss the challenges and solutions to satisfy food demands from a growing population as well as the roles played by nuclear applications in food and agricultural production. The Joint FAO/IAEA Division, together with the IAEA Technical Cooperation Department, is supporting this commendable event through multiple activities that will be highlighted at the Forum.

In closing, we extend our warmest welcome to our new fellows Mr Zhu Jie from the Chinese Academy of Agricultural Sciences, and Ms Kefilwe Precious Gadimorone from the Botswana National Veterinary Laboratory, who recently took up their duties at the Food and Environmental Protection Laboratory in Seibersdorf. We are also pleased to report that our intern Mr Wolfgang Werner from Costa Rica extended his internship at the laboratory through August 2012. And finally, we send our best wishes to our fellow Mr Khaled El-Hawari from the Lebanese Laboratory for the Analysis of Pesticides and Organic Pollutants, and to our intern Ms Malia Gallucio from Costa Rica, for their continued health and happiness in their new careers.

Best wishes to you and your families for a safe, healthy and happy holiday this summer season.

Sincerely,

David H. Byron

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Feature Article

A personal experience – 18 months as an Intern at the IAEA

By Sorivan Chhem-Kieth

It really started at Gate 1 of the Vienna International Center. Freshly arrived from Montreal, Canada, I was about to take my first steps as an intern at the International Atomic Energy Agency in Austria. If those first steps were something one thinks about for weeks, months, it's really at the moment my grounds pass was handed down that I felt that something big was about to happen. Me, at the age of 22, who just obtained his Bachelor degree, was about to have my first 'real' professional experience in one of the biggest and most influential international organizations in the world; for 12 months, I was going to work in the Seibersdorf laboratories, for the Food and Environmental Protection Laboratory (FEPL). But if I knew that it was starting there, I didn't realize that it would not simply finish after a year, not by a long shot…

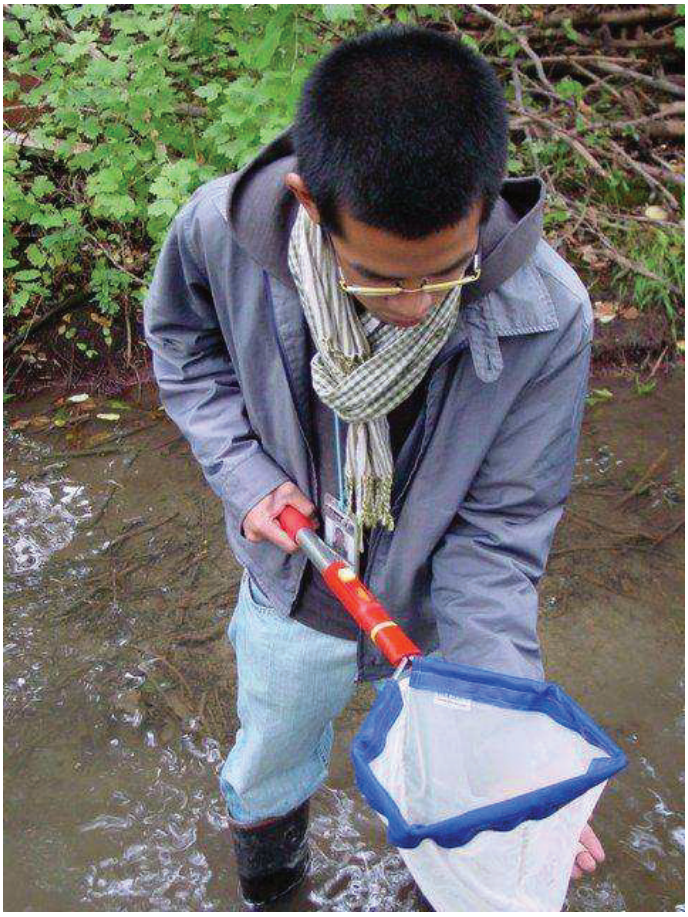
Sorivan Chhem-Kieth 1/4

I was welcomed by the head of the Laboratory, Andrew Cannavan. Feeling so small in the laboratory, around all those analytical instruments that were so scarcely used by undergrads back at my University, I quickly took my marks around, thanks to the other members of the FEPL, who made me realize that my apprehension about being confined in a 'photocopy internship' were nothing short of ridiculous. Not only with Mr Cannavan (who I would later refer to simply as 'Boss'), I also was lucky enough to end up with one of the liveliest sections of Seibersdorf. My direct supervisor, Britt, with her never ending ideas and projects; the lab technician, Nasir, as much competent as he is open and pleasant to work with; the consultants, Zora and James, so knowledgeable and always ready to help… That list of people that trained and taught me would eventually grow indefinitely, with staff members, consultants, fellows and interns that joined the FEPL later, came from other lab Units, from the IAEA's headquarters, or sent by member states. After only a few weeks, I was up and running in Seibersdorf, which eventually appeared to me as a big family house, with so many different people, with its daily routine and occasional malfunctions, and its peculiar atmosphere.

Sorivan Chhem-Kieth 2/4

In my case, I found this internship's real worth in the people working with me. I had the incredible opportunity to be immersed in different studies, training courses and regional coordination programmes, learning not only from my laboratory, but also from speaking with participants, researchers, and directors of other facilities about their own work, their problems and their successes. Initially attached in Seibersdorf to the other staff member's projects, I spent the first months on distinctive topics such as traceability of fruits and vegetables using stable isotopes, quality control of veterinary drugs and contaminant determination in soil and food samples. Thanks to the focus of the studies being so varied, I was able to familiarize myself in a short span of time with several sample preparation and analysis techniques, including the use of gas and liquid chromatography, mass spectrometer, cavity-ring-down spectroscopy for isotopic measurements, and sample oxidizer and liquid scintillation counter for detection and quantification of radioactive substances. In addition to being trained by qualified people and obtaining a firm grasp on techniques widely used in

the industry, I had the opportunity to attend meetings and seminars given by peer scientists and companies, and to create professional and friendly contacts with people from different laboratories, universities and corporations around the world. Those 12 months passed in such a flash that, even if I knew I learned more in a year than in the last three before that, I felt like I could do more, and get more from Seibersdorf and the IAEA. With the approbation of my supervisor, I obtained a 6 month contract extension, with in addition a shared internship between the FEPL and the Soil and Water Management and Crop Nutrition Laboratory (SWMCNL). The initial year, which fulfilled all my expectations and even more, was thus continuing…



Sorivan Chhem-Kieth 3/4

It is also of note that as far as internships go, the IAEA is most probably one of the best organizations to join. I would have not been able to stay a year, even less 18 months, if it was not for the stipend provided for interns without any financial support from an institution or from relatives. Staying so long permitted me not only to gain a considerable amount of knowledge, but also to work in a quasi-fully autonomous manner in the laboratory, even with my unchanged intern status. Thus following through with the projects of the FEPL, I also met new co-workers: Marivil and Khaled, Aiman and Russell, fellow interns Malia and Wolfgang. With a full staff, the laboratory was even more busy and lively. In addition, I was now dealing with my alternating contract under the supervision of Lionel Mabit and Arnie Toloza in the SWMCNL. I was introduced by Lionel to the use of fallout radionuclide (FRN) based methodologies for assessing soil erosion and the efficiency of soil conservation measures in agricultural lands, and was deeply involved in the publication process of related papers. Looking back at my colleagues of the FEPL and the SWMCNL, I now realize that I was working with some of the best people I could have ever hoped for: they weren`t interns, staff, consultants, but rather colleagues and friends completing the work assigned, making use of each other's strengths and complementing one's weaknesses. And the occasional coffee breaks and after-work drinks kept the working mood quite enjoyable…

Sorivan Chhem-Kieth 4/4

Now that those 18 months are quickly reaching an end, I slowly comprehend how much has been done since, and how invaluable this experience was, professionally and socially. I trained hands-on with several analytical instruments in a well-equipped laboratory; I had a deep insight on the functioning of a massive organization; and most important, I met incredible people. I'm going away with outputs, publications and a practical knowledge unavailable from the benches of a university; I'm going towards a 5 months working position in a Chilean food and feed product analysis laboratory; and I know I will be fully prepared when I return for my studies. Initially in Vienna for a 12 month period, I now cannot see the end to the path my time in the Agency created. And it is thanks to this internship and to the people I met and who taught me so much. Thank you.

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Past Events

Codex Committee on Residues of Veterinary Drugs in Foods, 20th Session, San Juan, Puerto Rico; 6–11 May 2012

Technical Officer: James Sasanya

On 5 May 2012 Mr Sasanya travelled to Puerto Rico to attend the 20th Session of the Codex Committee on Residue of Veterinary Drugs in Foods (CCRVDF), held from May 7–11 2012, and two working group meetings on 6 May 2012. During the meeting he presented a report on activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture relevant to Codex Work. Mr Sasanya also contributed oral interventions during the plenary sessions, including on relations between the Joint FAO/WHO Codex Alimentarius Commission and other international organizations. Furthermore, Mr Sasanya made presentations on methods of analysis related to proposed draft guidelines on performance characteristics for multi-residues methods (CAC/GL 71-2009) that included an oral intervention and a Power Point presentation.

Mr Sasanya highlighted activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture that are of interest to the CCRVDF as detailed in document CX/RVDF 12/20/3 Add. He informed the committee that the Joint FAO/IAEA Division continues to strengthen its collaborative efforts with sister divisions at FAO Headquarters to improve food safety, protect consumer health and facilitate international agricultural trade by providing assistance in diverse areas. One such area is the ongoing Coordinated Research Project (CRP) on Analytical Methods to Strengthen National Residue Control Programmes, focusing on areas of priority and concern to developing countries.

This CRP is investigating, among others, sources of natural antimicrobial compounds likely to impact the regulatory framework for veterinary drug residues as well as the distribution of veterinary drugs in the environment. Mr Sasanya also reported on another CRP on traceability helping laboratories in Member States to establish robust analytical techniques to determine the origin of food through the assessment of isotopic and elemental composition of foodstuffs.

Mr Sasanya further reported how the Division continues to support developing countries in establishing national and regional residue control laboratories through technical cooperation projects. He also highlighted the new initiative involving the establishment of inter-regional laboratory networks through technical cooperation as well as extra-budgetary support such as the Peaceful Uses Initiative.

Mr Sasanya brought to the CCRVDF's attention how the Joint FAO/IAEA Division was working in association with the FAO, IFAH, UNIDO and GALVmed as well as Strathclyde and Manchester Metropolitan Universities to address the problems associated with the use of counterfeit and low quality veterinary pharmaceuticals and to develop protocols for quality control/quality assurance for trypanocidal and other veterinary drugs. Mr Sasanya also added that prepared monographs were due for publication, and that plans to transfer the technology to member states were in advanced stages.

The Joint FAO/IAEA Division was thanked by the Committee for developing the database on analytical methods (see Publications for details) and encouraged countries to provide additional information and data. Mr Sasanya also delivered a Power Point presentation on 8 May attended by over 70% of the delegates whose enthusiastic response indicated the need for methods/information or the willingness to contribute methods/information, e.g. reference standards sought by many Member States. Copies of the presentation were requested to facilitate database access by Burkina Faso, Cameroon, Cote d'Ivoire, Egypt, Japan, Morocco, Nigeria, Thailand, and Trinidad and Tobago. Willing contributors included the Philippines, the US Department of Agriculture, who provided a link to an entire laboratory guidebook of analytical methods, and Brazil (to submit and access information). Australia promised to provide information on reference standards, while South Africa and Belgium also expressed a willingness to submit methods through relevant laboratories. Although delegates were eager to access the database, Mr Sasanya informed them that the website will soon be active following a testing process by the IAEA. It was agreed that once the database was active, the URL would be sent to the CODEX Secretariat for distribution to Member States as soon as possible. Given the Joint FAO/IAEA Division's contribution, the committee also agreed to forward the 'Compendium of Methods of Analysis as Suitable for Support of Codex MRLs' for publication on the database.

Mr Sasanya also participated in the working groups on risk analysis principles, priorities and on sampling plans for aquaculture products. On banned substances, Mr Sasanya reminded the committee of continued research on potential natural sources of chloramphenicol and shared a publication on the subject with the FAO Secretariat to the Joint FAO/WHO Expert Committee of Food Additives.

The role of the Joint FAO/IAEA Division, alone or in partnership with other global institutions, continues to be appreciated around the world as demonstrated by the enthusiasm witnessed at the recent CCRVDF meeting where deliberations centred on pertinent issues of public health and trade.

This included additional requests from a Japanese particpant at the Codex Committee on Contaminants in

Foods who requested information on proposed revisions to the Codex Guideline Levels for Radionuclides. This work was presented at the most recent CCCF meeting held in the Netherlands, where activities of the Joint FAO/IAEA Division were presented in absentia. The Japanese delegation at the CCRVDF also used this opportunity to thank the Joint Division and the IAEA in general for the support to Japan during the recent Fukushima nuclear emergency. Another interest was expressed by the delegation from Brazil on Joint FAO/IAEA Divison activities in emergency preparedness and response as a result of nuclear or radiological emergencies.

Thus, both developed and developing Member States, as well as Codex observer organizations, continue to look forward to the contributions of, and networking with, the Joint FAO/IAEA Division.

Codex Committee on Pesticide Residues, 44th Session; Shanghai, China; 23–28 April 2012

Technical Officer: David H. Byron

An information document (CX/PR 12/44/4) on Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Relevant to Codex Work was presented by the Codex Secretariat at the 44th Session of the Codex Committee on Pesticide Residues (CCPR) in Shanghai, China, from 23–28 April 2012.

Among other things, the information document highlighted the new Food Contaminant and Residue Information System (FCRIS) web application, which is currently being created and revised on the basis of the existing Joint Division INFOCRIS database, as a compendium of certain contaminants in foods in a user friendly platform that facilitates the uploading of new information (see Publications for details).

The associated Pesticide Attributes Database (PAD) and Pesticide Residue Methods (PRM) database are being developed as resources for physicochemical / toxicological data and for methods of analysis for pesticides, respectively.

In discussing the new FCRIS and associated PAD and PRM databases in the context of the Codex Standard on the Analysis of Pesticide Residues: Recommended Methods (CODEX STAN 229-1993), the Committee agreed to recommend the revocation of the Standard to the Joint FAO/WHO Codex Alimentarius Commission. Depending on the decision of the Commission, it was suggested that the FCRIS database could be the primary repository of analytical methods for the determination of pesticide residues.

FCRIS and the related PAD and PRM databases still require further review and refinement before publication on the Joint Division website. In the meantime, we welcome the submission of additional information from Codex members and observers through established Codex procedures. The Joint FAO/IAEA Division looks forward to establishing the database as a resource in collaboration with the Joint FAO/WHO Codex Alimentarius Commission.

Texas A&M National Center for Electron Beam Research Workshop in Electron Beam and Xray Irradiation Technologies, College Station, Texas, USA; 2–6 April 2012

Technical Officer: David H. Byron

The role of food irradiation in improving food safety and quality, and in reducing the risk of food borne diseases, is clear. The World Health Organization estimates that food borne and water borne diseases kill 2.2 million people annually – and over 1.9 million of them are children – this is unacceptable. Food irradiation also plays a key role in reducing food spoilage and in preventing the loss and waste of foodstuffs through harmful insect pests. According to the United Nations Food and Agriculture Organization, approximately one third, or 1.3 billion tonnes, of the total food produced for human consumption every year is lost or wasted. Food losses, which occur at the production, harvest, post-harvest and processing phases, are most prevalent in developing countries, mainly due to factors such as poor infrastructures, low levels of technology and low investment in food production systems. Food waste, on the other hand, is more of a problem in industrialized countries, most often caused by retailers and consumers, where perfectly edible foodstuffs are routinely discarded. Improving food quality and safety through the reduction of food borne diseases, as well as the reduction of food losses and waste, through the safe application of food irradiation technologies could therefore have an immediate and significant impact on global food security.

Food irradiation is one of the few technologies which addresses both food quality and safety by virtue of its ability to control spoilage and food borne pathogenic microorganisms, as well as harmful insect pests, without significantly affecting sensory or other organoleptic attributes of foods. Foods are irradiated to provide the same benefits as processing by heat, refrigeration, freezing or chemical treatments without significantly raising food temperatures or leaving potentially harmful residues. Irradiation can also be used to protect both packaged and unpackaged food products from microbiological hazards.

The technical officer highlighted these facts during his participation and presentation of a keynote opening speech at the Hands-On Workshop in Electron Beam and Xray Irradiation Technologies that was hosted by the Texas A&M National Center for Electron Beam Research in College Station, Texas, from 1–6 April 2012. A report on the global activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture related to

food irradiation was also presented at the Workshop. The National Center for Electron Beam Research at Texas A&M University serves as an un-biased venue for academic, government, and industry scientists to carry out strategic electronic pasteurization and sterilization research and commercial projects using E beam and X rays.

Workshop deliberations and discussions covered the ongoing strengthening of joint activities as well as possible future collaboration with the Joint FAO/IAEA Division in addressing the needs of the food, plant and agribusiness industries, food inspectors, and regulatory officials through the use of sanitary and phytosanitary applications of food irradiation. The Workshop promoted a strong understanding of E beam and X ray irradiation technologies and illustrated how these technologies can be utilized in collaboration with the Joint FAO/IAEA Division to improve consumer protection, to control insect pests and to facilitate international trade in fresh produce.

Participants of the Electron Beam Research Workshop in Texas, USA

While noting that food irradiation, especially related to the phytosanitary control of insect pests for quarantine purposes, is rapidly expanding in the North and South American regions, the Workshop highlighted the critical need for Joint FAO/IAEA Division assistance in the promotion of irradiation technologies through ongoing and future research on generic irradiation doses for the treatment of insect pests; for the use of sanitary applications of irradiation technologies for pre-packed foodstuffs; for capacity building and technology transfer through technical cooperation programs related to the establishment, audit and accreditation of food irradiation facilities; and for the development of protocols to facilitate the export and import of fresh produce, including the treatment of produce at Texas A&M facilities.

The Workshop and subsequent discussions with university staff provided an excellent opportunity to review ongoing and potential partnerships and collaborative activities with Texas A&M University, including the AgriLife Research Program; the Division of Research; the College of Agriculture and Life Sciences; the College of Veterinary Medicine and Biomedical Sciences; the Nuclear Power Institute; the United States Department of Agriculture - Animal and Plant Health Inspection Service; IBA Industrial; and L3 Applied Technologies. Discussions with university staff also resulted in the agreement of the Director of Texas A&M AgriLife Research, Mr. Craig L. Nessler, to participate and present remarks at the forthcoming food irradiation session at the IAEA Scientific Forum on Food for the Future: Meeting the Challenges for Nuclear Applications.

The Food and Environmental Protection subprogramme thanks Texas A&M, and in particular the National Center for Electron Beam Research, for sponsoring and financing our participation at this important event.

Codex Committee on Contaminants in Foods, 6th Session, Maastricht, the Netherlands; 26–30 March 2012

Technical Officer: David H. Byron

An information document (CX/CF 12/6/6) on Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Relevant to Codex Work was presented by the Codex Secretariat at the 6th Session of the Codex Committee on Contaminants in Foods (CCCF) in Maastricht, the Netherlands, from 26–30 March 2012.

Among other things, the information document highlighted Joint FAO/IAEA Division activities related to preparedness and response to nuclear and radiological emergencies affecting food and agriculture, including activities related to the Fukushima nuclear accident. In this regard, the CCCF noted that the 16th Meeting (May 2011) of the Interagency Committee on Radiation Safety (IACRS) was of the opinion that the excessively low values for iodine in the Joint FAO/WHO Codex Alimentarius Guideline Levels for Radionuclides in Foods could justify the revision of the Standard (see Past Events section of the May 2011 FEP Newsletter). The WHO representative at the CCCF also noted that several countries struggled with the interpretation and application of the Guideline Levels and that there may be some merit in looking into their possible revision and/or clarification.

In view of the above discussions, the CCCF agreed to establish an electronic Working Group to start new work on the Guideline Levels for comment and further consideration by the next session, subject to approval by the 35th Session of the Commission. The Working Group would review the current Guideline Levels and develop in connection with this review clear guidance on the interpretation and application of the standard. The Committee noted the importance of involving the IAEA and other relevant organizations in this work.

The Joint FAO/IAEA Division looks forward to future collaboration with the Joint FAO/WHO Codex Alimentarius Commission in further strengthening FAO preparedness and response to nuclear and radiological emergencies affecting food and agriculture, including collaboration in the potential revision of the Codex Guideline Levels for Radionuclides in Foods..

Fourth Annual Meeting of the EU 7th Framework project 'CONffIDENCE', Liege, Belgium; 21–22 March 2012

Technial Officer: Andrew Cannavan

The EU 7th Framework Integrated Project 'Contaminants in Food and Feed: Inexpensive Detection for Control of Exposure' (CONffIDENCE) is a 4-year project with 17 partners from 10 countries and a budget of €7.5 million, of which €5.8 million is from the EC. The main objective of the project is the development of novel, multiplex screening methods for a wide range of contaminants in high risk products such as fish and cereal based food and feed, and vegetables. The validated methods will be applied to provide data for risk assessment and for regulatory systems for food safety.

The fourth annual meeting of the CONffIDENCE project was held on 21–22 March in Liege, Belgium. The meeting included plenary sessions at which each project work package leader presented the results of their research and development in the current phase of the project, individual work package meetings, meetings of the Project Management Board and the Advisory Board, and finally a meeting of the Project Management Board with the Advisory Board. The FEP Laboratory Head participated in the meeting as chair of the Advisory Board and also contributed to the work package meetings on plant toxins and antibiotics, which are areas of work with complementarities to some of the research being performed in the Food and Environmental Protection Laboratory at Seibersdorf. The programme also included a visit to the Centre d'Economie Rurale (CER) laboratories in Marloie, where opportunities for collaboration in various research projects were discussed with the director and staff.

The CONffIDENCE project was scheduled to end in March 2012, but has been extended by the European Commission until December 2012 to allow the completion of some areas of promising research and the inter-laboratory validation of several of the methods produced. The Advisory Board was asked for, and provided, advice on several aspects of the additional work to be undertaken and the method validation studies.

The project has resulted in the development of several simple, cheap, robust and portable test methods to enhance food safety both within and outside Europe. The methods will be validated in the final phase of the project in 2012. Some of these test methods will be transferrable to Member States through the IAEA TC mechanism.

The inclusion of an IAEA representative in an advisory capacity in the above and similar projects helps to guide the project work plan and to facilitate the effective transfer of the technologies developed to a wider customer base, including IAEA developing country Member States that are unable to undertake the primary research and development themselves. This adds value to the project outcomes through the enhancement of food safety both within and outside the EU, and through increased potential to meet the requirements for trade between developing countries and the major trading blocks of the developed world. The appropriate results of the EU project, in terms of analytical methodology developed, can be utilised to enhance capacity building through the IAEA TC mechanism.

31st Meeting of the Radiation Safety Standards Committee (RASSC), IAEA Headquarters, Vienna, Austria; 13–15 December 2011

Technical Officer: David H. Byron

At the 31st RASSC[1] meeting, the technical officer noted that on 29 October 2011 the Director General of FAO, Mr Jacques Diouf, confirmed the Organization's endorsement and co-sponsorship of the International Basic Safety Standards (BSS) for Radiation Protection and Safety of Radiation Sources.

The FAO Director General further noted that the organization has been officially represented and actively involved through the Joint FAO/IAEA Division since October 2006 in the Inter-Agency BSS Secretariat for the coordination of the BSS preparation, and that Joint Division representation ensured full collaboration with other members of the BSS Secretariat to confirm that those provisions of the BSS related to food and agriculture adequately reflect the demands of FAO Member States. The Director General of FAO concluded that the organization looks forward to further cooperation in this field.

These activities are carried out within the context of FAO obligations as a full party to the IAEA Early Notification and Assistance conventions, and under the FAO cosponsored Joint Radiation Emergency Management Plan of the International Organizations (EPR JPLAN 2010), which provides the management tools for coordinating international organization arrangements in preparing for, and responding to, nuclear or radiological emergencies. These practical arrangements are also reflected in the Cooperative Arrangements between FAO and IAEA in Response to Nuclear or Radiological Emergencies.

The technical officer informed the meeting that these FAO activities related to the Japanese nuclear emergency conducted under these conventions and agreements helped to ensure the dissemination of information on food monitoring and food restrictions, the consideration of agricultural countermeasures and remediation strategies to mitigate immediate and longer term effects arising from radionuclide contamination, and the interpretation of standards related to radiological protection of the public, to both FAO and IAEA and other international organization Member States.

1 Please see the FEP Newsletter January 2012 for mandate and and fuctions of the Radiation Safety Standards Committee (RASSC).

Specifically, recent and ongoing activities of the Joint FAO/IAEA Division and FAO Headquarters Divisions include the following[2]:

- Represented FAO and IAEA in video/teleconferences through the IACRNE to ensure a unified approach in addressing issues related to food and agriculture.
- Established a multi-functional database for the management of data submitted by the Japanese authorities. This enabled the creation of predefined reports with 'real time' data.
- Participation in, and follow-up to, the IAEA Mission to Japan on the Remediation of Large Contaminated Areas Off-Site the Fukushima Daiichi Nuclear Power Plant (7–15 October 2011).

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

22nd Meeting of the Interagency Committee on Radiological and Nuclear Emergencies, Paris, France; 7–9 December 2011

Technical Officer: David H. Byron

The 22nd Meeting of the Interagency Committee on Nuclear and Radiological Emergencies (IACRNE) took place in Paris, France from 7–9 December 2011 at the invitation of the IAEA. The OECD hosted the meeting.

David H. Byron represented the Joint FAO/IAEA Division and Mr. Andrew Sobey, Liaison and Operations Officer, FAO Technical Cooperation Department, represented FAO Headquarters.

FAO regularly participates in the IAEA sponsored IACRNE meetings, whose purpose is to coordinate the arrangements of the relevant international intergovernmental organizations in preparing for and responding to nuclear and radiological emergencies, including their participation in international nuclear emergency exercises.

Representatives of 14 IACRNE participating organizations attended the meeting (EC, EUROPOL, FAO, IAEA, ICAO, INTERPOL, IMO, NEA/OECD, OCHA, PAHO, UNEP, UNSCEAR, WHO and WMO). In addition, representatives of CTBTO, IATA, ILO, ODA (for CTITF), NATO (CEP), NCACG, UN DSS and UNESCO attended the meeting as observers.

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

FAO activities related to the Japanese nuclear emergency helped to ensure the dissemination of information on food monitoring and food restrictions, the consideration of agricultural countermeasures and remediation strategies to mitigate immediate and longer term effects arising from radionuclide contamination, and the interpretation of standards related to radiological protection of the public, to both FAO and IAEA and other international organization Member States.

The FAO representatives anticipated that all of the conclusions and recommendations concerning the strengthening of FAO preparedness and response to nuclear and radiological emergencies affecting food and agriculture will be considered by the Joint Division and relevant FAO divisions in the near future (see Past Events of this Newsletter, 31st Meeting of the Radiation Safety Standards Committee, for details).

High Level Meeting on the Role of the Analytical Laboratory in the Provision of Risk Assessment Data in the Context of Risk Management and Risk Communication for Food Safety, San José, Costa Rica; 2 December 2011

Technical Officer: Britt Maestroni

The IAEA, in collaboration with the University of Costa Rica (UCR), FAO and ARCAL, hosted a high level meeting in San José, Costa Rica on 2 December 2011 in connection with the completion of the ARCAL project RLA5053 on 'Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean (LAC) Region'. The objective of the meeting was to raise awareness about the central role played by analytical laboratories in the farm to fork chain, especially in the provision of risk assessment data in the context of risk management and risk communication in national and regional food safety contexts.

Along with the Costa Rican Minister for Science and Technology, ambassadors from Brazil, Ecuador and El Salvador participated at the outreach event. About 60 people attend the meeting.

The event provided an excellent forum for dialogue between high-level decision makers, experts working in the food safety and related fields as well as local and interna-

2 Please see also the FEP Newsletter January 2012

tional media representatives. The event began with opening remarks by representatives of the UCR, IAEA, IICA, FAO and project counterparts from the ARCAL project RLA5053, and concluded with a special round table discussion session for suggestions and questions. The high level meeting ended with the presentation of a video and an oral presentation specifically prepared for the event to demonstrate the important role played by regional laboratory networks.

Coordinated Research Projects

Consultants Meeting to Develop a Proposal for a Coordinated Research Project on Applications of Radiation Techniques in the Development of Advanced Packaging Materials for Food Products, Vienna, Austria; 14–18 May 2012

Technical Officers: Carl Blackburn and Agnes Safrany

A meeting of expert consultants was held in collaboration with colleagues from the IAEA's Industrial Applications and Chemical Section (IACS) of the Programme for Nuclear Applications in the Physical and Chemical Sciences Division (NAPC). The purpose of this meeting was to (i) review the current situation and advances in the field of food packaging (including advanced packaging materials and coatings); (ii) identify issues and challenges and probe the role of radiation techniques in solving them; and (iii) advise both the Food and Environmental Protection (FEP) Subprogramme and the IACS of NAPC on a proposal for a joint CRP on the application of radiation processing technology in the development of advanced packaging materials for food products.

Background

The prepared convenience food sector has become a significant part of the economy and/or is evolving in many developed and developing countries. Packaging technology underpins the development of this sector and ensures food quality and safety. Radiation processing could provide attractive options for the food packaging industry worldwide. Radiation technology enables the development of new polymeric materials (modified natural polymers and nanocomposites), new packaging technologies (surface irradiation) and new dye printing methods (e.g. high gloss, abrasion and chemical resistant finish produced without volatile chemicals), which can be both sustainable and environmentally friendly. In addition, the irradiation of pre-packaged food requires radiation tolerant packaging that retains the necessary properties to prevent post treatment contamination. There is an opportunity to further nuclear technology through collaboration between radiation chemists, material scientists, food irradiation specialists and food safety specialists to examine the complete life cycle of food packaging and encourage the development and acceptance of novel and environmentally friendly food packaging technologies.

The Meeting

The consultants meeting was held at IAEA headquarters in Vienna, Austria from 14–18 May 2012 with the objective to consider and develop a draft proposal for a Coordinated Research Project (CRP) on the Application of Radiation Technology in the Development of Advanced Packaging Materials for Food Products. Five internationally recognized and respected experts (Ms Monique Lacroix, Mr Arun Sharma, Ms Clara Silvestre, Mr Thomas Dunn, and Mr George Sadler) were invited and attended the meeting. Each made a technical presentation highlighting issues related to food packaging and also engaged in discussions on the potential of radiation technology in this area. Technical discussions also included areas where radiation processing technology could significantly impact food safety and quality. The consultants deemed this a suitable topic for research and developed a proposal for a CRP. They also produced a number of conclusions and recommendations to assist the IAEA in taking forward a CRP in this crosscutting area. The draft CRP proposal, their conclusions and recommendations, and a provisional list of suitable participating organizations and institutes were captured in the report of the meeting.

Opening of the consultants meeting

Ms Lacroix (INRS-Institut Armand-Frappier and Canadian Irradiation Centre, Canada) gave a presentation entitled 'Development of Active and Intelligent Packaging for the Control of Food Quality: Evolution from Micro to Nanotechnology' . Her presentation focused on the development of polymer formulations to produce green packaging and the use of nano and irradiation technology to improve the functional properties of the films. The incentive to this research comes from the facts that lifestyle changes result in an increased demand for ready to eat food products containing fewer synthetic additives, but

with increased safety, quality and shelf life. Additionally, market globalization results in a longer timescale for the distribution of food. However, food manipulation during the preparation of ready to eat food and longer distribution times represent higher risks of contamination, and present major challenges for food packaging industries to find alternative packaging materials, which should be environmentally friendly, economical, with good thermo-mechanical properties, and in some cases have additional properties such as to interact with consumers to communicate the quality of the food product. The usefulness of radiation initiated chemical reactions aimed at the synthesis or modification of polymer properties has already been proven, and these advantages can be exploited when new packaging materials based on polymers, both natural and synthetic, are being developed.

Mr Sharma (Bhabha Atomic Research Centre, India) explained in his talk that although fossil hydrocarbon based plastics have historically been used as packaging materials, concerns related to their sustainability, particularly with reference to environment, have been raised worldwide. While stress is on development of more eco-friendly biodegradable materials for food packaging, intelligent packaging materials with bioactive and quality reporting properties would be more useful for food applications, and need concerted research efforts for their development and deployment. Radiation technology has been used as a tool for the modification of biopolymers and the development of improved packaging materials. Also, developing suitable low cost packaging materials for packaging of foods in general, and for high dose irradiated foods in particular, obviating the need for multi-layered laminates, would improve the overall economic sustainability and affordability of food processing. Therefore, research and development on the use of radiation technology for the development of advanced packaging materials for foods needs be strengthened.

Participants and organizers of the consultants meeting at the IAEA

Ms Silvestre (Istituto di Chimica e Tecnologia dei Polimeri, Italy) reviewed the potential of polymer nanotechnology in the food packaging area. She provided a broad perspective that highlighted the demanding needs of 'users' in terms of the health, environmental, taste and cost issues that food packaging could address. She also identified and discussed research and technological successes as well as barriers to progress, and the role of collaborative research, safety and standardisation. There is a need for trained people and support to ensure that new packaging technologies are successfully transferred to developing as well as developed countries. She provided a detailed account of the European Network COST ACTION FA0904 'Eco-sustainable Food Packaging based on polymer nanomaterials' with which possible links and joint actions with the proposed CRP were underlined. The COST ACTION network is particularly interested in working in collaboration with such a CRP in order to encompass radiation processing and food irradiation, two elements that are not at present well represented in FA0904.

Mr Dunn (Flexpacknology LLC, USA) presented summaries of work on the effects of electron beam curing of acrylate coatings on polyolefin films, high barrier non-foil laminations for microwave assisted thermal processing, and the impairment of barrier levels of plastic films by microwave and high pressure thermal sterilization. This provided an example of generating technical solutions to packaging issues and included issues related to securing regulatory clearance for novel packaging materials and coatings.

Mr Sadler (PROVE IT LLC, USA) gave a lecture on 'Packaging-related Regulatory Hurdles to Commercial Food Irradiation', explaining that the lack of regulatory approved polymers for food packaging limits the broader commercialization of food irradiation. He reviewed the current status of FDA-approved packaging materials for pre-packaged foods intended for irradiation, and discussed the polymers approved by the US Food and Drug Administration (FDA) in the Code of Federal Regulations title 21 section 179.45 (21 CFR 179.45). These polymers provide a good core selection for irradiation treatment with pre-packaged foods. However, while these core polymers are approved, contemporary additives for these polymers are not approved for irradiation, especially for pre-packaged foods irradiated in the presence of oxygen. More data is needed if the FDA approval of contemporary polymer material for irradiated pre-packaged food is going to be extended and these data would be most efficiently generated by a coordinated effort involving numerous institutions.

The consultants agreed that a CRP in this proposed area involving the radiation processing of packaging materials and food irradiation would be an important and fruitful area for technical and scientific investigations. The presentations generated a good deal of discussion and debate about the potential for many different research activities in this crosscutting area. Many polymers are irradiated together with their associated additives, as part of the normal production process, in order to bring about beneficial modifications to the properties of the material. This area of materials science and technology is an important aspect of industrial scale radiation processing,

and a future CRP was thought to be particularly important for food irradiation because there is a lack of modern packaging materials (polymers plus additives) for irradiated packaged foods.

This lack of officially sanctioned packaging materials for the irradiation of pre-packed food is proving to be a barrier to the commercialization of food irradiation technology. A CRP to encourage collaborative research in this area would generate information that would help regulators consider and approve packaging for use with pre-packaged irradiated foods. A CRP was also seen as a means of encouraging the development of radiation processing techniques to produce new and improved polymeric materials and to ensure that developing food packaging technologies do not preclude food irradiation due to scarcity of data on the efficacy of irradiation or lack of agreed protocols (e.g. protocols to quantify the effects of radiation processing on chemical and mechanical attributes and that could affect the suitability of these materials for use with food).

Participants and organizers of the consultants meeting at the Vienna International Centre (VIC)

The consultants concluded that radiation processing technology is being used and continues to be developed to modify and improve the properties of polymers and additives. In contrast, current national and international regulations are vague regarding the use of contemporary packaging materials for pre-packaged radiation processed foods. There are limited data on the use of contemporary and emerging packaging materials with respect to the effects of irradiation on pre-packaged foods. In addition, new packaging materials and technologies are emerging and being used commercially. New materials continue to be researched and have shown considerable promise for commercial applications; these include polymer nanocomposites and materials with smart, active and intelligent functions.

The consultants recommended that a future CRP should generate data to help regulators consider and approve packaging materials for use in pre-packaged irradiated foods. This should include the quantification of radiolytic products of polymer additives, especially commercially used antioxidants and migration into food systems upon irradiation. The first research coordination meeting of a future CRP should review and prioritize such additives and focus on those that are more commercially applied. It was thought that the CRP participants should generate data on the migration of chemical species from irradiated commercial polymer formulations (down to low concentrations e.g. 15 ppb). This research should use food-simulating solvents as a 'worst case' scenario for investigating the potential effects with actual foods. It was also thought that research in this area should not preclude 'active packaging' (e.g. packaging with antimicrobial / antioxidant properties) where slow release mechanisms are employed to benefit food quality.

In conclusion, the experts agreed that a joint CRP in this area is necessary. They thought that the main objective of the CRP should be on the assessment of the effects of ionizing radiations (gamma, electrons, and X rays) on commercial and emerging food packaging materials. This research should primarily focus on pre-packaged foods intended for irradiation with the aim to improving food safety, enhancing shelf life and promoting international trade. The research would facilitate regulatory approval of the food contact packaging materials (polymers, coatings and inks) and include additives that together with the polymer material comprise the 'packaging system'. The draft proposal for this CRP, together with the agenda and list of participants, are recorded in the meeting report (available on request).

Progress Report on the Coordinated Research Project (CRP) on the Development of Radiometric and Allied Analytical Methods to Strengthen National Residue Control Programs for Antibiotic and Anthelmintic Veterinary Drug Residues

Technical Officer: James Sasanya

Since the second Research Coordination Meeting held in Kandy, Sri Lanka from 14–18 March 2011, and in recognition of the RCM conclusion that there is a need to develop, validate and apply screening and confirmatory techniques to monitor safe management of veterinary

drugs used in animal production in the environment, the following research progress is noted.

The Animal, Plant and Fisheries Quarantine and Inspection Agency (QIA) in the Republic of Korea are addressing problems associated with sample preparation and use of stable isotopes. Developed in-house methods have been applied to monitor five veterinary drugs in the animal farm environment. The findings have been presented at the 32nd annual meeting of the Society of Environmental Toxicology and Chemistry (SETAC) in 2011. Additional findings with regard to false positives will be presented at the 60th American Society for Mass Spectrometry (ASMS) Conference on Mass Spectrometry and Allied Topics in 2012. Findings have also been published in peer review journals. Further, analytical methods have been favourably evaluated through two proficiency tests involving a reputable institution (RIKIL) in the Netherlands and in collaboration with another member of the CRP.

Aminoglycosides (AGs) are commonly used potent broad spectrum antibiotics listed by the FAO/WHO/OIE as critically important antimicrobials. Their physicochemical properties, such as good water solubility and chemical stability, present challenges to analytical methods, especially sample preparation. Thus, tailored screening and confirmatory methods are necessary to overcome the bottlenecks and facilitate the assessment of associated drug residues in foods of animal origin. The sample preparation method has been optimized to address the problem of poor recoveries typically associated with these compounds. The quantitative LC-MS/MS based confirmatory method is being validated according to 2002/657/EC guidelines, and a detailed standard operating procedure (SOP) will be prepared to support routine method application in Shenzhen, China and beyond. Efforts to improve recovery levels for the aminoglycoside hygromycin B that are still very low are also ongoing.

Florfenicol has been identified by the FAO/WHO/OIE as a critically important antimicrobial to be monitored and rapid analytical methods are sought by AOAC International for the seafood community. The project attempts to address these needs by developing a Radioimmunoassay kit for the determination of Florfenicol in Fish tissue samples. Thus far, a complimentary HPLC-UV method for the determination and quantification of Florfenicol residues has been developed and validated. An SOP has been developed and Florfenicol residues can now be monitored in foods in Brazil.

Work is ongoing in Sri Lanka to expand laboratory capabilities to develop secondary screening and confirmatory testing for antibiotic residues (sulfonamides) using high performance thin layer chromatography (HPTLC) and high performance liquid chromatography (HPLC), respectively. Thus far, a TLC method has been established to analyse sulphonamides in chicken and shrimp tissue samples. This method has been validated for selected performance characteristics.

A microbiological screening method that is inexpensive, reliable, practicable and affordable to developing countries is being developed to detect antimicrobial residues and facilitate the establishment of simple residue monitoring plans. In Indonesia, one significant finding in the protocol is that un-extracted samples (e.g. meat) are associated with more sensitive results compared to extracted samples. This crucial observation now guides the development of a prototype assay for routine detection of multi-residue antimicrobial substances in various matrices.

The presence in animal products of residues of Chloramphenicol (CAP), a substance prohibited in animal production, has been associated with non-therapeutic natural sources such as plants in Mongolia. Thus, research aimed at developing nuclear and related confirmatory analytical techniques to measure CAP in certain pasture grass in Mongolia is ongoing. This technology will help member states address potential trade problems associated with natural sources of residues of this prohibited substance.

Surveillance of CAP residues resulting from indirect exposure to natural sources (e.g. plants) has now been completed in livestock products (meat) from western Mongolia where approximately 45% of the nation's animal population is found. Analysis of randomly selected samples revealed concentrations of 0.3-3.7 µg/kg of CAP in 13.3% of 79 samples collected from three counties only, namely Khuvsgul, Bayan-Ulgii and Bayankhongor. By the end of last year (2011) up to 256 meat samples from western Mongolia were investigated for CAP. The presence of CAP in selected plant samples has also been confirmed.

Artemisia, a possible source of Chloramphenicol residues in animal products

As part of efforts to develop and implement radiochemical techniques for the detection of authorized antibiotics using radioactive tracers for the effective monitoring of veterinary drug residues in aquaculture products, research is ongoing on pharmacokinetic studies of Flumequin (a synthetic quinolone) in fish in Tunisia. Recently, the US Food and Drug Administration donated ^{14}C-Flumequine 3 vials to support this work. A scientific and technical assistance agreement (of up to five years)

has also been established between the contract holder at the National Center for Nuclear Sciences and Technologies, Tunisia and the National Institute for Marine Sciences and Technologies, Norway to support the coordinated research activities. Another agreement was established between the same contract holder and the division of pharmacology and technology in the Norwegian Veterinary School to provide technical assistance for the pharmacokinetics research activities. A chromatographic analytical method (HPLC/UV), along with a liquid scintillation counter, is adopted for the purity test of ^{14}C – Flumequine (radiochemical purity of up to 94.7%).

Thalictrum simplex L, a possible source of Chloramphenicol residues in animal products.

Final Research Coordination Meeting of the Coordinated Research Project on Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Management Practices at the Catchment Scale (D5.20.35), Guanacaste, Costa Rica; 5–9 December 2012

Technical Officer: Britt Maestroni

The final Research Coordination Meeting (RCM) of the FAO/IAEA Coordinated Research Project (CRP) on Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Management Practices at the Catchment Scale was held in Guanacaste, Costa Rica from 5–9 December 2011. Research contract and agreement holders attended the meeting from Argentina, Australia, Brazil, Chile, China, Costa Rica, Ecuador, and Sweden. The objectives of the meeting were to strengthen the network, to review national results, to prepare a compilation of overall project outputs and outcomes and to agree on a time frame for the preparation of the final project document. The programme included presentations by all contract holders on the results achieved under the CRP. Training was provided on geographical information systems and a new open source software package (ILWYS) was introduced to all participants as an alternative to the expensive ESRI ArcGIS. During the RCM the participants reviewed a draft generic guideline prepared by the IAEA Secretariat on 'integrated approaches to assess indicators of pesticide management practices at a catchment scale' and agreed on its publication as the first chapter in a book on 'Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Management Practices at the Catchment Scale'. The meeting report can be accessed at http://elearning.iaea.org/ATutor/go.php/82. This includes a summary of the project outputs and outcomes, and also some requests by member countries to the IAEA, including requests to:

1. Maintain and enhance the momentum generated through the CRP to capture the benefits for promoting new programmmes aimed at improving food and environmental safety.

2. Encourage stronger links between technical cooperation projects and coordinated research projects in future IAEA programmmes in order to synergistically benefit from capacity building, technology transfer and a larger resource base.

3. Explore, through CRP D5.20.37 on the 'Implementation of Nuclear Techniques to Improve Food Traceability', the use of nuclear approaches (e.g. stable isotopes) to enhance knowledge about the origin and transport of contaminants, using sediments as markers.

4. Encourage cross cutting activities with other IAEA programmes to adequately understand the processes that govern the food-water-soil-pesticide-air compartments.

Participants of the final meeting of CRP D5.20.35

Technical Cooperation Projects

Country/Region	Project Number	Title	Technical Officer
Afghanistan	AFG5005	Study Food Irradiation as a Solution to Food Security	Blackburn, Carl Michael Byron, David Henry
Angola	ANG5009	Enhancing Veterinary Drug Laboratories for the Quality Control of Local Milk Production to Improve Public Health Checks	Sasanya, James Jacob Cannavan, Andrew
Bangladesh	BGD5027	Establishing a Veterinary Drug Residue Laboratory	Cannavan, Andrew Sasanya, James Jacob
Belize	BZE5003	Providing Technical Assistance and Training for the Control of Chemical Residues in Food	Maestroni, Britt Marianna
Belize	BZE5005	Providing Technical Assistance and Training for Upgrading National Laboratory Capacity	Maestroni, Britt Marianna Jandrić, Zora
Benin	BEN5008	Establishing Enhanced Analytical Capability to Comply with International Standards for the Evaluation and Control of Veterinary Drug Residues in Food of Animal Origin	Sasanya, James Jacob
Bolivia	BOL1009	Introducing Radiation Processing Technology	Sabharwal, Sunil (NAPC) Blackburn, Carl Michael
Botswana	BOT5006	Establishing a Laboratory for Monitoring Residues of Veterinary Drugs in Food of Animal Origin to Protect Public Health and Enhance International Trade Through Utilization of Nuclear and Related Analytical Techniques	Sasanya, James Jacob Jandrić, Zora
Chile	CHI1019	Establishing the Origin of Heavy Metal Contamination in Soil and Water	Fajgelj, Ales (NAEL) Padilla Alvarez, Roman (NAPC) Cannavan, Andrew

Country/Region	Project Number	Title	Technical Officer
Chile	CHI5049	Determining Veterinary Residues and Contaminants in Agricultural and Animal Products for Human Consumption	Sasanya, James Jacob Jandrić, Zora Cannavan, Andrew
China	CPR5018	Building Technological Capacity for Food Traceability and Testing of Pesticide Residues in Food	Cannavan, Andrew Frew, Russel
China	CPR5021	Facilitating the Application of Electron Beam for Food Irradiation	Blackburn, Carl Michael Byron, David Henry
Costa Rica	COS1007	Establishing Gamma Irradiation Capabilities at the Costa Rican Insitute of Technology for the Use of Radiation Processing Technology	Blackburn, Carl Michael Byron, David Henry
Costa Rica	COS5029	Strengthening of Good Agicultural Practices for Food Safety and Security and Environmental Protection	Nguyen, Minh-Long Dercon, Gerd
Ecuador	ECU5027	Improving Food Security and Environmental Sustainability by Monitoring Wetlands as Indicators of Good Agricultural Practice in Palm Oil Production	Maestroni, Britt Marianna Jandrić, Zora
Indonesia	INS5040	Supporting the National Mycotoxins Reduction Programme and Enhancing the National Reference Laboratory of the Indonesian Research Centre for Veterinary Science (BBALITVET)	Sasanya, James Jacob Cannavan, Andrew
Israel	ISR5016	Supporting a Feasibility Study for Using Irradiation as a Quarantine Treatment	Blackburn, Carl Michael Byron, David Henry

Country/Region	Project Number	Title	Technical Officer
Lebanon	LEB5014	Upgrading the Environmental and Food Analysis Laboratory at the National Council for Scientific Research	Maestroni, Britt Marianna
The Former Yugoslav Republic of Macedonia	MAK5007	Assessing and Enabling the Implementation of Food Irradiation Technologies	Blackburn, Carl Michael Byron, David Henry
Malaysia	MAL5029	Applying Mutation Breeding and Optimized Soil, Nutrient and Water Management for Enhanced and Sustainable Rice Production	Lagoda, Pierre Nguyen, Minh-Long Nielen, Stephan Blackburn, Carl Michael
Mongolia	MON5019	Enhancing Analytical Equipment for Animal Disease Prevention, Diagnosis and Surveillance	Sasanya, James Jacob Cannavan, Andrew
Montenegro	MNE5002	Upgrading Capabilities to Establish Effective Monitoring Systems for Residues in Food and Air Quality	Jandrić, Zora
Nicaragua	NIC5008	Improving Technical Capabilities for the Detection of Diseases and Residues in Agriculture	Viljoen, Gerrit Johannes Sasanya, James Jacob
Nigeria	NIR5037	Applying Nuclear and Related Techniques to Characterise Chemical Contaminants in Food for Risk Assessment and Management of Toxic Pollutants and Residues in Food, Feedstock and Water Resources through Training of Analytical Scientists	Sasanya, James Jacob Maestroni, Britt Marianna
Pakistan	PAK5048	Strengthening Capabilities to Monitor and Control Veterinary Drug Residues in Foodstuffs	Sasanya, James Jacob

Country/Region	Project Number	Title	Technical Officer
Panama	PAN5021	Enhancing Analytical Capability to Evaluate and Control Use of Veterinary Drugs through Residue Monitoring and Diagnostic Toxicology	Sasanya, James Jacob Cannavan, Andrew
Peru	PER5031	Improving and Strengthening Industrial Irradiation Techniques with an Emphasis on Agro-industrial Applications	Blackburn, Carl Michael Sabharwal, Sunil (NAPC)
Africa	RAF5067	Establishing a Food Safety Network through the Application of Nuclear and Related Technologies	Sasanya, James Jacob Cannavan, Andrew
Asia	RAS5046	Novel Applications of Food Irradiation Technology for Improving Socioeconomic Development (RCA)	Blackburn, Carl Michael Byron, David Henry
Asia	RAS5050	Enhancing Sanitary and Phytosanitary Treatment of Regional Products for Export by Irradiation (RCA)	Blackburn, Carl Michael Byron, David Henry
Asia	RAS5057	Implementin Best Practices of Food Irradiation for Sanitary and Phytosanitary Purposes	Blackburn, Carl Michael Byron, David Henry
Asia	RAS5061	Supporting Food Irradiation Technology to Ensure the Safety and Quality of Meals for Immuno-compromised Patients and Other Target Groups	Blackburn, Carl Michael Byron, David Henry
Asia	RAS5062	Building Technological Capacity for Food Traceability and Food Safety Control Systems through the Use of Nuclear Analytical Techniques	Frew, Russel Cannavan, Andrew
Europe	RER5019	Establishing a Sustainable Network on Irradiated Food	Blackburn, Carl Michael Byron, David Henry

Country/Region	Project Number	Title	Technical Officer
Latin America	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)	Dercon, Gerd Maestroni, Britt Marianna
Latin America	RLA5055	Establishing a South American Regional Network of National and Reference Laboratories for Pharmacologically Active Substances and Contaminants in Food of Animal Origin Through Implementation of Approved Nuclear & Conventional Analytical Techniques (ARCAL CIV)	Sasanya, James Jacob Cannavan, Andrew
Latin America	RLA5059	Harmonizing Official Control Laboratories to Analyse Chemical Contaminants in Food and Feedstuffs (ARCALCXXVIII)	Sasanya, James Jacob Cannavan, Andrew
Latin America	RLA5060	Harmonizing and Validating Analytical Methods to Monitor the Risk of Chemical Residues and Contaminants in Foods to Human Health (ARCALCXXVIII)	Sasanya, James Jacob Maestroni, Britt Marianna
Latin America	RLA 5061	Supporting Quality Management for the Assessment and Mitigation of Impacts of Contaminants on Agricultural Products and in the Environment (ARCALCXXIV)	Jandrić, Zora Maestroni, Britt Marianna
Latin America	RLA5072	Supporting a Database of Values of Radioactivity in Typical Latin American Food (ARCALCXXIX)	Blackburn, Carl Michael Byron, David Henry

Country/Region	Project Number	Title	Technical Officer
Sri Lanka	SRL5043	Supporting the Operation of A Gamma Irradiation Facility for Preservation of Food, Sterilization of Medical Products and Quarantine of Fruits	Blackburn, Carl Michael Sabharwal, Sunil (NAPC)
Sri Lanka	SRL8019	Technical Support for the Establishment and Operation of a Multi-Purpose Gamma Irradiation Facility	Blackburn, Carl Michael Byron, David Henry
Sudan	SUD5035	Establishing a Laboratory for Monitoring Veterinary Drug Residues and Prohibited Substances in Livestock and Livestock Products through Application of Nuclear and Related Techniques to Protect Public Health	Sasanya, James Jacob Cannavan, Andrew
Tajikistan	TAD5004	Improving Laboratory Capacity for Food Safety	Fesenko, Sergey Maestroni, Britt Marianna
Uruguay	URU5025	Determining Pesticide and Antibiotic Residues in Food for Local and Export Consumption	Maestroni, Britt Marianna
Uruguay	URU5027	Preparing for the Introduction of Irradiation Techniques	Blackburn, Carl Michael Byron, David Henry

Establishing a Laboratory for Monitoring Veterinary Drug Residues and Prohibited Substances in Foods; Khartoum, Sudan; 31 March–2 April 2012

Technical Officer: James Sasanya

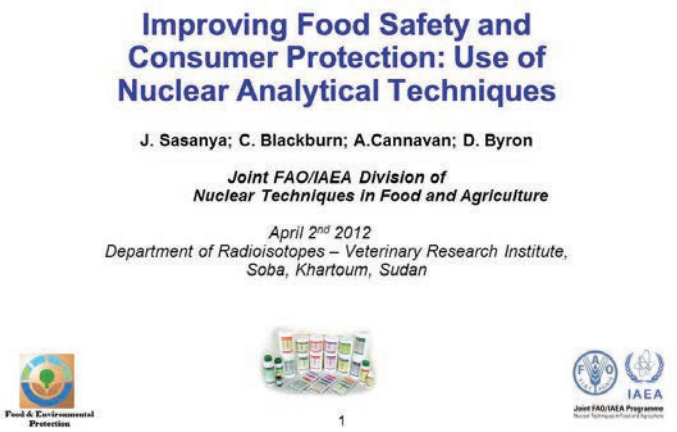
Mr Sasanya travelled from 31 March–6 April 2012 to the counter-part (CP) institute, the Department of Radioisotopes Veterinary Research Institute (VRI), in Khartoum, Sudan to initiate the implementation of TC project SUD5035 entitled 'Establishing a Laboratory for Monitoring Veterinary Drug Residues and prohibited Substances in Livestock and Livestock Products through Application of Nuclear and Related Techniques to Protect Public Health'.

There is currently no functional laboratory in Sudan that regularly analyses residues of veterinary drugs and prohibited agrochemicals that could pose public health risks. There is also no residue monitoring plan, despite the widespread and possibly injudicious use of these chemicals in an effort to control animal diseases. Moreover, there are speculative reports suggesting a correlation between the increased prevalence of chronic health conditions such as cancer and the misuse of agrochemicals in-large scale agricultural areas.

This project aims to establish a laboratory to respond to such public concerns through the application of nuclear and related techniques and initiate a multi-sectoral national residue monitoring program. As an innovative way to utilize IAEA procured equipment, radioimmunoassay tools, including a liquid scintillation counter, auto-gamma scintillation spectrophotometer (multi-counter), and single gamma counter scaler ratemeter, previously used in a TC project for hormone analysis/pregnancy tests in animal production, will now be used to analyze chemical food contaminants.

Meetings were held with various stakeholders at VRI, Sudan Atomic Energy Commission, Animal Resources Research Corporation in Khartoum and Agricultural Research Corporation (ARC) in Gezira to create awareness of nuclear applications. In this regard, the technical officer conducted an awareness seminar on 'Improving Food Safety and Consumer Protection - Use of Nuclear Analytical Techniques' attended by over thirty participants from various departments and institutions in Khartoum. Another strategic meeting of at least twenty participants helped to plan the creation of a national residue monitoring plan. Participants were also from various institutions within and outside Khartoum. Another networking meeting was held in Gezira – Sudan's 'food basket' – in support of the planned national residue programme.

Meetings were also held with the AFRA coordinator in Sudan and various prospective counterparts to identify a suitable network of laboratories/institutions that could participate in the new AFRA food safety project, RAF 5067.



Introductory slide of a food safety seminar presentation conducted in Khartoum, Sudan, April 2012

First Coordination Meeting of the Technical Cooperation Project on Harmonizing and Validating Analytical Methods to Monitor the Risk of Chemical Residues and Contaminants in Foods to Human Health (RLA5060); Sao Paulo, Brazil; 26–30 March 2012

Technical Officer: Britt Maestroni

Ms Britt Maestroni participated as technical officer in the first coordination meeting of the ARCAL project RLA5060 on Harmonizing and Validating Analytical Methods to Monitor the Risk of Chemical Residues and Contaminants in Foods to Human Health that was held in São Paulo, Brazil, from 26–30 March 2012. The overall objective of the project is to ensure food safety, promote good agricultural and production practices and enhance food exports. The first coordination meeting of RLA5060 brought together laboratory representatives from Brazil, Costa Rica, Cuba, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela.

On the first day of the meeting Ms Villavicencio, the project coordinator from Brazil, presented the logical framework and work plan of project RLA5060. On the same day, all project coordinators gave short presentations highlighting the existing laboratory infrastructure (both human and technical) and the proposed national project work plan. During the following days the participants worked in small groups on different aspects of the project, auto-evaluating the existing capacity within each institution and identifying all the project activities which need to be put into place in order to achieve the project objectives.

Working groups of project RLA5060

On the last two days of the meeting the original project work plan was analysed in detail and all necessary project activities were defined, including all necessary inputs. The meeting was the perfect occasion to continue networking, and therefore a technical session was organized with local laboratory representatives from EMBRAPA, FEA/UNICAMP, CENA/USP, and MAPA/LANAGRO-SP in the city of Campinas. The participants valued the technical visits to the laboratories of EMBRAPA and LANAGRO very much. The IAEA officers gave presentations covering the criteria for participation in project activities, the logical framework matrix and the requirements/procedures for technical cooperation projects as well as for the preparation of the project work plan.

Enhancing the Analytical Capability to Evaluate and Control the Use of Veterinary Drugs; Panama City, Panama; 17–24 March 2012

Technical Officer: James Sasanya

Mr Sasanya travelled to Panama City, Panama from 17–24 March 2012 on a mission to assess the readiness of the counterpart institute, The Veterinary Diagnostics and Investigation Laboratory (LADIV) of Panama's Ministry of Agriculture, to implement technical cooperation (TC) project PAN5021 on Enhancing the Analytical Capability to Evaluate and Control Use of Veterinary Drugs through Residue Monitoring and Diagnostic Toxicology.

Besides guiding the counterpart on the prioritization of infrastructure/equipment and human resource needs, ways to strengthen institutional collaboration (for greater project impact) between LADIV/MIDA and the authority in charge of aquaculture resources in Panama, Autoridad de los Recursos Acuaticos de Panama (ARAP) were identified. ARAP counterparts in two IAEA TC projects on environmental issues sometimes use MIDA equipment, such as the Atomic Absorption Spectrometer, to analyze metals in aquatic samples. A formal offer to collaborate with ARAP was proposed by LADIV management. This collaboration will strengthen the role of LADIV in the regional network of laboratories under RLA5059.

Final (RLA5055) and Inaugural (RLA5059) ARCAL Coordination Meetings on Establishing and Strengthening/Harmonizing a Network of Regional Laboratories for Food Safety; Santiago, Chile; 12–16 March 2012

Technical Officer: James Sasanya

Mr Sasanya travelled to Chile from 11–16 June 2012 to assess achievements of and evaluate lessons learnt from regional project RLA5055 of the Latin American and the Caribbean region for the benefit of future development activities in the region and to plan for the smooth implementation of two new projects, namely RLA5059 and the related Panama national project PAN5021 (see immediately above). The regional projects aim at establishing and strengthening/harmonizing a network of regional laboratories with the same food safety mandate.

The RLA meetings, involving participants from thirteen Latin American/Caribbean countries, were held at the Ministry of Agriculture and Livestock Services, Food and Environmental Chemistry Laboratories, Santiago, Chile and were graced on the first day by the National Director Mr Anibal Ariztia among other high level delegates.

Participants at the final coordination meeting for regional project RLA5055 and inaugural coordination meeting for RLA5059 in Santiago, Chile, 12–16 March 2012

Delegates at the opening ceremony for the RLA5055/59 meetings in Santiago, Chile, 12 March 2012

These laboratory networks have enhanced national analytical capabilities to evaluate and control the use of veterinary drugs through residue monitoring and diagnostic toxicology. Overall, the laboratories have helped reduce the rejection of food exports in international markets due to residues of chemical contaminants. At least three of these laboratories (in Argentina, Chile and Uruguay) are in advanced stages to becoming reference laboratories as well as centers of excellence, training and facilitating many other laboratories that are at a lower level of development. Their activities on an arbitrary scale of 1-7 (7 being the highest) are demonstrated in figures 1-3 below.

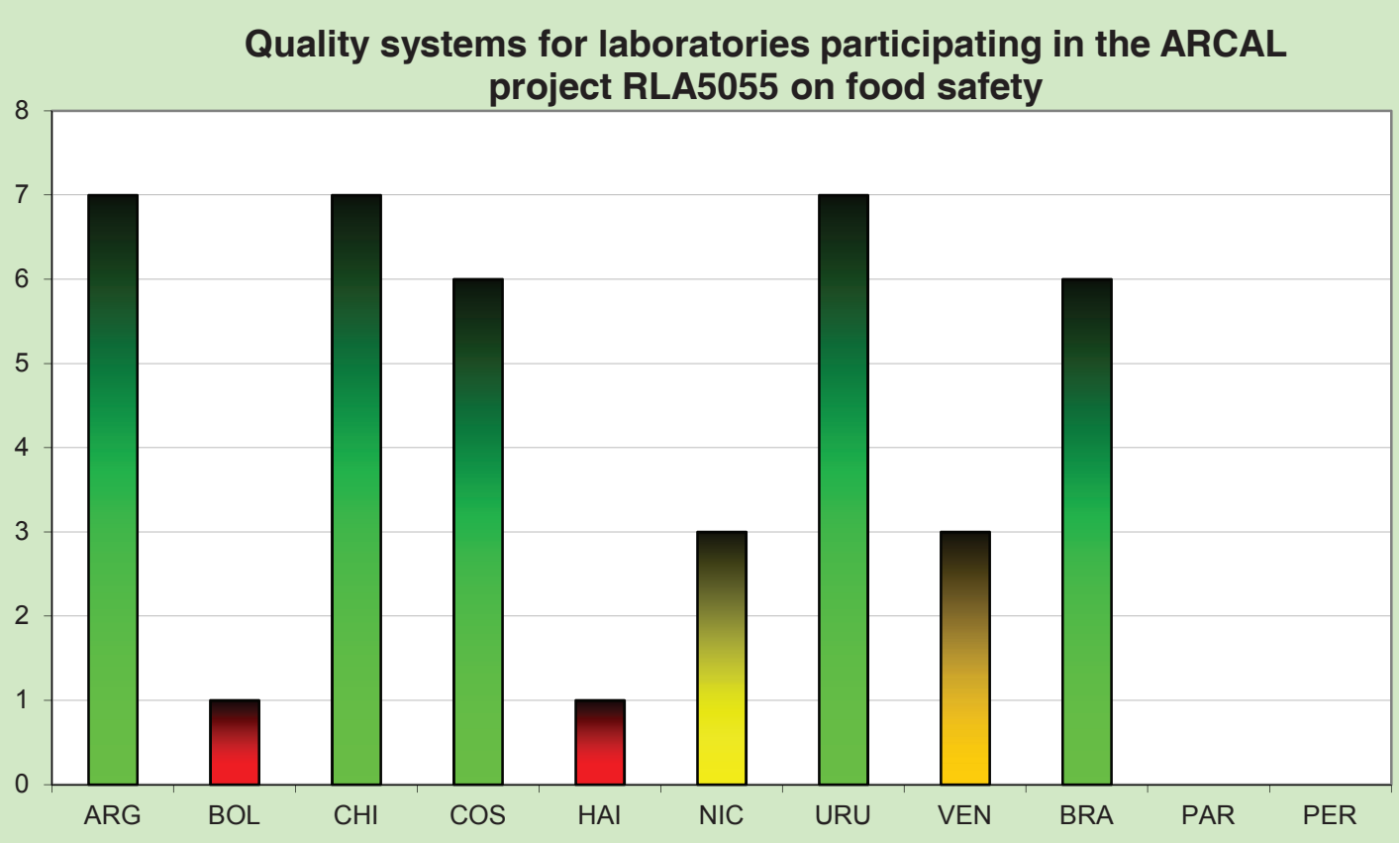


Figure 1 showing levels of laboratory quality systems of selected countries participating in RLA5055

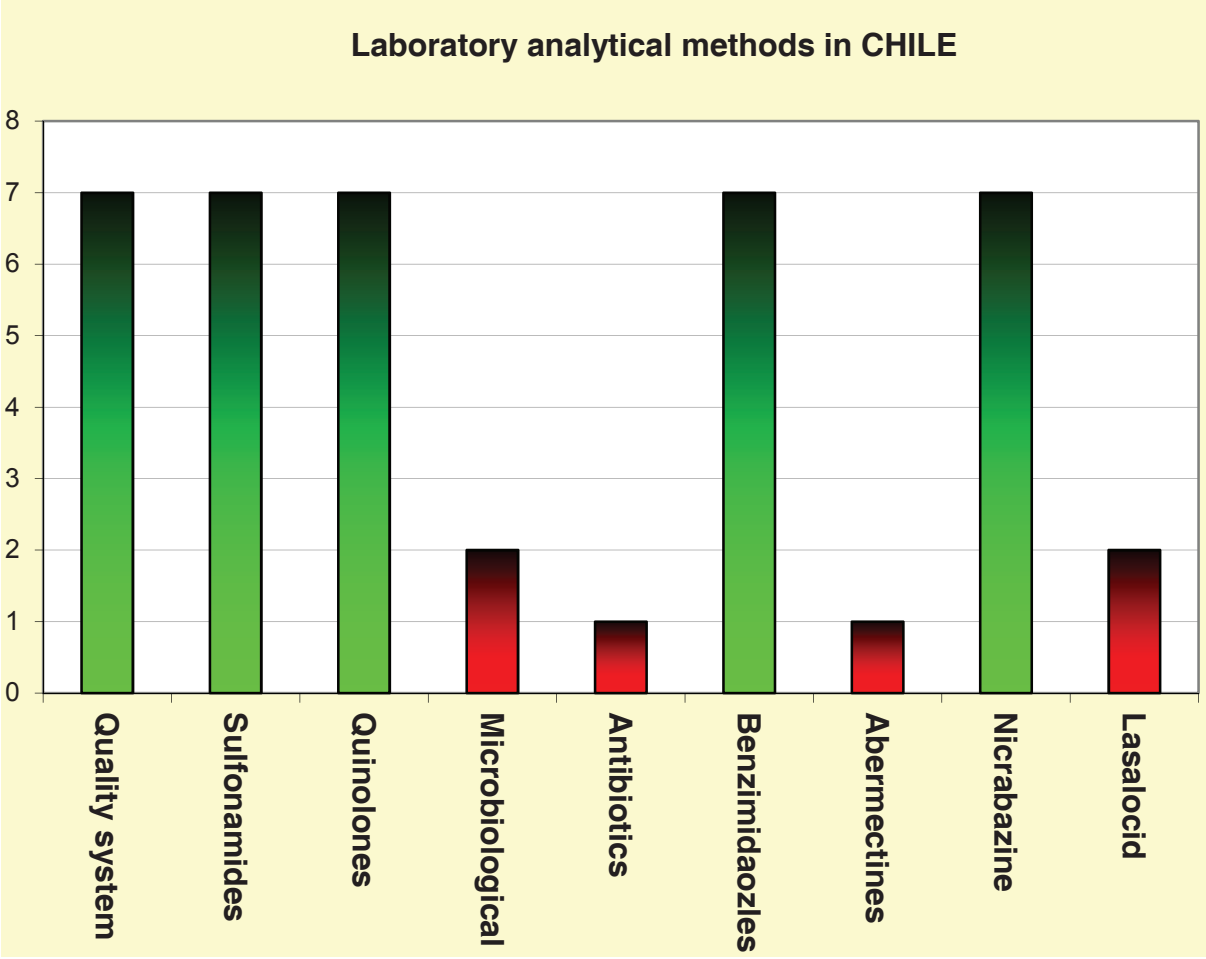


Figure 2 showing levels of laboratory operational analytical methods at the Food and Environmental Chemistry Laboratories in Santiago, Chile

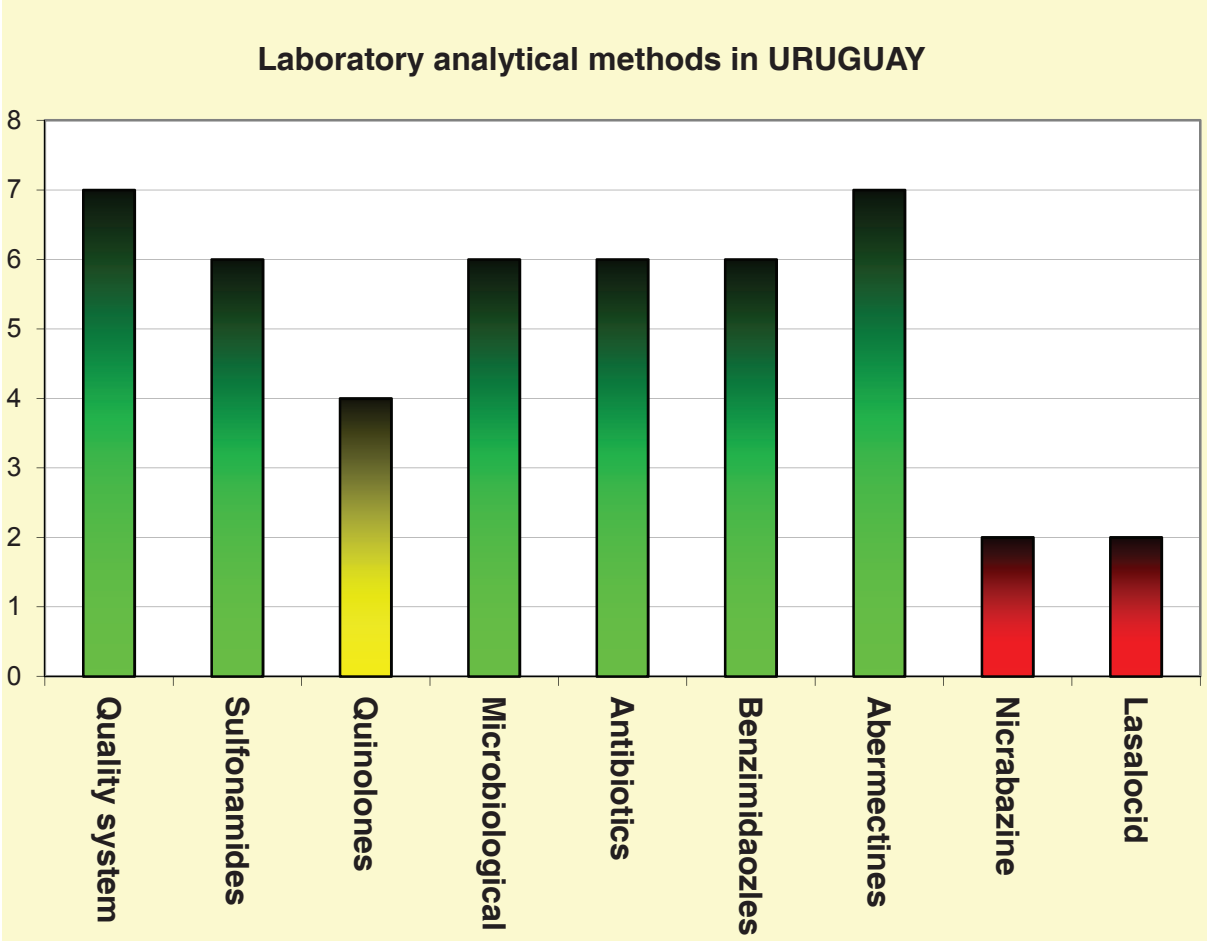


Figure 3 showing levels of laboratory operational analytical methods at DILAVE, Uruguay's food safety laboratory participating in RLA5055

First Coordination Meeting of the Technical Cooperation Project on Supporting Quality Management for the Assessment and Mitigation of Impacts of Contaminants on Agricultural Products and in the Environment (RLA5061); Neuquen, Argentina; 5–9 March 2012

Technial Officer: Britt Maestroni

Ms Britt Maestroni participated as technical officer in the first coordination meeting of the ARCAL project RLA5061 on Supporting Quality Management for the Assessment and Mitigation of Impacts of Contaminants on Agricultural Products and in the Environment, which was held in Neuquen, Argentina, from 5–9 March 2012. Under a previous project, 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 (RLA5053), a regional network of laboratories was established to monitor residues of pesticides in water, soil and air which act as indicators of good agriculture practice and thus help to prevent contamination at the source. RLA5061 expands on RLA5053 and includes participation from 15 laboratories from Latin American countries. The overall objective of the project is to establish internationally recognized quality management systems in participating laboratories for the sustainable monitoring of representative agriculture catchments in the region.

Participants of the first coordination meeting of RLA5061

The first coordination meeting brought together laboratory representatives from Argentina, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay and Uruguay. On the first day of the meeting the project coordinator from Argentina presented the logical framework and overall work plan of project RLA5061.

All project coordinators gave short presentations highlighting their existing laboratory infrastructure (both human and technical) and the proposed national work plan.

During the following days all participants worked in small groups on different aspects of the project, auto-evaluating the existing capacity within each institution and identifying all project activities necessary to achieve project objectives. On the last day of the meeting the original project work plan was analysed in detail and all necessary activities were identified, including all inputs.

The meeting was the perfect occasion to continue exercising outreach, therefore a whole session was organized with local stakeholders to share the work already performed but also to continue further with the exchange of information as envisaged under RLA5061. The response from stakeholders demonstrated the importance of laboratory data being distributed to all stakeholders in the farm-to-fork chain, with an explanation of their significance in facilitating effective decision making.

One day was dedicated to practical field exercises in the Argentinian microcatchment area, which was used as the study site for the project. The local team demonstrated the collection of water macroinvertebrates, use of the D-net, taking measurements using the PASCO sensors, measurement of water flow, groundwater sampling, and soil sampling using corers. The participants valued these practical sessions highly. The IAEA officers gave presentations covering criteria for participation in project activities, results based budgeting, the role of the analytical laboratories and gave support towards the preparation of the overall project work plan.

Ms Cecilia Dufliho explains the use of a Doppler flow meter

Establishing Enhanced Analytical Capability for the Evaluation and Control of Veterinary Drug Residues and other Contaminants in Food; Cotonou, Benin; 26 February–2 March 2012

Technical Officer: James Sasanya

Mr Sasanya travelled to Benin from 26 February–2 March 2012 to assess the achievements of a closing TC project BEN5004 on Regulatory Control and Monitoring of Mycotoxins to Facilitate Trade and to note lessons learnt as well as to explore future prospects in the country. Part of the mission was also to initiate the implementation of a new TC project BEN5008 on Establishing Enhanced Analytical Capability to Comply with International Standards for the Evaluation and Control of Veterinary Drug Residues (and other selected contaminants) in Foods of Animal Origin. The Beninese counterpart institute, the Department for the Promotion of Quality and Processing of Agricultural products (DPQC), is now collaborating with other counterpart institutes in the country and the achievements and capacity built during the previous project will benefit BEN5008.

BEN5004 has made significant contributions towards the control and monitoring of food contaminants, including mycotoxins in various agricultural products in Benin. More advanced qualitative and quantitative analytical tools were purchased and used to assess levels of mycotoxins in agricultural products and with the help of IAEA fellowship training, greater awareness has been created among stakeholders. Beneficiaries of the fellowships have trained many others. Manuals to inform various stakeholders on the control of mycotoxins in food have been prepared and distributed. Many producers now demand that their products be tested for contaminants. DPQC contributions are reflected in its active involvement in upcoming Food Safety Authority meetings (Agence Beninoise de Securite Sanitaire des Aliments, ABSSA) where it will play a central role. Given its experience and infrastructure, DPQC can now collaborate with many others in upcoming national/regional IAEA and non-IAEA projects.

A sample of the different types of booklets containing guidelines for controlling mycotoxins in agricultural products produced by DPQC with support from the Joint FAO/IAEA Division

Besides collaboration with the counterpart for BEN5008, the Beninese National Institute of Agricultural Research (INRAB), potential collaborators include Benin's livestock department and the new but better equipped (with state of the art instrumentation) Central Laboratory for Food Safety (LCSSA) sponsored by the government of Benin with support from the Belgian government. This Laboratory will become a national reference laboratory meeting international standards and hopefully enhance Benin's prospects as a potential regional center of excellence in food safety. Such collaboration will contribute to self-sustainability.

Such capacity building and the galvanizing role of the IAEA will support efforts of the Standard and Trade Development Facility (STDF), a partnership of The Food and Agriculture Organization of the United Nations (FAO), World Organization for Animal Health (OIE), World Health Organization (WHO), World Bank and World Trade Organization (WTO), where Benin is scheduled to participate in a project monitoring consumer exposure to chemical food contaminants in sub-Saharan Africa. Other participating countries will include Burkina Faso, Cameroon, Kenya, Mali, Nigeria and Togo. STDF is a global partnership supporting developing countries in building capacity to implement international sanitary and phytosanitary (SPS) standards, guidelines and recommendations as a way to improve their human, animal and plant health status and ability to gain or maintain access to international markets. Such activities present an excellent opportunity for inter-institutional collaboration that the IAEA could contribute towards for the benefit of Member States.

Technical Cooperation Project BZE5003; Belize City, Belize; 11–14 December 2011

Technical Officer: Britt Maestroni

Ms Britt Maestroni undertook a 3 day mission to Belize City, Belize, from 11–14 December 2011 to discuss the results achieved under the technical cooperation project BZE5003 and to agree on the work plan for the follow-up project BZE5005 starting in 2012.

Food safety and environmental sustainability are critical issues as Belize is required to comply with developed country standards to maintain export markets and further develop eco-tourism. Progress was made under project BZE5003, which strengthened the Belize Agricultural Health Authority (BAHA) and its Central Investigation Laboratory (CIL), by providing training and by procuring one gas chromatograph with mass spectrometric detector to monitor toxic agrochemicals and to assess the effectiveness of good agricultural practices (GAPs) at a sub-catchment scale. This programme now needs to be scaled up to the national level and to include food traceability systems.

Therefore, the strategy agreed for the 2012–2013 biennium will focus on human resource development, including capacity building activities, to be able to quickly reach laboratory accreditation and establish a traceability system for one value chain commodity. The local IICA office will assist the IAEA in the implementation of project BZE5005 and the InterAmerican Development Bank (IDB) will assist Belize with funding to ensure that an adequate overall infrastructure exists for BAHA.

The technical officer obtained a better understanding of the situation and the challenges related to the food safety project in Belize, and was able to identify a new strategy under TCP BZE5005. Since the human resource component is critical it was agreed that the local university in Belize City will provide qualified chemistry candidates to work on a yearly basis at the CIL laboratory, and BAHA will identify opportunities for creating new technical positions in the laboratory, thus ensuring sustainability to the laboratory operations. An updated work plan was agreed by the counterpart and the technical officer for implementation starting in 2012.

Dr Natalie Gibson showing the sample preparation laboratory in CIL, BAHA, Belize

It can be concluded that Belize has great potential to develop capacity for food safety control. However, a more integrated approach should be encouraged, as capacity is widely scattered among different institutions in the country.

Final Coordination Meeting of Project on Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartment at a Catchment Scale in the Latin American and Carribean (LAC) Region (RLA5053); Guanacaste, Costa Rica; 5–9 December 2011

Technical Officer: Britt Maestroni

Regional project coordinators from 11 countries in Latin America and the Caribbean (LAC) convened to discuss the results of technical cooperation project ARCAL RLA/5/053 on Implementing a Diagnosis System to Assess the Impact of Pesticide Contamination in Food and Environmental Compartments at a Catchment Scale in the Latin American and Caribbean (LAC) Region. The meeting was the culmination of three years of multi-disciplinary and multi-stakeholder projects meant to harmonize analytical approaches and apply them in cooperation with like-minded international and regional organizations, national and local bodies and especially farmers and other land managers or their representatives.

During the meeting participants recognized that during the last ten years 35 analytical projects in the field of food safety had been implemented and that, while good capabilities had resulted, little recognized socio-economic impact had occurred. Transforming data to policy requires advocacy- the challenge for concluding RLA5053. Participants were asked to pursue this line of action in finalizing their outcomes. On 1 December the project results were presented in a meeting organized with representatives from IICA, OIRSA and FAO. In a brainstorming session it was evident that the regional organizations will support and facilitate the future work of the IAEA in the region. On 2 December a high level meeting was organized to raise awareness about the central role played by analytical laboratories in the farm to fork chain. The meeting had representatives at ministerial and ambassadorial levels and is reported under the Coordinated Research Project section of this newsletter.

Participants of the ARCAL project RLA5053

Suggestions by the participants at the coordination meeting included:

- Continue with the implementation of proficiency tests, which help improve laboratories' technical competence.
- Coordinate periodic meetings to foster the harmonization of methodologies and to interchange experiences.
- Take advantage of the model established by the laboratory network to replicate it in other regions.
- Support the implementation of quality management systems and, eventually, accreditation of laboratories under ISO/IEC 17025 using the existing expertise of the already accredited laboratories in the network.
- Include in all IAEA projects a social component (such as the association of the laboratory with a 'communications expert') to facilitate the transfer of results to all stakeholders, including decision makers.

Food and Environmental Protection Laboratory, Seibersdorf

IAEA
International Atomic Energy Agency
Atoms for Peace

50th Anniversary of the

Agency's Nuclear Sciences and Applications Laboratories in Seibersdorf

Believe it or not: the Agency's Nuclear Sciences and Applications (NA) Laboratories in Seibersdorf have just completed half a century of dedicated support to Member States in their efforts to optimally exploit 'atoms for peace'. It seems to be an appropriate time to celebrate the completion of these five decades in a fitting manner.

Throughout these many years, the activities of the NA Laboratories in Seibersdorf have continuously evolved, also through their partnership with FAO, in response to the ever changing landscape of nuclear technologies and applications, and to the multitude of expectations of national and international organizations for cooperation in nuclear research and technology transfer. In this process, the Laboratories have consistently remained at the forefront of assisting Member States in fostering the use of nuclear science and technology wherever these offer unique opportunities or provide added value.

The Laboratories have indeed come a long way. Starting with a mere 1736 m² of combined laboratory, office and corridor space in 1962, the original U-shaped building housed 14 professional and 24 general service staff. Today, it covers an area of more than 13 000 m² and is a dynamic hub for nearly one hundred scientists, technicians, fellows, visitors, interns and students from all over the world that are engaged in a wide range of activities dedicated to supporting global development and cooperation. These dedicated and concerted efforts have led to a myriad of success stories in the many areas of work in the Laboratories, which is both satisfying and enthusing.

Many of you have, at some stage in your career, interacted with the NA Laboratories in Seibersdorf and contributed to these successful projects and programmes, which are glowing examples of success stories that fully justify the mandate of these Laboratories. We are very grateful to all of you for seamlessly working with us, as we realize that it is only through the dedication, the enthusiasm and the numerous ideas of our many internal and external stakeholders, that it has been possible for the Laboratories to consistently remain at the forefront in our numerous and very diverse endeavours.

Nonetheless, this is not the time to lay back in satisfaction but a time to look forward to further enhance the performance of the Laboratories and to improve our outreach. While the NA Laboratories in Seibersdorf have served the Member States well over the last half century, they need to be modernized and upgraded to cater to growing demands and to keep pace with increasingly rapid technological developments. The planned 50 year anniversary celebration of the Laboratories is an apt time to look back and feel proud of the numerous achievements, as well as to plan the future road map that will enable the Laboratories to retain the high level and quality of service that Member States have come to expect.

So, when we celebrate the 50th anniversary of the NA Laboratories in Seibersdorf, it is really you we are celebrating. We sincerely hope to see as many of you as possible during this year of celebration or maybe even at the actual event in late November 2012 at the Laboratories.

Daud Mohamad

Deputy Director General
Department of Nuclear Sciences and Applications

Sustainability of Capacity Building Activities to Improve Food Safety and Quality through Nuclear Technology and Networking

Technical Officer: Britt Maestroni

In 2011, The United States of America started a Peaceful Uses Initiative (PUI), the objective of which is to support the IAEA in facilitating greater access for Member States to peaceful uses of nuclear technology. In this context a project proposal entitled Sustainability of Capacity Building Activities to Improve Food Safety and Quality through Nuclear Technology and Networking was prepared by FEPL staff and granted funding under the PUI in late 2011. The project has a planned duration of three years. The objective is to ensure food safety and quality while addressing the sustainability of technical capacity, laboratory infrastructure and regional/interregional networking.

Access to food control laboratories and related services represents the minimum requirement to generate monitoring data for the food risk management activities within a nation. Currently, outsourcing analytical services and the use of private analytical services are the only option available in some countries, but this is not feasible as a regular practice. Each national government needs to establish and sustain accredited laboratories for the control of food, both for domestic consumption and for export, by effective monitoring of small and large-scale producers.

Under the project activities will be implemented in developing countries to build infrastructure for the intervention of donor organizations (regionally and internationally) to implement food control systems and ultimately to contribute to enhanced food safety and quality. The project will follow a modular plan applying successful approaches adopted in other countries and coordinating donor resources to accelerate the commissioning of laboratories and state of the art analytical equipment. Successful capacity building will also require a multidisciplinary approach. All project participants will work cooperatively on the core programme using nuclear and complementary technologies. As members of a wider group, the project participants will apply proven technical solutions and efficient information and communication technologies to allow countries without any existing capacity to quickly begin their training using regional capacity and technology transfer from well-established to less well established laboratories. Project results are expected to include:

1. State of the art food control laboratories, including methodologies to address identified gaps in food control systems, commissioned and fully operational.

2. Networks of laboratories and affiliated/donor/technical cooperation agencies established and recognized internationally.

3. Analytical strategies and integrated monitoring initiated in several countries to ensure adequate risk management decisions.

4. A recognized platform, including a financial mechanism to ensure sustainability of capacity building activities, in place in several countries.

Activities planned for the year 2012 include the implementation of train the trainers courses and sustainable technology transfer to developing country scientists, and workshops for regulators and policy-makers on food quality and safety.

Recently held and upcoming events relating to this initiative:

16–27 April 2012: Regional workshop on Use and Deployment of LC-MS/MS, Panama City, Panama, 20 participants from Latin America and the Caribbean (see immediately below).

29 June–2 July 2012: Inter-regional train-the-trainers FAO/IAEA Food Safety Workshop: From Farm to Fork, FEP Laboratory, Seibersdorf, Austria, 20 participants from developing countries.

27–31 August 2012: Regional FAO/IAEA Food Safety Workshop: From Farm to Fork, Belize City, Belize, 15 participants from Latin America and the Caribbean.

27 September–7 October 2012: Inter-regional train-the-trainers Course on Radiotracers Techniques for Food Contaminant Control, FEP Laboratory, Seibersdorf, Austria, 20 participants from developing countries.

5–9 November 2012: Regional workshop on Integrated Analytical Approaches and Food Safety, Montevideo, Uruguay, 15 participants from Latin America and the Caribbean.

26 November–7 December 2012: Inter-regional train-the-trainers Workshop on Integrated Analytical Techniques to Control Contaminants in Food, 20 participants from developing countries.

FAO/IAEA/OIRSA/MIDA Training Course on the Use and Deployment of Liquid Chromatography Coupled to Tandem Mass Spectrometry (LC-MS/MS); Panama City, Panama; 16–27 April 2012

Technical Officer: Britt Maestroni

The FAO/IAEA Food and Environmental Protection Laboratory (FEPL), in collaboration with the Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA) and the Ministerio de Desarrollo Agropecuario (MIDA) of Panama, organized a training course on the use and deployment of liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) at the analytical laboratory of MIDA in Tocumen, Panama, from 16–27 April, 2012. Twenty participants attended the training from Costa Rica, Dominican Republic, El Salvador, Guatemala Honduras, Nicaragua, Panama and Uruguay. The training was partially funded under the Peaceful Uses Initiatives (PUI) programme of the USA under the project Sustainability of Capacity Building Activities to Improve Food Safety.

The Minister of Rural Development of Panama, Mr Oscar Osorio Casal, delivering a training course certificate to a participant from Costa Rica

The training covered theoretical aspects related to the use of the LC-MS/MS system, including the theory of the triple quadruple mass analyser, the ion source and routine maintenance, matrix effects, the use of internal standards, calibration, and confirmatory criteria for pesticide residue analysis by LC-MS/MS. Additional lectures were given on multi-residue methods for pesticide residues in food and examples of applications for pesticide residues analysis by LC-MS/MS.

The practical aspect of the training covered an introduction to the software, setup of operating parameters for the instrument, preparation of a calibration curve, quality control measures, injection of orange and paprika extracts, integration of total ion chromatograms, confirmation of residues and data analysis. Participants were divided in two groups. At the end of the training, each group prepared a standard operating procedure that will help all trainees to set up the methods and implement pesticide residues analysis in the laboratories in their home countries. The course instructors were Mr Patrick Knittl from Austria and Mr Orlando Lucas and Ms Roxana Ventocilla from Peru.

The evaluation of the course was very positive and attracted the attention of the highest authorities in Panama. The Minister of Rural Development (Desarrollo Agropecuario) of Panama, Mr Oscar Osorio Casal, participated in the official closing of the training course along with the Director of the MIDA-Sanidad Vegetal, Mr Emmeris Quintero, Ms Gisela Tapia, representing OIRSA, and Ms Eva Bravo, representing the food safety branch of OIRSA.

Participants of the regional workshop in a lecture on the theory of the triple quadruple mass analyser

Sample Preparation Techniques for Laser Spectroscopy δD and $\delta^{18}O$ Measurements in Apples

Technical Officers: Sorivan Chhem Kieth and Nasir Rathor

Work on food traceability using cavity-ring-down spectroscopy (CRDS) continues in FEPL with the objective of elaborating methodologies for traceability and authentication of food that can be transferred and applied in developing countries. The CRDS instrument installed in the FEPL is a stable isotope analyzer based on laser absorption, which measures $^{2}H/^{1}H$ and $^{18}O/^{16}O$ isotope ratios (δD and $\delta^{18}O$) in liquid water. This type of instrument, for certain applications, may offer a robust and affordable alternative to more complex and expensive techniques such as isotope ratio mass spectrometry (IRMS), especially for fieldwork.

The work carried out at the FEPL focused on the optimization of sample preparation methodology to obtain 'pure water' (water free from interfering substances) from fresh fruits and vegetables to allow the accurate measurement of the isotopic ratios by CRDS. Two main approaches

were applied, namely, the cryodistillation of extracts obtained from homogenized fruits and vegetables to produce a liquid sample, and measurement of the isotopic composition of the vapour phase above the homogenised apple samples in a sealed bag after a defined equilibration time.

The aim of this preliminary study was to assess the correlation between the two sample preparation methods in order to establish a methodology to be used for isotopic traceability and authenticity applications in Member States.

Over a period of one month apple samples were prepared on seven different occasions according to both methodologies. Statistical evaluation indicated that the results were significantly different on each occasion, the difference between the methods being constant over the replicates (Figure 4). This can indicate that interferences are present and further experiments are needed to optimize the sample preparation for CRDS isotopic analysis. Future work includes investigation of further purification of the sample extract after cryodistillation to remove interfering alcohol traces naturally present in fruit products.

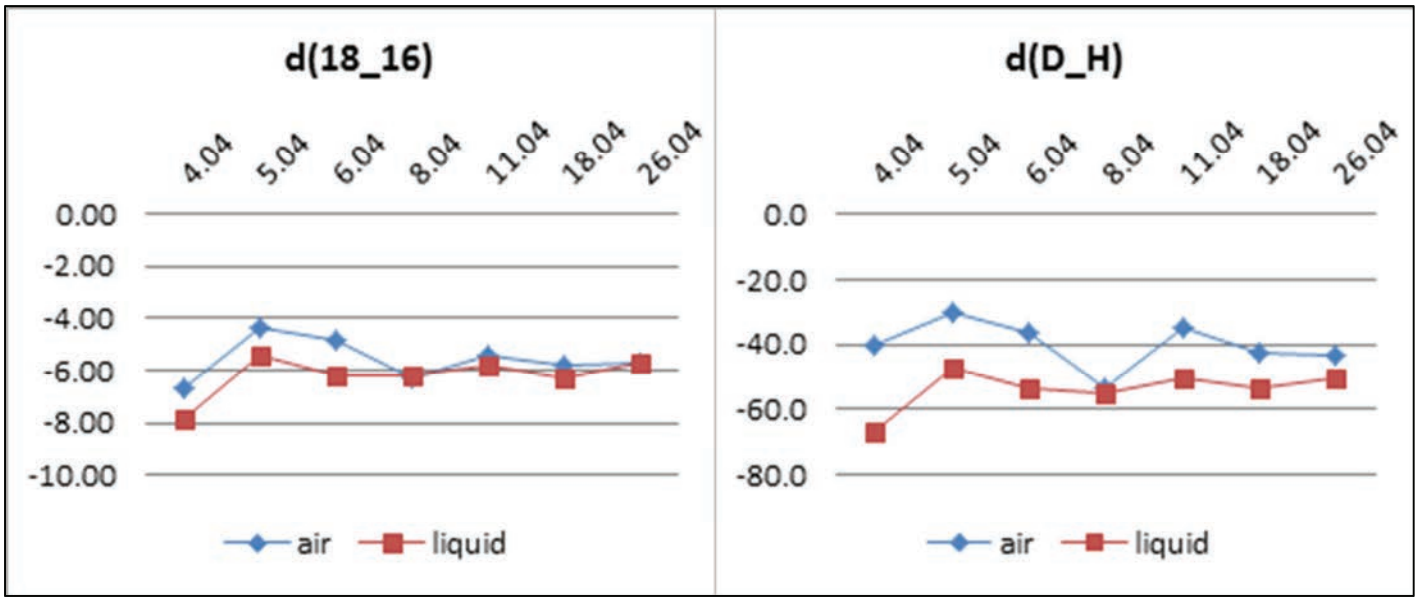


Figure 4 Bias between liquid (cryodistillation) and vapour (equilibration method) results

Authenticity Assessment of Fruit Juices using Ultra-performance Liquid Chromatography-time of Flight Mass Spectrometry

Technical Officer: Zora Jandrić

Adulteration of food and beverages is a growing problem in today's global market. Advanced analytical methods are required to protect the rights of producers and consumers with respect to fraudulent practices and the adulteration of foods. These are important issues for legislative, economic, and religious or cultural reasons and can also have an impact on food safety. Fruit juices are particularly susceptible to adulteration, high value juices often being adulterated with relatively low priced juices, perhaps with lower nutritional value.

The authenticity of pineapple juice was investigated using ultra performance liquid chromatography (UPLC) and accurate single mass spectrometry (MS) and MS/MS mass spectra. Adulterated samples were prepared in the laboratory by adding 14% of orange to pineapple juices.

The experimental data were analysed using principal component analysis (PCA). Obvious separation between the sample groups (pineapple, orange and pineapple-orange mix) was observed, as shown on the scores plot (Figure 5). This indicated that the samples contained some compounds which are distinctly different and could be used to discriminate between the juices and to indicate adulteration.

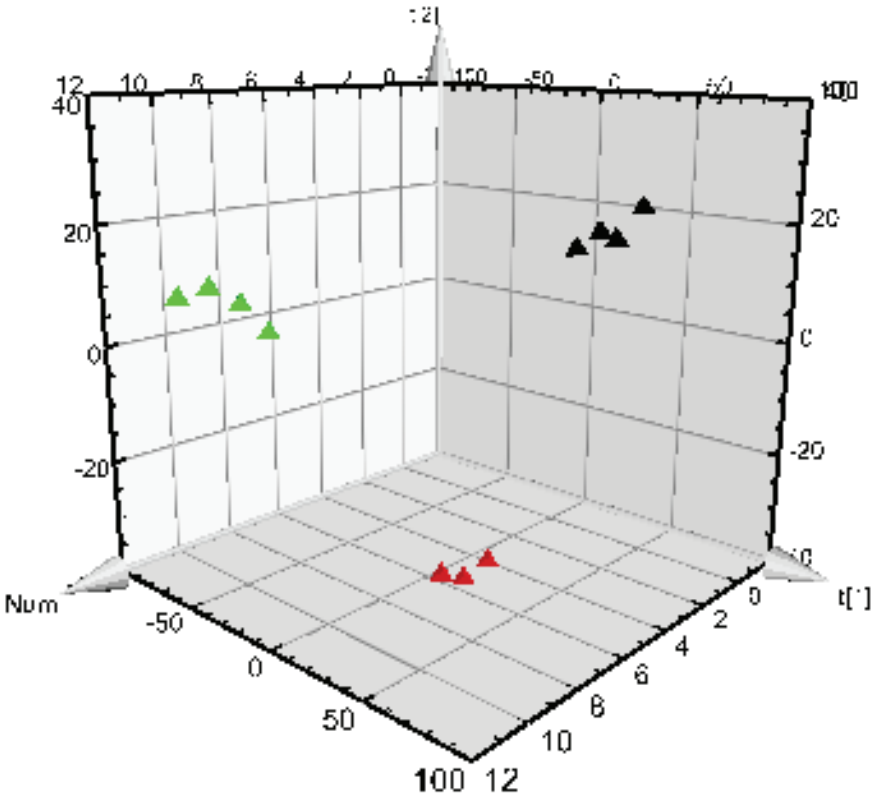


Figure 5 The PCA 3D scores plot obtained from pineapple and orange juices
(red triangles-pineapple juice adulterated with 14% of orange juice; green triangles-orange juice; black triangle-pineapple juice)

The data were processed using orthogonal projection to latent structures-discriminate analysis (OPLS-DA) to obtain potential characteristic markers for each juice. Tentative markers with exact retention time pairs were observed from S plot (Figure 6) for pineapple and orange fruit juices. Discriminating marker compounds were identified using database searching. Three compounds (Limonin 17-beta-D-glucopyranoside, narirutin and hesperidin) were identified as markers present in orange juices and one compound (S–sinapylglutahtione) as a marker from pineapple juice.

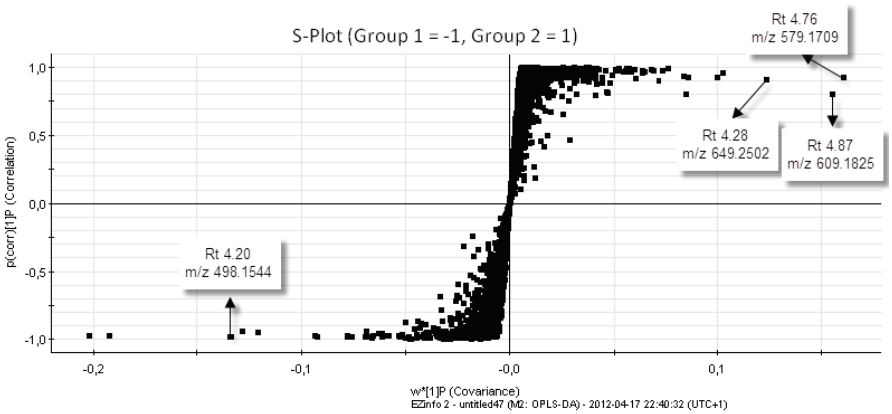


Figure 6 S-plot of fruit juices with characteristic markers
(m/z 498.1544, S –sinapylglutahtione; m/z 649.2502, Limonin 17-beta-D-glucopyranoside, m/z 579.1709, narirutin; m/z 609.1825, hesperidin)

Using exact mass measurement and multivariate data analysis, it was possible to discriminate between authentic and adulterated fruit juices and to identify marker chemicals responsible for differences between the groups. The detection and quantification of these markers can therefore be used to detect the adulteration of pineapple juice with orange juice, and the same methodology can be applied to identify discriminatory markers for other juices. Research and development in this field is ongoing in FEPL.

Fellows and Interns

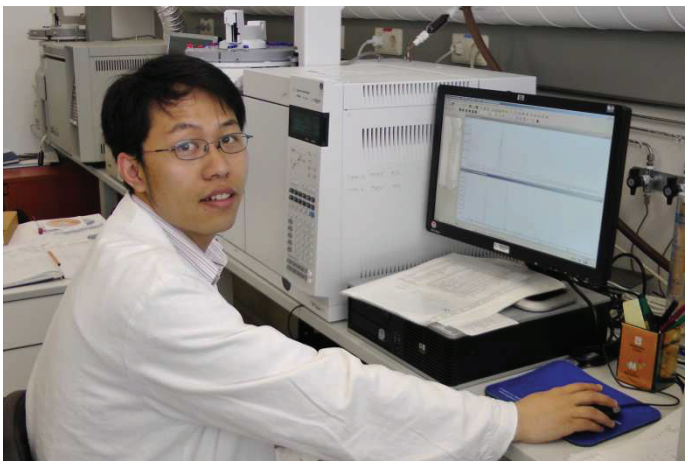
Ms Malia Gallucio and Mr Wolfgang Werner from EARTH University, Costa Rica, commenced internships in FEPL in September 2011. Malia completed her internship in December 2011, while Wolfgang had his internship extended by 6 months. Both interns' interest is in the development of bioassays and bio-monitoring techniques as indicators of the effectiveness of agricultural management practices.

Ms Malia Gallucio (right), Mr Wolfgang Werner (middle) and Mr Nasir Rathor (left) taking samples for bio-monitoring

Mr Khaled El-Hawari commenced a 4 month TC fellowship in FEPL in October 2011. Khaled is from the Laboratory for the Analysis of Pesticides and Organic Pollutants, National Council for Scientific Research, Lebanese Atomic Energy Agency. Khaled worked on methodology for the traceability of food and feeds using stable isotope ratio analysis and he completed his fellowship training related to LEB5014 in January 2012.

Mr Khaled El-Hawari (left), Ms Malia Gallucio, Mr Nasir Rathor and Mr Wolfgang Werner

Mr Zhu Jie from the Institute for the Application of Atomic Energy, Chinese Academy of Agricultural Sciences, joined FEPL in April 2012 for a 3 month fellowship focusing on analytical methodology for pesticide residues analysis using modern, rapid, sample preparation techniques and gas chromatography – mass spectrometry. This is the final fellowship under TCP CPR5018.



Mr Zhu Jie working on Pesticides method optimisation on GC-MS

Ms Kefilwe Precious Gadimorone, Botswana National Veterinary Laboratory, commenced a 3 month fellowship under TCP BOT5006 in May 2012 working with FEPL staff on the development and validation of a liquid chromatography – tandem mass spectrometry method for the detection of a range of antibiotic residues in animal-derived foods.

Ms Kefilwe Precious Gadimorone (right) being trained by Ms Jandric on operation of mass spectrometry

Publications

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New Database Applications on Food Contaminants and Food Irradiation

Veterinary Drug Residues

Access to analytical methods continues to be a problem in many developing country Member States, especially in the form of validated method protocols. To help address this problem, the Joint FAO/IAEA Division has collaborated with the Codex Committee on Residues of Veterinary Drugs in Foods in publishing analytical methods made available by National Authorities on its web pages.[3]

A new Food Contaminant and Residue Information System (FCRIS) web application has been created. In addition to the new methods database within FCRIS (http://nucleus.iaea.org/fcris), the system includes revised information from the previous Joint FAO/IAEA Division

3 Please see the report of the 20th Session of the Codex Committee on Residues of Veterinary Drugs in Foods for additional details (paragraphs 24-29 and 91-96, REP12/RVDF)

INFOCRIS database (http://www-infocris.iaea.org/EN/default.htm), which will be replaced by FCRIS. This is a compendium of certain contaminants in foods in a user friendly platform that facilitates the uploading of new information.

The methods database will contain methods from various sources. Some of the methods already uploaded have been developed through activities of the Joint FAO/IAEA Division, while others are linked to, for example, the United States Department of Agriculture/Food Safety Inspection Service (USDA/FSIS) webpages and the DILAVE laboratories of the Ministry of Agriculture, Livestock and Fisheries, Uruguay. Additional methods will soon be obtained from the United Kingdom and Canada, and further submissions are invited from all Codex Member States for review and upload by FAO/IAEA staff. The FCRIS database will accommodate both multi-residue analytical methods and single analyte methods. Access to the methods is intended to enhance the capabilities of developing countries and strengthen residue monitoring plans.

A screen shot of the Food Contaminant and Residue Information System (FCRIS) of the Joint FAO/IAEA Division

Pesticide Residues

The associated FCRIS Pesticide Attributes Database (PAD) and the Pesticide Residue Methods (PRM) database are being developed as resources for physicochemical/toxicological data and for methods of analysis for pesticides, respectively.

FCRIS and the related PAD and PRM databases still require further review and refinement before publication on the Joint FAO/IAEA Division website. In the meantime, we welcome the submission of additional information from Codex members and observers through established Codex procedures. (Please see the report of the 44th Session of the Codex Committee on Pesticide Residues in Foods for additional details (paragraphs 11-12, 16 and 180-183, REP12/PR)).

Food Irradiation

Two new Food Irradiation Treatment Facilities and Irradiated Food Authorization databases have been developed on the basis of current NUCLEUS databases related to food irradiation (http://www-naweb.iaea.org/nafa/databases-nafa.html).

As the current databases are becoming outdated both in terms of entries and the computer coding that supports the data, we have totally revised and recoded the database in a user friendly platform that facilitates the uploading of new information as well as the editing of existing information.

Please look for additional information and updates on these revised databases in our next January 2013 edition of the Food and Environmental Protection Newsletter.

Impressum

Food and Environmental Protection Newsletter Vol. 15, No. 2, July 2012

The FEP Newsletter is prepared twice per year by the Food and Environmental Protection Section, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and FAO/IAEA Agriculture and Biotechnology Laboratory, Seibersdorf.

International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Printed by the IAEA in Austria, July 2012

12-23281