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Nuclear Techniques in Food and Agriculture

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Contents

To Our Readers

Photo: IAEA / L.Potterton

Please allow me to introduce myself as the Head of the Food and Environmental Protection Section of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture. I joined this section in September of 2015 and since then, I have been oriented to work in accordance with the mission and mandate assigned to this section, which includes food irradiation, food traceability and authenticity, residues and contaminants analysis, and preparedness and responses to nuclear incidents and/or emergencies. Our activities mainly focus on strengthening Member State capacities for application of international standards, food irradiation and use of nuclear and related analytical technologies in the control of food and environmental hazards, verification of food authenticity and determination of food origin.

I come to this international platform with a long track record of research in entomology and food safety, research management and international collaboration in agriculture. My previous positions for research include the Coordinator of National Program on Integrated Management of Crop Pests and the Principal Investigator of several national and international research projects on food quality and safety at

the Chinese Academy of Agricultural Sciences (CAAS) in China. I served as the Director General and Professor of the Research Management Department of CAAS for 5 years. I was a professor and the Founding Director General of the Institute of Quality Standards & Testing Technology for Agro-products of CAAS for 12 years, leading and coordinating research on development of analytical techniques for agri-food safety and quality in the country and providing advice for policy-making on food safety regulation. I hold positions in several professional societies and organizations and served as chair and co-chair of national and international conferences, symposia and workshops, and as member in editorial boards of several professional journals and magazines.

As regards the activities of the subprogram, I am very glad to report that over the 2014−15 biennium and in planning the major programme and budget for 2016−17, it was recognized that the key areas of demand for assistance from our Member States include support for food safety and security. In this regard, FEP objectives over the next biennium are to:

- improve food safety and food control systems, as well as environmental protection, including preparedness and response to nuclear and radiological emergencies and in relation to the use of agrochemicals;
- enhance international food trade through the use of nuclear and related techniques for sanitary and phytosanitary purposes.

These objectives reflect the increasing demand for the use of radioisotope products and radiation technology to support food safety, industrial growth and environmental protection and also increasing demand for assistance in establishing incident and emergency response capabilities. In addition, the Renovation of the Nuclear Applications Laboratories (ReNuAL) project will continue, with the goal of establishing fully fit-for purpose laboratories in Seibersdorf to better serve Member States for the next 15−20 years. Efforts also continue to strengthen and expand partnerships, such as our networks of Member State scientific and research institutions.

The partnership between the IAEA and FAO continues to be strengthened through the Joint Division's contribution to the five FAO strategic objectives. Our section is focused on inclusive and efficient agricultural food systems, and the resilience of livelihoods to threats and crises.

Concerning staff news, I would like to take this opportunity to thank Mr Carl Blackburn for his great efforts and dedicated contributions as Acting Section Head in the past year. Carl continues to be a great asset to our team. I would like to say thank you and a fond farewell to Mr Yves Hénon who has completed his work as a Food Irradiation Specialist and left us in December 2015. We wish Yves every success for the future and look forward to working with him as an expert. At the same time, we also extend a warm welcome to Mr Simon Kelly who has joined as a food safety specialist in the area of food traceability and authenticity. Ms Barbara Massinger was also recently promoted to a different position at the laboratories in Seiberdorf. While we will miss her, we offer a warm welcome to Ms Anita Pavkovic as our new Team Assistant at the Seibersdorf laboratories. In this reporting period, we also welcomed as interns Ms Helene Muehlehner and Ms Hanna Zakala. One final change is that we say goodbye to Mr Enrique Nacif, and thank him for his support as Team Assistant at FEP and welcome back Ms Stella Attakpah.

Finally, best wishes to you and to your families for a happy, healthy and prosperous new year!

Sincerely,

Zhihua Ye
Section Head

The FEP team at the Joint FAO/IAEA committed to serving your Food Safety and Quality needs.

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http://www-naweb.iaea.org/nafa/fep/fep-laboratory.html
http://www.fao.org/ag/portal/age-index.html

Feature Article

e-Learning Course on Food Irradiation

Technical Officer: Yves Hénon

The growing popularity of e-learning can be explained by its many advantages such as[1]:

- Information can be provided as and when needed and can be accessed wherever a computer with an internet connection is available.
- Training can be scheduled around work and personal responsibilities.
- Immediate access to additional online resources can be embedded directly into the course.
- Costs associated with third party trainers or remote training (travel time and expenses) are reduced.
- Self-paced learning modules allow users to learn at their own pace.

Since May 2015, an online, interactive, multi-media and self-study course on *Food Irradiation - Technology, Applications and Good Practices* has been made available by the Food and Environmental Protection Section.

This e-learning Course on Food Irradiation was initiated during a project (RAS/05/057) of the Regional Cooperative Agreement (RCA) *Implementing Best Practices of Food Irradiation for Sanitary and Phytosanitary Purposes*.

During a consultant meeting held in Vienna in July 2014, the concept of the course was refined. It was agreed that the course would be for different audiences:

- The general public, in order to provide an easily accessible source of scientific information. Information on food irradiation is abundant but scattered and much of what can most easily be found on the Internet is often of a non-scientific nature. No recent publication offers to non-specialists a general view of the topic.
- Operators of irradiation facilities, in particular those in developing countries, who will find practical tips to improve their practice and to comply with international standards.
- Academics who could use it as a source of teaching material;
- Food policy makers and inspectors who could use the course to make informed decisions and obtain guidance for the audits of irradiation facilities;
- Potential users of irradiation who could thus get a better understanding of the technology.

Based on the category that they select, users are given access to different sets of modules. Using the ISO 14470-2011[2] standard and the *Manual of Good Practice in Food Irradiation*[3] as references, the course was divided into 10 modules.

Modules	General Public	Academia	Users or potential users of irradiation processing	Food regulators and inspectors	Operators of irradiators
01 - Food Irradiation	✓	✓	✓	✓	✓
02 - Irradiation facilities	✓	✓	✓	✓	✓
03 - Dose		✓	✓	✓	✓
04 - Validation				✓	✓
05 - Product characterization		✓	✓	✓	✓
06 - Process Characterization		✓	✓	✓	✓
07 - Quality management			✓	✓	✓
08 - Monitoring and control				✓	✓
09 - Process effectiveness				✓	✓
10 - Audits			✓	✓	✓

[1] HRTribe, Stephanie Reyes, 2015

[2] Food irradiation - Requirements for the development, validation and routine control of the process of irradiation using ionizing radiation for the treatment of food

[3] Technical Reports Series no. 481, International Atomic Energy Agency, Vienna, 2015

Each module contains:

- A lesson, largely based on the *Manual of Good Practice in Food* except for the first part (Food Irradiation) for which expanding the contents and addressing frequently asked questions seemed necessary. The latest chapters will help operators of irradiation facilities to appreciate and improve their practices.
- A section called 'Essentials' that summarizes the key points.
- A quiz to assess the knowledge acquired by the user from the course material. The quiz questions take a variety of forms: answer matching, multiple choice, true or false, picture selection, or simple calculation.

Videos, Power Point presentations, pdf files and pictures enrich the contents. The course includes a glossary and approximately 80 downloadable references. These references cover safety of irradiated food, effects of irradiation on the nutritional quality of food, effects of irradiation on food microorganisms, insects and parasites, effects of irradiation on parasites, sanitary and phytosanitary applications of irradiation, packaging of irradiated food, food irradiation standards and regulations, history of food irradiation, and communication aspects.

A survey with general and simple questions regarding food irradiation was included before and after the first two lessons (Food Irradiation and Irradiation Facilities) to assess the progress and the evolution of the user's opinion on irradiated food. The table below shows this evolution for two of the questions (based on data collected in early December 2015). The table below shows this evolution for two of the questions (based on data collected in early December 2015).

Irradiated food is radioactive	Before	After
Never	78%	97%
Maybe	14%	-
For a short time	7%	3%
Always	2%	-
Whenever irradiated food is sold and labelled as irradiated, people will buy it	Before	After
I don't believe it	8%	3%
Hard to believe	33%	15%
I believe it	59%	82%

Users having access to all lessons may obtain a uniquely numbered completion certificate valid three years under the conditions that all lessons have been taken and that the mark is over 80% for each of the ten quizzes.

At the end of the course, feedback, comments or suggestions can be provided. All comments have so far been positive regarding the quality of the learning material (62% very satisfied and 38% satisfied), the volume of the learning material (38% very satisfied and 62% satisfied), the course interactivity (46% very satisfied and 54% satisfied), the appropiateness of tests (31% very satisfied and 69% satisfied). A majority of users were very satisfied with the ease to use the platform.

The platform for the course was provided by the Nuclear Knowledge Management Section (NKMS) of the IAEA who maintains the state-of-the-art Cyber Learning Platform for Nuclear Education and Training (CLP4NET) to deliver e-learning to the Member States. NKMS also offered expert advice on course development and assisted with two pilot runs intended to review and improve the course during two meetings on food irradiation in the Asia-Pacific region.

In the first six months since it has been available, the site of the e-learning course has been visited by hundreds of individuals from 44 Member States with nearly 200 of them taking all or part of the course for a total of several hundred learning hours. A dozen individuals have obtained their completion certificates. The course is already in use in irradiation facilities as a training tool. The Food and Environmental Protection Section now asks attendants to some of its meetings to take specific lessons as a prerequisite.

One of the advantages of such an e-learning course is that its contents can be regularly updated and enriched. Consequently the course should improve with time. As part of the Technical Cooperation Project RLA 5066, a Spanish version of the course will be available in 2016.

Feedback from users:

Simple and attractive.
Really innovative awareness programme on food irradiation for layman and even for experts.
Very interesting experience.
I learned a lot. The course is very good.
The tests helped improve my knowledge.
Excellent course.
A very good and pleasant experience.

To access the course: http://bit.do/iaeafoodirradiation

Forthcoming Events

International Meetings/Conferences

Sixth Annual Chapman Phytosanitary Irradiation Forum, 23−24 March 2016, Orange, CA, USA.

10th Session of the Codex Committee on Contaminants in Foods, 4−8 April 2016, Rotterdam, Netherlands.

2016 Annual Hands-On Workshop in eBeam Technologies. The National Center for Electron Beam Research (NECBR), Texas A&M University, USA, 17–22 April 2016.

Third Food Integrity Consortium Meeting and Conference, 4−7 April 2016, Prague, Czech Republic.

Euro Residue VIII Conference on Residues of Veterinary Drugs in Food, 23−25 May 2016, Egmond aan Zee, The Netherlands.

25th International Trade Fair for Laboratory Technology, Analysis, Biotechnology and analytica Conference, 10−13th May 2016, Munich, Germany.

EPRW 2016, 11th European Pesticide Residue Workshop, 24−27 May 2016, Limassol, Cyprus.

Ninth Conference of the World Mycotoxin Forum with the XIVth IUPAC International Symposium on Mycotoxins, 6−9 June 2016, Winnipeg, Canada.

Eighth Meeting of the Representatives of Competent Authorities (Nuclear Preparedness), 6−10 June 2016, Vienna, Austria.

40th Meeting of the Radiation Safety Standards Committee (RASSC), 20−24 June 2016, Vienna, Austria.

39th Session of the Joint FAO/WHO Codex Alimentarius Commission, 27 June−1 July 2016, Italy

North American Chemical Residue Workshop, 17−20 July 2016, Tampa Florida, USA.

Food Metabolomics Conference, 10−12 October 2016, Karlsruhe, Germany.

Technical Workshop: Remediation of Radioactive Contamination in Agriculture, 17–18 October 2016, IAEA Headquarters, Vienna.

18th International Meeting on Radiation Processing, 7−10 November 2016, Vancouver, Canada.

41st Meeting of the Radiation Safety Standards Committee (RASSC), 21–25 November 2016, Vienna, Austria.

2016 Annual Hands-On Workshop in eBeam Technologies. The National Center for Electron Beam Research (NECBR), Texas A&M University, USA, 17–22 April 2016

Technical Officer: Carl Blackburn

The internationally renowned IAEA collaborating centre for Electron Beam Technology for Food, Health and Environmental Applications is to hold a practical workshop to address the needs of the food, phytosanitary, agribusiness, and pharmaceutical industries. This week-long hands-on workshop in eBeam technologies will be the seventh in an annual series, held by the National Center for Electron Beam Research [4] (NCEBR) at Texas A&M University in College Station.

The workshop objectives are to provide attendees with:

- an understanding of the basic principles of ionizing radiation - focusing on eBeam technologies;
- hands-on training in dosimetry (alanine & radiochromic film), dosemapping, and dose penetration, distribution, and validation with single and dual eBeam configurations;
- an understanding of the equipment and other infrastructure requirements needed for this technology;
- unparalleled access to leading international commercial eBeam equipment and sub-system vendors and suppliers to accelerate commercialization;
- information needed to commercialize eBeam and technologies in the food industry for food security, food quality, phytosanitary treatment, and food safety;
- information to commercialize eBeam and technologies in the pharmaceutical and biomedical industries for sterilization applications and vaccine development;
- information to commercialize eBeam technologies in the environmental industry for wastewater remediation, industrial waste treatment, treatment of municipal sludges and water reuse programmes.

[4] http://ebeam.tamu.edu/

There is a discount for early registration and the registration fee includes hotel accommodation, a welcome reception, an eBook manual, a hard-copy manual, five lunches, three dinners, refreshments, workshop materials, workshop completion certificates, and daily transportation from your local hotel to workshop venues. Please register online at https://agriliferegister.tamu.edu/EBeam

IMRP 18 in Vancouver, Canada, 7–10 November 2016

Technical Officer: Yves Hénon

The 18th International Meeting on Radiation Processing (IMRP) will be held in Vancouver, Canada, during week commencing Monday 7 November 2016. Organized in cooperation with the IAEA, this is the premier event in radiation technology research and applications. The event will feature a conference, an exhibition, posters and social events that will enable participants to network. Special sessions will be devoted to phytosanitary and other applications of food irradiation.

More information at
http://iiaglobal.com/index.php?page=imrp-2016

Past Events

Second Meeting of the Scientific Committee for the EuroResidue VIII International Conference, Utrecht, The Netherlands, 4 December 2015

Technical Officer: Andrew Cannavan

The second meeting of the Scientific Committee for the EuroResidue VIII International Conference on Residues of Veterinary Drugs in Food was held in Utrecht, The Netherlands, on 4 December 2015.

EuroResidueVIII Scientific Committee Meeting Utrecht, the Netherlands, 4 December 2015.

The EuroResidue conferences, held every four years, are amongst the most important meetings in the world on residues of veterinary drugs in food and the environment. The conference covers aspects such as analytical techniques, pharmacological and toxicological studies, anti-microbial resistance and regulation of veterinary drugs.

The eighth in the series of EuroResidue conferences will be held in Egmond aan Zee, the Netherlands, from 23 to 25 May 2016. Mr Cannavan, Head of the Food and Environmental Protection Laboratory, participated in the second meeting as Chair of the Scientific Committee for the conference. The meeting was attended by 15 of the committee members representing research institutes, regulatory laboratories, academia and industry. The committee discussed and evaluated approximately 200 abstracts that had been submitted for oral or poster presentation and drafted a preliminary program for the ER VIII conference in May 2016.

Control of residues of veterinary drugs in food is important to many IAEA and FAO member nations. This is reflected in the fact that there are currently more than 20 IAEA TCPs and one CRP focusing the control of veterinary drug residues in food. One of the issues to be discussed at the conference is the development of antimicrobial resistant organisms and the linkages with residues of antibiotics in food, which has become a major focus for FAO (and the Joint FAO/IAEA Division) and WHO in recent times due to current fears that antibiotics may become totally ineffective for many infections in the near future.

It is hoped that a number of TCP and CRP counterparts will be able to participate in the conference in May, and discussions are currently under way with respect to using the conference to add value to a coordinators meeting for a new regional TCP that has veterinary drug residue control as a major focus, by holding the meeting as a satellite event.

PREPARE WP3: Management of Contaminated Goods after a Nuclear Accident, Paris, France, 12−13 November 2015

Technical Officer: Carl Blackburn

The Technical Officer represented FAO and participated in the final workshop of the European Union funded research project "PREPARE work package 3" covering the management of contaminated goods (including foods and agricultural products) after a nuclear accident. It was the final in the series and was hosted by the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development in Paris, France.

The overall objective of work package 3 is to assist in designing and strengthening participating countries nuclear emergency preparedness plans for post-accidental situations by taking into account the views of producers, processors, retail industries and consumers. This meeting included delegates from Japan and representatives of national stakeholder panels from 11 European countries.

As regards food and food production, the overall conclusions were that food issues are complex (not only in terms of wellbeing and health but also on psychological and cultural levels). Therefore anything that threatens the safety or supply of food has a major impact on people's lives. The stakeholder responses from different countries were remarkably similar. They thought it important to provide clear information and have consistent / harmonized maximum permitted levels (MPLs) of radionuclides in foods. They also considered that the roles and responsibilities for response and coordination were not always clear in different countries and it was also felt that stakeholders should be involved in emergency exercise. International cooperation was seen as an important issue in ensuring consistency and striving towards establishing internationally acceptable MPLs for radionuclides in foods and in other commodities. They therefore pressed upon international organizations and national organizations the need for consistency and for clarity in providing MPLs.

FAO-IAEA/GFSP/UNIDO Training Workshop on Food Safety, Quality and Traceability, Ho Chi Minh City and Hanoi, Viet Nam, 9–20 November 2015

Technical Officer: Britt Maestroni

The Food and Agriculture Organization of the United Nations (FAO) and the International Atomic Energy Agency (IAEA), through the Food and Environmental Protection Laboratory in collaboration with the Global Food Safety Partnership (GFSP) and the United Nations Industrial Development Organization (UNIDO) organized a train-the-trainers workshop on "Food Safety, Quality and Traceability" that took place in Ho Chi Minh City from 9 to 13 November and in Hanoi from 16 to 20 November 2015 in Viet Nam. The workshop was attended by 49 participants from 11 countries of the Asia Pacific and Middle East region.

Participants of the training workshop during the training in Ho Chi Minh City.

The workshop was one in a series under the Peaceful Uses Initiative Project (PUI) on "Sustainability of Capacity Building Activities to Improve Food Safety and Quality through Nuclear Technology and Networking" funded by the USA. This workshop aimed at providing assistance and support to countries in their efforts to ensure the safety and quality of food and agricultural commodities while at the same time facilitating international trade. The workshop aimed to raise awareness of the requirements for effective food control systems to protect the integrity of the food supply chain, with a focus on the role of the analytical laboratory in addressing challenges related to food contaminants, food traceability and food authenticity.

The first week of the workshop was hosted by the Quality Assurance and Testing Center 3 (Quatest 3), which is a science-technological organization under the Directorate for Standards, Metrology and Quality of the Ministry of Science and Technology of Viet Nam. The UNIDO representative in Viet Nam participated in the opening event, giving an introductory lecture on UNIDO's food safety approach and experiences in the region.

Participants splitted into two groups for the group assignment, week 1.

The programme of the first week included lectures on food control systems and the role of the different stakeholders in the farm-to-fork food chain, international guidelines and regulations for consumer protection and international trade, an overview of isotopic and other complementary analytical technologies for food authentication and traceability, food contaminant analysis and sample preparation options, method validation analytical requirements, and an overview of advanced analytical instrumentation.

The second week of the workshop was hosted by the National Institute for Food Control (NIFC) in Hanoi. During the second week, extensive practical laboratory training on methods to detect mycotoxins in food and feed took place at the NIFC laboratory, in addition to lectures on sampling challenges, mycotoxin analysis for food and feed, sample preparation, method validation analytical requirements and quality assurance and quality control aspects, mycotoxin health impacts, screening and confirmatory methods for mycotoxin analysis. Practical laboratory work aimed at demonstrating the principles of lateral flow tests for aflatoxins, enzyme linked immunosorbent assay (ELISA), immunoaffinity column cleanup, standard preparations, and liquid chromatography coupled with fluorescence detection (LC-FLD) and mass spectrometric detection (LC-MSMS).

Participants of the training workshop during the training in Hanoi.

The importance of establishing quality systems and applying quality control and quality assurance measures in the laboratories was stressed, focusing on the need to ensure that data produced is reliable and can be used in risk assessments and shared with decision makers.

The participants of the second week of the workshop received a laboratory manual on methods of determination of mycotoxins in food, prepared by the International Food Safety Training Laboratory of the University of Maryland, JIFSAN, in collaboration with US FDA and Waters Corporation. Representatives of instrument manufacturers such as Waters, Agilent and Thermo-Fisher Scientific contributed with technical lectures on sample preparation, modern technologies to target food contaminants and mass spectrometry.

Participants in the laboratory, week 2.

On the final day of the workshop the World Bank through its manager for the food and agriculture global practice East Asia and the Pacific region participated at the workshop and discussed the importance of promoting capacity building to improve food safety in the region. UNIDO also attended the closure event of the workshop and provided local support to the workshop.

The training workshop was well received by the participants. A final evaluation questionnaire indicated that all participants were happy with the workshop and that 82% judged they will be able to apply the knowledge acquired once they are back in their laboratory. One result of the workshop was a regional network of scientists from the Asia Pacific Region and the Middle East who initially joined in an ad hoc google group. The network decided that every month, on rotation, every laboratory will prepare a webinar and share it with the network. In addition, all participants will prepare a gap analysis for food safety in their country and submit it for a joint publication. Further support is needed to consolidate the network and to ensure its sustainability. This analytical network can help ensure that experiences, challenges and contacts can be shared in an integrated way amongst several laboratories and institutions in the region.

Recommendations to the IAEA from the workshop participants included the establishment of a follow-up programme and an impact assessment to further consolidate the interdisciplinary networking.

Seventh International Symposium on Recent Advances in Food Analysis, Prague, Czech Republic, 3–6 November 2015

Technical Officers: Zora Jandrić and Andrew Cannavan

The International Symposium on Recent Advances in Food Analysis (RAFA) is a biennial event, held in Prague, Czech Republic. The seventh Symposium in the series was held from 3 to 6 November 2015. The symposium covered a wide range of topics including recent advances in analytical and bioanalytical technologies, allergens, novel foods and supplements, emerging food-related issues, risk assessment, food authenticity and fraud, and analysis of nanoparticles, residues and natural contaminants. The FAO/IAEA Workshop, "Food Safety - Challenges for Developing Countries", the third European Ambient Mass Spectrometry Workshop and several vendor workshops were also included in the agenda. The symposium had approximately 800 registered participants from more than 65 countries world-wide.

Ms Zora Jandrić participated in the symposium and presented a poster entitled "Differentiation of Manuka and Kanuka Honeys by Mass Spectrometry and Chemometrics". This research, performed in the Food and Environmental Protection Laboratory (FEPL) under the project "Traceability to Improve Food Safety and Quality and Enhance International Trade", demonstrated that untargeted metabolomics analysis can be used to differentiate between manuka and kanuka honeys, which cannot currently be differentiated reliably by any other method. This is an important step forward in the development of methodology to protect product authenticity and combat fraud, which is a very costly problem in many countries, both developing and developed. The poster raised a lot of interest and discussion amongst symposium participants.

Two posters on collaborative work with FEPL were presented by project counterparts from the Laboratorio de Bromatologia in Montevideo, Uruguay, one on "Method validation for selected pesticides in potato by gas chromatography coupled to single quadrupole and triple quadrupole mass spectrometry" and another on "A modified QuEChERS method coupled to GC QQQ MSMS for the determination of pesticide residues in a herbal, boldo, its leaves and their infusion and the resulting transference to the brew".

The symposium programme also included two open-day sessions of the EU 7th Framework project FoodIntegrity.

FEPL is a full partner in FoodIntegrity and is actively involved in work package 1, Food Integrity Network, work package 2, Knowledge Base and work package 10, Industrial Integration. Mr Cannavan participated in both open-day sessions, representing FEPL.

The information exchange in the field of food analysis at the symposium was extremely useful. The participants included key figures in the fields of food safety and food control. A number of individuals who had previous or current interactions with FEPL through Technical Cooperation Projects (TCPs), Coordinated Research Projects (CRPs), or as participants in training workshops were present. The event provided an opportunity for mutual updating of information and maintenance and extension of contact networks, and was an effective forum for creating awareness of the activities of the Agency in food safety and consumer protection, for keeping abreast of technical and regulatory developments, and for the interchange of information and ideas. There was considerable interest in the work of the Agency in food traceability and authenticity, including opportunities for potential collaboration with several institutions. Participation in this symposium was of direct benefit to the work of FEPL and, ultimately, to the Member States.

FAO/IAEA Workshop on Food Safety - Challenges for Developing Countries, Prague, Czech Republic, 3 November 2015

Technical Officers: Andrew Cannavan and Zora Jandrić

Effective food control systems are needed to ensure a safe and wholesome food supply on a global basis. One key element of such a system is the provision of feedback on the effectiveness of agricultural practices in producing food that is safe and meets requirements for international trade. In this regard, analytical laboratories to underpin monitoring and surveillance schemes are essential. Testing of agricultural products is important to maintain consumer confidence, ensure food safety, and facilitate international trade and the provision of safe food supplies.

Implementing these testing schemes is challenging, especially for developing countries, and requires strong networking, human resource development, research and capacity building in the field of food control systems. To help Member States in this regard the Joint FAO/IAEA Division held a workshop on “Food Safety - Challenges for Developing Countries” in conjunction with the 7th International Symposium on Recent Advances in Food Analysis (RAFA), in Prague, Czech Republic, from 3 to 6 November 2015. Workshop participants also participated in the full RAFA symposium.

The purpose of the workshop was to identify problems and issues of high importance and to provide information and guidance on research and capacity building in the field of food control systems. The workshop had more than 70 participants from more than 30 countries.

Mr Cannavan moderating the panel discussion session.

Mr Andrew Cannavan, Head of the FAO/IAEA Food and Environmental Protection Laboratory at Seibersdorf, chaired and opened the meeting. Presentations were given by Mr Ihsan Ihsanullah (Nuclear Institute for Food & Agriculture, Paksitan), Mr Alphonse Yakoro (National Public Health Laboratory, Burkina Faso), Ms Veronica Cesio (UdelaR, Uruguuay), Mr Bruno Le Bizec (ONIRIS-LABERCA, France) and Ms Janie Dubois (International Food Safety Training Laboratory, JIFSAN, USA).

Prof. Le Bizec presenting a lecture at the FAO/IAEA Workshop.

Following the presentations, the lecturers joined together in an expert panel for an interactive discussion/question and answer session with the workshop participants, moderated by Mr Cannavan.

The workshop provided an excellent opportunity for developing country scientists to network and potentially develop working collaborations with participants in RAFA. This networking will enhance the sustainability of the control systems in Member States and will help to harmonise the approach to food safety control internationally.

Food Safety Workshop in Senegal to Strengthen Networking in Africa, Dakar, Senegal, 19−23 October 2015

Technical Officer: James Sasanya

An FAO/IAEA Workshop on Food Safety, Quality and Traceability Workshop was organized by the Food and Environmental Protection and the Laboratory for Control of Veterinary Drugs (LACOMEV) of the Interstate School of Science and Veterinary Medicine, Senegal.

Participants deliberating at a food safety workshop in Dakar, Senegal. Photo courtesy of J. Sasanya.

The purpose of the workshop was to contribute towards on-going efforts to promote interaction and networking among food safety stakeholders in Africa, including laboratory quality control and ability to trace foods and food related hazards. The participants included 30 Scientists, laboratory personnel and food inspectors from 18 African countries namely, Benin, Botswana, Burkina Faso, Burundi, Cote d'Ivoire, Gabon, Ghana, Guinea, Kenya, Lesotho, Malawi, Morocco, Nigeria, Rwanda, Senegal (the host), Sudan, Togo and Zambia. A number of staff from local food safety institutions as well as Ms Fatou Sock, FAO, Senegal, who presented on the state of food safety in Senegal, actively participated.

Mr Vincent Martin, FAO Representative in Senegal welcomed the participants on behalf of the FAO Director General Mr José Graziano Da Silva and reiterated the importance of the FAO/IAEA partnership. He reminded participants of food safety's key role in public health and trade in Africa thus its increasing importance. He then challenged participants to work closely among themselves and with other stakeholders and contribute to a safer food supply in Africa.

Workshop participants in a local food safety laboratory. Photo courtesy of J. Sasanya.

Technical information was presented by a team of regional experts and the Scientific Secretary, also the Technical Officer. All participants also presented their countries' experiences and challenges and group discussions were held on viable solutions. The local institutions hosted the participants in their respective laboratories were practical demonstrations were conducted.

On behalf of their institutions, participants expressed great desire to network among food safety stakeholders in Africa including willingness to join the African Food Safety Network (AFoSaN). They also recommended ways to strengthen the network, such as through increased exchange of technical information, more inter-laboratory tests, exchange visits and workshops. They called on the Technical Officer (Joint Division) to continue administering the AFoSaN web platform as the members identify a substantive secretariat.

The participants rated the workshop as 8.3. on a 10 point scale against the administrative/organizational and technical arrangements, workshop content and resource persons, venue, laboratory demonstrations/visits, participation and interaction. They also provided suggestions on how to improve similar activities in future.

While closing the workshop, Professor Cheikh Bécaye Gaye, Director General, General Directorate for Research, Ministry of Higher Education and Research, on behalf of the Minister of Education, Senegal thanked the IAEA and particularly the Joint Division for identifying Senegal to host the workshop, and for giving Member States the opportunity to network and solve common problems. He challenged participants to take ownership and leadership of Agency supported programs as a way to ensure sustainability. He appreciated the regional expertise involved in the workshop.

Hot Topics in Microbiology Conference, Campden BRI, Chipping Campden, UK, 8–9 October 2015

Technical Officer: Carl Blackburn

The Technical Officer (TO) participated at the conference and provided a keynote presentation as an overview and up-date on food irradiation. The meeting provided the TO with an update on current topics in microbiology and recent developments concerning food and water borne organisms that cause human illness from both regulatory bodies and food industry experts.

Campden BRI provides the food and drink industry with the practical scientific, technical and advisory services needed to ensure product safety and quality, process efficiency and product and process innovation. The audience comprised microbiologists and food technologists from the food industry and from European regulatory agencies. These specialists were broadly in favour of food irradiation as a technique to minimize the risk of food borne illness and encouraged the agency to continue its work to promote food irradiation. The audience were surprised to learn that food irradiation is finding more favour in Asia and the Americas and that current interest in this area also includes the use of irradiation as a phytosanitary technique.

Microbiology is undergoing a transformation; a science that has for over one hundred years relied mainly on agar and culture plates is now being revolutionized by the introduction of rapid molecular techniques such as DNA amplification, genetic profiling and high resolution scanning microscopy techniques. For example, many organisms are being re-classified and what may have been once thought of as particular species of food borne pathogens are now proving to be more complex varieties of organisms.

The 38th Session of the Joint FAO/WHO Codex Alimentarius Commission (CAC), Geneva, Switzerland, 6–11 July 2015

Technical Officer: Carl Blackburn

In his statement to the CAC, the Technical Officer provided information on joint FAO/IAEA programmatic activities concerning food quality and safety covering nuclear and related techniques for; food authenticity; control of residues and contaminants particularly pesticide and veterinary drug residues; food irradiation; food related radiation standards, and; the management of nuclear and radiological emergencies. He also provided a written report [5] on the activities of the Joint FAO/IAEA Programme. The Joint FAO/IAEA Division offered its continued cooperation with Codex Committees in regard to international standards and in particular concerning food authenticity, food contaminants, pesticide residues and veterinary drug residues - especially in terms of issues related to methods of analysis and sampling for contaminants, including the inclusion of analytical methods developed by the IAEA in the Food and Environmental Protection Section's webpages.

The Commission expressed its thanks for the involvement of the Joint Division in Codex activities, for the useful information provided at the session and for the future continued cooperation. The Delegation of Japan expressed its appreciation to the IAEA for the continuous support in response to the Fukushima Daiichi nuclear accident. The Delegation of Iran welcomed the work of the IAEA on food authenticity and its impact on food safety, quality and origin of the product and reiterated the relevance of this topic.

EXPO 2015 Conference on "Fighting Food Crime - Enforcing Food Safety", Milan, Italy, 9 July 2015

Technical Officer: Andrew Cannavan

The two-day conference "Fighting Food Crime - Enforcing Food Safety" was held by the Italian national competent authorities for food safety as part of EXPO 2015 in Milan, Italy. The first day was a plenary session comprising a number of presentations by the Italian competent authorities; representatives of countries from Europe (session1), the Americas (session 2), Asia and the Pacific (session 3); and international cooperation to combat food fraud (session 4). The second day provided the opportunity for participants to visit local food production facilities to experience the regulatory mechanisms in place to combat food crime.

Mr Cannavan, Head of the Food and Environmental Protection Laboratory, was invited to give a presentation in session 4 of the plenary session, representing the Joint FAO/IAEA Division on Nuclear Techniques in Food and Agriculture. Mr Cannavan presented the work done at Food and Environmental Protection Laboratory at Seibersdorf in developing, validating and transferring isotopic and complementary methods for food authentication and tracing of origin, in the context of holistic food control systems.

The presentation was very well received and generated a lot of interest and discussion after the session.

The invitation to speak at this prestigious conference provided the opportunity to build awareness of the work of the Joint FAO/IAEA Division in this field, and the possible applications of nuclear/isotopic and related methods as essential elements to underpin control systems for food traceability and authenticity.

[5] ftp://ftp.fao.org/codex/meetings/cac/cac38/if38_07e.pdf

The opportunity was also taken to make the audience aware of the ReNuAL project, its objectives and relevance to applied research and capacity building for workable food control systems, amongst the many other activities of the Nuclear Applications laboratories at Seibersdorf.

EXPO 2015 Conference on "Fighting Food Crime - Enforcing Food Safety".

Summer School on "Food Safety and Food Security: a Multilevel Educational Perspective"

Technical Officer: Britt Maestroni

Protection of the integrity of the food supply is of utmost importance in terms of food security, food safety and quality, consumer protection and international trade. Techniques to maintain and assure the quality and safety of food are necessary throughout the food production and supply chain. The need for methods to monitor and verify food safety and quality and to support food traceability is evidenced by the ever growing list of food product recalls due to contamination or food fraud. In this context, a Summer School on "Food Safety and Food Security: a Multilevel Educational Perspective", organized by the University of Brescia, Italy, under the patronage of EXPO 2015. The goal was to provide students with a multidisciplinary perspective on the societal and scientific challenges of food security and food safety. Ms Maestroni was invited to present an introductory lecture, which highlighted the central role played by the analytical laboratory in providing end product testing and advice in the context of food control systems. The lecture was attended by twenty university students from Italy.

Coordinated Research Projects (CRPs) and Research Coordination Meetings (RCMs)

CRP Reference Number	Ongoing CRPs	Scientific Secretary
D52037	Implementation of Nuclear Techniques to Improve Food Traceability	S. Kelly A. Cannavan
D52038	Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety	S. Kelly A. Cannavan
D61024	Development of Electron Beam and X ray Applications for Food Irradiation (DEXAFI)	C.M. Blackburn
D52039	Development and Strengthening of Radio-Analytical and Complimentary Techniques to Control Residues of Veterinary Drugs and Related Chemicals in Aquaculture Products	J.J. Sasanya
CRP Reference Number	**Closed CRPs**	**Scientific Secretary**
D52036	Development of Radiometric and Allied Analytical Methods to Strengthen National Residue Control Programmes for Antibiotic and Anthelmintic Veterinary Drug Residues	J.J. Sasanya, A. Cannavan
D62008	Development of Generic Irradiation Doses for Quarantine Treatments	C.M. Blackburn Y. Hénon
D62009	Development of Irradiated Foods for Immuno-compromised Patients and Other Potential Target Groups	C.M. Blackburn Y. Hénon
CRP at the Planning Stage	**Proposed CRPs**	**Scientific Secretary**
2156	The Use of Irradiation to Prevent Foodborne Parasitic Infections Associated with Fresh Fruits and Vegetables	C.M. Blackburn
2144	Nuclear Techniques and Novel Instrumentation for Low-Z isotope analysis in Food Products	A. Cannavan

Third Research Coordination Meeting of the Coordinated Research Project on the Implementation of Nuclear Techniques to Improve Food Traceability (CRP 52037), Kampala, Uganda, 26–30 October 2015

Technical Officer: Zhihua Ye

The Research Coordination Meeting (RCM) was held in Royal Suites Hotel, Kampala, Uganda from 26 to 30 October 2015. The meeting, which was hosted by Kampala Makerere University, was attended by seven research contract holders and four agreement holders from 10 countries. Mr Zhihua Ye, representing the IAEA, was the Scientific Secretary for the meeting. Mr Russell Frew, invited by the IAEA as a consultant, assisted the Scientific Secretary. Dr Archileo Kaaya, Prof. and Head of Department of Food Technology and Human Nutrition, Makerere University, gave opening remarks, representing the host country.

The meeting included research progress reports from each of the contract holders and technical presentations from each of the agreement holders. Discussions and working group sessions in the "World Café" format were held to confirm the current status of the project implementation, to combine outputs and outcomes and to identify gaps and solutions to problems encountered. On the basis of the extensive discussions, the work plan for the final year of the projects was revised to strengthen the development of analytic techniques, improvement of datasets/database and networks, and finalizing publications and SOPs for optimizing impacts and fulfilling the objective of the Coordinated Research Project (CRP).

The meeting agreed that the work achieved by the contract holders since the second RCM had been outstanding. This clearly demonstrates the importance of the RCMs for the success of the projects. This CRP had been significantly hampered by the delay in holding the second RCM but

progress since the last RCM is such that much of that setback has been reversed. The agreement holders are to be congratulated on the quality advice and tangible support (e.g. sample analyses) they have provided. It is the hard work put in by the contract holders that has made these projects and the CRP so successful.

There is a need to continue the work and maintain the momentum that has been built up particularly since the last RCM. The aim is to develop systems based on the nuclear technologies that contribute to food safety and traceability by verifying the authenticity of food and natural commodities. The present CRP has achieved the first stage of this by demonstrating the applicability of the techniques to a wide range of foodstuffs. The protocols and databases developed here are foundational to the future development of food control systems.

Participants at discussions and working group sessions in the "World Café" exercises. Photo courtesy of Mr Z. Ye.

Awareness of the contribution nuclear techniques can make to food safety and trade has been raised within the Member States. One of the main barriers to entry for this technology is simply that stakeholders do not know about it and how it can help. Publicity around the CRP as well as individual presentations using resources developed in the CRP have raised awareness and interest among food producers, regulators and even some Government officials.

This RCM provided a forum for the incubation of ideas for further research and development. It is expected that these ideas will lead to further collaborations and cooperation between Member States.

The meeting strongly recommended that a final RCM should take place in 2016 in Vienna, unless it can be scheduled in conjunction with a suitable and relevant conference.

First Research Coordination Meeting of the Coordinated Research Project on the Development of Electron Beam and X ray Applications for Food Irradiation (CRP 61024), Vienna, Austria, 19–23 October 2015

Technical Officers: Yves Hénon and Carl Blackburn

The first Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on the Development of Electron Beam and X ray Applications for Food Irradiation (DEXAFI) was held at the headquarters of IAEA in Vienna, Austria from 19 to 23 October 2015.

Gamma irradiation is the dominant technology for food irradiation. The CRP aims at giving other options by accelerating research and development that would facilitate implementation of practical techniques using electron beam (EB) and X ray and thus unlock the potential of machine sources for radiation treatment of agricultural and food products. The project intends to adopt an international and multidisciplinary approach involving cooperative research and development between food scientists, radiation equipment manufacturers, dosimetry experts, and stakeholders within the agro-food industry.

Industrial irradiation with high power and high energy X ray machines is still a novelty with only two machines in the world as of 2015 (Hawaii, USA and Switzerland) continuously operating in X ray mode. At the other end of the power and energy spectrum, there are attempts by SMEs to propose X ray lamps that could be used in-line to irradiate food. Pasteurization by irradiation may in certain cases require a surface treatment only. For such applications low penetration treatments using low energy EB or X ray might provide a solution. In spite of the interest shown by food manufacturers for this technology, there are still questions to be answered regarding the microbiological efficacy of these types of ionizing radiation while the specific needs and constraints of the food sector must be taken into account.

Participants of the first RCM at the IAEA, Vienna Austria.

Fifteen research proposals from 13 countries were selected for the CRP. The projects fall into four main broad topics:

- Microbiological effects of low energy EB / surface treatments,
- Development of protocols for the EB irradiation of specific food items,
- Effects of EB on insect pests and host products,
- Induction of radioactivity in food with 5-7.5 MeV X-ray,
- Modelling of density and configuration for EB irradiation.

The meeting provided a basis to launch concrete cooperation between participants through the exchange of information, protocols, samples, expertise and scientific visits. The presence of several equipment manufacturers who attended as observers enriched the discussions. A plan of collaboration between the participants within each group and an inventory of the individual fields of expertise of all participants were established.

As dosimetry will be an essential aspect of the project, provisions were made to increase the confidence in the dosimetry systems that will be used. During the first year of the project (2016), the dosimetry practices such as calibration will be reviewed and adjusted as needed in order to bring them to international standards. Participants were also asked to work by an international quality management system such as ISO 14470:2011.

Proposed Coordinated Research Project on the Use of Irradiation to Prevent Foodborne Parasitic Infections Associated with Fresh Fruits and Vegetables, Vienna, Austria, 7–11 September 2015

Technical Officers: Yves Hénon and Carl Blackburn

The Food and Environmental Protection Section organized a Consultants' Meeting in Vienna from 7 to 11 September 2015 in order to assess the relevance of a new Coordinated Research Project on the use of irradiation to prevent foodborne parasitic infections associated with fresh fruits andvegetables. Parasites are a significant endemic problem affecting public health and increasingly associated with raw produce due to growing consumption, global trade and global warming. Recent surveys have showm that the risk of parasitic infections exists both in developed and developing countries.

Few processing technologies are capable of inactivating parasites without affecting the fresh character of fruits and vegetables. Irradiation, as a cold treatment, can play an important role in controlling parasitic foodborne illnesses but the literature on effectiveness of this technology on parasites is almost entirely for products of animal origin. Little information exists about the efficacy of irradiation on viability and infectivity of parasites found in fresh produce or of emerging interest such as *Cryptosporidium* and *Cyclospora*.

Consultants' Meeting from 7 to 11 September 2015.

The objective of this CRP would be to develop irradiation and combination treatments that, along with smart packaging, will be effective against key parasites associated with fresh fruits and vegetables without adversely affecting quality. Susceptibility of microorganisms to irradiation is highly dependent on factors such as food matrix, temperature, water activity or pH. Other factors specific to fresh produce such as variety, maturity, type of fruit (climacteric versus non-climacteric) plays a role in radio-tolerance of the specific food. These factors need to be considered in radiation efficacy studies for parasites. The effects of modified atmosphere packaging and preservatives and additives such as essential oils in the produce or in active smart packaging materials could possibly reduce required dose to optimize quality and also to comply with regulations such as the 1 kGy limit imposed by the US FDA.

The FAO "Top Ten" list of food-borne parasites of greatest global concern:

1. *Taenia solium* (pork tapeworm): **in pork**
2. *Echinococcus granulosus* (hydatid worm or dog tapeworm): **in fresh produce**
3. *Echinococcus multilocularis* (a type of tapeworm): **in fresh produce**
4. *Toxoplasma gondii (protozoa)*: **in meat from small ruminants, pork, beef, game meat** (red meat and organs)
5. *Cryptosporidium spp.(protozoa):* **in fresh produce, fruit juice, milk**
6. *Entamoeba histolytica (protozoa)*: **in fresh produce**
7. *Trichinella spiralis* (pork worm): **in pork**
8. *Opisthorchiidae* (family of flatworms): **in freshwater fish**
9. *Ascaris spp.* (small intestinal roundworms): **in fresh produce**
10. *Trypanosoma cruzi (protozoa)*: **in fruit juices**

FAO, Rome, 1 July 2014
http://www.fao.org/news/story/en/item/237323/icode/

The consultants were Dr Louise Deschênes (Agriculture & Agri-Food Canada), Dr Adelard Mtenga (Tanzania Food and Drug Authority), Prof. Anuradha Prakash (Chapman University, USA) and Prof. Glenn L Sia Su (University of the Philippines). The team recommended that the Food and Environmental Protection Section implement this CRP. The proposal will be submitted to the Committee for Coordinated Research Activities (CCRA) for approval in February 2016.

Final Research Coordination Meeting of the Coordinated Research Project on the Development of Irradiated Foods for Immuno-compromised Patients and other Potential Target Groups (CRP 62009), Vienna, Austria, 1–5 June 2015

Technical Officers: Yves Hénon and Carl Blackburn.

The final Research Coordination Meeting (RCM) of the Coordinated Research Project (CRP) on the Development of Irradiated Foods for Immuno-compromised Patients and other Potential Target Groups was held at IAEA headquarters in Vienna, Austria, from 1 to 5 June 2015.

Despite the potential for food irradiation to provide food that is sterile or very clean its use to provide food for patients or other potential target groups who require this level of food safety appears to be extremely limited.

The overall objective of this CRP that ran from 2009 to 2014 was to develop the use of irradiation in collaboration with the healthcare community to increase the variety, availability and acceptability of foods for immuno-compromised patients and other special groups. The specific objective was to research a range of simple irradiated foods (fresh fruits, vegetables and salads) and complex irradiated foods (ready-to-eat meals) for these potential target groups.

The achievements of this CRP include:

- The establishment of icrobiological specifications for food for immunocompromised patients;
- The inception of a dialogue with hospitals and healthcare professionals working with immunocompromised patients in several countries, which has increased their awareness of irradiated food and the opportunities to widen the range of food offered to the patients;
- The development of a wide variety of irradiated foods having acceptable sensory and nutritional qualities while meeting the set microbiological criteria for which the technology is ready to be transferred to interested parties;
- The assessment of the acceptability of irradiated foods by patients and other target groups and their effects on nutritional status and health related outcomes;
- The production of educational material and the dissemination of information on the potential of irradiated foods for hospital patients, school children, victims of disasters or security forces;
- The publication of more than 50 articles in international and national peer-reviewed journals.

In the course of the project about 100 presentations were made during national and international conferences and nearly 150 undergraduate and postgraduate students were involved.

The summaries of the research carried out in each participating country will be published in a technical document that will be published by the IAEA in the first semester of 2016.

Example of product developed during the project: fortified bread (CNEA, Argentina). Left: non-irradiated sample. Right: irradiated sample. After six months of storage at room temperature.

Participants of the final RCM at the Vienna International Centre, Vienna Austria. Photo courtesy of Ms Monique Lacroix.

Technical Cooperation Project

Country/Region	Project No.	Title	Technical Officer
Azerbaijan	AZB5001	Establishing a Spectrometry Laboratory at the State Metrology Service under the State Committee for Standardization, Metrology and Patents	G. Kis-Benedek, (NAEL) C.M. Blackburn
Bahrain	BAH5001	Determining Pesticide and Mycotoxin Residues in Water and Food	B.M. Maestroni J.S. Corley
Bangladesh	BGD5031	Strengthening Capacities to Monitor and Control Veterinary Drug Residues in Foods of Animal Origin	J.J. Sasanya
Belize	BZE5007	Supporting Sustainable Capacity Building through Distance Learning for Laboratory Personnel of the National Agricultural Health Authority	J. S. Corley G. J. Viljoen B.M. Maestroni
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	J.J. Sasanya
Benin	BEN5009	Monitoring Safe Food Supply through Total Diet Studies and the Application of Nuclear and Complementary Analytical Techniques	C.M. Blackburn J.J. Sasanya A.R.R. Pitois (NAEL)
Botswana	BOT5010	Enhancing Veterinary Drug Residue Monitoring Capabilities	A. Cannavan J.J. Sasanya
Botswana	BOT5014	Enhancing the Use of Nuclear and Isotopic Analytical Techniques in Monitoring Chemical Food Contaminants	J.S. Corley
Central African Republic	CAF5007	Enhancing Laboratory Capacity to Control Chemical and Bacteriological Hazards in Foodstuffs of Animal Origin	J.J. Sasanya
Colombia	COL5025	Improving Capacity to Diagnose Residual Pesticides and other Contaminants in Exotic Tropical Fruits to Make Food Exports More Acceptable on the International Market	J.S. Corley
Costa Rica	COS5032	Enhancing the Capacity to Control Contaminants and Residues of Veterinary Medicines and Pesticides in Foodstuffs of Animal Origin Using Nuclear and Conventional Analytical Techniques	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Costa Rica	COS5033	Assessing and Implementing Biochar Use in Climate Smart and Environmentally Friendly Pineapple Production Using Isotopic Techniques	G. Dercon A. Cannavan K. Sakadevan J.S. Corley C.M. Blackburn
China	CPR5022	Implementing the Stable Isotope Technique for High Quality Agro-product Traceability and Authenticity	A. Cannavan
China	CPR5023	Strengthening the Regulatory System for the Effective Control of Food Irradiation and Promoting Good Manufacturing Practices(Not Funded)	C.M. Blackburn
Cuba	CUB5019	Strengthening National Capacity for Monitoring Heavy Metals to Improve Soil and Food Quality Using Nuclear and Related Techniques	K. Sakadevan J.S. Corley C.M. Blackburn
Dominica	DMI5001	Enhancing Capacity to Monitor Agrochemical Residues in Foods and the Environment	J.S. Corley J.J. Sasanya
Ecuador	ECU5028	Consolidating Food Security and Environmental Sustainability in Palm Oil Production Using Nuclear Applications	A. Cannavan B.M. Maestroni L.K. Heng
Egypt	EGY5026	Establishing a National Reference Laboratory Applying Nuclear/Isotopic and Related Techniques in the Analysis of Food Contaminants	J.J. Sasanya
El Salvador	ELS7006	Building Capacities to Minimize Environmental Contamination and to Protect the Health of the Rural Population by Strengthening Research Capabilities and Laboratory Infrastructure	B.M. Maestroni
Guatemala	GUA7004	Developing Capabilities to Evaluate the Transfer and Fate of Water Pollutants to Improve the Management of Major Basins and the Safety of Agricultural Products	B.M. Maestroni
Haiti	HAI5006	Increasing Productivity and Exportability in the Agricultural Sector through Soil and Water Management and Food Safety Monitoring	K. Sakadevan J.S. Corley C.M. Blackburn
Inter-Regional	INT5154	Improving Food Safety through the Creation of an Interregional Network that Produces Reliable Scientific Data Using Nuclear and Isotopic Techniques	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Iraq	IRQ5021	Developing Food Safety and Assurance System Using Nuclear and Other Related Technologies	A. Cannavan J.S. Corley C.M. Blackburn J.J. Sasanya
Libya	LIB5012	Using Nuclear and Complementary Techniques for Monitoring Agrochemical Residues in Food Products and the Environment	J.S. Corley
Malaysia	MAL5030	Strengthening National Technical Capability in Food Traceability of Edible Birds Nest through the Application of Nuclear and Related Technologies	A. Cannavan
Mauritius	MAR5024	Building Capacity to Analyse Veterinary Drug Residues and Related Chemical Contaminants in Animal Products	J.J. Sasanya
Mauritania	MAU5005	Strengthening of Laboratory Capacity to Monitor Natural, Chemical and Microbial Food Contaminants	J.J. Sasanya
Mongolia	MON5019	Assessing and Enabling the Implementation of Food Irradiation Technologies	J.J. Sasanya A. Cannavan
Morocco	MOR1008	Developing Application and Implementation of Quality Management Protocols for Multipurpose Gamma Irradiation Facility	S. Sabharwal (NAPC) C.M. Blackburn
Morocco	MOR5034	Improving Veterinary Drug Residue Detection and Animal Disease Diagnosis with Nuclear and Molecular Techniques	I. Naletoski J.J. Sasanya
Morocco	MOR5036	Valorizing and Improving the Quality of Food Products by Using Irradiation Techniques	C.M. Blackburn
Mozambique	MOZ5006	Building Laboratory Capacity for Food Safety Using Nuclear/Isotopic and Complementary Analytical Techniques	J.S. Corley J.J. Sasanya
Namibia	NAM5013	Assessing the Spatial Distribution of Lead, Cadmium and Selected Pesticide Residues in Livestock Farming	J.S. Corley A. Cannavan J.J. Sasanya
Niger	NER5017	Improving Onion Quality and Storage Life by means of Gamma Irradiation	C.M. Blackburn
Niger	NER5020	Building Capacity at the Central Laboratory (LABOCEL), Niamey, for Control of Food Products of Animal Origin	J.S. Corley J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Nigeria	NIR5039	Enhancing Dietary Exposure Assessment of Chemicals in Food	J.J. Sasanya
Oman	OMA5003	Strengthening National Capabilities in Food Safety and Food Traceability	J.S. Corley B.M. Maestroni
Pakistan	PAK5048	Strengthening Capabilities to Monitor and Control Veterinary Drug Residues in Foodstuffs	J.J. Sasanya
Panama	PAN5022	Determining Pesticides and Inorganic Pollutants in Vegetables and Studying the Adsorption and Migration Through Nuclear Technologies in Zones of High Pollution Incidents to Guarantee Safe Food for Consumers	B.M. Maestroni
Panama	PAN5024	Developing Analytical Capabilities for the Detection of Chemical Contaminants in Food and the Quality of Agrochemicals	B.M. Maestroni J.S. Corley C.M. Blackburn
Panama	PAN5025	Expanding and Strengthening the Phytosanitary Surveillance System for Fruit Fly, Emphasizing Exotic Species of Quarantine Importance, and Exploring the Use of Nuclear Techniques for Post-Harvest Treatment as a Complementary Action	W.R. Enkerlin Hoeflich C.M. Blackburn
Paraguay	PAR5010	Strengthening the National Network of Laboratories Involved in Chemical Risk Analysis to Ensure Food Safety Through the Use of Nuclear and Complementary Non-Nuclear Techniques	J.S. Corley B.M. Maestroni J.J. Sasanya
Qatar	QAT5004	Upgrading the Central Food Laboratory	C.M. Blackburn A. Ceccatelli (NAEL)
Senegal	SEN5038	Strengthening Laboratory Capabilities for Analysing Veterinary Drug Residues and Contaminants in Food	A. Cannavan J.J. Sasanya
Sierra Leone	SIL5016	Strengthening Laboratory Capabilities to Evaluate and Monitor Levels of Mycotoxins, Toxic Metals and Related Contaminants in Foods	J.S. Corley J.J. Sasanya
Sri Lanka	SRL1008	Providing Technical Support for Smooth, Safe and Sustained Operation of the Multipurpose Gamma Irradiation Facility	S. Sabharwal (NAPC) C.M. Blackburn

Country/Region	Project No.	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	C.M. Blackburn S. Sabharwal (NAPC)
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	J.J. Sasanya A. Cannavan
Syria	SYR5023	Enhancing Analytical Capacities of Major Pesticide Residues	B.M. Maestroni J.S. Corley
Syria	SYR5024	Enhancing Capabilities to Monitor Naturally-Occurring and Synthetic Anabolic Hormones and other Veterinary Drug Residues in Foods	J.J. Sasanya
Uganda	UGA5034	Strengthening National Capacity for Testing and Monitoring of Drug Residues in Animal Feeds and Animal Products	J.J. Sasanya
Uganda	UGA5039	Enhancing the Monitoring of Veterinary Drug Residues, Related Chemicals and Natural Food Contaminants	J.J. Sasanya
Tanzania	URT5033	Establishing the Feasibility of an Irradiator Facility	C.M. Blackburn
Uruguay	URU5029	Implementing a System for Traceability and Authenticity to Ensure Food Safety of Cheeses and Wines	A. Cannavan
Zambia	ZAM5030	Establishing a National Mycotoxins Monitoring Programme	J.S. Corley J.J. Sasanya
Africa	RAF1006	Facilitating the Commercial Application of Irradiation Technologies	G.J. Hallman S. Sabharwal (NAPC) C.M. Blackburn
Africa	RAF5067	Establishing a Food Safety Network through the Application of Nuclear and Related Technologies	J.J. Sasanya A. Cannavan
Africa	RAF5078	Establishing a Food Safety Network through the Application of Nuclear and Related Technologies, Phase II	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Asia	RAS5061	Supporting Food Irradiation Technology to Ensure the Safety and Quality of Meals for Immuno-compromised Patients and Other Target Groups	C.M. Blackburn
Asia	RAS5062	Building Technological Capacity for Food Traceability and Food Safety Control Systems through the Use of Nuclear Analytical Techniques	Z. Ye A. Cannavan
Asia	RAS5071	Strengthening Adaptive Climate Change Strategies for Food Security through the Use of Food Irradiation (RCA)	C.M. Blackburn
Asia	RAS5078	Enhancing Food Safety Laboratory Capabilities and Establishing a Network in Asia to Control Veterinary Drug Residues and Related Chemical Contaminants	C.M. Blackburn
Asia	RAS7026	Supporting the Use of Receptor Binding Assay (RBA) to Reduce the Adverse Impacts of Harmful Algal Toxins on Seafood Safety	A. Cannavan M.Y. Dechraoui Bottein (NAEL)
Latin America	RLA5065	Improving Agricultural Production Systems Through Resource Use Efficiency (ARCAL CXXXVI)	B.M. Maestroni K. Sakadevan
Latin America	RLA5066	Increasing the Commercial Application of Electron Beam and X Ray Irradiation Processing of Food	C.M. Blackburn
Latin America	RLA5069	Improving Pollution Management of Persistent Organic Pollutants to Reduce the Impact on People and the Environment (ARCAL CXLII)	B.M. Maestroni J.S. Corley J.J. Sasanya
Latin America	RLA7019	Developing Indicators to Determine the Effect of Pesticides, Heavy Metals and Emerging Contaminants on Continental Aquatic Ecosystems Important to Agriculture and Agroindustry (ARCAL CXXXIX)	B.M. Maestroni E.T. Vasileva-Veleva (NAEL)

Mitigating Hazards Posed by Persistent Organic Pollutants to Human & Environmental Health, Santiago, Chile, 30 November–4 December 2015

Technical Officer: Johannes Corley

Persistent organic pollutants are highly toxic substances that pollute soil, water and the environment. Preliminary studies have shown extremely high levels of POPs in breast milk of the mothers from certain regions in parts of South America. Their presence in human breast milk demonstrates the health hazards posed by POPs not only to the most vulnerable amongst us, our infants and children but all human beings. But, how do these toxic substances get into the human body?

The RLA5069 project team with officials from the host country Chile at the first Project Cooordiantion Meeting.

The term Persistent Organic Pollutants or, POPs for short, covers a wide variety of environmental contaminants including agrochemicals such as organo-chlorine pesticides, e.g. DDT, industrial chemicals such as polychlorinated biphenyls (PCBs) and compounds produced by industrial processes or improper incineration of household waste namely, dioxins. POPs persist in the environment for very long periods of time, getting into the human food chain through contaminated water and food and bio accumulate. In May 2001, more than 90 countries got together and signed a treaty (a.k.a. Stockholm Convention) agreeing to reduce or eliminate the production, use and, release of several of these compounds. Since then, more compounds and classes have been added to the list of POPs to be regulated and/or eliminated under the Stockholm Convention Treaty.

Recognizing the health hazards posed by these toxic chemicals and joining with the rest of the world in calling for urgent global action, Latin America and Caribbean Nations requested assistance from the IAEA via the regional TC Project "*RLA5069 Improving Pollution Management of Persistent Organic Pollutants to Reduce the Impact on People and the Environment (ARCAL CXLII)*". TCLA and the Food and Environmental Section of the Joint FAO/IAEA Division are cooperating with 10 countries from South and Central America to generate data and develop maps for enabling their governments to take mitigating action to reduce both the environmental and human health hazards posed by these toxic chemicals.

The first of this four-year Project Coordination Meeting took place in Santiago, Chile form 30 November to 4 December 2015. The meeting was organized in collaboration with the Government of Chile through the Servicio Agrícola Ganadero (SAG) and attended by the Technical Officer (TO), Johannes Corley, the Program Management Officer (PMO), Carmina Jiménez, the DTM Patricia Gatti (Argentina) and the counterparts from nine other participating countries: Bolivia, Chile, Colombia, Costa Rica, Guatemala, Paraguay, Dominican Republic, Mexico, and Uruguay. Over five days, the team worked together sharing available data from their respective countries, discussing their countries and the regions needs and priorities for mitigating the health and environmental risks posed by POPs and expanding on the project document & logical framework matrix previously developed by the TO, PMO and DTM.

Additionally, the group provided commitments for the achievement of the expected results, identified key partners, and agreed on providing maps identifying contaminated areas of concern to address the needs in each country. The discussions allowed the incorporation of mechanisms for South-South cooperation into the project, the definition a work plan with clearly assigned roles and responsibilities, set milestones, and a time frame for the execution of each activity. The participants provided a rich technical dialogue in successfully defining the project implementation strategy. Procedures/methodology for studying the presence of POPs in human milk and understanding the transfer mechanisms between contaminated areas in the environment and human beings via food and water intake were clearly defined along with processes for dealing with unexpected results/need for additional studies. Each participating country volunteered and accepted leadership responsibilities in coordinating tasks and activities including procedure development, training coordination, sampling procedures and analytical method development for different matrices, risk analysis, compiling and sharing of data, etc. between project participants.

The urgency to produce results leading to the development of a workable action plan for mitigating the hazards and risks posed by POPs from the environment to human health was clearly understood by all participants. The final output of the project would be the development of such a plan and disseminating it amongst stakeholders and appropriate government ministries within countries of the region thereby enabling the reduction of human and environmental health risks posed by POPs and thus meeting the goals of the Stockholm Convention in Latin America and the Caribbean.

Food Safety a High Priority for Namibia, Windhoek, Namibia, 12–16 October 2015

Technical Officer: Johannes Corley

Namibia has made food safety a very high priority to protect their citizen's health and improve the international marketability of their food produce. Currently, beef is the major food produced in Namibia along with some vegetable production. Fishing is also a major source of income for certain parts of costal Namibia and aquaculture production is slowly growing around Namibia's rivers. Animal diseases such as food and mouth disease (FMD) and residues/contaminants including pesticides, veterinary drugs and heavy metals in animal products are of major concern in Namibia. The Central Veterinary Laboratory (CVL) in Windhoek has been tasked with monitoring animal products to ensure compliance with national and international food safety standards.

CVL is working in several international cooperation agreements to build capacity for food safety monitoring. One such cooperation agreement is with the IAEA through TC project NAM5013. Through the project, CVL hopes to develop and train their scientists in methods of analysis for pesticide and heavy metal residues in animal products. Separately, through South-South cooperation via the FAO, Namibia is working closely with China to build similar capacities in vet. drug analysis and animal disease prevention/detection. CVL is a well-equipped laboratory having UPLC-MS/MS, LC-MS, GC-MS, HPLC/UV and a GF-AAS among their tools for food safety monitoring. Additionally, CVL is ISO17025 accredited and has a dedicated QMS and a QA department overseeing data quality at CVL.

The Technical Officer (TO) visited Namibia to assess capabilities, needs and progress made in the project. Previously, the IAEA had sponsored a fellowship training for one scientist from CVL to the China Agriculture University in Beijing to train on multi-residue analytical methods for pesticides in animal products. Through that fellowship organized by Food and Environmental Protection Section (FEP) and Joint FAO/IAEA Division, the scientist trained on QuEChERS based methods along with the use of multi-walled carbon nanotubes (MWCNT) as a clean-up technique. Unfortunately, the MWCNT could not be procured in Namibia. During the TO's visit several alternatives including the use of PSA as a substitute for the MWCNT were discussed. The scientific team at CVL agreed to attempt method development/validation based upon the discussions with the TO. Additionally, the TO provided the team with several analytical methods including some specific to the LC-MS/MS (Agilent) instrument at CVL. The Scientific team at CVL agreed to try these different methods including combinations to develop and validate an analytical method suitable for the required monitoring analyses in Namibia. As a follow-up, if needed, an expert mission could be organized at CVL to assist with the method development for pesticide residues in animal products towards the end of the third quarter 2016.

Separately, in the area of heavy metal analysis, FEP is organizing a two-month fellowship training for a scientist from CVL to train in analytical methods development and validation for heavy metal (and other elemental analyses) of animal products and animal feed commodities. The training would be organized in early 2016 hopefully in South Africa. Once completed, an expert mission is planned at CVL to assist in transferring and adapting the methods to CVL, and training a team of CVL scientists in method development and validation for heavy metal residues in animal and vegetable commodities. These activities are aimed to build capacity in Namibia to preform food safety monitoring activity is ensuring the safety of Namibian food products and improving their global marketability.

The Technical Officer and the Counterpart also met with the FAO representative Mr Babagana Ahmadu to discuss the IAEA Food Safety project as well as FAO activities in Namibia. Currently, CVL has needed to contract with laboratories in the UK to analyze samples for residues because of the lack of training and analytical methods to perform the job in Namibia. Through the TC project NAM5013 FEP is providing technical assistance to CVL in Namibia to build residue monitoring capacity in Namibia and eliminate the need to contract out the necessary analyses.

Meeting between Namibia's Central Veterinary Laboratory, FAO and FEP in Namibia.

Mr Babagana expressed interest in the IAEA providing technical support for FAO projects including food safety policy and training. Namibia's Food Safety Policy was developed by Namibia's Ministry of Agriculture, Water and Forestry with assistance from the FAO. There are multiple areas in food safety including training and capacity building where the Joint FAO/IAEA Division could assist. Some areas of cooperation in ongoing FAO

activities in Namibia include: Capacity building in Food Safety (joint workshop with laboratories in South Africa) Training for Meat Inspectors from the Ministry of Agriculture Training to growers and farmers on Good Agricultural Practices.

The TO also met with the Namibian Standards Institute (NSI) which has been tasked with fish and fishery quality and safety monitoring. There is significant scope for cooperation between CVL and NSI in the area of food safety monitoring. The EM training planned for late Q1 in Heavy Metal Analysis would be an ideal opportunity to involve NSI scientists as well. NSI with CVL assistance is leading the task of building a network of Food Safety laboratories in Namibia, another area where FEP is assisting by providing technical advice and expertise.

Regional Meeting on the Commercial Use of Phytosanitary Irradiation by Electron Beam or X ray, Toluca, Mexico, 12–14 October 2015

Technical Officer: Yves Hénon

The Regional Meeting on the Commercial Use of Phytosanitary Irradiation by Electron Beam or X rays was organized by the IAEA in cooperation with the Government of Mexico through the National Institute for Nuclear Research (ININ). The event was one of the key activities planned under project RLA5066 "Increasing the Commercial Application of Electron Beam and X ray Irradiation Processing of Food".

Mexican guavas with the Radura logo on sale in the USA. Photo courtesy of Mr Guy Hallman.

The Meeting was attended by 88 participants from the 12 countries involved in the project (Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Dominican Republic, Ecuador, Jamaica, Mexico, Peru and Uruguay) and five other countries (Australia, Canada, Korea, USA, New Zealand). The participants were national and international stakeholders from regulatory bodies, technical institutions, producers and traders of fresh produce as well as manufacturers of accelerators and irradiation contractors.

The focus of the meeting was on trade and technological aspects of phytosanitary irradiation which is now used at a significant scale in the USA (20,000 tons of irradiated fresh produce from Mexico, Hawaii and countries of Asia Pacific marketed in 2014) and Mexico (10,000 tons exported to the USA in 2014) but has not yet taken off in the other counties of the region.

The information provided aimed at enabling participating countries to make an informed choice between different irradiation technologies (gamma, e-beam and X ray) and the opportunities and challenges that they offer. The feedback from the meeting participants was extremely positive and it is expected that the information generated through this event will foster the emergence of commercial projects.

The presentations made during the meeting are available on the website of the Technical Cooperation Department: https://www.iaea.org/technicalcooperation/Home/Highlights-Archive/Archive-2015/11092015-food2.html

Training Workshop on Analytical Instrumentation, Khartoum, Sudan, 2–6 August 2015

Technical Officer: James Sasanya

Training on basic troubleshooting of analytical tools used in the food and environmental safety laboratories was held at the Sudan Department of Radioisotopes, Centre of Veterinary Research in Khartoum.

Participants a training workshop on basic troubleshooting of certain analytical instrumentation used in food and environmental safety laboratories. Photo courtesy of J. Sasanya.

Seventeen nonlocal participants from 14 African countries and nine locals including laboratory staff and young graduate level scientists in Sudan benefited from theoretical and practical training in tools including liquid

scintillation counting, liquid and gas chromatography. Application of radio-tracer technique to chemical hazard/residue analysis was also discussed in addition to common challenges in food and environmental safety laboratories. The countries included Botswana, Burkina Faso, Cameroon, Chad, Egypt, Ethiopia, Nigeria, Mauritius, South Africa, Tunisia, Uganda, United Republic of Tanzania and Zimbabwe as well as the host Sudan.

Mid-term Coordination Meeting for TCP RAS5062, Hanoi, Viet Nam, 27–31 July 2015

Technical Officer: Andrew Cannavan

The Mid-term Coordinator's Meeting for Project RAS5062, 'Building Technological Capacity for Food Traceability and Food Safety Control Systems through Nuclear Analytical Techniques', was held in the Silk Path Hotel, Hanoi, Viet Nam from 26 to 30 July 2015. The meeting, which was hosted by VINATOM, was attended by 19 National Project Coordinators or their representatives from 16 countries; Bangladesh, China, Indonesia, Iraq, Jordan, Lao PDS, Malaysia, Mongolia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka, Syria, Thailand and Viet Nam. A delegate from Japan also participated as an observer and the FAO Programme Officer for Livestock and Food Safety participated for one day of the meeting. Mr Kiri Mc Comb (NZ) participated as a Technical Expert. Mr Massoud Malek and Mr Andrew Cannavan represented the IAEA as the Programme Management Officer (PMO) and Technical Officer (TO) of RAS5062, respectively. Mr Cannavan was the Scientific Secretary for the meeting.

RAS5062 Mid-term Coordinators' Meeting, Hanoi, Viet Nam.

The meeting included reports from each participating country representative on the capabilities of their institute, work done to date in the framework of RAS5062, challenges encountered in implementing the project, and future work plans for the final phase of the project and beyond.

Discussion and working group sessions were held to confirm the current status of project implementation, identify gaps and identify solutions to problems encountered. On the basis of the extensive discussions the work plan was revised to optimise the use of existing resources in fulfilling the project objective. This includes the development of a web-based database for information and knowledge exchange, extension of the project for the first half of 2016 with no additional funding, and a technical training aspect to the final coordinators' meeting.

A delegate from Japan participated as an observer in the meeting, resulting in an offer to provide proficiency testing for isotopic measurements in rice. This is highly appreciated by the participating institutes and by the IAEA officers.

RAS5062 has achieved some of the key objectives (networking, knowledge sharing) and will continue to strengthen these, and work towards achieving further technical objectives such as implementing proficiency testing for isotopic measurements in the region. The revised work plan for the final phase of the project includes further technical training on data analysis, a key aspect of food traceability/authenticity testing, as well as the development of a database for the project partners, and this will help to ensure a successful outcome and future sustainability of the capacity built through the project.

Belize and the IAEA Cooperate to Build a Food Safety Monitoring Program, Belize City and Belmopan, 13–17 July 2015

Technical Officer: Johannes Corley

Food safety has become a priority for Belize in order to protect the health of their citizens and improve the marketability of their food products both regionally and globally. Belize requested assistance from the IAEA to assist Belize Agricultural Health Authority (BAHA) develop a food residue monitoring programme at the Central Investigation Laboratory and separately to assist BAHA with the establishment of a fully equipped PCR laboratory at the Veterinary Diagnostics Laboratory for monitoring the health status of their livestock and aquaculture industries.

Through the TC Project BZE5007, Belize and the IAEA are cooperating in human resource development through distance learning, technical assistance in developing and validating methods for monitoring residues in food commodities as well as assistance with procurement of equipment, reagents and consumables. The Technical officer visited Belize to evaluate the project progress and provide technical guidance in the simultaneous conduct of the various activities so as to reach the desired project outcome. The TO also met with the science faculty at University of Belize and BAHA management to discuss joint projects and cooperative activities between the two organizations in the area of food safety.

The Central Investigation Laboratory of BAHA in Belize City has recently been renovated to meet the requirements of a modern residue analytical laboratory through funding from the Inter-American Development Bank. With modernization work completed, the IAEA is in the process of procuring equipment and accessories to augment BAHA's efforts in establishing the state-of-the-art facility needed to comply with today's food safety testing laboratories.

Discussions with BAHA/CIL management and the TO resulted in the simultaneous prioritization of activities to reach BAHA's goals of having capacity in-house to test food products for compliance with national and international food safety standards. BAHA/CIL with assistance from the IAEA (FEP and TCLA) is currently taking the following steps towards reaching the project outcome:

- Developing and validating QuEChERS based methods for the extraction and analysis of groups of pesticides (organo-chlorines, pyrethroids and carbamates) in food commodities of importance to Belize using available equipment (GC/ECD, FPD, MSD and LC/DAD & FLD). The TO advised CIL/BAHA on preliminary standards for data acceptability criteria and ways to resolve problems faced in previous attempts at method development.
- Simultaneously, Ms Colette Eusey of CIL/BAHA is continuing her distance learning program at the Illinois Institute of Technology in the USA. to develop her skills to lead the residue monitoring program at CIL. Her distance learning program is being sponsored by the IAEA through the TC project BAH5007.

The progress towards the above two goals would be evaluated in early 2016 to determine additional training/support needs including the use of stable isotope internal standards for improving the food safety monitoring capacity at BAHA.

Additional discussions between BAHA and the University of Belize were very fruitful and the two organizations are working on a memorandum of understanding for cooperation in the area of food safety and residue monitoring. Cooperation between the two would be beneficial for both. BAHA could have help through interns from the University conducting basic analytical tasks such as extractions and clean-ups while learning about the more complex modern analytical instrumentation and the University being able to offer more advanced training to their students in areas of chemistry and food safety. University faculty skills would also be enhanced through the collaboration.

At this time, most samples from Belize from batches slated for exports were received and processed at CIL/BAHA however; the samples have to be sent to ISO 17025 Accredited laboratories outside the country for analysis. The objective of the project is for BAHA/CIL to have the capacity to conduct most of the analyses in-house.

Paraguay takes Significant Steps towards Development of a National Food Safety Programme, Asuncion, Paraguay, 29 June–3 July 2015

Technical Officer: Johannes Corley

Since 2014, the FAO/IAEA Food and Environmental Protection Section has been providing technical assistance to a network of five laboratories in Paraguay via TC Project PAR5010, assisting them in their objective of strengthening the national network of laboratories involved in chemical risk analysis to ensure food safety through the use of nuclear and complementary non-nuclear techniques. Since then, Paraguay has taken significant steps towards the development of a national food safety programme. During his second visit to Paraguay, the Technical Officer (TO) noted several accomplishments by the team in Paraguay in the area of food safety and security.

SENAVE, SENACSA, INAN, CEMIT and UA-FCQ meet with TO from the IAEA (not in picture) in Paraguay.

- INAN, SENACSA, SENAVE, CEMIT and UA-FCQ are working together at the request of Paraguay's Parliamentary Health Commission to draft legislation for establishing a Food Safety National Surveillance/Monitoring Program in Paraguay. The group has enlisted the assistance of legal counsel in drafting the legislation and also has the assistance of the PAN American Health Organization in addition to technical assistance being provided by FEP via the PAR5010 project. The draft legislation is expected to be submitted to Paraguay's Parliament before the end of 2016.

- Under the leadership of the project CP Dr Laura Mendoza the five participating laboratories have created a network of 10 laboratories called Red Nacional de Laboratories de Alimentos del Paraguay (RENLAP) for food safety monitoring in Paraguay. The proposal for creating RENLAP has been sent to the President and endorsement is expected by early 2016.

- Several fellowship training activities have been completed in areas of quality management systems (QMS) and method development and validation (MD/MV) in pesticide residues and heavy metal analyses of food samples. These fellowship trainings have been followed by expert missions jointly led by an IAEA sponsored expert and the scientific fellows from Paraguay resulting in the training of more than 30 additional scientists from the participating laboratories. All the trainings followed ISO 17025 guidelines.

- In the areas of actual monitoring of food samples for compliance with food safety standards, INAN has been developing methods for heavy metals (As, Pb, Hg, Cd, Cu, Zn, Se, etc.) in salt, yogurt, juices, marmalade/jams and flour. The breakdown of an old instrument essential for elemental analysis has not significantly hampered their efforts and, through cooperative agreements, INAN has been able to work with SENACSA to continue their method development and validation work. INAN is also planning to move to a new state-of-the-art facility sometime in 2016−2017.

- Following up on an IAEA sponsored fellowship training on QMS, SENACSA has begun implementing a QMS plan and has validated more than 15 methods for veterinary drug in foods of animal origin. They are now participating in proficiency tests through FAPAS and have submitted a plan for having the laboratory ISO17025 accredited to senior management. They expect to pursue laboratory accreditation during 2016.

- SENAVE successfully renewed their ISO17025 accreditation during 2015 and are in the process of transferring most of their analytical methods to a recently installed UPLC-MS/MS. Both SENAVE and UA-FCQ have UPLC-MS/MS instruments of the same make and model and need training on the application of the instrument for pesticide residue analysis. The joint applications training will be sponsored by the IAEA through technical support from FEP and via the TC project PAR5010.

- Additionally, the IAEA will be procuring 2 GC-MS/MS instruments, one each for CEMIT and SENAVE. The instruments are expected to be operational and scientists from both laboratories will be trained on instrument operation, routine maintenance and applications to residue monitoring in early 2016. These instruments will greatly increase Paraguay's capacity for residue monitoring in food and environmental samples and food traceability and authenticity.

- An additional training is planned for all participating laboratories in Paraguay on the use of stable isotope internal standards in residue monitoring for 2016.

Paraguay has made excellent progress towards achieving the project outcome of, "Ensuring effective control of food contaminants (such as pesticides and heavy metals) through enhanced laboratory networking". A network of 10 laboratories (RENLAP) has been established and is awaiting Presidential signature. Furthermore, the participating laboratories are in the process of drafting legislation as requested by Paraguay's Parliamentary Health Commission for the creation of a legal framework for a National Food Safety system. These advances made by Paraguay in the area of food safety are a direct consequence of excellent teamwork between the participating labs in Paraguay and financial and technical support from TC and FEP/Joint FAO-IAEA Division/NA at the IAEA via the PAR5010 project.

Regional Meeting on Potential Benefits of Irradiated Foods for Relief Organizations and Security Forces (RAS 5061), Chengdu, China, 16−18 June 2015

Technical Officer: Yves Hénon

The Technical Cooperation Project RAS 5061 *Supporting Food Irradiation Technology to Ensure the Safety and Quality of Meals for Immuno-compromised Patients and Other Target Groups* that was launched in late 2015 aims at making use of the knowledge and know-how that were acquired during a Coordinated Research Project (CRP) on the same theme that ended in 2015.

The meeting, graciously hosted by the government of the People Republic of China and the Sichuan Institute of Atomic Energy, was the first of two regional meetings planned during the project and its focus was on food for relief organizations and security forces. Representatives of armies (Jordan, Pakistan, and Thailand) and relief organizations such as the Civil Defence of the Philippines and Aksi Cepat Tanggap (ACT) an emergency relief unit of Indonesia who could make use of the advantages of irradiated food came in direct contact food irradiation specialists. While the former gained a better understanding of the technology, the latter were able to discuss the attributes that the food should have in the special situations. The representatives of Nuclear Institute for Food and Agriculture in Peshawar, Pakistan reported their experience

on supplying security forces with half a million packs of irradiated meals ready-to-eat monthly. A representative of the Sichuan Institute of Atomic Energy gave details on long shelf-life meals to be used in case of disasters. The Centre of Applications of Isotopes and Radiation of Indonesia (BATAN) is in the process of transferring the know-how to prepare such meals to SMEs.

In conclusion of the meeting the participants agreed that the technology was ready to be transferred and that resources should be allocated to increasing awareness among the potential users and scaling-up the production of irradiated food for relief organizations and security forces. Several national meetings will follow this regional meeting. The first one took place in Bangkok in November 2015 and was attended by nearly 50 delegates from the target organizations, governmental organizations and SMEs manufacturing food.

The participants sampled ready-to-eat irradiated food from Pakistan (naan, curries, biryani) and Indonesia (beef and fish).

Training Course on Internal Auditing of Food Safety Laboratories, Harare, Zimbabwe, 8–12 June 2015

Technical Officer: James Sasanya

The course was coordinated by the Central Veterinary Laboratory (CVL) and the Chemistry and Soil Research Institute under the framework of the AFRA Project RAF/5067 "Establishing a Food Safety Network through the Application of Nuclear and Related Technologies". This was held at Cresta Hotel, Harare, Zimbabwe with a practical session at the CVL. Eighteen participants from 14 laboratories in 12 African countries namely Botswana, South Africa, Cameroon, Sudan, Egypt, Tunisia, Ethiopia, Uganda, Namibia, Tanzania, Nigeria and Zimbabwe the host, attended. Among others the training included ISO/IEC 17025 overview, associated management and technical requirements; attributes and responsibilities of an internal auditor; role and benefits of internal auditing in quality management systems; and the internal audit process including report and non conformity writing. The participants presented the status of their respective laboratories and addressed opportunities to strengthen quality management through networking under the African Food Safety Network. Cooperation with the Southern and Eastern Africa Network of Analytical Chemists was discussed with a representative of the network from the University of Zimbabwe. The possibility for synergies with other associations was also raised and is being pursued.

Participants at an Internal Auditor Training Course for Food Safety Laboratories in Harare, Zimbabwe.

Food and Environmental Protection Laboratory, Seibersdorf

Collaboration with Uruguay – Visiting Scientists in FEPL

Technical Officer: Britt Maestroni

The Food and Environmental Protection Laboratory (FEPL) started a technical collaboration in 2015 with the University of the Republic (UdelaR), Montevideo, Uruguay, to collaboratively study the validation of methods of analysis for pesticide residues in difficult matrices such as medicinal plants. The objective of this work is to enable member states to monitor contamination in consumer products and to protect national and regional value markets. Ms. Natalia Besil and Prof. Veronica Cesio worked at the FEPL on the validation of a method for the detection of 41 pesticides in *Peumus Boldus* (Boldo), a Chilean medicinal plant that it is included in the most recent Edition of the European Pharmacopoeia, using gas chromatography coupled to tandem mass spectrometry (GC-MSMS). Boldo is consumed as an infusion to aid digestion and prevent stomach diseases. It is a natural forest plant and is also cultivated to meet the high demand from all over the world. Boldo is therefore of great economical interest as an agricultural product that constitutes a valuable market opportunity.

The aim of the collaboration with Uruguay was to validate a method for the determination of forty-one representative pesticides in Boldo. This matrix is very complex because of the high content of secondary metabolites with similar physicochemical properties to the pesticides under study, interfering with their extraction and detection. Previous studies in Uruguay were undertaken to identify the best sample preparation method. The optimum method was a modified, citrate-buffered QuEChERS method (Figure 1).

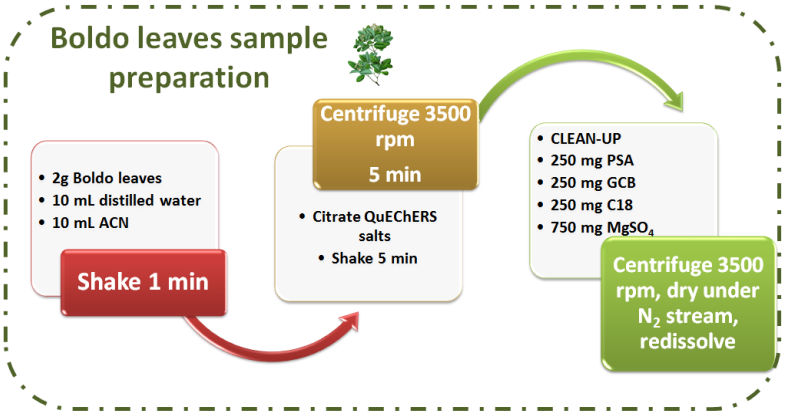


Figure 1: Sample preparation for Boldo leaves

A specific method was also developed for the analysis of pesticide residues in the Boldo infusion (Figure 2). One gram of homogenized Boldo leaves were infused for 10 minutes with 50 mL of warm water, following the same procedure adopted for home tea preparation, and filtered. A portion (15 mL) of the infusion was extracted with ethyl acetate and prepared according to the procedure in Figure 2.

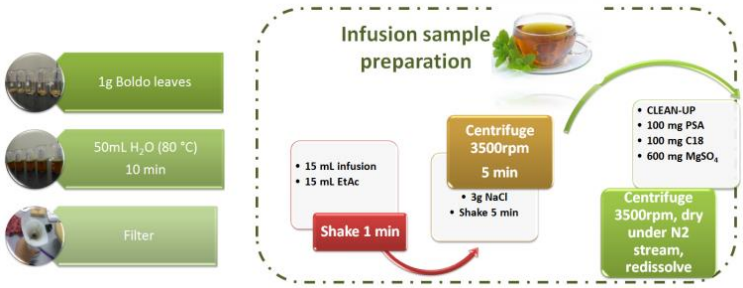


Figure 2: Sample preparation for the Boldo infusion

Based on this sample preparation strategy, the method was tested and validated using GC-MSMS. The instrument detection method was modified from Agilent's Analyser configuration.

Important matrix effects were observed at the retention times where the pesticides under study eluted. It is hypothesed that the matrix effects in boldo are due to matrix components such as ascaridol and boldine that have

high reactivity in the GC injection port. Further studies using high resolution mass spectrometry are needed to understand the behaviour of Boldo extracts in GC analysis.

Matrix calibration curves were linear in the range 12.5-600 µg/kg for Boldo leave extracts and 2.5–60 µg/kg for Boldo infusion. At 50 µg/kg level in Boldo leaves the majority of pesticides showed recoveries in the acceptable range of 60-120%. At 10 µg/kg about 30% of the pesticides under study showed recoveries less than 60% in the Boldo infusion, indicating that further work is required to fully develop the method for the Boldo infusion.

The methods were applied to study the transference of pesticide residues from the leaves to the infusion. Figure 3 shows the preliminary results obtained. 87% of the pesticides under study showed less than 40% transfer. However compounds like carbofuran, dimethoate, metalaxyxl andoxadixyl showed a higher percentage transfer to the infusion. Depending on the initial concentration, adverse health effects could possibly occur due to these pesticide residues. Therefore, the monitoring of the contamination levels in herbal medicinal plants is important to be able to protect consumers.

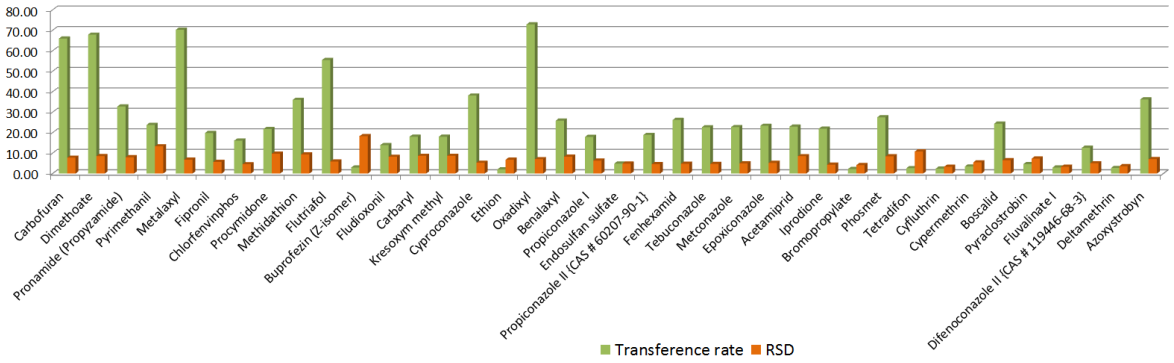


Figure 3: Percentage transfer of pesticides into the infusion.

Method Validation for Selected Pesticides in Potato by Gas Chromatography Coupled to Tandem Mass Spectrometry

Technical Officer: Britt Maestroni

Potatoes are an important staple food all over the world. To protect the crop from various diseases farmers apply a range of regulated pesticide formulations which can sometimes leave residues in the crop. To help ensure safe food for consumers it is important to apply end control testing to agricultural products. As part of an initiative under the "Red Analitica de Latino America y el Caribe" (RALACA) network, the FAO/IAEA Food and Environmental Protection Laboratory contributed to the validation of a multi-residue method for 85 pesticides in potato. The method includes the pesticides that are most frequently used in potato production. The aim of the study was to validate the method according to the Codex Alimentarius Guidelines on Good Laboratory Practice in Pesticide Residue Analysis (CAC/GL 40-1993) using gas chromatography coupled to tandem mass spectrometry (GC-MSMS). Within-laboratory method validation experiments were conducted to provide evidence that the method is fit-for-purpose. The method was validated using two different sample preparation options. One was the original QuEChERS method using acetonitrile as the extraction solvent and the salts from an Agilent QuEChERS kit. The second was an IAEA modified QuEChERS method using ethyl acetate as the extraction solvent and clean up using QuEChERS salts. The sample preparation steps are outlined in Figure 1. Detection was carried out using gas chromatography coupled to tandem mass spectrometry (GC-MSMS).

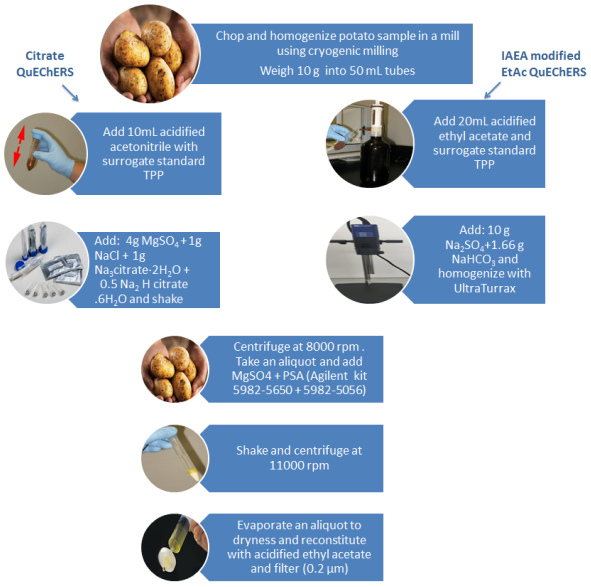


Figure 1: General description of the method.

The instrument acquisition method for the GC-MSMS was based on Agilent's Pesticide Analyser configuration for a 7000C Triple Quadrupole, and was optimised using the Agilent RTL MRM data base, resulting in a 22minute run time.

The method performance was characterized in terms of its scope, specificity, accuracy, sensitivity, repeatability, within-laboratory reproducibility and robustness. The

experimental design for validation involved the analysis of 85 pesticides, belonging to several different chemical classes, at three spiking levels; 10 µg/kg (the reporting limit), 20 µg/kg and 40 µg/kg. Six replicate samples were spiked at each level and the study was repeated three times with both methods. Matrix matched calibration was used to compensate for matrix effects, with the addition of an internal standard to correct for possible chromatographic effects.

The calibration was linear in the range of 5–100 µg/kg. Ion ratios for compound confirmation were within 30% of the average ion ratio values derived from the calibration curve, complying with the quality criteria according to analytical guidelines (SANCO/12571/2013). Similar recoveries were obtained with both extraction procedures, with a few exceptions. Most of the pesticides had recoveries and relative standard deviations within the CODEX acceptable range of 60−120% and 20%, respectively.

The instrument detection limits (IDL) were determined for some representative compounds, and are shown in Figure 2.

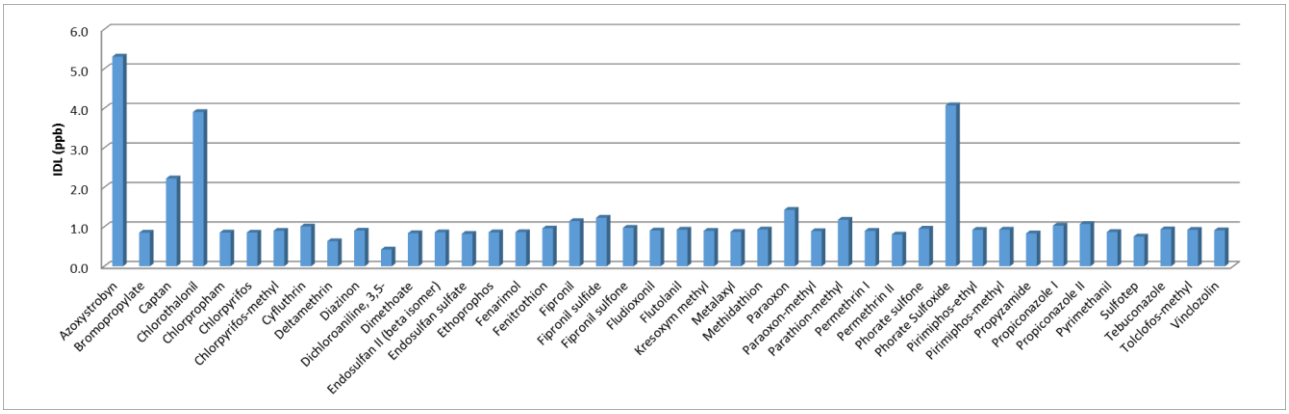


Figure 2: Instrument detection limit for representative pesticides expressed in µg/kg (ppb)

The sample extracts analysed by GC-MSMS were also analysed using a single quadrupole mass selective detector (GC-MSD). Figure 3 shows a comparison between the recoveries and relative standard deviations of 34 pesticides at 10 µg/kg detected using the two different detection systems.

Both instruments had good sensitivity for a number of compounds; however the GC-MSMS method was more robust due to the increased confirmatory power and lower variability of results.

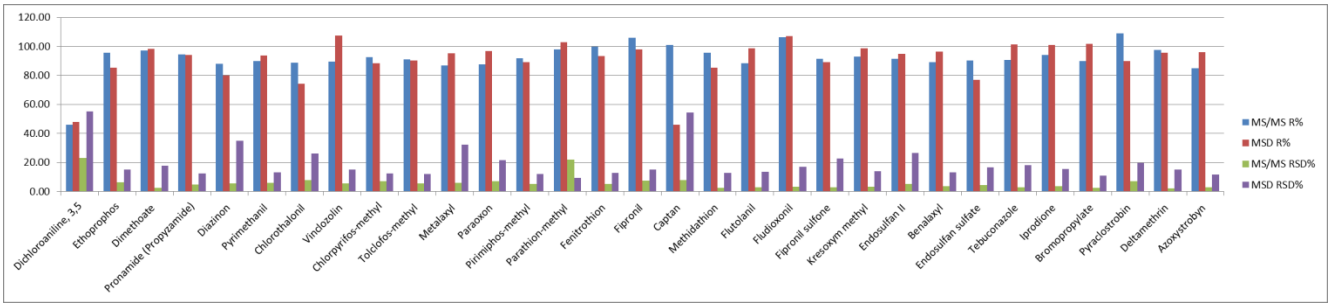


Figure 3: Recoveries and relative standard deviations of 34 pesticides at 10 µg/kg level using single quadrupole (MSD) and triple quadrupole (MSMS) mass spectrometric systems.

The method is quick, robust and relatively cheap. The IAEA modified QuEChERS method using ethylacetate as extraction solvent provides a cheaper alternative in routine analysis using gas chromatographic detection. Future work will include the extension of the method to additional pesticides more amenable to liquid chromatography-tandem mass spectrometry, giving the possibility of using a single extraction method and two detection methods to cover a broad range of pesticides.

Differentiation of Manuka and Kanuka Honeys by Mass Spectrometry and Chemometrics

Technical Officer: Zora Jandrić

New Zealand manuka (*Leptosperum scoparium*) honey, produced by bees that pollinate the native Manuka bush, has high antibacterial activity and is marketed and traded as one of the most medically effective honeys. The authentication of manuka honey is of great importance; it is a high value honey and it has been reported that much more manuka honey is sold on the market than is actually

produced, which suggests a high rate of fraud. Kanuka (*Kunzea ericodis*) honey is one of the major contaminants of manuka honey because the kanuka bush coexists with the Manuka bush in New Zealand. The pollen of these two plants is almost identical and indistinguishable by microscopic pollen analysis. Kanuka has different antimicrobial properties to manuka and so it is important to be able to distinguish these two floral sources.

Authentic manuka and kanuka honey samples were collected from hive sites in the North Island (Northland, Wairarapa, Wairoa, Hawkes Bay, East Coast, Taupo, and Waikato) of New Zealand and analysed by ultra-performance liquid chromatography – quadrupole time of flight mass spectrometry (UPLC-QToF MS) with multivariate data analysis (MVA).

Using untargeted metabolomics and principal component analysis, reliable discrimination was obtained between manuka and kanuka honeys, as well as between honeys sampled in different regions (Fig. 1). Some of the metabolites that clearly discriminate the sample groups were tentatively identified through database searching using Progenesis MetaScope.

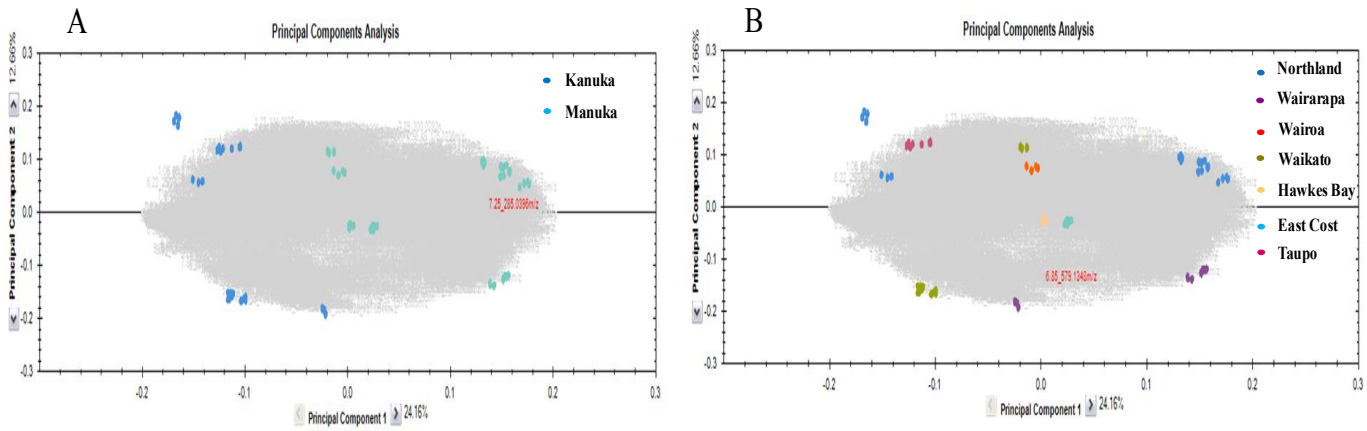


Figure 1. Principal component analysis performed on kanuka and manuka honeys: (A) floral origin; (B) geographical origin.

This is an important development that suggests possible applications of untargeted metabolomics in authentication testing of honeys. The same technique could be applied for other food commodities - we have already investigated this approach for detection of orange juice adulteration with cheaper citrus juices, with the further development of a cheaper and less complex detection method through the identification of selected markers that can be used to differentiate the authentic and adulterated samples using targeted analysis. Both untargeted and targeted metabolomics are included in the suite of methods, with other techniques such as stable isotope analysis, spectroscopic and trace element profiling, that are being developed to support authenticity testing and food traceability systems.

RALACA Update

Technical Officer: Britt Maestroni

The 'Red Analitica de Laboratorios de America Latina y el Caribe' (RALACA) is a non-profit network of laboratories and associated institutions in Latin America and Caribbean countries that aims to enhance regional capabilities for food safety and environmental sustainability[6]. RALACA held its first general meeting on the 11th of May in Santiago, Chile, on the occasion of the fifth Latin American Pesticide Residue Workshop. The meeting was attended by 80 participants. Since May, RALACA has incorporated new members from Ecuador, Brazil, Guatemala and El Salvador. Today RALACA encompasses more than 50 laboratories and institutions in 21 countries. RALACA operates through a governing board and a number of committees. In 2015 RALACA organized a number of training courses and meetings, sponsored by the IAEA under the regional project RLA7019. Three training courses were held, one on bio-indication of pesticide contamination in aquatic and terrestrial environments using radiometric techniques from 20 to 31 July in Brazil, one on statistics and modelling from 11 to 22 May in Chile and one on scientific communication from 11 to 15 May in Argentina. RALACA members also attended a meeting on validation of the Biological Monitoring Working party (BMWP) index for neo-tropical streams from 8 to 11 September in Costa Rica, and on SWAT modelling from 14 to 25 September in Costa Rica.

The issue of network sustainability is high on the agenda for RALACA and the board has regular meetings to discuss this issue, amongst others. The network makes use of any chance to meet, for example when opportunities are offered by training courses, expert missions or, meetings in the member countries. It is hoped that the south-south cooperation fostered through the network will enhance skills and capabilities and help participating laboratories to achieve ISO 17025 accreditation. This would create the conditions that would allow laboratories to set up mechanisms for charging fees for services, which in turn would start generating funds and operational resources for RALACA through voluntary donations by the institutions and in-kind donations by private industry. So far

[6] http://red-ralaca.net

instrument manufacturers such as Agilent, Thermo-Fisher Scientific and Waters Corporation have been working closely with RALACA to share technical knowledge. The board is currently working on the modalities for fair incorporation of the private sector into the network.

The list of publications by RALACA member laboratories and institutes will be soon available on the web page along with a database of national experts available for south-south cooperation. RALACA has recently benefitted from an expert mission financed by the IAEA to update the web page, including new features such as the possibility for uploading video and photos relevant to the work of the committees. Webinars will be soon announced on the webpage and members are volunteering to hold webinars on a rotational basis.

The second general meeting of RALACA is planned to coincide with the sixth Latin American Pesticide Residue Workshop, which will be held in 2017 in Costa Rica. Finally, RALACA will feature in a side event on "The FAO/IAEA Partnership for Food Security: High Impact of Nuclear Applications on the Ground - Food Safety Networks in Latin America and the Caribbean" organized by the Joint FAO/IAEA Division on the occasion of the 34th FAO Latin America and Caribbean Regional Conference that will be held in Mexico in March 2016. The side event will help sensitize stakeholders and decision makers to the benefits of partnerships among FAO and IAEA Member States.

RALACA welcomes the support of the private sector, donor and/or technical cooperation agencies to be able to generate viable research proposals for the region and address local challenges through an integrated and sustainable strategy. For further information contact ralacaboard@gmail.com.

FEP Laboratory Staff

There have been a number of changes in the FEPL staff since the last edition of the newsletter.

In June, Mr Russell Frew left the IAEA after almost three and a half years as FEPL's specialist on stable isotope applications for food traceability and authenticity. During his time in FEPL, Russell developed our capability to prepare and analyse various food products for stable isotope ratios, working in collaboration with colleagues from the terrestrial Environment Laboratory who generously allowed time on their instrumentation for this work. Russell was also Technical Officer for two Coordinated Research Projects, "Implementation of Nuclear Techniques to Improve Food Traceability" and "Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety" and for the regional Technical Cooperation Project RAS5062, "Building Technological Capacity for Food Traceability and Food Safety Control Systems through the Use of Nuclear Analytical Techniques" and the National Project URU5029, "Implementing a System for Traceability and Authenticity to Ensure Food Safety of Cheeses and Wines". Russell's work with FEPL was of a high standard and he was a popular member of staff. Fortunately, we will be able to continue collaborative projects with Russell now that he has returned to his post as Professor in the Department of Chemistry of the University of Otago, Dunedin, New Zealand, and he has already contributed to several projects as a consultant. We miss Russell in FEPL, and wish him all the very best for his future career in the University of Otago.

Other departures from FEPL in this period were our temporary Team Assistant, Ms Barbara Massinger and an intern, Ms Agneta Krukle. Barbara joined FEPL (and the Insect pest Control Laboratory, IPCL) in early 2013 and provided excellent administrative support until her departure in October 2015. Barbara hasn't moved too far, having been successful in competition for a full-time post in the Terrestrial Environment Laboratory (TEL) in Seibersdorf. Agneta was an intern with FEPL from April until October 2015. During her internship, Agneta worked mainly on the development of a method for the analysis of pesticide residues in potato. Both Barbara and Agneta take with them our best wishes for the future.

During the past 6 months we have also had several new starts in FEPL. In October, Ms Anita Pavkovic took on the role of team assistant for FEPL (and IPCL), moving from a position in the Insect pest Control Section at IAEA headquarters. Anita has settled quickly into the job and is providing excellent support for the laboratories. Three new interns also joined FEPL. Ms Hanna Zakala joined FEPL from the National University of Food Technologies, Ukraine, in July 2015. Hanna will work on a variety of projects during her internship, and is currently involved in metabolomics analysis of food products for food authenticity studies, under the supervision of Ms Zora Jandrić. Helene Muehlehner joined FEPL for a two-month internship in August, from the University of Natural Resources and Life Sciences, Vienna, where she was studying environmental and bio-resources management. She worked mainly on stable isotope measurements and related analytical techniques for food traceability and authenticity. Ms Valeria Avossa commenced her internship in December. Valeria studied in Italy at the Università di Napoli Federico II, Napoli, and the Università di Bologna. She will also gain experience in a variety of projects, mainly working on pesticide residue analysis under the supervision of Ms Britt Maestroni.

Announcement

Technical Workshop: Remediation of Radioactive Contamination in Agriculture, IAEA Headquarters, Vienna, Austria, 17–18 October 2016

Breaking news – just as this Newsletter was being finalized, the National Agriculture and Food Research Organization (NARO) of Japan and the Joint Division initiated a joint project to hold a Technical Workshop: "*Remediation of Radioactive Contamination in Agriculture*". A two day meeting at the IAEA in Vienna is being planned for 17 and 18 October 2016. Recovery from the Great East Japan Earthquake and the Fukushima Daiichi Nuclear Power Plant accident is an important cornerstone of NARO's R&D mission and it has been contributing to the development of decontamination technologies for farmland soil, and radionuclide transfer-control technologies for agricultural production. It is envisaged that the Technical Workshop will also include results of agricultural remediation activities from areas affected by the accident at the Chernobyl Power Plant. This year marks the 5th and 30th anniversary of both events respectively and there is considerable interest from our member countries on limiting the impact of radio caesium on agricultural production. We will announce more details on the Joint Divisions website in due course.

New IAEA publication: Manual of Good Practice in Food Irradiation

Technical Report Series # 481

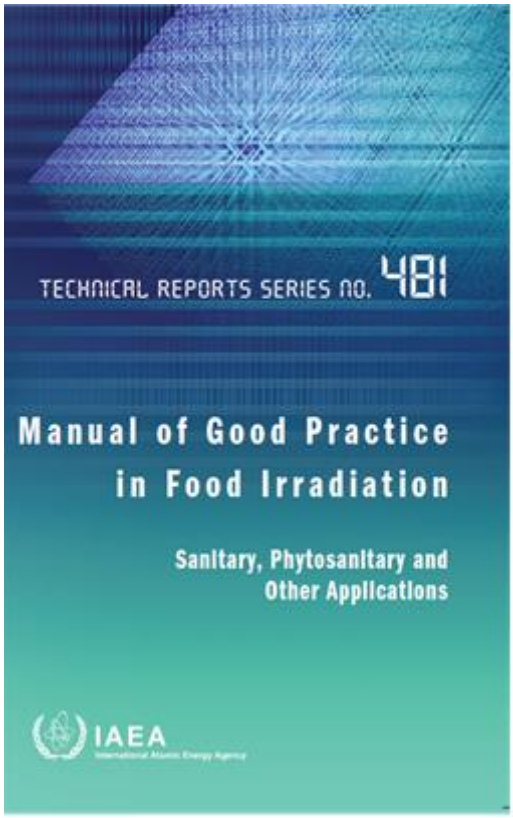
ISBN 978–92–0–105215–5

ISSN 0074-1914

Technical Officer: Yves Hénon

Ensuring that the process of irradiating food consistently delivers the desired result is essential for the correct application of the technology and will help to inspire stakeholder, and ultimately consumer, confidence in irradiated food. This publication aims to help operators of irradiation facilities to appreciate and improve their practices and also to provide detailed, yet straightforward, technical information for stakeholders such as food regulators, manufacturers and traders, who also need to understand 'good practice'.

This new publication is the result of a collaborative effort by the participants of the IAEA Regional Technical Cooperation Project RAS 5057 Implementing Best Practices of Food Irradiation for Sanitary and Phytosanitary Purposes. Originally drafted by an independent expert with extensive experience in the commercial operation of irradiation facilities and quality systems based on ISO standards, this publication was then reviewed, discussed, developed and agreed upon during meetings held in Jeongeup, Republic of Korea, in 2012, and finalized in Shanghai, China, in 2013.



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New Phytosanitary Irradiation Treatment Schedule Published by the International Plant Protection Convention

Technical Officer: Yves Hénon

The 10th Session of the Commission on Phytosanitary Measures of the International Plant Protection Convention held in Rome in March 2015 adopted a 15th irradiation treatment that has now been published as Annex 19[7] of ISPM 28. The schedule describes the irradiation treatment of fruits and vegetables to prevent the reproduction of adult females of the mealybugs *Dysmicoccus neobrevipes*, *Planococcus lilacinus* and *Planococcus minor*. A minimum absorbed dose of 231 Gy was adopted to prevent the reproduction of adult females of the three species.
This treatment should prove very useful since mealybugs are the second most important pest group according to Pest Risk Analyses. The treatment schedule was based on the research that Doan Thi The and her colleagues of Vinagamma in Vietnam carried out during the CRP on the Development of Generic Irradiation Doses for Quarantine Treatments that ended in 2014.

The coffee mealybug Planococcus lilacinus.
(Credit: Peter A.C. Ooi, Tropical Press Sdn Bnd).

[7] http://www.neppo.org/wp-content/uploads/2015/10/PT-19-2015-En-2012-011-IrradiationTreatment-2015-04-08-rdkbXRH.pdf

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