Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Food & Environmental Protection Newsletter

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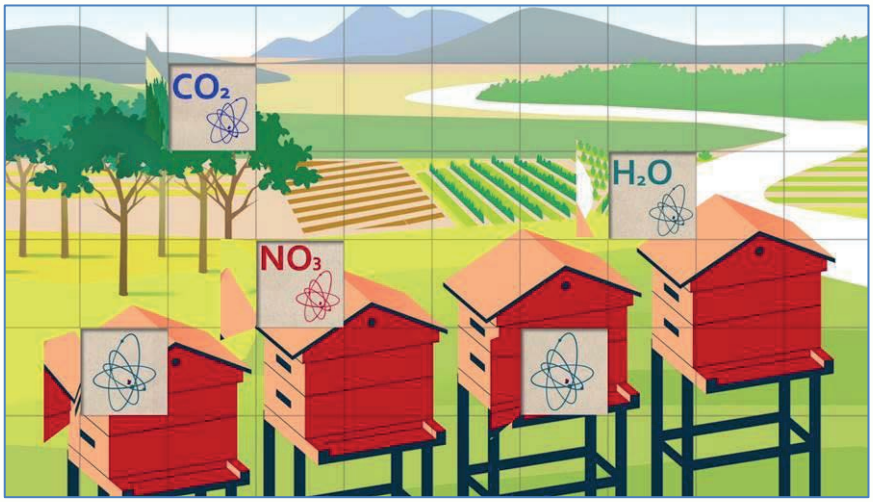
To Our Readers



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As 2017 draws to a close, we are completing our 2016–2017 activities and contributions to the IAEA and FAO programmes of work and budget, and finalizing the 2018–2019 workplans of our tasks and the design of outputs and outcomes for our Food and Environmental Protection (FEP) Subprogramme. We have continued our efforts in the development and application of nuclear and related techniques for improvement of food safety and control systems in Member States. The main activities, work progress and achievements of the Subprogramme during the second half of 2017 are summarized and reported in this issue of the newsletter, such as implementation of Coordinated Research Projects (CRPs), technical support to national and regional Technical Cooperation Projects (TCPs), R&D activities at the Food and Environmental Protection Laboratory, organization of workshops, participation in international conferences and meetings, and collaboration with other international organizations. You will also find a list of our recent publications.

Preparedness and responses to nuclear emergencies and radiological incidents affecting food and agriculture are very important parts of the work in the FEP Subprogramme. The feature article in this issue of the newsletter introduces the activities and contributions of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, on behalf of the FAO and coordinated by the FEP Section, in the large International Nuclear Emergency Exercise at level 3 (ConvEx-3 2017), which was co-organized by the IAEA and the nuclear authorities in Hungary. A total of 82 Member States and 11 international organizations participated in this exercise. The ultimate goal of the exercise was to test the responses of national authorities and international organizations to a simulated accident at a nuclear power plant. International procedures were successfully initiated in the exercise, including the Joint Radiation Emergency Management Plan of the International Organizations (JPLAN).

Implementation of coordinated research projects remains one of the main priorities in our Subprogramme. The third Research Coordination Meeting (RCM) of CRP D52038 on "Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety" was held at the IAEA Headquarters in Vienna, Austria. Research progress reports by the contract holders and technical presentations by agreement holders reinforced the understanding of the principles of food traceability using nuclear and complementary techniques, and case studies highlighted of how the data generated could be applied in actual traceability situations.

The FEP Subprogramme continues to provide technical support to the design and implementation of TCPs for both IAEA and FAO. We are currently working on 50 IAEA TCPs, including 10 regional and one interregional projects. The main activities during this reporting period included the organization of six regional and interregional training courses, several scientific visits and field trips, and a large number of procurements, all aimed at strengthening capacities in food safety analytic laboratories in Member States. We also provided support and assistance to a number of FAO TCPs, including supporting capacity building in food safety analysis in Botswana, Eritrea, Ghana and Tanzania. In addition, we are involved in the design of 26 selected IAEA TCPs for the 2018−2019 biennium. You can find more detailed reports on these activities and an updated list of the TCPs in this newsletter.

We also provide an update on the progress of the regional food safety networks, RALACA and AFoSAN.

The FEP Subprogramme continues its good collaboration with other relevant international organizations, such the Codex Alimentarius Commission (CAC) and the International Plant Protection Convention (IPPC). An updated information paper on relevant activities of the Joint FAO/IAEA Division was submitted to and accepted by the Commission as a formal communication document of CAC 40. The FEP representative at CAC 40 also contributed to a plenary panel discussion for international organizations, highlighting the commitments of the IAEA in strengthening global partnerships for sustainable development in terms of application of Codex standards and nuclear techniques in food and agriculture. In collaboration with IPPC, the FEP Section successfully co-organized and hosted the meeting of the Technical Panel on Phytosanitary Treatments (TPPT 2017), which evaluates data submissions from national and regional plant protection organizations and provides guidance to the Standards Committee regarding specific phytosanitary treatment issues pertaining to the use of irradiation technologies.

Staff of the FEP Subprogramme participated at a number of regional and international meetings during the reporting period to promote the development and application of nuclear techniques in food safety analysis and control. This included presentations at two consultant meetings of the IAEA Radiation Safety Standards Committee, one meeting of the Inter-Agency Committee on Radiation Safety, and one three-lateral (FAO-WHO-IAEA) meeting for promoting joint collaboration on harmonization of criteria/guidelines for radionuclide concentrations in food and drinking water, participation at two meetings of IAEA Emergency Preparedness and Response Standards Committee on the development, review and revision of radiation safety standards and related activities; leading work package and attending meetings of the IF Management Committee of the European Framework 7 Integrated Project 'Food Integrity (FI)' and contributing to the workshop on "Assuring the integrity of the food supply in the Central European countries"; presenting coordinated research activities of the FEP Subprogramme on development of nuclear related techniques for food safety and authenticity at the national outreach seminar on United Arab Emirates' Technical Cooperation with the IAEA. Detailed reports of all meetings are included in this issue of the newsletter.

A method for the detection of gelatin adulteration in edible bird's nests (EBN) has been developed at the Food and Environmental Protection Laboratory at Seibersdorf that can be used as a tool to combat food fraud involving EBN. Furthermore, we report here on an analytical calibration procedure as a key step to reliable data to investigate the use of procedural calibration as compared to other types of approaches to meet the requests by collaborating laboratories.

Please join me in extending a warm welcome to Ms Daniela Battaglia, who joined the FEP Section as a food and feed safety specialist under the FAO Geographic Mobility Programme. We wish her a pleasant and productive time with the FEP Subprogramme. In November this year, Ms Tamara Wimberger took up a temporary position in another Division in the IAEA and Ms Melika Osmic joined as Team Assistant for FEPL and the FAO/IAEA Insect Pest Control Laboratory. We welcome Melika to the group and to Seibersdorf, and pass on our best wishes to Tamara in her new post.

Finally, I would like to take this opportunity to thank you all for your continued efforts to support our Subprogramme and to express my best wishes to you and your families for a happy, health and prosperous New Year.

Sincerely,

Zhihua Ye
Head, Food and Environmental Protection Section

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Feature Article

Participation in the Largest International Nuclear Emergency Exercise, Vienna, Austria, 21–22 June 2017

Carl Blackburn

The Joint FAO/IAEA Division participated in a large scale exercise organized by the authorities in Hungary and colleagues at the IAEA. This exercise had the largest number of participants of any nuclear emergency exercise to date with organizations in 82 different countries and the involvement of 11 different international organizations. It was a two day exercise that continued for 36 hours and included over-night shifts. The overall aim was to test responses to a simulated accident at a nuclear power plant.

Accidental or malicious releases of radioactive material have the potential to threaten health and disrupt life. As regards agriculture, experience has shown that communities, agricultural production and food trade can be affected by major accidents. Such events may have international or even global consequences, therefore, it is important to prepare and rehearse arrangements for dealing with them.

There are two conventions governing notification and assistance to nuclear or radiological emergencies on which the international emergency preparedness and response framework is based: the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. The IAEA is central to the Conventions and FAO is a full party, both Conventions were adopted in 1986, following the accident at the Chernobyl nuclear power plant.

The Convention on Early Notification establishes a system to facilitate the provision of relevant information about nuclear accidents as early as possible in order to minimize transboundary radiological consequences. In the event of a nuclear accident, State Parties to the convention that could be directly affected and the International Atomic Energy Agency (IAEA) are notified promptly. The IAEA in turn informs other States Parties, countries and international organizations and provides further information on request.

The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency facilitates the provision of assistance and support. If help is requested, the IAEA serves as the focal point for such cooperation by channelling information, supporting efforts and providing its services.

The exercise scenario simulated a significant release of radioactive material into the atmosphere and was based at the Paks Nuclear Power Plant in Hungary. This scenario was designed to required countries and international organizations to rehearse arrangements according to the conventions on notification and assistance.

International procedures were successfully initiated in the exercise, including the Joint Radiation Emergency Management Plan of the International Organizations (JPLAN). Readers may recall the announcement of the publication of the revised JPLAN in our July 2017 Newsletter. The JPLAN describes the arrangements between key international organizations, including FAO. Under the JPLAN, the Joint FAO/IAEA Division is the FAO focal point and has assigned liaison officers to staff the IAEA Incident and Emergency Centre in Vienna, Austria. This ensures coordination and dissemination of information between the FAO and the IAEA. Other appropriate international organizations are also represented at the IAEA and international coordination is maintained through regular video- and teleconference meetings of the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE).

ConvEx-3 emergency exercise is in full swing with Zhihua Ye and Carl Blackburn of the Joint FAO/IAEA Division staffing the IAEA Incident and Emergency Centre (IEC) at IAEA Headquarters in Vienna, Austria and liaising with colleagues in FAO Headquarters, Rome, Italy (photo copyright IAEA).

Therefore, during the emergency exercise and according to our emergency response plan, the Joint FAO/IAEA Division maintained a team at the Incident and Emergency Centre (IEC) in the IAEA Headquarters in Vienna, Austria where we represent the FAO.

The FAO specific exercise objectives were to: implement FAO notification; exercise lines of communication; test and evaluate information exchange especially between the teams located the IAEA and FAO. I am happy to report that the Joint FAO/IAEA Division received and acknowledged the appropriate notification promptly and alerted FAO colleagues according to plan. The team staffed the IEC for the full duration of the exercise (including during might-time), assessment and information was communicated to FAO (Rome). Implementing the JPLAN also included several meeting of the IACRNE.

These meetings were successfully arranged and held by video link and involved all the participating international organizations.

The exercise was exceptionally well planned and very well "played" by the participants. The FAO main channels of information were to Hungary, the IAEA(IEC), World Health Organization (WHO), World Meteorological Organization (WMO), and European Commission (with Hungary being a European Union member country). Liaison with WHO was particularly important so that both organizations could coordinate public communications on food and agricultural products.

Such "Level 3 Conventions Exercises" (ConvEx-3) are large-scale events that are held every three to five years to thoroughly test arrangements for fulfilling obligations under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. They are always based on a national exercise in an IAEA Member State, and are IAEA's highest level and most complex emergency exercise. Events like this are important in that they help participating organizations test and develop their systems and cooperative arrangements at local, national and international levels.

I would like to convey a very special thank you to the exercise planners, especially those in Hungary and at the IAEA. This ConvEx-3 felt very real, with lots of pressure and lots of demands made on the participants. I would also like to thank my FAO and the Joint FAO/IAEA Division colleagues for their cooperation and commitment, a special thank you to: Ms Mona Chaya, Mr Gerd Dercon, Mr Emil Fulajtar, Ms Mirela Hasibra, Mr George Kourous, Mr Qu Liang, Mr Ivancho Naletoski, Mr Stephan Nielen, Mr Erwin Northoff, Ms Anita Pavkovic, Mr Gerrit Viljoen and Mr Zhihua Ye.

A meeting of the Inter-Agency Committee on Nuclear and Radiological Emergencies (IACRNE) involving 11 International Organizations in person and by video link, considering a situation report and agreeing coordinated actions as part of ConvEx-3 (photo copyright IAEA).

Forthcoming Events

Research Coordination Meetings (RCMs) of FAO/IAEA Coordinated Research Projects (CRPs)

Third Research Coordination Meeting on the Development and Strengthening of Radioanalytical and Complementary Techniques to Control Residues of Veterinary Drugs and Related Chemicals in Aquaculture Products. (D52039-CR-3), 30 May − 6 June 2018, Pretoria, South Africa

Third Research Coordination Meeting on the Development of Electron Beam and X-Ray Applications for Food Irradiation. (D61024-CR-3), 11−15 June 2018, Bangkok, Thailand

Fourth Research Coordination Meeting on the Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety. (D52038-CR-4), 3−7 September 2018, Ljubljana, Slovenia

Second Research Coordination Meeting on Field-deployable Analytical Methods to Assess the Authenticity, Safety and Quality of Food. (D52040-CR-2), 12−16 November 2018, Colombo, Sri Lanka

Consultant's Meeting on the Implementation of Nuclear and Related Techniques to Confirm the Authenticity of Foods with High Value Production Chains and High Value Food Property Labelling Claims. 14−18 May 2018, Vienna, Austria

International Meetings/Conferences

12th Session of the Codex Committee on Contaminants in Foods (CCCF 12), 12−16 March 2018, Utrecht, Netherlands

OIE Global Animal Welfare Forum, 28–29 March 2018, Paris, France

2018 Electron Beam Workshop, National Center for Electron Beam Research (NCEBR), 16−20 April 2018, Texas A&M University, College Station, USA

24th Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF 24), 23–27 April 2018

39th session of the Codex Committee on Methods of Analysis and Sampling (CCMAS 39), 7–11 May 2018, Budapest, Hungary

8th International Symposium on Hormone and Veterinary Drug Residue Analysis, 22−25 May 2018, Ghent, Belgium

African Food Safety Workshop to Promote Standards, Reliable Methods of Analysis and Interinstitutional Cooperation, for better Control of Mycotoxins and Related Contaminants, 4–8 June 2018, Pretoria, South Africa

Eighth Annual Chapman Phytosanitary Irradiation Forum, Bangkok, Thailand, 13−15 June 2018

41st Session of the Codex Alimentarius Commission (CAC 41), 1−6 July 2018, Rome, Italy

International Conference on Communicating Nuclear and Radiological Emergencies to the Public, 1–5 October 2018, IAEA, Vienna, Austria

Past Events

New Facility: Merah Putih Gamma Irradiator, Serpong, Indonesia, 15 November 2017

Carl Blackburn

Vice President Jusuf Kalla, along with Minister of Research, Technology and Higher Education Mohamad Nasir, Chairman of BATAN Djarot S.Wisnubroto and Mayor of Tangerang Selatan Airin Rachmi Diany (right - left) commence the of operation of Merah Putih Gamma Iradiator.

The Food and Environmental Protection (FEP) Section would like to congratulate our Indonesian colleagues at the National Nuclear Energy Agency of Republic of Indonesia (BATAN) on the opening of their new irradiation facility! The Vice President of the Republic of Indonesia, Jusuf Kalla inaugurated the Merah Putih Gamma Irradiator and laboratories at Serpong, Indonesia on 15 November 2017. He expressed his appreciation of BATAN and admired their ability to master this technology. He encouraged the use of nuclear technology and expressed a wish that is should be promoted to the wider public so that its benefits can be used directly. In this regard, on 16 and 17 November the FEP Section welcomed a delegation from Indonesia's Ministry of Maritime Affairs and Fisheries who visited the IAEA Headquarters and Laboratories to discuss the application of food irradiation and its potential for sea food and fish products.

The Vice President would like this technology to support the food producers and traders of Indonesia. As Indonesian fisheries and agricultural resources have a huge potential with commodities of high economic value. However, products may quickly mature, easily decay or be damaged due to the tropical climatic conditions. Food irradiation may have a commercial role to play in helping to maintain food quality and durability, especially for high value products such as spices, tropical fruits, fish and shellfish.

Radiation Safety Standards Committee (RASSC) IAEA, Vienna, Austria, 12–14 June and 13–15 November 2017

Carl Blackburn

The Technical Officer represents the Food and Agriculture Organization of the United Nations at RASSC meetings. The RASSC is one of five IAEA standards committees and is made up of senior radiation safety representatives. The committee provides feedback and recommendations to the IAEA on its safety programmes and on areas for improvement, with a view to achieving greater transparency, consensus, quality, coherence and consistency in the development of IAEA safety standards.

The International Basic Safety Standards (General Safety Requirements Part 3)[1] commonly referred to as the Basic Safety Standards (BSS) underpin the work of this committee. The BSS establishes the radiation protection criteria that apply to workers patients, the public and the environment. As regards radionuclides in food and water, the BSS requires national authorities to establish reference levels for food and water, and this is also reflected in the guideline levels found in the WHO *Guidelines for Drinking-Water Quality* and Joint FAO/WHO Codex Alimentarius Commission *Codex General Standard for Contaminants and Toxins in Foods*. A long term project is underway to harmonize IAEA international standards in this area. For example, our July 2016 Newsletter announced the publication TECDOC-1788 *Criteria for Radionuclide Activity Concentrations for Food and Drinking Water* (sponsored by IAEA, WHO and the Joint FAO/IAEA Division). The RASSC initiated this work and the TECDOC provides the background material for future harmonization of international standards in this area. It is envisaged that the technical work in collaboration with FAO, IAEA and WHO will take some time but RASSC will be kept up to date with developments and the Joint FAO/IAEA Division is also keeping appropriate Codex committees informed and is involving colleagues from the secretariat of the Codex Alimentarius and the FAO/WHO Joint Expert Committee on Food Additives.

Readers should also note a report on the recent Consultants Meeting on natural radioactivity in food, IAEA, Vienna, 30 October – 1 November, as this too is part of the initiative to enhance international radiation safety standards for food.

[1] http://www-pub.iaea.org/MTCD/publications/PDF/Pub1578_web-57265295.pdf

Supporting Antimicrobial Residue Monitoring in South East Asia as part of the Global and FAO Action Plan on Antimicrobial Resistance, Bangkok, Thailand, 13–15 November 2017

James Sasanya

The Technical Officer undertook a mission to Bangkok, Thailand to:

- Attend a meeting on Antimicrobial Resistance (AMR) that includes antimicrobial (AM) residue testing/monitoring, associated issues and initiatives in Asia Pacific Region;
- Provide expert advice to laboratory personnel and project managers from participating countries, namely Cambodia, Indonesia, Lao PDR, Philippines, Thailand and Viet Nam, review presentations and provide feedback;
- Specifically assess capabilities of the Bureau of Quality and Safety of Food (BQSF), Department of Medical Sciences, Ministry of Public Health, in analysis of drug residues and its role in AMR testing and surveillance

This meeting, the first in a series to come, also aimed at:

- Discussing relevance of AM residue monitoring within the Global Action Plan on AMR;
- Discussing minimum requirements for establishing systematic AM residue monitoring;
- Sharing country initiatives, discussing challenges and possible solutions;
- Planning a way forward on the matters

The Technical Officer would present and discuss the leveraging of analytical capabilities (nuclear/isotopic techniques) as well as Agency work done in the region and help enhance testing capabilities and promote synergies with FAO colleagues.

The meeting was convened on day 1 at the FAO Regional Office for Asia and the Pacific (FAORAP) and attended by 21 participants. The Technical Officer and group joined several others at the launching of the Antimicrobial Awareness Week, opened and addressed by Assistant Director General, FAORAP, Ms Kundhavi Kadiresan. The 2 day workshop on AM residues and AMR was then opened by Ms De Balogh Katinka, the focal point, One Health and AMR, and coordinated by Ms. Carolyn Benigno and colleagues.

The Technical Officer gave a talk on "AM Testing & Monitoring" where he discussed: antimicrobials; traces/residues in food and related matrices; laboratory infrastructure/facilities; residue control/monitoring plans (including analytical methods); scope of antimicrobials and matrices in relation to AMR; quality management system for laboratories interested in AMR work; and stakeholder roles. He also presented on challenges residue testing laboratories encounter (including sharing of national data in AMR surveillance) and provided possible solutions and ways forward.

Participating countries presented on their current work or plans for AM residue testing encompassing: organization/design of AM residue analysis; relevant laboratory capacity and any existing networks; residue/data reporting mechanisms; and priority gaps etc. The Technical Officer assessed these presentations, provided advice and noted needs/wishes.

On day 2, the Technical Officer and team visited BQSF and assessed their laboratory capabilities and preparedness to support AMR and AM residue monitoring in Thailand and the region. The Technical Officer interviewed various laboratory staff and managers, later providing feedback through extensive round table discussions.

On day 3 (15th), the Technical Officer visited the Bureau for Quality Control of Livestock Products (BQCLP) at PathumThani, toured the AM residue laboratory and discussed IAEA TC project activities including a new one (2018–2019). Workplan for this project was discussed with a group of personnel including two from the National Institute for Animal Health (NIAH). The counterparts from these 2 institutions agreed to work closely together. Their needs were also discussed including plans for implementation. The Technical Officer then visited NIAH and briefly toured the laboratory and spoke to some staff.

Participants from Cambodia, Indonesia, Lao PDR, Philippines, Thailand and Viet Nam, FAO, OIE and IAEA staff at the launching of a workshop on Antimicrobial Resistance and role of antimicrobial residue testing/monitoring.

Eighth International Symposium on Recent Advances in Food Analysis (RAFA), Prague, Czech Republic, 7–10 November 2017

Simon Kelly

The eighth in the series of biennial symposia on 'Recent Advances in Food Analysis (RAFA)' took place in Prague

between the 7th and 10th November 2017. The event had over 750 attendees from a broad range of food related disciplines and covered topics including authenticity and food fraud; 'omics' including foodomics; pesticide and veterinary drug residues; food forensics; mycotoxins, marine and plant toxins; bioactive compounds; nanoparticles in food; novel foods and supplements and organic crops and foodstuffs. There were also a number of workshops on novel analytical strategies including the 4th European workshop on Ambient Mass Spectrometry on food and natural products and information days.

The Technical Officer made an oral presentation on the second day of the symposium in *Session 6 - Achievements of EU Reference Laboratories (EURLs) and International collaboration* entitled "Improving accessibility to food authentication and traceability methods in developing countries: The activities of the Joint FAO/IAEA Division's Food and Environmental Protection Laboratory". The presentation described the barriers to international trade that developing countries can face whilst meeting increasing demands for authentic, quality food products. The fast evolving world of food fraud presents a unique set of challenges to developing countries due to the high costs of state-of-the-art instrumentation and the lack of human capacity to implement analytical surveillance often imposed by markets such as the European Union. For developing countries to actively participate in food authenticity testing of produce from their domestic markets, and for export, there is a need to develop appropriate, affordable and rapid methods to screen foods for adulterants using accessible methods and instrumentation. Consequently, there is an increasing demand for strategic technical support that enhances national food control systems and monitoring programs. The presentation gave some examples of the work of the FAO/IAEA Joint Division of Nuclear Applications in Food and Agriculture's Food and Environmental Protection Section and Laboratory to target testing for food authenticity and origin as a vital component of food safety and traceability.

Mr Kelly presenting the activities of the joint FAO/IAEA division's Food and Environmental Protection Laboratory at the Recent Advances in Food Analysis Symposium (2017).

The Technical Officer was also involved in the FoodIntegrity "Open Days" taking place on the afternoons of the second and third days of the symposium. These open days were an opportunity to promote the activities and outcomes of the European Framework 7 FoodIntegrity project through small booths that were set up in the annexes in the main congress centre. FEPL is a full partner in FoodIntegrity and is actively involved in work package 1, the FoodIntegrity Network; work package 2, Knowledge Base and work package 10, Industrial Integration. The Technical Officer recently took over as the WP1 lead and was presenting the outcomes of the workpackage, such as the scientific opinion on the use of stable isotopes in food fraud court cases, and encouraging delegates to register for the FoodIntegrity Network, which is a platform for sharing expertise and intelligence on food authenticity and safety.

The symposium also included vendor seminars from all of the major instrument manufacturers including Agilent, Brucker, Leco, Restek, Shimadzu, ThermoFisher and Waters on each day covering a wide range of analytical topics. This included a presentation by the Technical Officer on "Stable Isotope Analysis to Detect Food Adulteration and Fraud" in the ThermoFisher vendor seminar on day three on *Isotope Fingerprints in Authenticity and Food Fraud*. The seminar was well attended by over 70 delegates most of whom were not regular users of stable isotope methodology for food fraud detection. A final evaluation questionnaire indicated that of those who responded 82% considered the seminar to be 'very good' and well-worth attending.

The RAFA 2017 symposium was an excellent platform for networking with key figures in the fields of food safety and food authenticity and was attended by current and previous agreement and contract holders from Coordinated Research Projects and Technical Cooperation Projects. The event also offered an excellent opportunity to raise awareness of the Agency's activities and recruit potential hosts for training fellowships and scientific visits through both the main session and vendor seminar presentations. Participation in this well-attended and high profile symposium was of benefit to FEPL and ultimately our Member States.

Emergency Preparedness and Response Standards Committee (EPReSC-4 and 5 Meeting), IAEA, Vienna, Austria, 6–8 June and 5–7 November 2017

Carl Blackburn

The EPReSC was established in 2015 as one of the five IAEA Safety Standards Committees under the IAEA's Commission on Safety Standards. The committee is focused on nuclear and radiological emergency preparedness and response and makes recommendations on

the development, review and revision of radiation safety standards and related activities. The EPReSC membership includes at least 56 countries and 11 international organizations, with the Technical Officer representing the Food and Agriculture Organization of the United Nations. In addition to representatives from IAEA Member States, RASSC includes 17 international organizations that participate as observers.

As well as reviewing and discussing standards and guides from the other IAEA safety standards committees, EPReSC is also leading the development of several standards and guides. In regard to food and agriculture, a draft Safety Guide DS474 has been developed on *Arrangements for the Termination of a Nuclear or Radiological Emergency* this publication has been finalized and when published by the IAEA it will be the first safety guide led by EPReSC. It will also be jointly sponsored by the Joint FAO/IAEA Division as it includes guidance on how to consider food and agricultural production for the ending of nuclear emergency and the transition from an emergency situation. Future major work items will include a revision of Safety Guide GS-G-2.1: *Arrangements for Preparedness and Response for a Nuclear or Radiological Emergency*, and the Committee has also been kept up to date with plans to revise Safety Guide RS-G-1.8: *Environmental and Source Monitoring for the Purposes of Radiation Protection*. The Joint FAO/IAEA Division will be involved with the development and the revision of both GS-G-2.1 and RS-G-1.8 and it will provide input as necessary on issues relating to food and agricultural production. The Joint FAO/IAEA Division has also participated in writing guidance on *Arrangements for Public Communication in Preparedness and Response for a Nuclear or Radiological Emergency* and this document is now being reviewed by experts in IAEA Member States with a view to being adopted as a new safety guide in the coming year.

Discussions at EPReSC-5 included considering more joint meetings, in particular with the Nuclear Security Guidance Committee (NSGC). There is a strong desire to have more involvement between the radiation safety and radiation security areas. It was agreed that EPReSC would seek to hold its next committee meeting jointly with the NSGC in June 2018.

Consultants Meeting on Natural Radioactivity in Food, IAEA, Vienna, Austria, 30 October–1 November 2017

Carl Blackburn

This meeting was held as part of an FAO, IAEA and WHO initiative to investigate practical approaches for dealing with radioactivity in food in "normal" circumstances. The intention is to produce guidance that is more akin to that used in the WHO for radioactivity in drinking water.

The meeting participants reviewed information on the concentrations of natural radionuclides in food, the circumstances in which elevated concentrations might be expected with the aim of identifying specific radionuclides, foods or diets that may be of particular interest. It is important that these issues are well understood so that the scope of any future guidance relating to natural and man-made radionuclides in food properly reflects dietary practices.

The following presentations were made by four international experts in this area: Radionuclides in food and drinking water - The Brazilian experience, (Mr Fernando Carlos Araujo Ribeiro, affiliation); Public internal exposure to natural radionuclides from the consumption of foodstuffs and drinking water in the Islamic Republic of Iran, (Ms Nasrin Fathabadi); Control of the content of natural and man-made radionuclides in foodstuffs in the Russian Federation (Mr Dmitrii Kononenko), and; Behaviour of natural radionuclides in the environment, (Ms Lieve Sweeck, of Belgium and representing the International Union of Radioecologists).

It was concluded that individual doses by food intake are generally low (less than 1 mSv in a year), even in areas where elevated concentrations of natural radionuclides occur and might therefore be expected to accumulate in food products. The "exposure-pathways" most studied in the terrestrial environment are the transfer of uranium and its major decay products from soil into plants and animals, whereas in the aquatic environment it is the transfer of polonium-210 into seafood. In the terrestrial environment, the uptake of thorium by crops plant is generally much lower than for uranium, polonium-210 and lead-210. In the aquatic environment, measurement data indicate that levels of polonium-210 are enhanced in seafood and this radionuclide is the dominant contributor to radiation dose. Nevertheless, there are still large gaps in our knowledge and in the available data.

The key radionuclides of natural origin seem to be radium-228, radium-226, polonium-210 and lead-210. The main food group of interest is seafood due to the enhancement of polonium 210, but in the terrestrial environment other radionuclides may dominate the radiation dose. The meeting participants suggested several issues for further consideration.

Food Integrity Project Management Committee Meeting and Food Integrity Information Workshop, Budapest, Hungary, 24–25 October 2017

Simon Kelly

A meeting of the Management Committee of the European Framework 7 Integrated Project 'Food Integrity' (FI) took

place in Budapest, Hungary, on 24 October 2017. The Food and Environmental Protection Laboratory is a full partner in the FI project and is actively involved in work package 1, the FoodIntegrity Network; workpackage 2, Knowledge Base; workpackage 10, Industrial Integration and workpackage 11, Dissemination and Training. The FI Management Committee is composed of all twenty one workpackage leaders; the project coordinator from the UK's Food and Environment Research Agency and the FI Secretariat. The Technical Officer took over as the WP1 leader in September 2017 and is responsible for ensuring that the tasks, deliverables and milestones of the workpackage are achieved on time. Currently WP1 is drafting a series of scientific opinions on a range of topics related to food authenticity and fraud detection in the peer-reviewed journal *Trends in Food Science & Technology*. The scientific opinion articles include "The role of analytical testing for food fraud risk mitigation – how much is enough?"; "What are the scientific challenges in moving from targeted to non-targeted methods for food fraud testing"; "Multivariate statistics: considerations and confidences in food authenticity"; "Food authenticity database development, use and curation"; "The Use of nuclear magnetic resonance spectroscopy applications to tackle future food fraud issues"; "The future of next generation sequencing analysis in testing food authenticity" and "Stable isotope techniques for verifying the declared geographical origin of food in legal cases", which has already been published.[2] These scientific opinions will also be followed up with videos and info-graphics to promote their open-access.

In addition to promoting the FI Network, the Technical Officer is identifying opportunities to align FI's international outreach and dissemination activities with the Food and Environmental Protection Subprogramme's coordinated research and technical cooperation programme, where it is mutually beneficial and adds value to both organisations. For example, at the Budapest meeting, the FI management committee agreed to fund five expert missions to run a one-day FI seminar at the end of a week-long African Food Safety Congress taking place from 4–8 June 2018 in Pretoria, Republic of South Africa. The main objective of the FI seminar is to raise awareness of food authenticity and traceability issues and methodologies and promote the activities of the project and network. It was also agreed that a 'web-crawler', developed in the FI project to gather information on food fraud from news, media and grey-literature on the internet, could be used to supplement a study funded by the FAO Food Safety and Quality Unit to improve understanding of the food fraud situation in developing countries. In particular, the nature and the impact of food fraud and the way it is being managed. Currently, counterparts in Chile, China, India and Uganda are in the process of being commissioned by the FAO for the study.

A FI work shop entitled "Assuring the integrity of the food supply in the Central European countries" was held on 25 October 2017, at the same venue as the Management Committee meeting, for Hungarian stake holders and national food safety authorities from Slovakia, Poland and the Czech Republic. The work shop included presentations about the FI project; Hungarian experiences in food fraud; Practical food fraud detection solutions for food producers; The FI analytical method knowledgebase; food fraud early warning systems, and FI training opportunities and future dissemination activities. The workshop was well attended and received by the participants and will form the basis of future activities in food fraud detection and prevention in the Visegrád group of countries.

Ninth Session of Sub-Committee on Aquaculture of the Committee on Fisheries, Rome, Italy, 24–27 October 2017

James Sasanya

The Technical Officer joined 188 delegates from 94 countries including nine (9) observer organisations, to take a critical look at how the aquaculture sector can help meet SDGs. The Technical Officer gave a presentation to all participants, highlighting activities of the Joint FAO/IAEA Division relevant to COFI's Aquaculture Subcommittee. He reported ongoing and upcoming laboratory and institutional capacity building support programmes to Member States, for effective testing of food and environmental contaminants. A number of relevant TCPs and their role in capacity building and promoting networking as a mechanism to share expertise, experiences, practices, knowledge and information, among Member States in and across regions was shared. The Technical Officer also spoke to delegates about two relevant ongoing CRPs: (1) "Development and Strengthening of Radio-Analytical and Complementary Techniques to Control Residues of Veterinary Drugs and Related Chemicals in Aquaculture Products" and (2) "Integrated Radiometric and Complementary Techniques for Mixed Contaminants and Residues in Food".

The Technical Officer interacted with delegates, answering questions about the Joint FAO/IAEA Division activities, creating awareness, and attended a side event on Antimicrobial Resistance (AMR) in aquaculture. The Technical Officer also joined FAO colleagues in a working group meeting on AMR, to discuss among others, a forthcoming antimicrobial awareness week. The Technical Officer also interacted with various

[2] http://dx.doi.org/10.1016/j.tifs.2016.12.007

delegates and participated in a regional meeting on African aquaculture networking and safety of relevant products. Participants at this meeting included representatives from the African Union's Inter-African Bureau for Animal Resources, who expressed willingness to work closely with the Joint FAO/IAEA Division on matters of interest. The Technical Officer participated in adoption of the meeting report where he highlighted strengthening of laboratory capabilities and promotion of networking to ensure and enhance safety of aquaculture products for local consumption and trade. This 'intervention' was supported by the delegates.

The Technical Officer met FAO colleagues to discuss common food safety matters and activities, including cooperation with regional and national FAO offices. A regional African food safety workshop planned for June 2018 was discussed. The Technical Officer also joined a working group meeting on AMR. He briefed this meeting about final remarks made by the Subcommittee on aquaculture about AMR and antimicrobial use.

Insects as Feed or Food – Potential and Challenges, Vienna, Austria, 16 October 2017

Britt Maestroni

Participants of the Meeting, UNIS, Vienna, Austria.

The FEPL was invited to participate in an informal debate on edible insects by the United Nations Information Service, on the occasion of the showing of a movie called "Bugs", sponsored by the Permanent Mission of Denmark to the United Nations in Vienna. The debate that followed the movie discussed the potential and challenges of edible insects as a possible source of proteins to respond to the growing demand for feed and food security. In a world that will soon approach nine billion people, food security is a major challenge that needs to be addressed immediately. Whether as food for humans or feed for animals, the use of edible insects offers environmental benefits as they have a high feed conversion efficiency, converting an organic substrate into an edible output - the insect itself or its components. While livestock need around 6 kg of plant protein to produce 1 kg of high quality animal protein, crickets, for example, need about 1.7 kg of plant substrate to convert into 1 kg of edible protein. When these figures are adjusted for the edible part of the organism, insects are a more viable alternative than cattle, for example. While only 40% of a cow is edible, this figure increases to 80 for crickets.

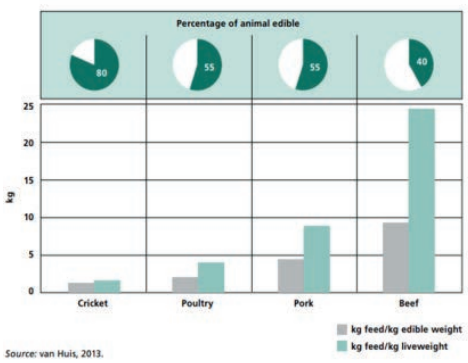

FIG.1: Efficiencies of production for different animals (Van Huis, A., 2013. Potential of insects as food and feed in assuring food security. Annual Review of Entomology, 58(1): 563–583.

It is estimated that insects form part of the traditional diets of at least 2 billion people. More than 1900 species have reportedly been used as food (FAO, 2013). On a global scale, the most commonly consumed insects are beetles (Coleoptera, 31%), caterpillars (Lepidoptera, 18%) and bees, wasps and ants (Hymenoptera, 14%). Following these are grasshoppers, locusts and crickets (Orthoptera, 13%), cicadas, leafhoppers, planthoppers, scale insects and true bugs (Hemiptera, 10%), termites (Isoptera, 3%), dragonflies (Odonata, 3%), flies (Diptera, 2%) and other orders (5%). Entomophagy, the practice of eating insects, is heavily influenced by cultural and religious practices.

Insects are commonly consumed as a food source in many regions of the world. In most Western countries, however, people view entomophagy with disgust and associate eating insects with primitive behaviour. Despite this, the topic of edible insects has recently started to capture public attention worldwide. On one hand, insects are a highly nutritious and healthy food source with high fat, protein, vitamin, fibre and mineral content. For example, the composition of unsaturated omega-3 and six fatty acids in mealworms is comparable with that in fish. On the other hand, recent high demand and consequent high prices for fishmeal and soy, together with increasing aquacultural production, is pushing new research into the development of insects for feed, as a source of proteins for aquaculture and poultry.

At present most edible insects are harvested in the wild. The concept of farming insects for food is relatively new; an example of rearing insects for human consumption in the tropics is cricket farming in the Lao People's Democratic Republic, Thailand and Viet Nam (FAO, 2013). Insect gathering and rearing as mini-livestock at the household level or industrial scale could offer important livelihood opportunities for people in both developing and developed countries, especially women.

In 2015, the European Food Safety Authority published an opinion on the risk profile related to the production and consumption of insects as food and feed. The main recommendation was to initiate research on a long list of topics including human consumption, animal/pet consumption, biological and chemical hazards as well as allergenicity and environmental hazards. A clear and comprehensive legal framework at national/international level is needed to move forward the full potential of insects as food or feed.

With the growth of the food insect sector, there will inevitably be related food safety issues. These are likely to include traceability and authenticity of the insects and insect-based foods. The technology platforms and applications and the methodology developed through the FEPL projects for our current traceability/authenticity work should be directly transferrable to this new field. Chemical and pharmaceutical residues may also be a potential issue if mass-rearing facilities for food insects become commonplace – for example, anti-viral drugs may be used to control pests and parasites affecting insect rearing, which could then be transferred into the foods produced and would require controls to be in place.

In conclusion edible insects represent a promising alternative to the conventional production of meat, either for direct human consumption or for indirect use as feedstock. Nevertheless, a tremendous amount of research still needs to be done to realize the potential that insects offer for food and feed security. A useful reference is "Edible insects: future prospects for food and feed security", FAO forestry paper No. 171[3].

Three-lateral Meeting on Criteria for Radionuclide Concentrations in Food and Drinking Water, Geneva, Switzerland, 2 October 2017

Zhihua Ye

The Technical Officer participated the three-lateral meeting (FAO-IAEA-WHO) at the WHO Headquarters in Geneva, Switzerland, on Monday 2 October 2017 and discussed the proposal of the IAEA representative on the joint implementation of the IAEA GC (61) Resolution requesting the Secretariat to develop principles for harmonized guidance on radionuclide activity concentration values in food and drinking water, in continued cooperation with relevant international organizations and national authorities.

On representation of the Joint FAO/IAEA Division, the Technical Officer introduced the main activities of the Joint Division on preparedness and responses to nuclear and radiological emergencies affecting food and water in agriculture, such as the incident in Fukushima, including: (1) Development and application of practical techniques and countermeasures for remediation of radioactive contamination in food and agriculture; and (2) Development and application of decision support system for nuclear emergencies affecting food and agriculture (DSS4NAFA), etc.

In response to the IAEA invitation to cooperate on preparation of the document, and subsequently to co-sponsor it, the reporting officer expressed the willingness of the Joint Division to continue the existing efforts together with relevant international organizations in the preparation of the safety guidance document on radiation safety of food and drinking water in the present exposure situation. Meanwhile, the Technical Officer addressed at the meeting that the arising document would be linked to the existing co-sponsored document IAEATECDOC-1788 and to the GSRS Part 3 (BSS), but not to establish a separate mechanism or safety standards from the existing Codex Standards.

It was also discussed and agreed that the safety guidance document will not aim at changing existing safety documents (WHO Guidelines for Drinking Water Quality and FAO CAC General Standard for Bottled/Packaged Drinking Waters), but instead it will aim to fill in the existing gaps, unify the principles (of radiation safety) applied in both documents and fill the gaps as identified through preceding as well follow up expert discussions.

To this understanding, the participating organizations (IAEA, FAO and WHO) agreed to cooperate with each other on preparation of the set of rules and supporting safety guidance document. The steps were agreed upon and FAO and WHO expressed their willingness to support discussion and participate to the extent feasible on relevant consultancy and technical meetings to be arranged by the IAEA. The next steps on the implementation plan will be prepared by the IAEA and will be subject to discussion for working group (FAO-IAEA-WHO).

Strong Commitment towards Higher Animal Welfare in China

Animal welfare, sustainable development and responsible consumption were advocated during the largest conference held to date in China on farm animal welfare.

Daniela Battaglia

Attention to animal welfare is currently a mature global trend. A rapid growing market demands products of animal origin that comply with animal welfare requirements. China is not exempt from this trend: according to the 2014 China Survey on Public Awareness of Animal Welfare, 82.73% respondents were willing to purchase animal

[3] www.fao.org/docrep/018/i3253e/i3253e.pdf

welfare products. More and more food companies and retailers are paying attention to animal welfare - one for all, Alibaba, the Chinese e-commerce conglomerate.

On 12 and 13 October 2017, FAO and China Association for the Promotion of International Agricultural Cooperation hosted jointly in Hangzhou the World Conference on Farm Animal Welfare, organized by the International Cooperation Committee of Animal Welfare (ICCAW). Over 400 experts, academics and professionals attended, from governmental institutions, China and world leading food and livestock producers and retailers, academia and civil society organization.

The meeting was opened by Yu Kangzhen, Member of Communist Party of China Leading Group and Vice Minister for Agriculture in the People's Republic of China. He said that promoting farm animal welfare is a major task for all the stakeholders in the Chinese animal husbandry industry and that the government will accelerate the introduction of a country's comprehensive animal welfare legislation. He also stated that animal welfare is not only important for the sustainable development of agriculture but also as an important example of human caring in modern society and an hallmark of socioeconomic development.

The conference also highlighted how animal welfare has an indirect impact on public health and on the reduction of antimicrobial resistance, other major objective of global interest. "Animals which are stress-free, suffer from fewer injures and are more resistant to diseases; this contributes to reducing the need to use antimicrobials" said Daniela Battaglia, FAO Animal Production Officer.

FAO recognizes the importance of animal welfare practices that lead to benefits for both producers and their animals and supports their implementation, with a variety of awareness raising and capacity development activities in partnership with multiple stakeholders.

Promoting Food Safety Partnerships with Private Industry – A Visit to Charm Sciences, Andover, MA, USA, 25–28 September, 2017

James Sasanya

The Technical Officer visited the Charm Sciences Inc in Lawrence MA, as part of a programme to enhance technical knowledge of the company's products for analysis of food contaminants. The company is a leader in food safety testing including production of radio receptors assay tools and kits that FAO/IAEA Member States use in their agrochemical residue testing and monitoring programmes, and also applicable in coordinated research activities. The Technical Officer participated in training workshop that included among others:

- Reviews Charm II system platform, running of beta lactam milk and tetracycline tissue assay
- Introduction to Charm HPLC receptogram
- ROSA milk and mycotoxin tests; overview of the EPIC system; peel plate and ATP among other
- A new Aflatoxin field test

The End Product Indicator Charm (EPIC) system, a microplate bioluminescence system for verifying quality and shelf life of foodstuff including milk and milk products, soy beverages and nutritional drinks.

The Technical Officer held discussions with scientists and managers at Charm with regard to collaboration in coordinated research activities including on mixed contaminants, capacity building under the IAEA TC programme. Possible support for an upcoming African Food Safety workshop due 2018 was also discussed.

Technical Officer, Charm Sciences Staff and National Representative at Charm HQ.

The 19th Meeting of the Inter-Agency Committee on Radiation Safety (IACRS), Washington, DC, USA, 12–14 September 2017

Carl Blackburn

This 19th regular meeting of the Inter-Agency Committee for Radiation Safety (IACRS) was held at the Pan American Health Organization (PAHO) Headquarters, Washington D.C. USA. The Technical Officer participated as the FAO representative and provided information on the joint FAO/IAEA programmatic work activities related to food and agricultural issues in relation to radiation standards. Mr Pablo Jiménez of the PAHO was appointed as IACRS chair for the next 15 month committee term and a joint meeting session was also held with the United States Inter-Agency Steering Committee on Radiation Standards (ISCORS).

Technical discussions were held with participating organizations (especially IAEA, WHO and PAHO) as well as with US counterparts from Federal Agencies involved with the development an application of standards related to

radionuclides in food and water. These discussions focused on possible future activities to develop guidance for the application and if feasible the harmonization of approaches to meet the requirements of IAEA Basic Safety Standards and apply the FAO/WHO Codex Alimentarius standards for radionuclides in food and drink including bottled water.

The IACRS meets in person every 15 months or so, other meetings are also held by video link and these meetings provide a forum for International Organizations involved in radiation safety standards to share views and information from their different perspectives. Information exchange and coordinated work efforts are promoted and mutual cooperation is discussed. For example, this meeting led to the organization of a liaison meeting between FAO, IAEA and WHO at WHO headquarters Geneva in order to agree on future coordination of efforts to harmonize an approach for radionuclides in food with the approach used for radionuclides in water. The IACRS also agreed to share information on risk communication for the mutual benefit of all organizations and their member countries.

The Inter-Agency Committee on Radiation Safety (IACRS) together with members of the US Interagency Steering Committee on Radiation Standards (ISCORS) at the Headquarters of the Pan American Health Organization (PAHO) in Washington D.C., USA.

Pre-appraisal: Tanzania Aflatoxin Control in Maize and Groundnut Value Chains, Dar Es Salaam, and Dodoma, Tanzania, 28 August–2 September 2017

James Sasanya

The Technical Officer participated in a mission to support a project pre-appraisal mission to Tanzania at the request of the Ministry of Agriculture, Livestock and Fisheries (MALF) and provide technical advice as part of a team of experts including staff of the African Development Bank (AfDB), FAO and FAO Investment Centre, Africa Service as well as external consultants. This is under a proposed project "Tanzania Initiative for Preventing Aflatoxin Contamination (TANIPAC)" now "Aflatoxin Control in Maize and Groundnut Value Chains in Tanzania".

Following reports of aflatoxin outbreak suspected to have caused loss of lives, the Government of the United Republic of Tanzania, submitted a project to the Global Agriculture and Food Security Programme (GAFSP) for funding to establish long term corrective measures. The Government is working with AfDB as supervisor but technical support was sought through the FAO's Investment Centre hence involvement of the Joint Division, especially with regard to infrastructure establishment including setup or strengthening of stakeholder analytical laboratories to support prevention of Aflatoxin Contamination.

The stake holder institutions evaluated included:

- Tanzania Food and Drug Authority (TFDA), Ministry of Health, Community Development, Gender, Elderly and Children;
- Tanzania Bureau of Standards (TBS), Ministry of Industries, Trade and Investments;
- National Biocontrol Control Unit, (NBCU) and Mikocheni Agricultural Research Institute (MARI) both of MALF;
- Others: Zanzibar Food and Drug Board (ZFDB); Zanzibar/Kizimbani Agricultural Research Institute (ZARI); Zanzibar Bureau of Standards;

The pre-appraisal mission was headed by staff AfDB and FAO Technical Cooperation Investment Centre. The Technical Officer visited and assessed capabilities of the above institutions between 28 August and 2 September 2017. The activities addressed include: Establishment of a Central Agricultural Reference Laboratory; Improvement of analytical infrastructure; and Scale up of bio-control technologies.

The Technical Officer continued to interact with the team in preparation of the group mission report, logical framework, refined budget and full pre-appraisal mission report that included technical annexes, weeks after the mission. This report has benefited subsequent mission (s) to Tanzania to ensure prompt and smooth project implementation and enhance the country's capability to address the challenge of mycotoxins, especially aflatoxins in foods.

An "international" maize market in Tanzania visited in relation with efforts to control mycotoxins, including sampling for analysis.

40th Session of the Joint FAO/WHO Codex Alimentarius Commission, Geneva, Switzerland, 17–22 July 2017

Zhihua Ye

The Technical Officer participated all events of the 40th Session of the Joint FAO/WHO Codex Alimentarius Commission (CAC 40), including side events on "WHO/FAO work on AMR (Antimicrobial Resistance) in support of Codex and member states" and "FAO/WHO food control system assessment tool". The activities and outputs of the Joint Division on development of international food standards were well presented at the 40th Session of the CAC meeting and the collaborative relationship of the Joint Division with the Codex was further enhanced through active participation at the plenary panel discussion for international organizations at CAC 40.

On representation of the IAEA, an updated information paper on relevant activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture was submitted to and accepted by the Commission as a formal communication document with the code CAC/40 INF/01[1].[4]

The Technical Officer, as a representative of IAEA, was invited to attend a special plenary panel discussion for international organizations. Based on the information paper (CAC/40 INF/01), he made an statement at the panel with highlights of recent activities of the Joint Division relevant to Codex including active participation in relevant activities and meetings of the Codex and, particularly, at the Codex Committee on Contaminants in Foods (CCCF), the Codex Committee on Pesticide Residues (CCPR) and the Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF). In response to the question from the Moderator to the panel on "How can we work together over the next 15 years in light of Sustainable Development Goal 17", he also briefed the Commission that: (1) The IAEA is committed to strengthen global partnerships for sustainable development in terms of application of Codex standards and nuclear techniques in food and agriculture; (2) Research and technical cooperation projects at IAEA build on codex standards also encourage and support the development of new codex standards; and (3) the IAEA through the Joint FAO/IAEA Division will continue to work with Codex to promote sustainable food production, food security and safety over the next 15 years.

The Commission expressed its appreciation to Representative of the IAEA for the useful information provided on the fruitful activities and for the contribution to CAC40, especially for making the panel discussion a successful event.

Mr Zhihua Ye attending the plenary panel discussions for international organizations at the 40th Session of the Joint FAO/WHO Codex Alimentarius Commission.

Technical Panel on Phytosanitary Treatments (TPPT), IAEA, Vienna, Austria, 17–22 July 2017

Carl Blackburn

The FEP Section hosted a meeting of the Technical Panel on Phytosanitary Treatments (TPPT). As part of the International Plant Protection Convention, the TPPT evaluates data submissions from national and regional plant protection organizations and reviews, revises and develops phytosanitary treatments. The TPPT also provides guidance to the Standards Committee regarding specific phytosanitary treatment issues. The TPPT evaluates treatment submissions against requirements in the International Measures for Phytosanitary Standards No. 28 (ISPM 28:Phytosanitary treatments for regulated pests). Readers will recall that previous Coordinated Research Projects of the Joint Division have resulted in phytosanitary irradiation treatments that have been accepted international phytosanitary standards, as annexes to ISPM 28.

It was a pleasure to host the TPPT and meet the FAO secretariat and technical experts in person. A detailed report of the meeting is now available on-line[5] and it should be noted that the International Plant Protection Convention (IPPC) Secretariat is soliciting further submissions for phytosanitary treatments to be adopted as international standards, as annexes to ISPM 28. Submissions will be accepted from Contracting Parties or Regional Plant Protection Organizations (RPPOs) and should be sent through the respective IPPC Official Contact Point.

[4] CAC/40 INF/01 http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-701-40%252FINF%2Bpapers%252Fif40_01e_IAEA.pdf

[5] https://www.ippc.int/static/media/files/publication/en/2017/11/Report_TPPT_2017_Jul_2017-11.01_EOqTwj3.pdf

Coordinated Research Projects

CRP Reference Number	Ongoing CRPs	Scientific Secretary
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
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
D52040	Field-deployable Analytical Methods to Assess the Authenticity, Safety and Quality of Food	S. Kelly A. Cannavan
D52041	Integrated Radiometric and Complementary Techniques for Mixed Contaminants and Residues in Foods	J.J. Sasanya Z. Ye
D61024	Development of Electron Beam and X ray Applications for Food Irradiation (DEXAFI)	C.M. Blackburn

Third RCM of Joint CRPs on "Accesible Technologiess for the Verification of Origin of Dairy Products and Example Control System to Enhance Global Trade and Food Safety (CRP52038), Vienna, Austria, 9–13 October 2017

Simon Kelly, Andrew Cannavan

The third Research Coordination Meeting (RCM) for the Coordinated Research Project (CRP) on "Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety" was hosted by the Food and Environmental Protection Sunprogramme at the Vienna International Centre, Austria between the 9th and 13th October 2017. All 10 research contract holders and all 4 research agreement holders were represented at the meeting with Ms Federica Camin in attendance as a meeting consultant to provide special input on the implementation of isotopic techniques to control the authenticity of products within the dairy sector. Mr Micha Horacek, an experienced isotope geochemist who previously published work on the origin of milk products, was present as an observer from the Francisco Josephinum Wieselburg, Austria. Mr Simon Kelly and Mr Andrew Cannavan were the Scientific Secretaries and Mr Russell Frew chaired the meeting with Ms Tricia Hoffman as Rapporteur. The RCM was formally opened by Mr Zhihua Ye, Head of the Food and Environmental Protection Section, who in his opening remarks highlighted the importance of CRP D52038 in developing national templates for food traceability and safety systems. He emphasised that traceability is a key component of food safety not only providing consumer protection but also enhancing international trade.

The meeting included research progress presentations from each of the contract holders and technical presentations from each of the agreement holders. The agreement holder, consultant and observer's technical presentations were on a range of topics of relevance to the contract holders. These presentations reinforced understanding of the principles of food traceability using nuclear and complementary techniques as well as providing case studies of how the data generated can be applied in actual traceability situations. The insights provided by the agreement holders helped the contract holders formulate the next steps in their own projects.

Group sessions in the "World Café" format were then held to evaluate the current status of the project implementation, to combine outputs and outcomes and to identify gaps and solutions to problems encountered. Each research contract holder's final year workplan was reviewed by the consortium using the World Café session to ensure that high scientific standards and the objectives of the CRP were maintained. The subsequent feedback and discussions led to the identification of common problems and barriers to progression for the entire group. On the basis of these extensive discussions, the contract holders' workplans for the next phase of the project were reformulated to strengthen the development of analytic techniques, improvement of datasets/database and networks, and outlining publications and SOPs for optimizing impacts and fulfilling the objectives of the CRP. The list of common barriers identified in the World Café exercise were then reviewed in an open group session to identify solutions that were formatted into an 'action table' assigning tasks and deadlines to all project members.

To ensure that a primary objective of the CRP, to populate a database with high-quality data from authentic-origin, is met it was agreed that the core methods developed and used by the contract holders will be presented as SOP's with appropriate validation data. The database structure from a successful Framework 7 European project on food authenticity and traceability, "TRACE", will be adopted and used as the starting point for the D52038 dairy origin database. The first joint publication from the consortium was also planned on the validation of multi-element measurements on a common IAEA reference material milk powder (IAEA 153). The results are being collated by the Florida International University with the aim to submit the publication in the first quarter of 2018.

The meeting concluded that good progress had been made by all participants in continuing collection of authentic milk samples and continuing programmes of isotopic and trace element measurement. In addition, the participants recognized that CRP D52038 had initiated useful collaborations between laboratories of different member states and that it provides information that can have a regulatory impact, e.g. the detection of milk whose chemical parameters do not comply with that from the claimed origin may be an indication of fraud.

The focus of the next phase of the project is to ensure consistency of methods and data quality between participants so that the ultimate goal of generating a sustainable database and maps of the spatial variability in dairy isotopic parameters can be achieved. It was recommended by the meeting that IAEA should collect sub-samples of milk powder from all participants and initiate a program of strontium isotope ratio measurements, through a technical contract, to assess global variability and potential of the technique. Furthermore, the IAEA should consider the possibility of hosting and maintaining the milk powder database from this CRP to ensure its sustainability and legacy in a similar way to the "Water Isotope System for data analysis, visualization and Electronic Retrieval (WISER)" maintained by the Water Resources Programme. All participants emphasized the need to communicate regularly and recommended that the IAEA and the FAO should support raising awareness of the CRP activities through a final workshop that could potentially be associated with an appropriate food authenticity conference in September 2018.

Meeting Participants at the Vienna International Centre, Vienna, Austria.

Technical Cooperation Projects

Country/Region	Project No.	Title	Technical Officer
Algeria	ALG5030	Contributing to the Implementation of the National Agricultural Development Programme Through Strengthening Soil, Water and Nutrient Management Practices Including Food Safety Using Nuclear and Related Techniques	J.J. Sasanya
Angola	ANG5014	Upgrading Laboratory Services for Control of Food Quality for Human and Animal Consumption	J.J. Sasanya Z. Ye
Bahrain	BAH5001	Determining Pesticide and Mycotoxin Residues in Water and Food	J.J. Sasanya Z. Ye
Bahrain	BAH5002	Establishing a National Quality Control Standard for Foodstuffs and Fishery Products	J.J. Sasanya Z. Ye
Bangladesh	BGD5031	Strengthening Capacities to Monitor and Control Veterinary Drug Residues in Foods of Animal Origin	J.J. Sasanya
Bangladesh	BGD5032	Building Capacity in Improving Food Safety Using Nuclear and Other Complementary Analytical Techniques	J.J. Sasanya
Belize	BZE5007	Supporting Sustainable Capacity Building through Distance Learning for Laboratory Personnel of the National Agricultural Health Authority	B.M. Maestroni G. J. Viljoen
Benin	BEN5009	Monitoring Safe Food Supply through Total Diet Studies and the Application of Nuclear and Complementary Analytical Techniques	J.J. Sasanya
Benin	BEN5011	Strengthening National Capabilities to Improve the Safety and Competitiveness of Exportable Food Products	J.J. Sasanya
Botswana	BOT5014	Enhancing the Use of Nuclear and Isotopic Analytical Techniques in Monitoring Chemical Food Contaminants	J.J. Sasanya
Botswana	BOT5017	Enhancing Capabilities for Inter-institutional Monitoring of Chemical Food Contaminants Using Nuclear/Isotopic and Complementary Analytical Techniques	J.J. Sasanya A. Cannavan
Cameroon	CMR5023	Strengthening Laboratory Capabilities to Monitor Contaminants in Fisheries Products	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Central African Republic	CAF5007	Enhancing Laboratory Capacity to Control Chemical and Bacteriological Hazards in Foodstuffs of Animal Origin	J.J. Sasanya
China	CPR5022	Implementing the Stable Isotope Technique for High Quality Agro-product Traceability and Authenticity	A. Cannavan S. Kelly
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.J. Sasanya
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
Costa Rica	COS5033	Assessing and Implementing Biochar Use in Climate Smart and Environmentally Friendly Pineapple Production Using Isotopic Techniques	C.M. Blackburn A. Cannavan M. Zaman
Costa Rica	COS5036	Improving Analytical Capacity to Monitor Food Contaminants and Veterinary Drug Residues Using Nuclear/Isotopic and Complementary Techniques	J.J. Sasanya
Cuba	CUB5019	Strengthening National Capacity for Monitoring Heavy Metals to Imrpove Soil and Food Quality Agro-product Traceability and Authenticity	C.M. Blackburn J.J. Sasanya S. Kelly
Cuba	CUB5022	Promoting Food Safety through the Mitigation of Contaminants in Fruits for Human Consumption	C.M. Blackburn
Dominica	DMI5001	Enhancing Capacity to Monitor Agrochemical Residues in Foods and the Environment	J.J. Sasanya
Ecuador	ECU5028	Consolidating Food Security and Environmental Sustainability in Palm Oil Production Using Nuclear Applications	B.M. Maestroni A. Cannavan J. Adu-Gyamfi
Ecuador	ECU5030	Reducing Post-Harvest Losses of Native Potatoes and other Fresh Foods by Irradiation	C.M. Blackburn

Country/Region	Project No.	Title	Technical Officer
Egypt	EGY5026	Establishing a National Reference Laboratory Applying Nuclear/Isotopic and Related Techniques in the Analysis of Food Contaminants	J.J. Sasanya
Fiji	FIJ5002	Increasing Trade and Export Capacities of Selected Value Chains Within the Agro-Food Sector Through the Adoption of an Appropriate Quality Infrastructure	C.M. Blackburn Z. Ye
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	C.M. Blackburn J. Adu-Gyamfi
Iraq	IRQ5021	Developing Food Safety and Assurance System Using Nuclear and Other Related Technologies	J.J. Sasanya A. Cannavan S. Kelly
Cambodia	KAM5004	Strengthening National Capability for Food and Feed Safety	D. Battaglia J.J. Sasanya
Libya	LIB5012	Using Nuclear and Complementary Techniques for Monitoring Agrochemical Residues in Food Products and the Environment	J.J. Sasanya
Malaysia	MAL5030	Strengthening National Technical Capability in Food Traceability of Edible Birds Nest through the Application of Nuclear and Related Technologies	A. Cannavan S. Kelly Z. Jandric
Marshall Islands	MHL7001	Developing a National Radioactivity monitoring Capacity	J.J. Sasanya I. Osvath (NAEL)
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

Country/Region	Project No.	Title	Technical Officer
Mongolia	MON5024	Enhancing Food Safety Analytical Capabilities for Veterinary Drug Residues and Related Contaminants Using Isotopic Techniques	J.J. Sasanya D. Battaglia Z. Ye
Montenegro	MNE5004	Strengthening Technical and Institutional Capacities of the National Reference Laboratory for Food and Feed Control	Z. Ye A. Cannavan Z. Jandric
Morocco	MOR5036	Valorizing and Improving the Quality of Food Products by Using Irradiation Techniques	C.M. Blackburn
Morocco	MOR5037	Enhancing Control of Chemical Food and Feed Contaminants, Animal Disease Diagnosis and Trade in Fresh Fruits	D. Battaglia J.J. Sasanya C.M. Blackburn
Mozambique	MOZ5006	Building Laboratory Capacity for Food Safety Using Nuclear/Isotopic and Complementary Analytical Techniques	J.J. Sasanya
Namibia	NAM5013	Assessing the Spatial Distribution of Lead, Cadmium and Selected Pesticide Residues in Livestock Farming	A. Cannavan J.J. Sasanya
Namibia	NAM5015	Developing Capacity of the National Standard Institution and Agro-Marketing and Trade Agency in the Areas of Food Safety	B. Maestroni A. Cannavan
Niger	NER5020	Building Capacity at the Central Laboratory (LABOCEL), Niamey, for Control of Food Products of Animal Origin	J.J. Sasanya
Niger	NER5022	Strengthening Nuclear / Isotopic and Complementary Laboratory Capabilities for Monitoring Contaminants in Food, Feed and Water	D. Battaglia J.J. Sasanya
Nigeria	NIR5039	Enhancing Dietary Exposure Assessment of Chemicals in Food	J.J. Sasanya
Oman	OMA5003	Strengthening National Capabilities in Food Safety and Food Traceability	B.M. Maestroni J.J. Sasanya Z. Ye
Panama	PAN5024	Developing Analytical Capabilities for the Detection of Chemical Contaminants in Food and the Quality of Agrochemicals	B.M. Maestroni

Country/Region	Project No.	Title	Technical Officer
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
T.T.U.T.J of Palestinian A.	PAL5010	Strengthening Capability to Monitor Contaminants in Food and Related Matrices through Nuclear and Complementary Analytical Techniques	J.J. Sasanya
Senegal	SEN5038	Strengthening Laboratory Capabilities for Analysing Veterinary Drug Residues and Contaminants in Food	J.J. Sasanya A. Cannavan
Seychelles	SEY5010	Strengthening Laboratory Capabilities to Enhance Food Safety Using Nuclear and Complimentary Analytical Techniques	J.J. Sasanya
Sierra Leone	SIL5016	Strengthening Laboratory Capabilities to Evaluate and Monitor Levels of Mycotoxins, Toxic Metals and Related Contaminants in Foods	J.J. Sasanya Z. Jandric
Sri Lanka	SRL1008	Providing Technical Support for Smooth, Safe and Sustained Operation of the Multipurpose Gamma Irradiation Facility	C.M. Blackburn
Sri Lanka	SRL5048	Strengthening National Capability for Food and Feed Safety	A.Cannavan
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
Sudan	SUD5039	Enhancing the Capacity to Monitor Pesticide and Veterinary Residues in Food Using Nuclear and Complementary Techniques	J.J. Sasanya
Syria	SYR5024	Enhancing Capabilities to Monitor Naturally-Occurring and Synthetic Anabolic Hormones and other Veterinary Drug Residues in Foods	J.J. Sasanya
Thailand	THA5056	Strengthening Food Safety Laboratory Capacities	J.J. Sasanya D. Battaglia
Uganda	UGA5039	Enhancing the Monitoring of Veterinary Drug Residues, Related Chemicals and Natural Food Contaminants	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Uganda	UGA5040	Strengthening Multi-Sectoral Food Contaminant Monitoring Programmes Through the Effective Use of Nuclear, Isotopic and Complementary Techniques	D. Battaglia J.J. Sasanya
Tanzania	URT5033	Establishing the Feasibility of an Irradiator Facility	C.M. Blackburn
Viet Nam	VIE5022	Promoting Interlaboratory Comparison and Accreditation in Testing Chemical Contamination for Food Safety	B. Maestroni Z. Ye
Zambia	ZAM5030	Establishing a National Mycotoxins Monitoring Programme	J.J. Sasanya
Zambia	ZAM5032	Strengthening and Expanding Analytical Capacity to Monitor Food Contaminants using Nuclear/Isotopic and Complementary Tools	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 D. Battaglia
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	J.J. Sasanya D. Battaglia G. J. Viljoen
Asia	RAS7026	Supporting the Use of Receptor Binding Assay (RBA) to Reduce the Adverse Impacts of Harmful Algal Toxins on Seafood Safety	M.Y. Dechraoui Bottein (NAEL) A. Cannavan
Asia	RAS5081	Enhancing Food Safety and Supporting Regional Authentication of Foodstuffs through Implementation of Nuclear Techniques (RCA)	S. Kelly Z. Ye Z. Jandric

Country/Region	Project No.	Title	Technical Officer
Latin America	RLA5065	Improving Agricultural Production Systems Through Resource Use Efficiency (ARCAL CXXXVI)	B.M. Maestroni L.K. Heng J. Adu-Gyamfi
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)	J.J. Sasanya B.M. Maestroni
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)
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 D. Battaglia

Interregional Training Course on Radionuclides in Food: Sampling, Analysis, Standards and Regulations, and its Relevance to International Trade, Singapore, 9–13 October 2017

James Sasanya

The meeting was organized the Veterinary Public Health Centre of Agri-Food & Veterinary Authority (AVA), Singapore, under the framework of the interregional project on enhancing Member State capabilities to more effectively contribute to and implement international food standards and guidelines besides promoting networking across regions. The event was attended by 17 scientists from Singapore, Mongolia and Tunisia, with focus on strategic food monitoring and sampling plans; an overview of radiological analytical techniques as well as standards and regulations of radionuclides in food and drinking water. Design of monitoring program for radionuclides based on knowledge gained at the workshop was also done. External and local (AVA) resource persons participated and included laboratory sessions on various analytical techniques such as Gamma Spectrometry, Alpha Spectrometry and Liquid Scintillation Counting; as well as on sample preparation and overall workflow of radiochemical analyses.

The participants are expected to either establish or upgrade their testing capabilities for radionuclide testing in food and corresponding monitoring programs as well as supporting standard and guideline setting or implementation. Networking among participating countries, institutions and staff was promoted.

Training on radionuclide testing in food and related matrices in Singapore.

Training on "International Food Safety Standards, and MRL setting", Bogota, Colombia, 2–6 October 2017

James Sasanya

Participants at a national training in Colombia on International Food Safety Standards, and MRL setting.

This national training course was hosted by the Chemistry Department, Universidad Nacional de Colombia (UNAL) and attended by 15 participants from the host UNAL; Instituto Colombiano Agropecuario (ICA); Instituto National de Salud (INS); Instituto nacional de Vigilancia de Medicamento y Alimentos (INVIMA) and Corporación Colombiana de Investigación Agropecuaria (CORPOICA).

The topics addressed included among others:

- Food safety and international food trade (SPS Agreement and Codex Alimentarius Commission)
- Risk analysis related to food safety – Overview
- Risk assessment of chemicals – Overview on toxicology and exposure assessment
- Long-term and short-term dietary exposure assessment for chemicals and use of the Excel template
- Risk management – overview; and management of contaminants
- Planning and collecting scientific data
- Analysis of obtained data (including basic statistics)
- Calculation of the minimum number of samples; and analysis of data (preparation of frequency table and graphs)
- Estimation of maximum levels for contaminants
- Estimation of MRLs for pesticides
- Description of use pattern of a pesticide
- Estimation of MRLs for pesticides
- Preparation and submission of data on supervised residues trials for pesticides
- Establishment of maximum residue limits (tolerances) or import tolerances for pesticides

Relevant analytical techniques were also discussed. The event is part of a national effort to strengthen inter-institutional collaboration for better food safety under a national technical cooperation project. The event was supported by Dr Yukiko Yamada, Advisor to Vice-Minister, Ministry of Agriculture, Forestry and Fisheries, Japan.

Regional (AFRA) Training Course on Analytical Methods for Veterinary Drug Residues in Foods Using Radio Receptor Assay and Complementary Techniques, Rabat, Morocco, 18–22 September 2017

James Sasanya

Training on residue testing using radio receptor assay and related techniques in Morocco.

The event was hosted by the Office National de Sécurité Sanitaire des Produits Alimentaires (ONSSA) attended by 36 participants (food safety analysts) from 28 countries. Activities included practicals, lectures and discussions on use of radio receptor assay techniques and LC-MSMS including effective sample preparations as well as legislation regarding residue monitoring.

The participants also analyzed field/food samples and learnt how to handle radioactive reagents and waste, though in small quantities.

The trainees also learnt how to use the list of veterinary drug residues with maximum residue limits (MRLs). The list of unauthorized products in the Table 2 of the Annex of Regulation 37/2010 was discussed as well as MRLs in milk, beef and pork meat, in fish and aquaculture, in honey and eggs as described in Table 1 of the Annex of Regulation 37/2010. They also learnt about sampling for a national residue plan with honey as example.

For the group used this meeting to further strengthen networking among food safety institutions and laboratories.

RALACA Updates

Britt Maestroni

The Red Analítica de Latino America y el Caribe (RALACA) is a non-profit regional network of laboratories and associated institutions in Latin America and Caribbean countries that aims to enhance regional capabilities to target food safety and environmental sustainability. [6] RALACA held its last general meeting in May 2017, when 56 new individual members enrolled. Since then the board has started restructuring and amending the composition of the committees as well as enhancing interaction with its members.

Four webinars were organized since August 2017. Dr Pablo Macchi presented the work of the biomonitoring committee, Mr Patricio Henriquez Pizarro introduced the data analysis module (MGDA) that is downloadable from the RALACA website, Ms B.Maestroni discussed the possible future role of insects for food security in Latin America, and Prof. Heinzen presented the analytical protocols for the detection of emerging contaminants in water. Starting at the beginning of 2018 RALACA will post on its website a biannual newsletter with news and articles about activities within the network.

The visibility and popularity of the network is constantly improving, with the number of guests on the RALACA website reaching more than 1000 per day. The website domain was recently renewed until 2019.

At the last general meeting the option to register RALACA with legal headquarters in Panama was discussed. This idea is moving forward in order to start generating in-kind contributions or pledges for its projects and sustainability. The objective is the delivery of capacity building activities to develop and support the analytical capabilities of member institutions.

Dr A. Nario and Ms B.Maestroni presenting RALACA in June 2017 at the IAEA.

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

TC Project RLA5069 Updates

Britt Maestroni

Photo: Participants of the training Course on "Harmonization of Sample Preparation and Analytical Methods", Bogota, Colombia, August 2017.

Technical Cooperation Project RLA5069 on "Improving Pollution Management of Persistent Organic Pollutants to Reduce the Impact on People and the Environment (ARCAL CXLII)" has, as overall objective, improvement of environmental quality and reduction of human exposure to persistent organic pollutants (POPs). To help achieve this, the project will establish a correlation between amounts of POPs found in humans and the environment where they live, thereby paving a pathway for reducing the human and environmental health impacts from the POPs. During the second half of 2017 representatives of ten participating countries took part in a practical training course hosted by the National University of Colombia, Department of Chemistry - Bogota, from August 28 to September 8, 2017.

Professor Jairo A. Guerrero from Colombia was in charge of the organization of the course and, with the valuable collaboration of collegues and Prof. Igor Olivares, from Brazil, developed a full programme. The objective of the training course was the harmonization of criteria for the development and validation of methods for the analysis of POPs in human and animal milk to achieve project results. Practical analytical and quality control aspects were also covered as part of the capacity building activity. The matrices studied were soils, water and different food products. An important part of the course was developed around statistics, method validation and the estimation of measurement uncertainty. As a result of this course project participants have enhanced capability to develop and validate methods of analysis in their home countries.

An important activity in 2017 was the establishment of sampling plans for different study matrices. Each counterpart institution has framed the study population and the associated sampling plan taking into account previously agreed criteria within the project.

Other activities included the purchase of analytical standards and chromatographic columns and local procurements for carrying out the sampling actvities. Expert missions are being planned to support the project activities in Bolivia, Dominican Republic, Mexico, Ecuador and Paraguay. These missions are called twinning missions - the experts are fromthose regional institutes that have good experience in these type of activities, and are establishing a "twin" in a less experienced Institute. In this way, the project builds skills and experience among the participating countries leveraging on south-south cooperation.

National Outreach Seminar on the UAE Technical Cooperation with IAEA, Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates, 20–23 August 2017

Simon Kelly

A national outreach seminar on United Arab Emirates' Technical Cooperation with IAEA was held at Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates between the 20th and 22nd August 2017. The IAEA delegation was led by Ms Jane Gerardo-Abaya, Section Head (TCAP2) and facilitated by Ms Linda Eid, UAE NLA and TC Coordinator of the UAE Permanent Mission. The seminar was structured in interactive sessions including presentations from IAEA, UAE counterparts and round-table discussions, captured by rapporteurs for every session for a consolidated set of recommendations and action plans. Presentations were made by IAEA staff Ms Lee Heng (Section Head, Soil Water Management and Crop Nutrition; NAFA); Mr Sean Dunlop (Technical Officer, Nuclear Power Engineer; Infrastructure; NENP); Mr. Manfred Groening (Laboratory Head, Terrestrial Environment Laboratory; NAEL); Mr. Thomas Pascual (Technical Officer, Nuclear Medicine Physician, NAHU) and Mr Simon Kelly; (Technical Officer, Food Safety and Traceability Specialist , NAFA).

Mr Kelly presented information on the activities of the FAO/IAEA Joint Division's Food and Environmental Protection Section (FEPS) and Laboratory (FEPL). The presentation briefly covered the structure of the Joint division and FEP's position within the Agriculture and Biotechnology Laboratories at Seibersdorf. Mr Kelly went on to present how FEPS/L assists and supports Member States in their efforts to improve their food safety, traceability and authenticity systems through the TC and CRP modes of delivery including advice through CODEX and FEPL's programmes of applied research and training. A range of success stories, generated through TC and CRP routes, were presented along with other resources such as the Food Contaminant Residue Information System and the web-site and newsletter repository. Finally, Mr Kelly presented the new CRP on "Field Deployable Analytical Methods to Assess the Authenticity, Safety and Quality of Food" and the CRP planned for 2019 on "Implementation of Nuclear and related techniques to confirm the authenticity of foods with high value production chains and high value food property labelling claims".

Mr Kelly had a separate bilateral meeting with Dr Mabrouk, the Head of the Radiation laboratories in the Quality Control Council (QCC) of UAE. Dr Mabrouk explained that the Abu Dhabi Food Control Laboratories had been 're-configured' and incorporated into the UAE QCC. It was clear from the discussions that the Food Control Systems in UAE were mature and that pesticide and veterinary drug residue testing were well established and had been accredited to ISO17025 since the 1990s. QCC also have an IRMS facility that is being used to confirm honey authenticity according to AOAC method 998.12 "C4 plant sugars in honey". However, Dr Mabrouk went on to explain that honey produced in UAE was typically adulterated with date syrup that is not detected by carbon isotope ratio analysis. Dr Mabrouk was willing to consider hosting TC Fellows for chemical residue analysis training and was interested in participating in the planned CRP on "Implementation of Nuclear and related techniques to confirm the authenticity of foods with high value production chains and high value food property labelling claims" in relation to Halal food authentication. Mr Kelly will also advise QCC on expanding the scope of their IRMS analyses in food authentication and traceability, including participation in the planned CRP.

Meeting Participants at the UAE-IAEA Technical Cooperation outreach seminar (Khalifa University of Science and Technology, Abu Dhabi.

Regional (AFRA) Training Course on Method Development/Validation for Mycotoxins in Food and Feed, Lusaka, Zambia, 24–28 July 2017

James Sasanya

The event was hosted by the National Institute for Scientific and Industrial Research (NISIR), and attended by a total of 33 participants from 26 countries. Various areas were covered including: Toxigenic fungi and relevant mycotoxins in the food/feed chain; Prevention and decontamination strategies; Sampling and sample

preparation for mycotoxin analysis; and Performance characteristics and validation of quantitative analytical methods for mycotoxins.

Practical sessions were supported with lectures and discussions including data analysis and interpretation of results. Demonstrations of proper 'on-site' sampling of maize was carried out at the Food Reserve Agency, Lusaka and the collected maize samples were analyzed during the laboratory practical sessions. Knowledge was also shared on "methods of sampling for the official control of levels of mycotoxins" that has been produced within the MycoRed project "Novel integrated strategies for worldwide mycotoxin reduction in food and feed chains" (EU, 7FP). Proper milling and homogenization of maize samples before mycotoxin analysis was also addressed.

The training provided yet another opportunity for food safety institutions and scientists to network.

Laboratory personnel from food safety institutions in Africa a mycotoxin training course in Lusaka, Zambia.

Developments at the Food and Environmental Protection Laboratory

A New "VisION" for the Food and Environmental Protection Laboratory

Simon Kelly

A new *Elementar VisION* gas isotope ratio mass spectrometer (IRMS) was commissioned in the Food and Environmental Protection laboratory (FEPL) in September 2016. The system is specially designed to precisely measure the stable isotope ratios of the light bio-elements hydrogen, carbon, nitrogen, oxygen and sulfur in food, agrarian, geological and other sample types by combustion and high temperature thermochemical conversion. This capability is an essential resource in FEPL's programme of applied and adaptive research for Member States that is underpinned by stable isotope and trace element analysis to establish reliable food traceability and food authenticity control systems.

The system is capable of measuring bulk samples up to 20 milligrams through the Pyrocube elemental analyser, which is fitted with a 120 place automatic carousel. The Pyrocube can be configured for both simultaneous carbon, nitrogen and sulphur isotope ratio measurements on bulk samples, by Dumas combustion at 1150°C, or simultaneous hydrogen and oxygen isotope ratio measurements on bulk samples, by thermochemical conversion at 1500°C. The Pyrocube system will initially be used to measure Pakistani Basmati rice samples for carbon, nitrogen and oxygen isotope ratios to assist the Member state to establish a control system for the production of Basmati rice, which is defined both by variety and production zones close to the Himalayas.

The *VisION* system is also coupled to an *Agilent 7890B Gas Chromatograph* (with Flame Ionisation Detector) through a *GC5* combustion and pyrolysis interface for compound specific stable isotope analysis (CSIA). This permits complex mixtures of analytes to be separated by capillary gas chromatography and then the individual compounds eluting from the column are quantitatively converted into measuring gasses for hydrogen, carbon, nitrogen or oxygen stable isotope analysis. The *GC5* system will initially be used to develop a method to detect the addition of low cost sugar syrups to adulterate a range of foods, which are prone to addition of exogenous sugars such as fruit juices, honey, maple syrup and palm sugar. The developments will provide a simpler, faster and considerably cheaper method making it more accessible to developing Member states. In addition the GC5 will also be used to optimise a method for the authentication of the active ingredient in Manuka honey, which has been derivatised to make it sufficiently volatile and amenable to GC analysis.

Visiting fellows, scientists and interns will have an opportunity to learn operational and analytical methods on the *Elementar VisION* instrument, thereby supporting Member state training efforts and raising awareness of the technique. As the supply chains that deliver food stuffs to our doors grow ever more complex, bringing incredible choice to consumers, so it becomes more difficult to ensure that we can trust those foods. Stable isotope analysis is a technique which can detect fraudulent or mislabelled premium and protected foods and reduce the risks of unintended food safety incidents associated with adulteration. The new *GC5* system also opens the opportunity for collaboration with the other FAO/IAEA Agriculture & Biotechnology Laboratories for research projects that require compound-specific stable isotope analysis.

The new Elementar VisION system. From left to right; the Agilent 7890B Gas Chromatograph; The GC5 combustion and pyrolysis interface; the VisION gas isotope ratio mass spectrometer and the PyroCube elemental analyser.

Assessment of the Withholding Period for Organophosphorus Pesticides Applied to Vine Leaves

Britt Maestroni

Grape (*Vitis vinifera*) was estimated by FAO to be the most widely cultivated fruit crop in the world. It is not only grapes that are of economic importance; vine leaves have also been used as a nutritious food in Greece and the Middle East for centuries and their popularity as a healthy food is increasing globally. Especially for countries like Syria it is important to assess human dietary exposure to residues of pesticides applied to vine leaves that are used to prepare local dishes like stuffed vine leaves. While pesticides are applied to be effective against a wide range of insect pests, their use has to be strictly regulated.

In assessing the impact of dietary exposure to pesticides a number of parameters have to be taken into account and carefully evaluated such as maximum residue limits, withholding time and dissipation rates, amongst others. These parameters are obtained either experimentally or through modelling and they vary according to the type of pesticide, type of crop and prevailing environmental conditions.

A study was initiated in Syria to study the behaviour of specific organophosphorus pesticides (OP) in the field under the current agricultural practices for grape vines. The objective of the study was to establish the withholding period (WHP) for three OPs used in vineyards in Syria. The WHP is the minimum time from the pesticide application until the treated area or crop is allowed to be grazed, cut for fodder or harvested. The WHP vary for the different pesticides and crop combinations. The WHP is important information that ensures that residues in the treated crop will not exceed the maximum residue limit.

Three different formulations of OPs were purchased from a local supplier and applied, in the concentration indicated on the labels, using a 20 L hand-pump pesticide sprayer, to two different vineyards near Damascus in Syria. Entire vine leaves were randomly collected at specific time intervals after the pesticide applications, brought to the laboratory and stored under frozen conditions until analysis. Under a fellowship and a scientific visit from Syria a method for the determination of pesticides in vine leaves was validated at FEPL and subsequently applied to the analysis of the samples from Syria. Vine leaves were collected immediately after application, and then at 1, 7, 14 and 21 days after treatment. Upon arrival at the laboratory each vine leaf sample was divided into three parts. One part was stored for analysis. The other two parts were washed by immersion into either boiling water or tap water, air dried in the dark and further stored for analysis. The washing of the vine leaves is an important domestic action when preparing the leaves as food. At FEPL the vine leaves were analysed using the validated method and residues of chlorpyrifos, diazinon and dimethoate were detected and measured. Current MRLs for chlorpyrifos, diazinon and dimethoate are indicated in Table 1 along with the limit of quantitation (LOQ) and the precision data obtained during method validation for the pesticides.

Table 1: Method validation information and current Codex maximum residue limit for commodities similar to vine leaves

Pesticide	LOQ (mg/kg)	Average recovery (%)	Repeatability RSD (%)	Reproducibility RSD (%)	MRL Codex (mg/kg)
Chlorpyrifos	0.01	83	15	16	0.5 (grapes)
Diazinon	0.01	82	13	14	0.5 (lettuce leaf)
Dimethoate	0.01	81	7	9	0.5 (peppers)

Results obtained from the analysis of vine leaves were plotted and statistically analysed. Chlorpyrifos and dimethoate residues displayed a first order decay. The slope of the regression line was associated to the rate of decay. The intersection of the regression line and the MRL indicated the time after application when the residual pesticide had reached the Codex MRL. The result for chlorpyrifos is shown in Figure 1. For chlorpyriphos, washing the leaves had no apparent effect on the WHP.

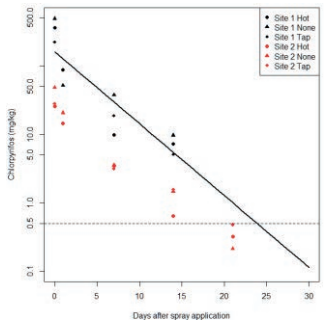

FIG. 1: Estimation of withholding time for chlorpyrifos.

By contrast, dimethoate showed that washing, especially with hot water, decreased the required WHP (Figure 2). The lack of effect of washing for chlorpyrifos was attributed to its high Kow (50,100) compared to dimethoate that had a Kow of 5.

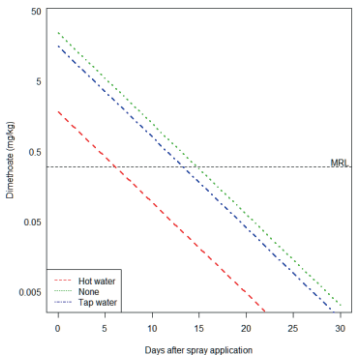

FIG. 2: Estimation of withholding time for dimethoate.

The loss of diazinon did not follow a first order decay (Figure 3). Analyses of those data are ongoing.

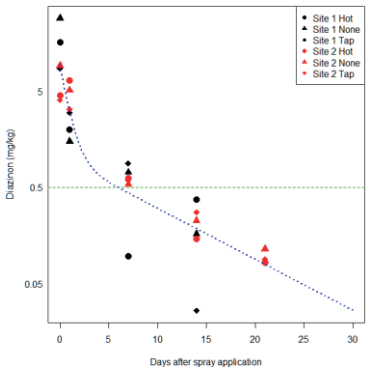

FIG. 3: Estimation of withholding time for diazinon.

Analyses of the data will produce recommendations for the WHP between spray application and harvesting. The range of pesticide used will be useful in setting WHP for other pesticides. The data indicate that washing with hot water removed approximately 90% of the dimethoate. This offers a practical method of decreasing the intake of that pesticide.

Analytical Calibration: a Key Step to Reliable Data

Britt Maestroni

Analytical calibration describes as a set of operations which aim to predict the unknown concentration of a target analyte through the establishment of a calibration curve. This is achieved by measuring reference standards, called the calibrators, and plotting area responses as a function of their concentration to establish a relationship in the form of a linear regression, preferably weighted regression to take into consideration inconsistency in the errors. Unknowns can then be predicted using the established calibration curve. A description of analytical calibration can be found in the European Commission's guidance document on analytical quality control and method validation procedures for pesticides residues analysis in food and feed' (SANTE/11945/2015). However, there are different ways of actually performing the calibration, and questions such as "which is more accurate: standards solutions calibration or procedural standards calibration?" arise among researchers.

The FEPL was requested by collaborating laboratories to investigate the use of procedural calibration as compared to other types of approaches. When it comes to analytical calibration, chemists are given several options: solvent calibration, matrix-matched calibration, standard additions, procedural standards calibration and the use of isotopically labelled internal standards. The choice of calibration to adopt depends on several factors, but primarily on the target matrix-analyte combination. In the analysis of fresh fruits and vegetables, extracts to be analysed by chromatography coupled to mass spectrometry are often prone to "matrix effects" in the system (GC or LC has signal enhancement or suppression). The calibration option should be as close as possible to the real sample situation. The calibration standards should preferably be in an environment that is similar to the sample, to reduce the effect from the sample matrix. A reasonable option could, therefore, be to opt for a matrix matched standard calibration, in which extracts of blank matrix, preferably of the same type as the sample, are used for calibration. However, it may be not that easy to find a suitable blank matrix. Another option is to use isotopically labelled internal standards (IS) that match with the analytes; however this option is expensive, especially when the screening is for multiple analytes in the sample. The use of IS calibration is the preferred option, since the IS should behave exactly like the target analyte, compensating for any matrix effect on the peak response. For multiresidue methods (10+ analytes) one can adopt the option of standard additions, which provides a good alternative calibration. This procedure is designed to compensate for matrix effects and recovery losses, but not for extraction efficiency (unlike procedural calibration) or chromatographic interferences caused by overlapping/unresolved peaks from co-extracted analytes. The standard addition technique assumes some knowledge of the likely residue level of the analyte in the sample, so that the amount of added analyte is similar to that already present in the sample. In particular, it is recommended that standard addition is used for confirmatory quantitative analyses in cases where the MRL has been exceeded and/or when no suitable blank material is available for the preparation of matrix-matched standard solutions. The use of procedural standards is an alternative type of calibration. This approach can compensate for matrix effects and low extraction recoveries associated with certain pesticide/commodity combinations, especially where isotopically labelled standards are not available or are too costly. It is only applicable when a series of samples of the same type are to be processed within the same batch. Procedural standards are prepared by spiking a series of blank test portions with different amounts of analyte, prior to extraction. The procedural standards are then analysed in exactly the same way as the samples.

In FEPL we compared different calibration options for the detection of 50+ pesticides in vine leaves by gas chromatography coupled to mass spectrometry. Figures 1, 2 and 3 show the graphical comparison of the calibration approaches for chlorpyrifos, diazinon and zoxamide, as examples. The calibration curves were constructed using linear weighted regression and the equations for each system are shown on the graphs. In all the three cases presented here, the slope of the solvent calibration curve is the highest, while the procedural calibration curve is the lowest. In other words the signal enhancement typical of GC is well compensated by the matrix matched curve

approach. On the other hand, procedural calibration helps to compensate for matrix effects and recovery losses, and also for extraction efficiency, if that is known to be an issue previously identified during method validation studies for the particular matrix-analyte combination. Zoxamide presents a strong matrix effect in vine leaves (131%). Compensation can be achieved with the use of matrix matched calibration or procedural calibration. However, the disadvantage for a routine laboratory is to considerably increase the number of samples and the analysis time. In addition test results obtained by procedural calibration should not be corrected for recovery.

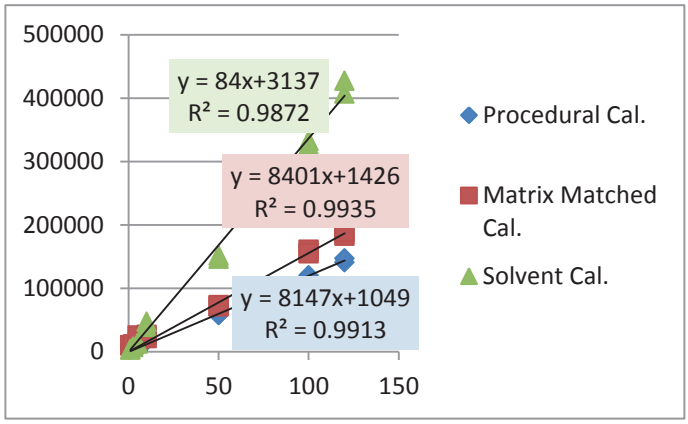

FIG. 1: Calibration curves for chlorpyrifos.

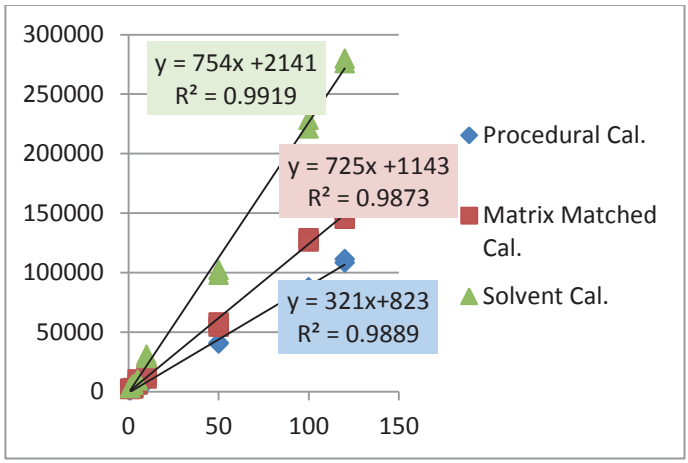

FIG. 2: Calibration curves for diazinon.

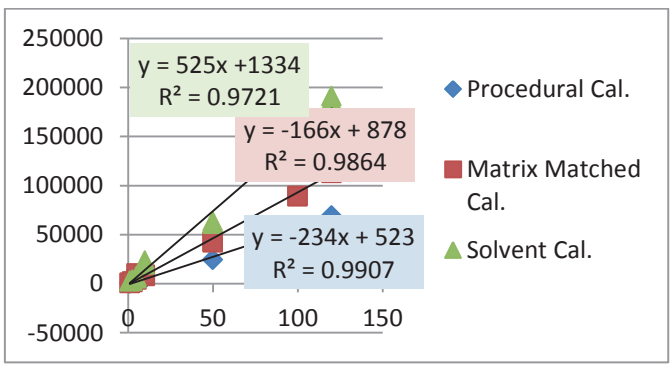

FIG. 3: Calibration curves for Zoxamide.

It is recommended that individual requirements are assessed on a case by case and the calibration approaches modified accordingly and in line with current guidelines.

Detection of gelatin adulteration in edible bird's nests using UPLC-QToF MS and chemometrics

Zora Jandrić, Marivil Islam

Mislabelling and adulteration is a problem in many areas of the food industry. For any food commodity, there is a greater incentive for food adulteration when the demand and prices are high, and greater opportunity when complex supply chains are involved. One food commodity that fulfils these criteria is edible bird's nest (EBN). As a rich source of amino acids, carbohydrates and mineral salts, bird's nests have been used for hundreds of years as an important health supplement in traditional Chinese medicine. Examples of the use of EBN include as a treatment for malnutrition, as an immune system booster, and to enhance the body's metabolism. More recently EBN have also been used in cosmetic products.

The high demand for EBN and the limited supply has led to a lucrative EBN market. This in turn has led to an upsurge in fake and adulterated edible bird nest products. Unethical suppliers blend the original bird's nest with additives (gelatin, algae, agar, white jelly fungus, sugar, monosodium glutamate, isinglass, etc.) in order to boost its weight, improve its physical appearance and increase market value. There is a need, therefore, for the development of analytical methods for the detection of EBN adulteration.

In FEPL, we previously carried out research on EBN authentication focusing on geographical classification by metabolite profiling and screening for adulteration using a mid-infrared spectroscopic method. The method development was combined with training of TC Fellows from Malaysia, which has a strong interest in ensuring the quality and authenticity of its EBN products. This research has now been extended to include the detection of gelatin adulteration in EBN using ultra-performance liquid chromatography – quadrupole time of flight mass spectrometry (UPLC-QToF MS) and chemometrics.

Untargeted profiling was performed using UPLC-QToF MS with multivariate data analysis (MVA). Authentic EBN samples, obtained directly from processing houses in Malaysia, and bovine, porcine and fish gelatin were analysed. Clear separation between EBN and gelatin samples was achieved using principal component analysis (PCA) (Fig. 1A). In order to obtain relevant information regarding differences in the metabolic profile between EBN and gelatin samples, a set of statistically meaningful markers was selected from a loadings plot (Fig. 1B).

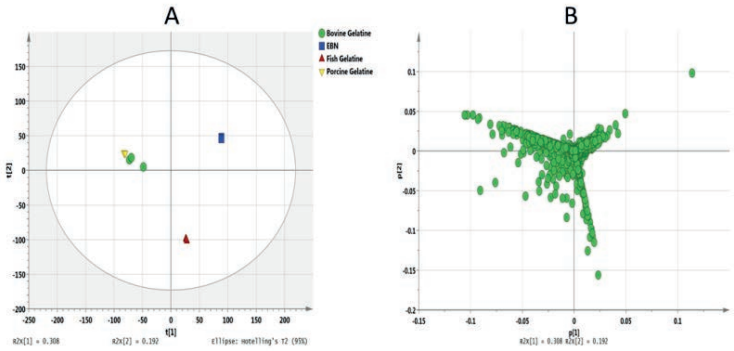

FIG. 1: PCA score plot (A) and loading plot (B) of authentic EBN, bovine, porcine and fish gelatin.

The unique marker peptides (RT_m/z pairs) selected for each gelatin, were as follows: 15.01_780.9153 (bovine gelatin), 12.55_773.9050 (porcine gelatin), and 5.60_625.8313 (fish gelatin) (Figure 2).

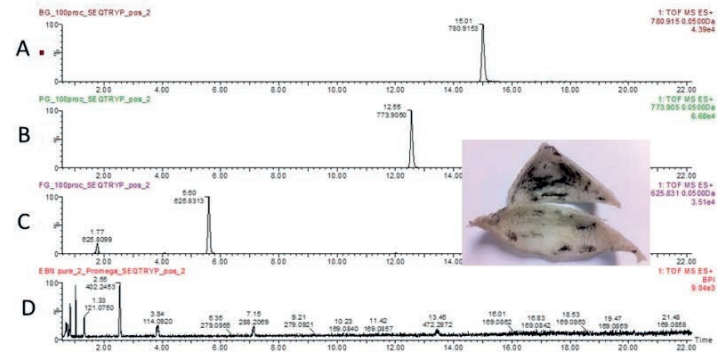

FIG. 2: Selected ion monitoring chromatograms of marker peptides in (A) bovine gelatin, m/z 780.9153; (B) porcine gelatin, m/z 773.9050; (C) fish gelatin, m/z 625.8313.

These peptide markers of the gelatin from different species will be used as the basis for targeted methods which could be applied to distinguish adulterated from authentic EBN samples, as well as to identify gelatins in a mixture even at low concentration levels. This methodology shows promise as a tool that regulatory bodies could harness to combat fraud involving EBN.

Geographical Origin Classification of Oranges by FTIR-ATR Spectroscopy Combined with Chemometrics

Zora Jandrić, Valentina Centonze

Oranges are one of the most important horticultural crops grown worldwide. They are of particular interest because of their high nutritional value and high content of vitamin C and phenolics. Italy, Spain and South Africa are in the top ten orange producing countries in the world. Oranges play an important role in the human diet and the orange fruit industry is very large and profitable. Their economic value makes oranges a target for misrepresentation. For example, oranges sold in Italy as high quality, high value local produce may in fact be cheaper, lower quality fruits imported from another country. This has negative implications for both industry and consumers.

In this research, we investigated the use of untargeted, quick, relatively cheap, and non-destructive spectroscopic measurements with subsequent data processing by means of chemometrics, for classification of the geographical origin of oranges. Mid-infrared (MIR) spectrometry with a micro-diamond attenuated total reflectance (ATR) accessory was used to analyse juice freshly squeezed from oranges grown in Italy, Spain and South Africa (150 samples).

The aim of this experiment was to build models for each country using authentic samples from that country (80% of the samples available), and predict whether the rest of the samples (20%) belonged to that country. Clear separation between orange samples obtained from different countries was achieved using linear discriminant analysis (LDA) (Fig. 1). The percentage specificity for the LDA model was 85% (Italy), 95.45% (South Africa) and 100% (Spain).

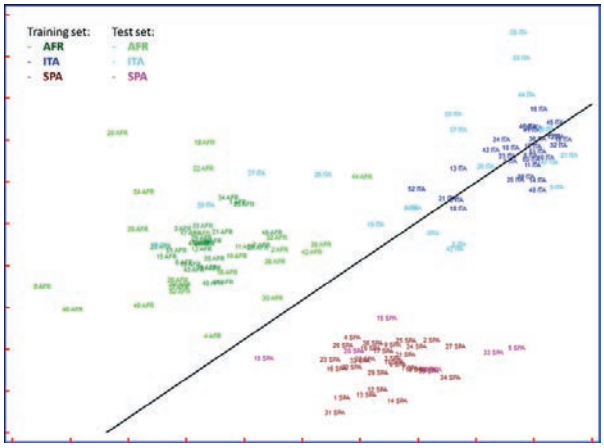

FIG. 1: LDA classification by geographical origin of orange samples from Italy, Spain and South Africa.

This set was further analysed using soft independent modelling by class analogy (SIMCA), to develop a one-class target classification model (Italy - class 1; Spain and South Africa - class2) (Fig 2). The mean percentage specificity for the SIMCA model after cross-validation was 93.48%.

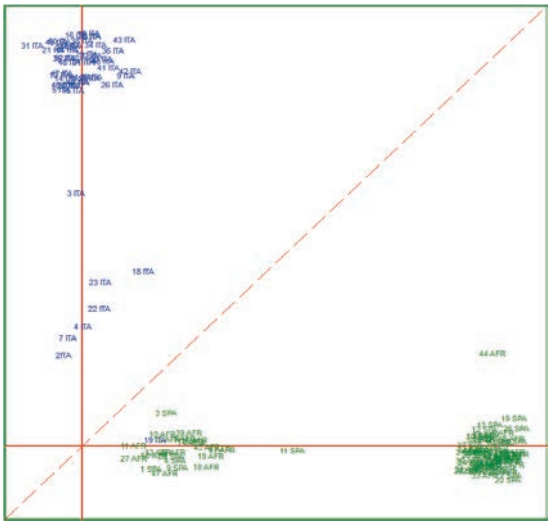

FIG. 2: SIMCA classification by geographical origin of orange samples from Italy, Spain and South Africa.

This study demonstrates the great potential of FTIR-ATR spectroscopy combined with chemometrics as a rapid screening tool for classification of oranges on the basis of their geographical origin.

Interns in FEPL

The FEPL gained two new interns in the second half of 2017.

Ms Amber Vaughan joined the FEPL team in late September for a one-year internship focusing on food sample analysis using Isotope Ratio Mass Spectrometry (IRMS). Amber graduated with a Master's degree in Earth Science from the University of East Anglia, UK, in summer 2017 and brings experience and knowledge of stable isotope measurements in a geochemistry context to FEPL. Her internship will enable her to broaden her experience through hands-on research into stable isotope measurements for food authenticity and to support food traceability systems, and to contribute to the FEPL outputs in this field.

Ms Valentina Centonze joined the FEPL at the start of October for a 3-month internship. Valentina is in the final stages of her PhD studies in the Department of Chemistry of the University of Bari "Aldo Moro" in Italy. Her studies focus on the development of innovative methods for food quality and safety, and she has experience of the application of IRMS, GC/MS, MS/eNose, NMR and chemometrics for the characterisation of geographical origin and agronomic practices of foods. Valentina's work during her internship will focus on the discrimination of oranges by variety and geographical origin using spectroscopic and mass spectrometric molecular fingerprinting techniques and chemometrics, which ties in perfectly with previous and current work on fruit and fruit juices in FEPL.

Visiting Scientists in FEPL

Mr. Iyad Ghanem, from the Atomic Energy Commission of Syria, completed a scientific visit of one week in the FEPL in October 2017. The placement was implemented under technical cooperation project SYR5023, Enhancing Analytical Capacities for Major Pesticide Residues, which aims to improve the scope and quality of pesticide residue analysis of food and food products in Syria to enhance monitoring, food safety and comply with trade standards. Mr Ghanem's programme focused on the analysis of contaminated vine leaves using a modification of the well-known QuEChERS method and analysis by GC-MS/MS, and included data analysis and interpretation. This work is related to a fellowship in FEPL earlier in 2017 by Mr Amer Abu Alnaser, who worked on the validation of the analytical method. The study is expected to lead, in the near future, to a publication on the dissipation of selected pesticides on vine leaves.

Within the framework of ongoing scientific collaboration with the Faculty of Chemistry, Universidad de la Republica, Montevideo, Uruguay, Ms Veronica Cesio visited the FEPL for two weeks in November 2017 to complete some joint studies on pesticide residue analysis. The studies focused on the use of analyte protectants to improve analytical method performance and processing factors for herbs and infusions of herbs, and the corresponding validation criteria.

Ms Brenda Checa, from the National Plant Protection Section of the Ministry of Agriculture in Panama, completed a scientific visit of two weeks in November 2017. The visit was included in the work plan of technical cooperation project PAN5024, Developing Analytical Capabilities for the Detection of Chemical Contaminants in Food and the Quality of Agrochemicals, which aims to develop screening methods for contaminants analysis and apply them in the field. Ms Checa's programme focused on the optimization of gas chromatography coupled to mass spectrometry to confirm positive results found using screening techniques such as electrochemical biosensors and ELISA, as applied in Panama.

Announcements

African Food Safety Workshop, 4–8 June 2018, Pretoria, South Africa

Belfast Summit on Global Food Integrity, Belfast UK, 28–31 May 2018

The Food and Environmental Protection Laboratory will contribute to the scientific programme of the ASSET 2018: Belfast Summit on Global Food Integrity, to be held in the Waterfront Hall, Belfast, UK, 28-31 May 2018. (https://www.qub.ac.uk/sites/ASSET2018Summit/)

The Summit will bring together representatives from international and governmental agencies, the academic and industrial research community, non-governmental organisations and the commercial & technical leaders in the food industry and its supply chain to discuss, debate and provide leadership on tackling a range of serious challenges that face the integrity of our global food supply system. The Summit will feature a number of high level strategic presentations on key issues by internationally recognised leaders. It will also place a firm emphasis on harnessing the collective knowledge and experience of the delegates to address these challenges through the formulation of policy recommendations to governments and a Summit communique.

https://www.qub.ac.uk/sites/ASSET2018Summi

Publications

2017

Jandrić, Z. and Cannavan, A. (2017). Authentication of fruit juices by metabolomics using UPLC-QToF MS. In Fruit Juices: Extraction, Composition, Quality and Analysis, Eds. Rajauria, G. & Tiwari, B.K. Academic Press, MA, USA, pp. 779–804.

Bennett, K.A., Kelly, S.D., Tang, X. and Reid, B.J. (2017). Potential for natural and enhanced attenuation of sulphanilamide in a contaminated chalk aquifer. Journal of Environmental Sciences. Available on line at https://doi.org/10.1016/j.jes.2017.08.010

Rajapaksha, D., Waduge, V., Padilla-Alvarez, R., Kalpage, M., Rathnayake, R. M. N. P., Migliori, A., Frew, R., Abeysinghe, S., Abrahim, A., and Amarakoon, T. (2017). XRF to support food traceability studies: Classification of Sri Lankan tea based on their region of origin. X-Ray Spectrometry, 46: 220–224. doi: 10.1002/xrs.2748.

Kelly, S. (2017). The power of stable isotope fingerprints in authenticity control and fraud prevention. Book of abstracts of the 8th International Symposium on Recent Advances in Food Analysis, Prague, Czech Republic, 7−10 November 2017, 68.

Kelly, S. (2017). Improving accessibility to food authentication and traceability methods in developing countries: the activities of the Joint FAO/IAEA Division's Food and Environmental Protection Laboratory. Book of abstracts of the 8th International Symposium on Recent Advances in Food Analysis, Prague, Czech Republic, 7−10 November 2017, 94.

Donarski, J., Camin, F., Fauhl-Hassek, C., Kelly, S., Posey, R. and Sudnik, M. (2017). Sampling guidelines for building and curating food authenticity databases. Book of abstracts of the 8th International Symposium on Recent Advances in Food Analysis, Prague, Czech Republic, 7−10 November 2017, 135.

Cahill, S., Desmarchelier, P., Fattori, V., Bruno, A. and Cannavan, A. (2017). Global perspectives on antimicrobial resistance in the food chain. Food Protection Trends, *in press*.

Kelly, S.D. and Mihailova, A. (2017) Organic food authenticity, in *Food Forensics: Stable Isotopes as a Guide to Authenticity and Origin*, Eds. Carter, J. & Chesson, L. CRC Press – part of the Taylor and Francis Group. ISBN-10: 149874172X.

Maestroni, B., Abu Alnaser, A., Islam, M., Ghanem, I., Cesio, V., Heinzen, H. and Cannavan, A. (2017). Development and validation of a method for the determination of selected pesticide residues in vine leaves by GC-MS/MS. Book of abstracts of 6th Latin American Pesticide Residue Workshop Food and Environment, LAPRW2017, San José, Costa Rica, 14−17 May 2017, 137.

Caceres, T., Maestroni, B., Rathor, N., Islam, M. and Cannavan, A. (2017). Determination of DDT soil sorption coefficients using ^{14}C-DDT. Book of abstracts of 6th Latin American Pesticide Residue Workshop Food and Environment, LAPRW2017, San José, Costa Rica, 14−17 May 2017, 201.

Maestroni, B., Kelly, S. and Cannavan, A. (2017). Food safety as a vital component of food security. Book of abstracts of ILSI Europe's Annual Symposium 2017, Brussels, Belgium, 30−31 March 2017, 13.

Camin, F., Boner, M., Bontempo, L., Fauhl-Hassek, C., Kelly, S., Riedl, J., & Rossmann, A. (2017). Stable isotope techniques for verifying the declared geographical origin of food in legal cases. Trends in Food Science & Technology. (published online 5th Jan 2017).http://www.sciencedirect.com/science/article/pii/S0924224416302771.

Blackburn C.M. (2017) Preparing for and Responding to a Nuclear or Radiological Emergency. Averting Risks to the Food Chain, FAO Rome, ISBN 978-92-5-109539-3, 100103. http://www.fao.org/3/b-i6538e.pdf.

Cannavan, A., Jandrić, Z. and Sasanya, J. (Eds.) (2017) FAO/IAEA International Symposium on Food Safety and Quality: Applications of Nuclear and Related Techniques, Vienna, Austria, 10–13 November 2014. Food Control, 72, Part B (published on line Dec 2016). http://www.sciencedirect.com/science/journal/09567135/72/part/PB

Jandrić, Z. and Cannavan, A. (2017). An investigative study on differentiation of citrus fruit/fruit juices by UPLC-QToF MS and chemometrics. Food Control, 72, Part B, 173-180 (published online Dec 2016). https://pubag.nal.usda.gov/pubag/article.xhtml?id=5431195

Jandrić, Z., Islam, M., Singh, D.K. and Cannavan, A. (2017). Authentication of Indian citrus fruit/fruit juices by untargeted and targeted metabolomics. Food Control, 72, Part B, 181-188 (published online Dec 2016). https://pubag.nal.usda.gov/pubag/article.xhtml?id=5431192

Jandrić, Z., Frew, R.D., Fernandez-Cedi, L.N. and Cannavan, A. (2017). An investigative study on discrimination of honey of various floral and geographical origins using UPLC-QToF MS and multivariate data analysis. Food Control, 72, Part B, 189-197 (published online Dec 2016). https://pubag.nal.usda.gov/pubag/article.xhtml?id=5431190

Ben Mansour. A., Bakke, M.J., Guerbej, H., Berriche, Z., Samaali, M., Shaikh, B., Sasanya, J., Horsberg, T.E. (2017). Disposition of 14C-flumequine in sea bream (Sparus auratus) after single intraperitoneal administration. Food Control,72, Part B, 198-204 (published online Dec 2016).https://pubag.nal.usda.gov/pubag/article.xhtml?id=5266395&searchText=subject_term%3A%22half+life%22&searchField

Chen, T., Chen, G., Yang, S., Zhao, Y., Ha, Y. and Ye, Z. (2017). Recent developments in the application of nuclear technology in agro-food quality and safety control in China. Food Control, 72, Part B, 306-312 (published online Dec 2016). https://pubag.nal.usda.gov/pubag/article.xhtml?id=5431187

2016

Hallman, G.J.; Blackburn, C.M. Phytosanitary Irradiation. Foods, (January 2016), Vol 5, Article 8 the link is http://www.mdpi.com/2304-8158/5/1/8

Hallman G.J. , Hénon Y. M, Parker A. G., and Blackburn C. M. (Oct. 2016): Phytosanitary irradiation: An overview. Florida

Entomologist, Vol 99, Special Issue 2, 1-13. http://journals.fcla.edu/flaent/article/view/88667

Manual of Standard Operating Procedures for Veterinary Drug Residue Analysis. Training Course Series, IAEA-TCS-63, ISSN 1018-5518, IAEA, Vienna (2016). http://www-pub.iaea.org/MTCD/Publications/PDF/TCS63web.pdf

Cannavan, A., Kay, J.F. and Jandrić, Z. (2016). Method validation and quality assurance/quality control approaches for multiresidue methods. In: Chemical Analysis of Non-antimicrobial Veterinary Drug Residues in Food, Kay, J.F., MacNeil, J.D. and Wang, J. (Eds). Wiley, NJ, USA, 549-574.

Cannavan, A. (2016). International efforts to combat food fraud. New science for food safety: an international conference on regional perspectives of food science developments in Asia in support of the International Food Safety Authorities Network (INFOSAN), Nanyang Technical University, Singapore, 7-10 November 2016, 33.

Maestroni, B.M. and Cannavan, A. (2016). Risk assessment and food safety. Summary of the scientific output presented at the 9th Scientific conference of the Bulgarian focal point of European Food Safety Authority(EFSA), Hissar, Bulgaria, 24−25 October 2016, 12-13.

Chen, T., Zhao Y., Zhang, W., Yang, S., Ye, Z. and Zhang, G. (2016). Variation of the light stable isotopes in the superior and inferior grains of rice (Oryza sativa L.) with different geographical origins. Food Chemistry, 209 (2016), 95–98

Jandrić, Z., Waduge, V., Abeysinghe, S.B. and Cannavan, A. (2016). A non-targeted approach for discrimination of Sri Lankan teas by UPLC-QToF/MS and chemometrics. Book of abstracts of the Max Rubner Conference 2016, Food Metabolomics, Karlsruhe, Germany, 10−12 October2016, 33.

Kanarat, S., Tangsirisup, N., Nijthavorn, N., Elliott, C. and Cannavan, A. (2016). Application of an isotope dilution method to investigate the possible natural occurrence of chloramphenicol in poultry litter. IAEA-TECDOC-1800, Development of Radiometric and Allied Analytical Methods and Strategies to Strengthen National Residue Control Programmes for Antibiotic and Anthelmintic Veterinary Drug Residues, 99-105.

Fodey, T., Murilla, G., Cannavan, A. and Elliott, C. (2016). Characterization by enzyme linked immunosorbent assay and biosensor technologies of antibodies to chloramphenicol produced in camel, donkey and goat. IAEA-TECDOC-1800, Development of Radiometric and Allied Analytical Methods and Strategies to Strengthen National Residue Control Programmes for Antibiotic and Anthelmintic Veterinary Drug Residues, 141-145.

Wesonga, J.O., Murilla, G.A., Guantai, A.N., Elliott, C.T., Fodey, T and Cannavan, A. (2016). Development of an enzyme-linked immunosorbent assay for chloramphenicol in serum. IAEA-TECDOC-1800C, Development of Radiometric and Allied Analytical Methods and Strategies to Strengthen National Residue Control Programmes for Antibiotic and Anthelmintic Veterinary Drug Residues, 146-149.

Granja, R.H., Montes Niño, A.M., Rabone, F., Montes Niño, R.E., Cannavan, A. and Salerno, A.G. (2016). Radioimmunoassay screening method for anilinic and phenolic beta-agonists in bovine liver. IAEA-TECDOC-1800, Development of Radiometric and Allied Analytical Methods and Strategies to Strengthen National Residue Control Programmes for Antibiotic and Anthelmintic Veterinary Drug Residues, 165-170.

IAEA-TECDOC-1788, Criteria for Radionuclide Activity concentrations for Food and Drinking Water, FAO/IAEA Division of Nuclear Techniiques in Food and Agriculture, IAEA, WHO. ISSN 1011-4289; no. 1788, IAEA (April 2016).http://www.pub.iaea.org/MTCD/Publications/PDF/TE-1788_web.pdf

Maestroni, B. M. (2016). Practical Experiences with Agilent's GC/MS/MS Pesticide Analyzer. Sep Science webinar, 21 July 2016, Available at: http://ll4.workcaststr.net/10311/0279275158671341/10311_20160722131641923_ondemand.mp4

Cannavan, A., Jandrić, Z. and Kelly, S. (2016). Food authenticity – fighting food crime. Proceedings of the 2016 International Symposium and Annual Meeting of the Korean Society of Environmental Agriculture, Integrated Management of Agricultural Environment for Food Security, Busan, Republic of Korea, 7−9 July 2016, 7-8.

Sasanya, J., and Cannavan, A. (2016). Development and Strengthening of Radio-Analytical and Complementary Techniques to Control Residues of Veterinary Drugs and Related Chemicals in Aquaculture Products. Proceedings of the EuroResidue VIII Conference on Residues of Veterinary Drugs in Food, Egmond aan Zee, The Netherlands, 23–25 May 2016, 776-779.

Sasanya, J., Lee, H-S., Maqbool, M., Chiew, P. Enhancing food safety laboratory capabilities and establishing a network in Asia to Control veterinary drug residues and related chemical contaminants. Proceedings of the EuroResidue VIII Conference on Residues of Veterinary Drugs in Food, Egmond aan Zee, The Netherlands, 23–25 May 2016, 887-889.

Maqbool, U., Ahmad, R., and Sasanya, J. J. In-House Standardization and Validation of Radio-Receptor Assays for Chloramphenicol Residues in Bovine Milk and Meat. In: 2016 Annual Meeting Abstract Supplement, Society of Toxicology, 2016. Abstract no. 3790.

Cahill, S.M., Desmarchelier, P., Fattori, V. and Cannavan, A. (2016). Global perspectives on antimicrobial resistance in the food chain. Proceedings of the EuroResidue VIII Conference on Residues of Veterinary Drugs in Food, Egmond aan Zee, The Netherlands, 23–25 May 2016, 59-65.

Maestroni, B., Leuseur, C, Akkermann, W.G.M., Goos, P.,Cesio, V, Avossa, V., Heinzen, H., Riener, J. and Cannavan A. (2016). A comparison of two approaches for the robustness testing of an analytical method. Book of abstracts of the 11th European Pesticide Residues Workshop, Limmasol, Cyprus, 24–27 May 2016, 73.

Zhu, Z., Liu, G., Wang F., Sasanya J.J., and Cannavan, A. (2016). Development of a liquid chromatography tandem mass spectrometric method for simultaneous determination of 15 aminoglycoside residues in porcine tissues. Food Analytical Methods, in press, published on line: doi 10.1007/s12161-016-0446-1.

Reports

2017

Ye, Z. (2017). Information on Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Relevant to Codex work (CAC/40 INF/01). 40th Session of the Joint FAO/WHO Codex Alimentarius Commission, Geneva, Switzerland, 17−22 July 2017; available at: http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-701-40%252FINF%2Bpapers%252Fif40_01e_IAEA.pdf

Blackburn, C.M. (2017), FAO Report to the 4th Emergency Preparedness and Response Standards Committee (EPReSC), Vienna, Austria, 6−8 June 2017.

Blackburn, C.M. (2017), 11th Session of the Codex Committee on Contaminants in Food, Rio de Janeiro, Brazil, 3−7 April 2017. http://www.fao.org/fao-who-codexalimentarius/sh-proxy/es/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-735-11%252FWD%252Fcf11_04e.pdf

Ye, Z. (2017). Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Relevant to CCPR work (CX/PR 17/49/04). 49th Session of Codex Committee on Pesticide Residues of Joint FAO/WHO Food Standards Programme, Beijing, China, 24−29 April 2017. http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-718-49%252FWD%252Fpr49_04e.pdf

2016

Blackburn, C. M. Food and Agriculture Organization of the United Nations, Reports from International Organizations, Item 8.2a, 3rd Meeting of the Emergency Preparedness and Response Standards Committee (EPReSC), 29 November − 1 December 2016, IAEA, Vienna, Austria.

Blackburn, C.M. Statement of the Joint FAO/IAEA Division, Reports from International Organizations, Item 9.1, 41st Meeting of the Radiation Safety Standards Committee (RASSC) Vienna, Austria, 21−23 November 2016. IAEA, Vienna, Austria.

Sasanya, J.J. (2016). Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture relevant to Codex Work (CCRVDF 23). 23rd Session of the Codex Committee on Residues of Veterinary Drugs in Foods, Houston,Texas, United States of America, 17−21 October 2016. http://www.fao.org/fao-whocodexalimentarius/shproxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-730-23%252FWD%252Frv23_03Add1e.pdf

Blackburn, C. M. (2016), FAO Report to the 2nd Emergency Preparedness and Response Standards Committee (EPReSC), Vienna, Austria, 27 June−1 July 2016.

Ye, Z. (2016). Information on Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Relevant to Codex work (CAC39_07e). 39th Session of the Joint FAO/WHO Codex Alimentarius Commission, Rome, Italy, 27 June−1 July 2016. http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-701-39%252FINF%252Fif39_07e.pdf

Corley, J.S. (2016). Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (CX/PR 16/48/4). 48th Session of the Codex Committee on Pesticide Residues, Chongqing, China, 25–30 April 2016.

Sasanya, J.J. (2016). Activities of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (CX/CF 16/10/4). 10th Session of the Codex Committee on Contaminants in Foods, Rotterdam, The Netherlands, 4–8 April 2016.

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