Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Food Safety and Control Newsletter

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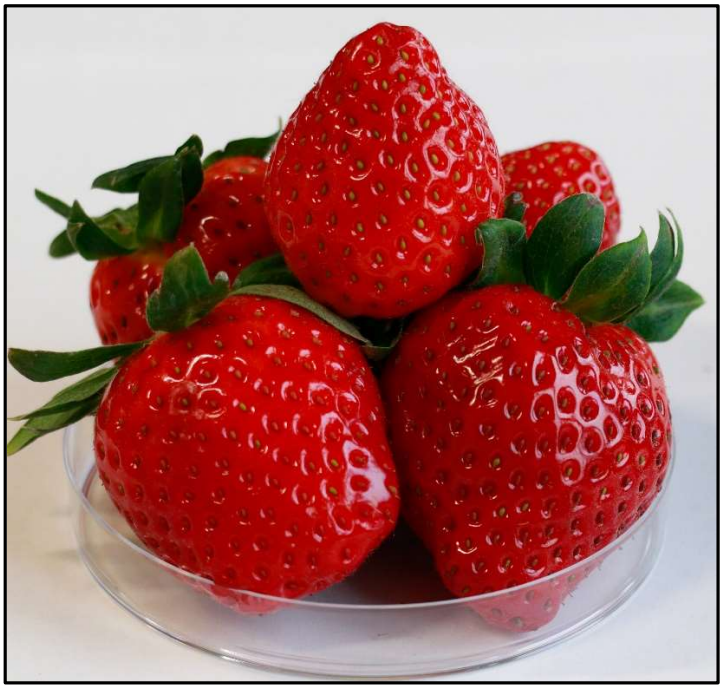
To Our Readers



Cultivated strawberries: Samples collected as part of on-going work at the Food Safety and Control Laboratory. (Photo courtesy of Ms Marivil Islam, FSCL, 2023)

Dear Colleagues,

An estimated 600 million people, almost one in ten of the world's population, fall ill as a result of eating contaminated food and 420,000 die every year (World Health Organization, 2015). Foodborne illness costs low- and middle-income countries US$ 100 billion per year. The Joint FAO/IAEA Centre's Food Safety and Control Section (FSC) assists Member States in rising to the challenges of maintaining a safe, authentic, nutritious and sustainable food supply for the growing global population. Some recent issues, outputs and achievements are highlighted in this edition of the FSC newsletter.

There is increasing interest in machine sources for food irradiation and FSC supports Member States in this regard. This issue of the newsletter includes a report of the FSC contribution to a workshop on accelerating the adoption of electron-beam and X ray technologies for sustainable economic prosperity in Africa.

Work contributing to preparedness and response to radiological emergencies included a technical meeting on draft safety guides related to protection strategy and criteria for a nuclear or radiological emergency, and a meeting of the Emergency Preparedness and Response Standards Committee.

Contributions to the development of international standards included participation in meetings of the Radiation Safety Standards Committee and the United Nations Scientific Committee on the Effects of Atomic Radiation, preparation of a Codex circular letter to invite feedback on a document on natural radioactivity in feed, food and drinking water, and participation in the Codex Committee on Residues of Veterinary Drugs in Food.

Regarding direct capacity building, the FSC currently works with our colleagues in the IAEA Department of Technical Cooperation to provide technical support and management for 72 national and 12 regional technical cooperation projects, and on the development of more than 40 new project designs for the next biennium. Some recent activities for projects focusing on the control of chemical residues and contaminants in food are summarized within these pages. These include reports on projects in Bangladesh, Cambodia, Dominica, Ecuador, Mongolia, Nepal, Rwanda, and St. Lucia and a report on a meeting for a regional project under the 'Co-Operative Agreement For Arab States In Asia For Research, Development And Training Related To Nuclear Science And Technology (ARASIA)' on climate-smart crop production and food safety.

Research continues apace, both in the Food Safety and Control Laboratory (FSCL) and in our coordinated research projects. Two research coordination meetings are reported; the final meeting of the project on methods for mixed contaminants and residues in foods, and the second meeting of a project on novel irradiation technology for phytosanitary treatment of food commodities and promotion of trade. An outline is given of work planned at FSCL in support of the International Year of Millets 2023. The laboratory also continues its important work on methodology to combat food fraud, which continues to be a major global challenge. To assist Member States in addressing these issues, analytical methods are developed continually in FSCL. In this issue of the newsletter, the development of a new approach to detecting sugar syrup addition to honey using stable isotope ratio measurements is summarized. Rapid methods are also reported for the geographical discrimination of green coffee beans from Costa Rica using portable and benchtop screening techniques and for the geographical discrimination of rice from Myanmar, Thailand, China, and Indonesia using near-infrared spectroscopy.

Antimicrobial resistance (AMR) is a major global issue, with the use of antimicrobials in the production of food producing animals implicated as a cause. Work by FSC on the control of veterinary drug residues in food is relevant to the understanding and control of AMR. There are various other causes of AMR, one of which is the use of substandard and falsified medicines. These medicines constitute a global health challenge that disproportionately effects low-income countries in Africa and Southeast Asia and there is a need for innovative research to inform interventions. The FSCL works in a project in this field in partnership with the University of Oxford, United Kingdom. The majority of substandard or falsified medicines are made with readily available low-cost food grade ingredients, such as cornflour, rather than expensive pharmacopeial grade materials. FSCL's expertise in tracing the provenance of food grade materials is, therefore, highly relevant. A report on the first meeting of the laboratory working group of this project is included in this issue.

Examples of knowledge transfer and expert advice provided include participation in the 'Risk Assessment Research Assembly' organised by the European Food Safety Authority with inputs to the session, 'Food Safety Research Needs - Prioritization and Involvement of Risk Assessor Community'; the Food Safety Live 2022 Online Summit virtual panel discussion 'Is it me you're looking for? The challenges of untargeted testing'; a workshop on the use of stable isotopes and trace elements combined with chemometrics for origin verification of food for the Sri Lanka Atomic Energy Board; and presentations at the European Geosciences Union conference in Vienna.

Lastly, I have to report that this will be my final 'To Our Readers' communication. I will retire from the Joint FAO/IAEA Centre at the end of July, 2023, after 22 years as a technical officer, Laboratory Head and Section Head. I take this opportunity to pay tribute to the many exceptional colleagues I have worked with and friends I have made over my time with the IAEA, both within the organization and in the many institutes and countries we have worked with. I leave with some sense of pride in our many achievements together and the contributions made to improvements in food safety and control systems over the past two decades. I wish you all the best for a safe, healthy and prosperous future.

Andrew Cannavan

Section Head,
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Feature Article

Enhancing Capacity for Rapid Response to Food Safety Incidents and Emergencies

Andrew Cannavan

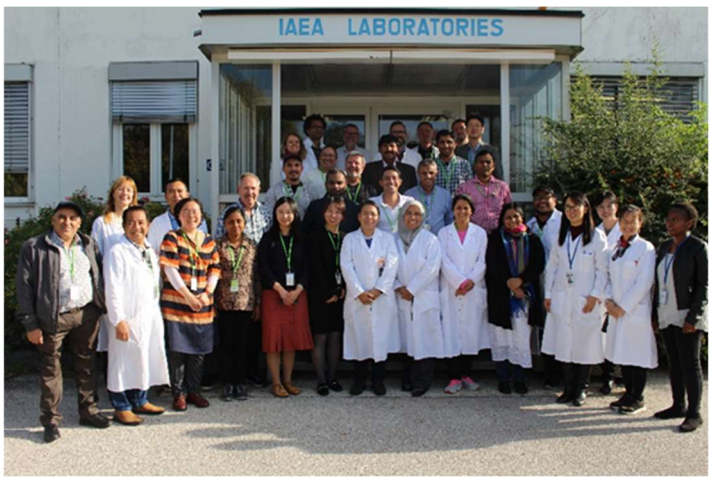
The three-year project, 'Enhancing Capacity in Member States for Rapid Response to Food Safety Incidents and Emergencies' was completed at the end of 2022. The project received extrabudgetary funding from the Japanese Government under the 'Peaceful Uses Initiative' mechanism.

Effective food control encompasses not only routine monitoring and targeted testing of the food supply chain, but also the capacity to rapidly respond to food safety incidents and emergencies. Food safety is paramount for consumer protection and food security, but today's complex food supply chains, compounded by factors such as climate change, which affects pest infestation and contamination patterns, food fraud and the threat of bio- and chemical terrorism make food safety incidents and emergencies ever more probable and frequent. The food supply is vulnerable to systemic shocks such as pandemics, extreme weather events, conflicts, and natural disasters, which can disrupt food inspection and testing and provide increased opportunities for food fraud and the misuse of agrochemicals. This vulnerability was illustrated by the outbreak of the Covid-19 pandemic. Although not a foodborne disease, the widespread illness, compromised supply chains, lockdowns and other response measures associated with the pandemic had significant disruptive effects on food control systems and food safety. There is a continuing increase in demand from Member States for assistance in preparing for and responding to events affecting food safety and the food supply.

Any response to a food safety incident or emergency must be carried out rapidly, and must provide as much information as possible about the cause of the incident with a view to minimising risk to the public and providing vital information to stakeholders. Generally, food control systems rely on laboratory-based two-tier testing programmes, with cost effective testing used to screen products taken in surveillance plans, and confirmation of any positive results using more sophisticated and time-consuming techniques. This type of food control system protects both consumers and producers and helps enable trade. In emergencies, when supply chains are disrupted and food control laboratories and systems are compromised, the over-riding priority is to ensure that the food supply remains safe to protect consumer health and avoid exacerbation of the crisis with further food safety problems. In crisis situations the emphasis is, therefore, shifted to fast, easily implemented screening methods to maintain food safety standards. Available resources can then be targeted to those high-end techniques that provide information essential for crisis control and management.

The first step in investigating and dealing with a food safety incident is identifying the cause, which is frequently unknown. As soon as the causative agents are identified, it is essential that methods are available to provide information on their probable source or origin, to facilitate follow-up action to remove the affected food from the supply chain as soon as possible to protect both human health and food trade, and to prevent further incidences. Accessible analytical methods must also be available for routine monitoring and surveillance following an incident or emergency to ensure that the controls put in place are effective.

Under this project, the Food Safety and Control Laboratory (FSCL) developed and transferred analytical methodology and protocols to enable Member States to quickly investigate the causes and identify the contaminants involved in incidents and emergencies, and to determine the origin of the contaminants. It was recognized that it was important to enhance the capabilities of FSCL to perform the necessary research and development and in this regard additional equipment and instrumentation were procured to facilitate the project. The enhanced capability in FSCL, in combination with existing analytical techniques such as the high-performance liquid chromatograph-mass spectrometer donated by the Shimadzu Corporation, provided the platform needed to assist Member States to develop a comprehensive rapid response capability to investigate, monitor and control food safety incidents and emergencies.



Participants in the training workshop at Seibersdorf on the use of stable isotope and trace element profiling to determine food origin and verify food authenticity. (Photo courtesy of Mr Simon Kelly, FSCL, 2019)

The project started in October 2019 with a training workshop at Seibersdorf on the use of nuclear techniques to determine food origin and verify food authenticity. Unfortunately, the next planned workshop, as well as laboratory-based activities, were postponed due to the outbreak of the Covid-19 pandemic and the first lockdown in Austria. In response to these restrictions, several virtual training courses were developed to maintain assistance to Member States in a

situation which was just what the project was designed to address. Although virtual training cannot provide the hands-on experience that a laboratory-based course can, the virtual platform does have the advantage that more trainees can be reached. Over the three-year course of the project 21 analytical methods were developed and more than 460 scientists and technicians from 87 countries were trained in seven workshops on the following topics:

- the use of rapid profiling/fingerprinting techniques to determine food origin and verify food authenticity
- analytical methods to detect and control organic contaminants in food
- the use of stable isotope and trace element profiling to determine food origin and verify food authenticity
- food contaminants testing and risk assessment programs
- detection and control of organic contaminants in food

In addition, three E-Learning courses were developed:

- E-Learning course on Analytical methods to Detect and Control Organic Contaminants in Food, https://elearning.iaea.org/m2/course/view.php?id=1575
- Chemometrics Add-in for Excel (CAFÉ), https://elearning.iaea.org/m2/course/view.php?id=1463
- Elemental Analysis for Isotope Ratio Mass Spectrometry, https://elearning.iaea.org/m2/course/view.php?id=1506

Method development work contributed to the publication of 31 papers in peer-reviewed scientific journals, including research with counterpart institutions.

Outcomes of the project included improved capabilities of Member States to analyse agricultural samples to identify and control food contaminants and identify the origin of such contaminants. Capabilities and cooperation in food safety laboratory networks for rapid response to food safety incidents were strengthened. Surveillance and research capacities were enhanced to underpin effective control measures for protection of the public from food fraud, mitigate the disruptive impact of emergencies affecting the food chain, and minimize disruption to trade in agricultural commodities.

There is continued and high demand for assistance in building resilience to incidents and emergencies affecting the food supply. A new project proposal is being developed as a follow-up to this successful project and it is hoped that it will attract further extrabudgetary funding in the near future.

Training in sample preparation at Seibersdorf (Photo courtsesy of Ms Alina Mihailova, FSCL, 2019)

Forthcoming Events

Research Coordination Meetings and Training Courses

Second Research Coordination Meeting on Novel Irradiation Technology for Phytosanitary Treatment of Food Commodities and Promotion of Trade (D61026-CR-2), virtual, 3–7 July 2023.

Third Research Coordination Meeting on Depletion of Veterinary Pharmaceuticals and Radiometric Analysis of their Residues in Animal Matrices (D52043-CR-3), Ohrid, North Macedonia, 21–25 August 2023.

Second Research Coordination Meeting on Nuclear Techniques to Support Risk Assessment of Biotoxins and Pathogen Detection in Food and Related Matrices (D52044- CR-2), virtual, 2–6 October 2023.

Latin American Risk Assessment Symposium, Lima, Perú, October 2023 (TBC).

International Meetings/Conferences

Virtual Codex Committee on Pesticide Residues (CCPR54), China, 26 June – 01 July 2023.

Codex Alimentarius Commission (CAC46), TBD, 27 November – 2 December 2023.

Codex Committee on Contaminants in Foods (CCCF17), Netherlands (TBC), 15–19 April 2024.

Past Events

Technical Meeting on Draft Safety Guides Related to Protection Strategy and Criteria for a Nuclear or Radiological Emergency

Carl Blackburn

Under the Joint Radiation Emergency Management Plan of the International Organizations, the Joint FAO/IAEA Centre is the FAO focal point. For example, it assigns liaison officers to staff the IAEA Incident and Emergency Centre to ensure coordination and the dissemination of information between FAO and the IAEA. Therefore, in February this year the Food Safety and Control section participated in an IAEA technical meeting of experts to review draft texts for two closely related proposed safety guides: the revision of "Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency (IAEA Safety Standards Series, No. GSG-2)" (DS527) and "Protection Strategy for a Nuclear or Radiological Emergency" (DS534).

It is intended that the revised safety guide DS527 will include appendices that give, in one document, all the Operational Intervention Levels (OILs), including those that relate to restrictions on milk, food, and water (i.e., OIL3, OIL5, OIL6 and OIL7). The objective of the revised document is to update and present a coherent set of criteria for supporting decision making regarding the implementation of protective actions and other emergency response actions with an emphasis on operational criteria, such as the OILs (e.g., when measurements exceed an OIL it gives an indication that restrictions should be implemented, including on food production, sale, distribution and trade to prevent contaminated food from entering the supply chain).

The draft document DS534 aims to provide guidance and recommendations on the development, justification, and optimization as well as implementation of a protection strategy for a nuclear or radiological emergency. Despite the availability of existing emergency preparedness and response safety standards and technical guidance addressing the topic of protection strategy, feedback from Member States indicates that comprehensive guidance on the topic applicable to all emergency phases is required at the Safety Standards level. Therefore, a new IAEA Safety Guide will focus on the concept of a protection strategy, its development, justification, and optimization, as per Requirement 5 in IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency. The new Safety Guide will be based on the Emergency Preparedness and Response Series Publication entitled "Considerations in the Development of a Protection Strategy for a Nuclear or Radiological Emergency" that was published by the IAEA in April 2021.

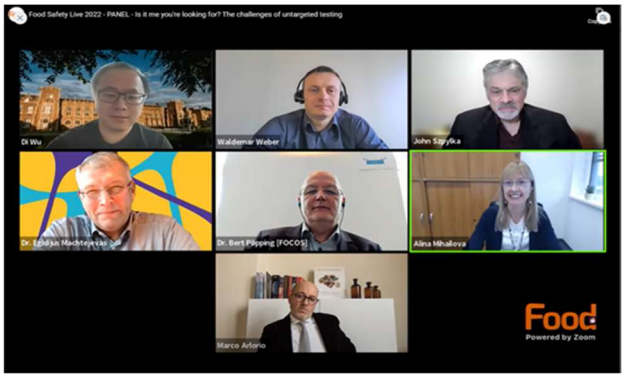
Participation in the Food Safety Live Summit: Virtual Panel Discussion "Is It Me You're Looking for? The Challenges of Untargeted Testing"

Alina Mihailova

The Food Safety Live Summit, organised by 'New Food' on 16th November 2022, was a virtual event that addressed the current challenges in the field of food safety and authenticity. The online event included keynote presentations, panel sessions, webinars, case studies and roundtables with over 30 experts from academic institutions, the commercial sector and international organisations. The main topics included food fraud, food safety and authenticity, food sustainability, analysis of heavy metals, mycotoxins, PFAS & MOSH/MOAH, and microbial monitoring in food.

The keynote presentation was given by Mr Peter Emmrich, a John Innes Foundation Fellow at the Norwich Institute for Sustainable Development and a Visiting Group Leader at the John Innes Centre (Norwich, UK).

Ms Alina Mihailova took part in the panel discussion entitled 'Is it me you're looking for? The challenges of untargeted testing'. The panel included Mr John Szpylka (Association of Official Analytical Communities (AOAC) International; Food Safety Net Services), Mr Marco Arlorio (Universita Del Piemonte Orientale), Mr Di Wu (Queen's University Belfast), Mr Egidijus Machtejevas (Merk), and Mr Waldemar Weber (Shimadzu Europa). The panel discussion was moderated by Mr Bert Popping (FOCOS, Germany). The questions covered during the discussion included: differences between targeted and non-targeted methods (NTMs) of analysis, advantages and standardisation of NTMs, along with their applications in food safety and authenticity testing, and future developments and applications.



Ms Alina Mihailova discussing the application of non-targeted analytical methods for the verification of food authenticity. (Photo courtesy of Mr Evans Rockson, Tawiah, 2022)

Participation in the Risk Assessment Research Assembly

Christina Vlachou

The Risk Assessment Research Assembly was organised by the European Food Safety Authority (EFSA) in Berlin on December 7, 2022. The purpose was to bring together food safety researchers, policy/decision makers and funders, to showcase how research outputs can support the achievement of Sustainable Development Goals (SDGs) and the Green Deal. Ms Christina Vlachou was invited to attend the assembly and to provide inputs to the break-out session "Food Safety Research Needs - Prioritization and Involvement of Risk Assessor Community".

More than 250 delegates from 40 countries attended the event, which hosted plenary sessions, panel debates, and three break-out sessions. Interactive participation, networking and relationship building were facilitated throughout the whole event. The speakers were representing the EU Commission (DG for Research and Innovation, DG SANTE, DG AGRI), EFSA, FAO, research institutions, national authorities, and the academia. The discussions focussed on the research needs regarding the transition towards sustainable food systems, without compromising food safety. Transdisciplinary, gap-based, and impact-driven innovative research and risk-benefit and sustainability assessments will drive this transition. Specific emphasis was placed on the adoption of appropriate regulatory framework to ensure resilience to crises, establishment of data-handling methodologies, investment on capacity building, international perspectives and complexities for middle- and low-income countries, as well as on OneHealth aspects.

The break-out session "Food Safety Research Needs - Prioritization and Involvement of Risk Assessor Community" aimed to highlight the benefits from involving risk assessors in research projects, the need for identification, prioritisation, and communication of research needs for risk assessment and policymaking, as well as the required expertise (train the researchers and assessors, train/drive researchers in supporting regulatory science).

An overview of the EFSA Food Safety Regulatory Research Needs 2030, comprising three research streams (Safe food systems, Innovation in risk assessment and Holistic risk assessment), was also presented. Some indicative topics were the following: Food Risk Analysis; Quicker detection of food fraud through improved surveillance; Safe novel foods and feeds; Preparedness through transdisciplinary analysis of food safety threats; Integrated approaches for chemical and microbiological hazards and anti-microbial resistance (also in foods of non-animal origin); Micro-/nano-plastics in food chain; Real-time monitoring, signal alerts and open data platforms; Artificial Intelligence & machine learning; Capacity building.

The assembly presented an excellent opportunity for the participants to get insights into the food risk assessment research needs and their prioritisation towards the transformation of food systems under the sustainability and One Health objectives. The need for scientific research-risk assessment-policy interface was particularly highlighted.

Forensic Epidemiology and Impact of Substandard and Falsified Antimicrobials on Public Health (FORESFA) – Laboratory Working Group Meeting

Simon Kelly

Substandard and falsified (SF) antimicrobials are a massive and underappreciated global health challenge, that disproportionately effects low-income countries. Professor Paul Newton, Head of the University of Oxford's Medicine Quality Research Group is leading a Welcome Trust Collaborative Award project to establish an innovative, multidisciplinary research hub that will improve understanding, and inform global policy and action, on SF medicines. The project consortium is composed of leading specialists investigating illegal wildlife trade, forensic genomics and isotope chemistry, social network analysis and modelling. The collaborators will work together to answer two main research questions. The first is how can novel genomic, chemical and isotopic analyses, with social network techniques, be used to characterise the trade routes of SF antimicrobials, and their constituents, to inform action to improve global pharmaceutical supply quality. This will be addressed through high-throughput sequencing and novel chemical and isotopic analysis of falsified and authentic antimicrobials to determine their comparative bio-geochemical 'fingerprints'. Furthermore, social network analysis will be performed to investigate origins and trade routes from accessible reports. The second question to be addressed is what are the modelled impacts of SF antimicrobials on patient outcome and global public health; especially stimulating antimicrobial resistance and how can these be minimised. A One Health approach will be used to aid understanding of which pathogen-antimicrobial pairs are at greatest risk of SF antimicrobials.

Members of the FORESFA project Laboratory Working Group meeting in Trento Italy, 16-19 January 2023. (Photo courtesy of Dr Luana Bontempo, Fondazione Edmund Mach, 2023)

The Food Safety and Control Laboratory (FSCL) is in the final stages of negotiating a collaboration agreement with the University of Oxford to participate in the Wellcome Trust Funded project. Mr Simon Kelly was invited to present FSCL's existing applied and adaptive research, which aligns with the objectives of the FORESFA project, to trace the geographical origin of excipient materials used in SF medicines, at their first in-person Laboratory Working Group meeting at the Fondazione Edmund Mach in Trento, Italy, from 1-19 January 2023. It is already known that food grade materials are often used in SF medicines instead of pharmaceutical grade products due to their relatively lower cost and availability. Mr Kelly presented two hydrogen stable isotope methods used in FSCL to verify the geographical origin of corn (maize) starch, which is often used in SF medicine tablets as a 'filler' along with other hydrogen bearing excipient materials such as potato starch, bovine lactose, soya lecithin, xanthan gum, magnesium stearate and cellulose. The measurement of the ratio of the stable isotopes of hydrogen (deuterium/protium, $^{2}H/^{1}H$) can reveal information regarding both the geographical and botanical origin of plant materials due to systematic global variations in the hydrological cycle, and morphological and biochemical differences in plants, respectively. However, this information is retained by the non-exchangeable (NE), or intrinsic, hydrogen bound directly to carbon in biopolymers, such as starch and cellulose. Selectively measuring the NE hydrogen presents significant challenges which can be overcome using a novel method of derivitisation developed in FSCL, which removes the exchangeable hydrogen contribution from hydroxyl groups, after microwave hydrolysis of starch and cellulose, through trifluoro-acetylation (TFA) of glucose. The TFA-glucose is then measured by compound-specific gas chromatography - isotope ratio mass spectrometry analysis. Additionally, Mr Kelly informed the meeting that NE hydrogen isotope ratios in carbohydrate and other materials can be determined with the UNIPREP online equilibration module prior to isotope ratio measurement by elemental analyser - chromium reduction - IRMS. This widely used and accepted method for the accurate measurement of the NE hydrogen isotope ratios requires dual-water vapour equilibration with water of known isotopic composition, followed by the use of a zero blank autosampler to avoid uncontrolled hydrogen exchange during the analysis. This procedure is very time consuming due to the 5-days needed for offline equilibration of the sample, whereas the UNIPREP online equilibration unit utilized in FSCL allows equilibration in 3 hours for each isotopically controlled water, followed by analysis from the same carousel autochanger used for the equilibration. The other project participants involved in laboratory analysis gave presentations on the use carbon, nitrogen and oxygen stable isotope analysis of the excipients (Fondazione Edmund Mach, IT); and genomics to characterise the fragments of environmental DNA found within SF medicines; and Direct Analysis in Real Time – Mass Spectrometry to characterise fake pharmaceuticals and give clues as to their origin (University of Edinburgh, UK). Currently, a database of maize starches and a repository of authentic and seized SF medicines are being compiled, with the help of the WHO, pharmaceutical companies, medical and enforcement agencies in Southeast Asia and Africa, before characterisation and model building to test the reliability of the analytical procedures.

Workshop on The Use of Stable Isotopes and Trace elements Combined with Chemometrics for Origin Verification of Food

Simon Kelly

A Workshop on "The Use of Stable Isotopes and Trace Elements combined with Chemometrics for Origin Verification of Food" was hosted by the Sri Lanka Atomic Energy Board (SLAEB), for their National Tea Board and Tea Research Institute, on 15th February 2023 in Colombo. The Workshop was organised by SLAEB to update tea industry stakeholders on their pilot project, a "Geochemical Approach to Verify the Origin of Ceylon Tea" and a previous successfully completed project, in IAEA CRP D52038, on "the use of Stable Isotope and Elemental Profiling to Determine the Agroclimatic Origin of Cow's Milk in Sri Lanka". The workshop was attended by twelve senior members of the Sri Lanka Tea Board, three senior members of the Sri Lanka Tea Research Institute, and nine members of SLAEB, including the Director of the Life Sciences Division, Professor Champa Dissanayake. Mr Kelly was invited to give a one-hour on-line lecture to the workshop participants on "The use of Stable Isotope and Trace Element (SITE) analysis to verify the origin of foods with Geographical Indication (GI) status". His lecture provided an introduction to stable isotope analysis and elemental profiling, information on the theoretical basis underpinning the application of SITE analysis to origin verification, why consumers are interested in the origin of food, a roadmap to implementation of a national food origin control system, and several real-world examples where SITE analysis is being successfully applied to protect and promote added-value GI foods.

Mr Kelly then participated in a 30-minute question and answer session. The workshop participants asked several questions related to Mr Kelly's presentation. The first was regarding the amount of effort required to gather authentic tea sample stable isotope and trace element data. Mr Kelly explained that establishing a 'robust database' of authentic samples is one of the most important conditions to be fulfilled if SITE analysis is to be used as an officially acknowledged procedure for enforcement activities and market quality control. He emphasized the need to ensure that the tea samples represented the natural variation in stable isotope composition that could arise from many different bio-geoclimatic, and permitted technological process, factors. These may include, but not be limited to,

micro-climate, underlying geology, applied fertilisers, time of harvest, fermentation, maturation and so on. He then explained the ongoing commitment required to update the database with contemporary tea samples on an annual and/or harvest basis and the need to regularly challenge any developed tea origin models with anonymized samples. The second question was regarding whether enforcement agencies were using SITE analysis to confirm the origin of foods. Mr Kelly spoke of his experiences in the United Kingdom where some food industry associations and food retailers were routinely using the technique to gather 'intelligence' on suppliers of protected GI foods. He explained that he was also aware of some European producer associations, such as Parmigiana Reggiano and Grana Padano cheese in Italy, who were regularly checking market samples for counterfeit or adulterated products. Mr Kelly concluded by stating that, in his opinion, the technology is best used in conjunction with inspection and traceability systems, with appropriate supply chain vulnerability assessment, and that this would be the optimum modus operandi rather than relying completely on analytical end-product testing. Several other questions were asked relating to practical aspects of sample preparation, stable isotope and trace element analysis, quality control and data processing. Mr Kelly was informed later by Professor Dissanayake that the presentations and question and answer sessions had been well received by the members of the Sri Lanka Tea Board and Tea Research Institute and had reassured them of the value of the SITE analysis approach to protect and promote Ceylon Tea in the global tea markets, where it is widely acknowledged as a premium product, and economic incentives exist to counterfeit or adulterate it.

Mr Simon Kelly giving an on-line presentation to the 'Workshop on The Use of Stable Isotopes and Trace elements combined with Chemometrics for Origin Verification of Food' at the Sri Lanka Atomic Energy Board.

Participation in Codex Committee on Residues of Veterinary Drugs in Foods, Portland, Oregon, United States of America

James Sasanya

The IAEA, through the Joint FAO/IAEA Centre continues to partner with the Codex Alimentarius, including the commission and a number of its committees such as the Codex Committee of Veterinary Drug Residues in Food (CCRVDF). Mr. Sasanya represented the Joint Centre at the 26th session of this committee, which was attended by more than 200 delegates, where he presented a report on relevant activities and contributed to deliberations on setting and implementation of international food safety standards on residues of veterinary drugs and associated pesticides in food and feed. This was also an opportunity to network with various Member States and stakeholders and listen to pressing or emerging issues the Joint Centre could support, such as deliberations of the working groups on: (a) a priority list of veterinary drugs for evaluation/re-evaluation by the Joint Expert Committee on Food Additives; (b) extrapolation of maximum residue levels to one or more animal species; and (c) criteria and procedures for establishment of action levels for residues in food and feed, among others.

IAEA represented at the 26th Session of the CCRVDF in session in Portland, Oregon, 13-17 Feb 2023. (Photo courtesy of Mr James Sasanya, 2023)

CCRVDF appreciated the presence, active participation and report of the IAEA. Several Member States and observers acknowledged the key role played by the IAEA through the Joint FAO/IAEA Centre in capacity building and research, among other activities, which are required for the development, adoption and implementation of Codex standards for food safety, particularly veterinary drug residues. Ongoing research work at the IAEA under CRP D52043 on the depletion of veterinary drugs (some potential dual use as pesticides) in a wide range of food animals, is expected to generate and provide useful scientific data to this and related committees. There are still several veterinary drugs without standards and to address this challenge such CRPs are needed. A number of Member States, while thanking the IAEA for the support and research work, asked for continued assistance. While the call for support by the Member States and stakeholder is surmountable, it requires more funding, notably for procurement of radiolabelled drugs and animal experiments. Many delegates expressed interest in the International Symposium on Food Safety and Control the IAEA is organizing in May 2024 as well as the African Food Safety workshop in the fourth quarter of 2024, as a followup to a similar workshop held in 2022 in South Africa.

Codex Circular Letter: Natural Radioactivity in Feed, Food and Drinking-water

Carl Blackburn

At its 14th session in 2020, the Codex Committee on Contaminants in Foods (CCCF) considered a discussion paper on radioactivity in food, feed and drinking-water. As part of its deliberations the committee also welcomed the offer of an informative document for the food safety regulatory community, providing the state of the art of natural radioactivity in food, feed, and water. In this respect, the Food Safety and Control Section collaborated with colleagues in FAO, IAEA and WHO to develop a draft informative document. Comments were also provided by the United Nations Scientific Committee on the Effects of Atomic Radiation as its 2000 and 2008 reports are extensively referenced in the text.

With the assistance of the Codex Secretariat, the draft informative document was recently circulated to Codex Members as a circular letter so that they may offer their comments should they wish to provide feedback. The circular letter provides the background and includes the proposed document as an appendix. The deadline for comments was 30 June and a final version of this document will be prepared for the next CCCF session scheduled for early 2024.

The document is the third in a series on radioactivity in food. The FAO, IAEA and WHO have cosponsored the production of two documents, available as IAEA publications: Safety Report No. 114 entitled 'Exposure due to Radionuclides in Food Other Than During a Nuclear or Radiological Emergency. Part 1: Technical Material' is currently available online as a preprint. A companion publication (Part 2) is already published as IAEA-TECDOC-2011, also cosponsored by FAO, IAEA and WHO. It builds on the information in Safety Report No. 114 to put forward approaches that can be used by regulatory bodies, policy makers, interested parties and others with responsibilities in relation to the management of food in various circumstances where radionuclides are, or could be, present, excluding any nuclear or radiological emergency, i.e., it supports the implementation of Requirement 51 of the International Basic Safety Standards related to exposure due to radionuclides in commodities.

Workshop on Accelerating Adoption of Electron Beam andX ray Technologies for Sustainable Economic Prosperity in Africa

Carl Blackburn

The above workshop was held in Rabat, Kingdom of Morocco from 6–10 March 2023. This is a technical cooperation initiative helping to transfer knowledge on machine source irradiation for different radiation processing applications, including food irradiation. It was implemented by Morocco's National Center for Energy and Nuclear Science and Technology (Centre National de l'Energie, des Sciences et des Techniques Nucléaires, CNESTEN), in cooperation with the Office of Radiological Security (ORS) of the United States of America Department of Energy/National Nuclear Security Administration. The Food Safety and Control Section participated to give an overview of IAEA regional support for the adoption of irradiation technologies in Africa under IAEA Technical Cooperation project RAF5088. The organizers also invited all countries participating in RAF5088 to present to the workshop and give details of their needs and plans for the adoption of irradiation technologies.

The purpose of this US funded workshop was to discuss and encourage the use of electron accelerator technologies for commercial processing using ionizing radiation. Although many people are aware that food can be irradiated at facilities that use gamma rays from the radioactive isotope cobalt-60 (^{60}Co) many are not aware that electron beam or X ray irradiation is also viable for food irradiation. Using these electrically generated beams of ionizing radiation is increasing being favoured, with more commercial scale electron beam facilities being constructed and growing interest in also adopting X ray irradiation where accelerated electron beams are directed onto metallic targes to produce X rays. These electron or X ray technologies rely on electron accelerators that can be switched off when not in use and avoid the need for safeguarding issues associated with large quantities of radioactive ^{60}Co. The workshop provided an opportunity for those who use electron beam and X ray irradiation to provide information and share their experiences and resources related to the operation of these machine source technologies.

As well as practical information and detailed reviews of case studies, this workshop also included discussions on the economics of implementing the different technologies and several success stories with entrepreneurs providing advice on how to take forward and initiate a new facility, the associated capital costs, operating costs, and ideal locations for siting different kinds of units.

Ms Afaf Ouardi of CNESTEN, Morocco presents information on the opportunities for using electron beam and X ray technologies in Morocco. (Photo courtesy of Mr Carl Blackburn, FAO/IAEA, 2023).

Participation in the General Assembly 2023 of the European Geosciences Union (EGU)

An Li, Aiman Abrahim, Simon Kelly

The 2023 General Assembly of the European Geosciences Union (EGU) was held from 23-28 April 2023 at the Austria Center in Vienna. There were approximately 19,000 researchers and students from over 100 countries who participated in over 900 sessions.

The Food Safety and Control Laboratory (FSCL) was invited to present its latest achievements in applied and adaptive research on the stable isotope ratio measurement of intrinsic, or non-exchangeable, hydrogen ($\delta^2H_{(NE)}$) for food authentication. FSCL research was presented in two posters in the session on "Oxygen and hydrogen isotope analyses of aquatic and terrestrial compounds: Advances in methods, models, and interpretation". Mr An Li and Mr Aiman Abrahim presented new approaches to measuring $\delta^2H_{(NE)}$ in sugars present in honey, "Stable Isotope Analysis of Non-exchangeable Hydrogen in Sugars by Oxidation/Derivatisation to hexamethylenetetramine and Elemental Analyzer-Chromium/High Temperature Conversion-Isotope Ratio Mass Spectrometry", and polysaccharides such as starch, "Determination of carbon bound non-exchangeable (CBNE) hydrogen isotope ratios in starch by Microwave Assisted Hydrolysis (MAH) and GC-CrAg/HTC-IRMS". The two posters focused on novel methods developed in FSCL involving chemical transformation of carbohydrates to access intrinsic hydrogen isotope data.

This session also showed different methods in the application and measurement of intrinsic hydrogen isotope data of a broad range of compounds especially polysaccharides such as starch, cellulose and lignin. FSCL staff joined in many discussions and exchanged ideas about the development and limitations of hydrogen isotope detection with other researchers who were routinely using stable isotope analysis of hydrogen in related fields of science such as ecology and biochemistry.

Poster presentations in the General Assembly 2023 of the European Geosciences Union (EGU). (Photo courtesy of Mr Aiman Abrahim, 2023)

The Launch of the RALACA-DSC Committee

Britt Maestroni, Nicola Schloegl

A dedicated regional project, titled "Strengthening the Regional Collaboration of Official Laboratories to Address Emerging Challenges for Food Safety" (ARCAL CLXV), has enabled an initiative of 16 countries of the Latin America and the Caribbean region, belonging to the Latin America and the Caribbean Food Safety Laboratory Network (RALACA), to promote the use and share of analytical data to strengthen risk analysis in the region and promote science-based decision-making in food safety. The RALACA network officially launched the Data Sharing Committee of RALACA (RALACA-DSC) on 25 May 2023, in Panama, during the Regional Meeting on Data-Driven Innovation in Food Safety, hosted by the IAEA from 25 to 26 May. The event was aimed at members of the official food safety laboratories of Latin American and Caribbean (LAC) region and member countries of the RALACA network. Regional and international intergovernmental organizations with expertise in the subject matter also participated. The purpose of this meeting was to promote the use of analytical data to strengthen food safety and to explore new approaches aimed at ensuring food safety for consumers in the LAC region, as well as promoting international trade, specifically by strengthening risk-based monitoring and the effective use of analytical data. In the frame of the meeting, RALACA-DSC presented an example of a legal framework established to facilitate the collection and storage of analytical data, as well as a database hosted by the IAEA for sharing of these data at the regional level.

Since data on chemical contaminants and residues are considered sensitive information, there are strict requirements for maintaining confidentiality and security for data sharing: first, indication of data origin is at the level of one of four subregions, not at the country level; second, different roles have been assigned to the members of the institutions uploading data, the only owners of their data, and for those responsible for validating the submission of data on behalf of a subregion; third, after data are uploaded to the database, only the submitting institution will have access to subregion information for further validation and data aggregation purposes.

To standardize its uploading to the database, data are being recompiled through a macro workbook in Excel. Figure 1 shows an extract of the data input tool. By using this macro and filling out all the fields, an Excel data file is automatically generated. This can be uploaded to the database by the previously registered laboratory. Only institutions officially selected by RALACA-DSC may register as users of the database, which is linked to the IAEA´s Nucleus information resource portal.

In this framework, sharing of food safety data is voluntary, and carries an enormous advantage in terms of the further usage that can be attributed to it. It helps the LAC region to

utilize the aggregated data to show trends and challenges in food safety, and to carry out preliminary, first tier, risk assessments. The benefits include focusing limited resources to risk-based needs and implementation of risk-based monitoring programmes based on information that the subregion has provided, thus enhancing the protection of the regional consumers and helping enable trade.

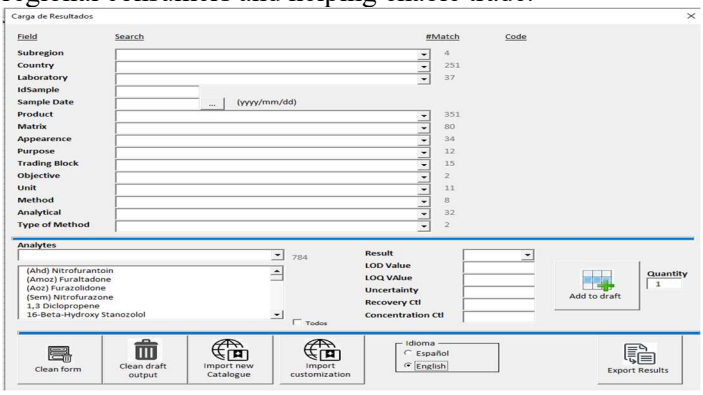


FIG. 1. Screen shot of the English version of the data input tool.

70th Session of the United Nations Scientific Committee on the Effects of Atomic Radiation

Carl Blackburn

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) was established by the General Assembly of the United Nations in 1955 with its mandate to evaluate and report levels and effects of exposure to ionizing radiation. The Committee regularly reports on its evaluations to the General Assembly, which are then published for use by the scientific community, national and international organizations, regulatory bodies and the general public.

The 70th Session of UNSCEAR was held at the United Nations Office in Vienna from 19–23 June. The Scientific Committee discussed technical documents on: Second primary cancer after radiotherapy; Epidemiological studies of radiation and cancer, and; Evaluation of public exposure to ionizing radiation. This public exposure assessment will provide a comprehensive and independent evaluation of public exposures to natural and other sources of radiation. Work is at an advanced stage and a draft manuscript is in preparation for the Committee's evaluation by early next year.

The Joint FAO/IAEA Centre participates at UNSCEAR in an "observer" capacity representing the FAO, not least because UNSCEAR assessments of public exposure to ionizing radiation include estimates of the radiation dose received through the consumption of naturally occurring and human-made radionuclides in foods. The last comprehensive UNSCEAR evaluation on public exposure to ionizing radiation was in their 2008 report. Since that time more data has been published in the scientific literature, UNSCEAR has also reviewed and revised its methodologies for estimating public exposures. A new UNSCEAR evaluation of public exposure is therefore timely.

54th Meeting of the Radiation Safety Standards Committee and 16th Meeting of the Emergency Preparedness and Response Standards Committee

Carl Blackburn

The IAEA is authorized by its Statute to establish or adopt safety standards for the protection of health and to minimize the danger to life and property. The Agency develops such standards on the basis of an open and transparent process for gathering, integrating and sharing the knowledge and experience gained from the use of nuclear technologies and from the application of the Safety Standards themselves. The Radiation Safety Standards Committee (RASSC), and the Emergency Preparedness and Response Standards Committee (EPReSC), are two of the five Safety Standards Committees convened by the IAEA to provide feedback and recommendations, with a view to achieving greater transparency, consensus, quality, coherence and consistency in the development of IAEA safety standards. The RASSC is primarily concerned with radiation safety and EPReSC focuses on emergency preparedness and response. For example, in previous meetings both committees had been informed of progress in the development of Safety Report No. 114 entitled 'Exposure due to Radionuclides in Food Other Than During a Nuclear or Radiological Emergency. Part 1: Technical Material' and the companion publication (Part 2) now published as IAEA-TECDOC-2011.

Both RASSC and EPReSC met in the week 13–16 June, with a joint session on 14 June. Both committees separately reviewed a number of "document preparation profiles" for new or revised safety standards. The committees in a joint session also received updates on progress in the development of a safety standard that is being developed on radiation protection and safety in existing exposure situations. Other updates of interest in the area of food and agriculture were updates on IAEA activities related to managing the presence of radionuclides in consumer goods and the production of a Safety Report on international trade of non-food commodities. The committees also received an overview of the Technical Meeting on Draft Safety Guides Related to Protection Strategy for a Nuclear or Radiological Emergency (DS534) and Criteria for use in Preparedness and Response for a Nuclear or Radiological Emergency (DS527). The final day of the RASSC meeting had a topical session on radiation induced second primary cancer following radiotherapy and associated imaging. In the closing sessions of RASSC and EPReSC, the Food Safety and Control Section was invited as the FAO Observer to produce an up-date on joint FAO/IAEA activities of interest.

Recent Additions to the International Standards for Phytosanitary Measures and a New Generic Dose Irradiation Treatment

Carl Blackburn

The International Plant Protection Convention (IPPC) is an intergovernmental treaty signed by over 180 countries, aiming to protecting the world's plant resources from the spread and introduction of pests, and promoting safe trade. This convention introduced the International Standards for Phytosanitary Measures (ISPMs) as its main tool to achieve its goals, making it the sole global standard setting organization for plant health. The Food Safety and Control section provided input into the up-dating ISPM number 18, which in April became available as "Requirements for the use of irradiation as a phytosanitary measure". Recent updates have added to the number of irradiation treatments being adopted as annexes to the International Standard for Phytosanitary Measures number 28 "Phytosanitary treatments for Regulated Pests (ISPM28), there are now 23 out of 45 internationally accepted phytosanitary treatments included as annexes to ISPM28. Irradiation treatments include an additional generic phytosanitary treatment available as Annex 40, this is an irradiation treatment against Tortricidae (ISPM28 PT7). There are currently only three are generic irradiation treatments (ISPM28 PT7 family Tephritidae, PT39 genus Anastrepha, and PT40 Tortricidae). Having more internationally accepted generic treatments, where one radiation dose is broadly applicable to a wide range of different pest species, would enhance trade in fresh commodities and support further up take of irradiation technology.

This newly recognized generic irradiation treatment against species of the family Tortricidae gives a minimum effective dose of 250 Gy to prevent emergence of viable adults from irradiated eggs and larvae of Tortricidae. This family of moths feed on an enormous variety of plants and they include many serious economic pests of agriculture, horticulture and forestry. The IPPC Technical Panel on Phytosanitary Treatments based its evaluation of this treatment on a scientific publication produced by a group of researchers that were involved in one of our previous CRPs on phytosanitary irradiation (CRP D62008). This CRP on the development of generic irradiation doses for quarantine treatments was held from 2009 to 2015 and published key research findings. It proved to be very productive in generating new data on doses of ionising radiation effective against 34 species in 10 families of insects, 3 families of mites and 1 family of snails. Several new generic doses were supported by the research which proposed possible generic doses for Lepidoptera (moths and butterflies), Pseudococcidae (mealybugs), and Curculionidae (weevils).

The Joint FAO/IAEA Centre is currently implementing a coordinated research initiative on Novel Irradiation Technology for Phytosanitary Treatment of Food Commodities and Promotion of Trade (CRP D61026). This research initiative aims to build on the earlier CRP research and validate more radiation doses proposed as generic treatments for key groups of pests. Research is also examining methods of innovating new treatments by investigating factors that might affect treatment efficacy.

Coordinated Research Projects

CRP Reference Number	Ongoing CRPs	Project Officer
D52040	Field-deployable Analytical Methods to Assess the Authenticity, Safety and Quality of Food	S. Kelly
D52041	Integrated Radiometric and Complementary Techniques for Mixed Contaminants and Residues in Foods	J.J. Sasanya
D52042	Implementation of Nuclear Techniques for Authentication of Foods with High-Value Labelling Claims (INTACT Food)	S. Kelly
D52043	Depletion of Veterinary Pharmaceuticals and Radiometric Analysis of their Residues in Animal Matrices	J.J. Sasanya
D52044	Nuclear Techniques to Support Risk Assessment of Biotoxins and Pathogen Detection in Food and Related Matrices	J.J. Sasanya
D61025	Innovating Radiation Processing of Food with Low Energy Beams from Machine Sources	C.M. Blackburn
D61026	Novel Irradiation Technology for Phytosanitary Treatment of Food Commodities and Promotion of Trade	C.M. Blackburn

Final Research Coordination Meeting (RCM) for the Coordinated Research Project (CRP) D52041 on 'Integrated Radiometric and Complementary Techniques for Mixed Contaminants and Residues in Foods

James Sasanya

A little of over five years ago, this CRP was initiated in recognition that current risk management of chemical hazards in food and feed requires reconsideration. Risk management is currently based on health risk assessments considering data from studies on individual chemical hazards, yet humans can simultaneously be exposed to multiple chemicals through consumption of food and drinking water – this should be considered in managing the risks. Such a paradigm shift would require laboratories equipped with the capabilities to analyse a mixture of chemical contaminants (such as mycotoxins) and residues (including veterinary drugs and pesticides). Ensuring fit-for-purpose methods including innovative sample preparation approaches that address the diverse physico-chemical properties of these cocktails of hazards, presents a challenge to laboratories. The project involved researchers and regulatory institutions in Benin, Botswana, Chile, China P.R, Colombia, Ecuador, Italy, Netherlands, Nicaragua, North Macedonia, Pakistan, Papua New Guinea, Peru, Spain, South Africa, Uganda and the United States of America (USA). The final RCM was held in Vienna, Austria, 8–12 May 2023 and attended by 22 visiting scientists and IAEA staff. As a result of the project, more than 25 methods have been established for the testing of a wide scope of analytes in a range of food commodities of plant and animal origin. The project also generated new information related to antimicrobial resistance including analytical methods that support monitoring of multiple antimicrobials; the presence of antimicrobial residues at levels as low as reasonably possible, and detection of bacterial genes resistant to selected antimicrobials.

Participants at the final research coordination meeting for the CRP D52041 (Photo courtesy of Ms Malgorzata Rydeng, FSC, 2023)

Novel Irradiation Technology for Phytosanitary Treatment of Food Commodities and Promotion of Trade (CRP D61026)

Carl Blackburn

The second research coordination meeting (RCM) of CRP D620126 was held as a virtual meeting on 3, 5 and 11, 12 July. Although hosting an RCM as an online meeting is not ideal, one advantage is that it enables a wider participation from a broad range of different collaborators that although are not directly participants are nevertheless interested in

progress in the development of phytosanitary irradiation treatments. For example, we invited members of the International Plant Protection Commission's Technical Panel on Phytosanitary Treatments (TPPT). We also invited representation from the International Irradiation Association (iiA) and the Phytosanitary Irradiation Platform (PsIP).

The research initiative is being coordinated by the Food Safety and Control Section in collaboration with the Insect Pest Control Section of the Joint FAO/IAEA Centre. It aims to build on a previous CRP and validate the absorbed radiation doses proposed as generic treatments for nine key groups of pests. In doing so it aims to produce at least five generic phytosanitary irradiation treatments using large numbers of pests. Factors that might affect treatment efficacy will also be investigated to stimulate the development of new techniques for irradiation to combat pests and maintain food quality. The purpose of this second RCM was therefore to review the research work carried out by the participating institutions and refine the work plans for the next phase of research.

Mr Guy Hallman (Phytosanitation, USA) chaired the meeting. In the opening session, opening remarks were provided by Mr Osama El-Lissy, Secretary, International Plant Protection Convention, and Ms Dongxin Feng, Acting Director, Joint FAO/IAEA Centre. Ms Janka Kiss (IPPC Secretariat, FAO) provided a presentation and facilitated a discussion on phytosanitary treatments and the process of making submissions for review by the TPPT. Seventeen research presentations were provided as up-dates. The first series of technical presentations focused on factors that might affect treatment efficacy, and later presentations focused on research that targets mealybugs, leafminers and Lepidoptera. The IAEA collaborating centre at Aerial, in France also provided an up-date on a forthcoming dosimetry inter-comparison exercise that will be held as part of the CRP. A report of the meeting is in production and will be circulated to participants.

Technical Cooperation Projects

Country/Region	Project No.	Title	Technical Officer
Burundi	BDI5003	Strengthening National Capacities for Monitoring and Testing Veterinary Drug Residues in Food	J.J. Sasanya
Burundi	BDI5004	Enhancing Control of Chemical Residues and Related Contaminants in Food	J.J. Sasanya
Benin	BEN5013	Expanding Analytical Capabilities for Systematic Control of Veterinary Drug Residues and Related Contaminants in Foodstuff	J.J. Sasanya
Bangladesh	BGD5034	Enhancing Competence in Nuclear and Complementary Capabilities for Testing/Monitoring Veterinary Drug Residues and Other Contaminants in Foods	J.J. Sasanya A. M.V. M. Rodriguez y Baena
Bahrain	BAH5002	Establishing a National Quality Control Standard for Foodstuffs and Fishery Products	J.J. Sasanya
Bosnia and Herzegovina	BOH5003	Using Nuclear Technology in Enhancing Science Based Safety, Quality and Control Systems in Feed and Food Chains	A. Cannavan
Botswana	BOT5020	Enhancing Capabilities for a Holistic Approach to Testing Food Hazards in Poultry Production and Products	J.J. Sasanya
Botswana	BOT5023	Enhancing Control of Food Hazards in Poultry Production and Products	J.J. Sasanya
Belize	BZE5011	Strengthening Laboratory Capabilities to Monitor Contaminants in Fisheries Products	B.M. Maestroni
Cameroon	CMR5025	Improving Laboratory Testing Capabilities to Enhance the Safety and Competitiveness of Agricultural Products - Phase I	J.J. Sasanya
Chile	CHI5053	National Reference System for Verification of Authenticity and Determination of Origin of Food using Nuclear Isotopic Techniques	S.D. Kelly
Costa Rica	COS5037	Strengthening Capabilities to Analyse and Monitor Toxic Metals in Animal Products	J.J. Sasanya
Cuba	CUB5022	Promoting Food Safety through the Mitigation of Contaminants in Fruits for Human Consumption	C.M. Blackburn J.J. Sasanya
Djibouti	DJI5001	Developing Nuclear/Isotopic and Complementary Food Safety Testing Capabilities	J.J. Sasanya
Dominica	DMI5002	Enhancing Capacity to Monitor Agrochemical Residues in Foods and Related Matrices	J.J. Sasanya
Dominica	DMI5003	Strengthening a Nuclear Isotopic Laboratory and Complimentary Field Food Safety Surveillance Capabilities	J.J. Sasanya
Dominican Republic	DOM5005	Strengthening National Capabilities to Ensure Food Authenticity	S.D. Kelly

Country/Region	Project No.	Title	Technical Officer
Ecuador	ECU5030	Reducing Post-Harvest Losses of Native Potatoes and other Fresh Foods by Irradiation	C.M. Blackburn
Ecuador	ECU5033	Strengthening Laboratory Capacities for Monitoring Residues of Neonicotinoid Pesticides in Honey Bees and Honey	B.M. Maestroni
Eritrea	ERI5012	Developing Analytical Capabilities for Food Safety	J.J. Sasanya
Eritrea	ERI5014	Enhancing Food Safety Analytical and Monitoring Capabilities	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
Fiji	FIJ5005	Establishing a Food Safety Laboratory for Analysis of Pesticide Residues in Fresh Fruits, Vegetables and Root Crops — Phase II	B.M. Maestroni
Georgia	GEO5001	Enhancing National Programmes for Testing and Monitoring Food Contaminants and Residues	J.J. Sasanya
Haiti	HAI5009	Strengthening Laboratory Capacity to Test and Monitor Food Contaminants	J.J. Sasanya
Honduras	HON0003	Improving National Capabilities in the Use of Nuclear Technologies for the Promotion of Sustainable Development Goals	Mr P.D.M. Brisset Ms T. Jevremovic Ms I.T.Bertral J.J. Sasanya
Indonesia	INS5045	Strengthening Food Security Through Improvement of Food Safety for Exports Using Gamma Irradiators and Electron Beams	C.M. Blackburn B. S. Han
Iran, Islamic Republic of	IRA1011	Building Capacity for the Development of Stable Isotope Techniques in Medicine, the Environment, Agriculture, and Sciences	S. D. Kelly U.D. Sarvana Kumar O. Kracht J.A. Miller
Cote d'Ivoire	IVC5042	Improving Testing and Monitoring of Food Hazards Using Nuclear and Isotopic Techniques	J.J. Sasanya
Cambodia	KAM5004	Strengthening National Capability for Food and Feed Safety	J.J. Sasanya
Kazakhstan	KAZ5005	Building Capacities in Effectively Irradiating Food	C.M. Blackburn
Kenya	KEN9007	Establishing a National Standard Laboratory for Individual Monitoring, Radioanalysis, and Calibration of Neutron and Surface Contamination Services	C.M. Blackburn J.J. Sasanya
Kyrgyzstan	KIG5001	Establishing Effective Testing and Systematic Monitoring of Residues and Food Contaminants and of Transboundary Animal Diseases	J.J. Sasanya I. Naletoski

Country/Region	Project No.	Title	Technical Officer
Lebanon	LEB0010	Strengthening the Nuclear and Complementary Analytical Techniques of the Lebanese Atomic Energy Commission to Meet Forensic Needs for Materials Investigation and Characterization	S. D. Kelly
Lebanon	LEB1010	Establishing an Isotopic Ratio Mass Spectrometry Laboratory Dedicated to Authentication and Provenance for Supporting the National Fraud Repression Scheme	S. D. Kelly F. Camin
Lebanon	LEB5016	Strengthening Capacity for Exposure Assessment of Residues and Contaminants in the National Diet	J.J. Sasanya
Lebanon	LEB5017	Strengthening Technical Capabilities by Introducing Metal Speciation Techniques to Support Health and Environmental Safety	S. D. Kelly
Lesotho	LES5011	Strengthening Nuclear and Related Food Safety Laboratory Capabilities to Control Veterinary Drug Residues and Related Contaminants	J.J. Sasanya
Madagascar	MAG5028	Developing Food Safety Laboratory Capabilities	J.J. Sasanya
North Macedonia	MAK5009	Enhancing National Capacities to Standardize Nuclear Based and Related Techniques for Food Safety and Detection of Irradiated Food	A. Cannavan B. S. Han A. Mihailova C.I. Horak
Malaysia	MAL5032	Strengthening National Capacity in Improving the Production of Rice and Fodder Crops and Authenticity of Local Honey Using Nuclear and Related Technologies	A. Mihailova S.D. Kelly J. J. Adu-Gyamfi E. Fulajtar C. Zorrilla
Mauritius	MAR5027	Building Capacity to Analyse Veterinary Drug Residues and Related Chemical Contaminants in Animal Products	J.J. Sasanya
Mauritania	MAU5008	Strengthening Laboratory Capacity to Analyse and Monitor Residues and Contaminants in Foods	J.J. Sasanya
Marshall Islands	MHL5002	Building Core Capacities to Control Contaminants and Other Residues in Food — Phase I	J.J. Sasanya
Mali	MLI5032	Improving Laboratory and Monitoring Capabilities for Contaminants in Cereals and Nuts	J.J. Sasanya
Mongolia	MON5024	Enhancing Food Safety Analytical Capabilities for Veterinary Drug Residues and Related Contaminants Using Isotopic Techniques	J.J. Sasanya
Mozambique	MOZ5010	Strengthening Confirmatory Analytical Capabilities for Veterinary Drug Residues and Related Contaminants in Animal Products	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Mozambique	MOZ5012	Enhancing Food Safety Testing and Monitoring of Hazards Using Nuclear and Related Techniques	J.J. Sasanya
Namibia	NAM5018	Strengthening Animal Health and Food Safety Control Systems	J.J. Sasanya
Namibia	NAM5019	Enhancing National Capacity for Contaminant and Adulteration Monitoring of Marine and Other Food Products for Consumer Protection	J.J. Sasanya A. Mihailova M. H. T. Metian
Nepal	NEP5007	Supporting Analysis of Pesticide Residues in Agricultural Products	B.M. Maestroni
Niger	NER5023	Strengthening Capacity of the Public Health Laboratory to Monitor Food Contaminants	J.J. Sasanya
Niger	NER5025	Improving Food and Biological Hazard Detection, Food Preservation and Mutation Breeding	J.J. Sasanya C.M. Blackburn S. Sivasankar
Vanuatu	NHE5004	Strengthening Agro-Food Laboratory Quality Infrastructure — Phase II	J.J. Sasanya
Nicaragua	NIC5012	Strengthening the Monitoring and Control System for Food Contaminants	J.J. Sasanya
T.T.U.T.J. of T. Palestinian A.	PAL5010	Strengthening Capability to Monitor Contaminants in Food and Related Matrices through Nuclear and Complementary Analytical Techniques	J.J. Sasanya
Panama	PAN5027	Strengthening Analytical Capabilities for Risk-based Monitoring of Agricultural Products for Internal Consumption	J.J. Sasanya
Panama	PAN5030	Strengthening Laboratory Capacity in Monitoring Veterinary Drug Residues and Contaminants in Milk and Honey Using Nuclear/Isotopic Techniques	J.J. Sasanya
Philippines	PHI5035	Advancing Laboratory Capabilities to Monitor Veterinary Drug Residues and Related Contaminants in Foods	J.J. Sasanya
Qatar	QAT5009	Enhancing National Food Safety Capacity to Test and Monitor Residues/Contaminants Using Nuclear and Related Isotopic Techniques	J.J. Sasanya C.M. Blackburn
Romania	ROM5010	Enhancing Food Safety and Quality of Consumer Protection	C.M. Blackburn J.J. Sasanya
Rwanda	RWA5003	Strengthening Laboratory Capacity of the Standards Board to Analyse and Monitor Chemicals (Veterinary Drug Residues and Related Contaminants) in Foods — Phase II	J.J. Sasanya A. M.V. M. Rodriguez y Baena
South Africa	SAF5018	Establishing National Capacities for Monitoring and Control of Pesticide Residues in Agricultural Produce	B.M. Maestroni
Seychelles	SEY5014	Developing Toxicological Analytical Capability for Monitoring and Biomonitoring Exposure to Toxic Agents in Biological and Environmental, as well as Food and Water Matrices	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Singapore	SIN5001	Enhancing Food Safety	C.M. Blackburn J.J. Sasanya
Sri Lanka	SRL5048	Strengthening National Capability for Food and Feed Safety	A. Cannavan A. Mihailova
Sudan	SUD5040	Strengthening the Evaluation of Quality, Monitoring and Control Programmes for Food Contaminants	J.J. Sasanya
Uganda	UGA5042	Strengthening Capabilities of Two Central Food Safety Laboratories and Selected Regional Veterinary Centres of Public Health	J.J. Sasanya
Democratic Rep. of the Congo	ZAI5028	Controlling Food and Feed Contaminants in Fish Production	J.J. Sasanya
Zambia	ZAM5032	Strengthening and Expanding Analytical Capacity to Monitor Food Contaminants using Nuclear/Isotopic and Complementary Tools	J.J. Sasanya
Africa	RAF0050	Promoting Institutional Capacity Building Through Triangular Partnerships (AFRA)	V. Gershan J.J. Sasanya
Africa	RAF5084	Strengthening Food Contaminant Monitoring and Control Systems and Enhancing Competitiveness of Agricultural Exports using Nuclear and Isotopic Techniques (AFRA)	J.J. Sasanya
Africa	RAF5088	Building Capacity for Food Irradiation by Facilitating the Commercial Application of Irradiation Technologies — Phase II (AFRA)	C.M.Blackburn B. S. Han
Asia/ Pacific	RAS5087	Promoting Food Irradiation by Electron Beam and X Ray Technology to Enhance Food Safety, Security and Trade (RCA)	C.M. Blackburn
Asia/ Pacific	RAS5096	Strengthening Multi-Stakeholder Food Safety Monitoring Programmes for Chemical Contaminants and Residues in Plant and Animal Products Using Nuclear/Isotopic Techniques	J.J. Sasanya
Asia/ Pacific	RAS5099	Developing Climate Smart Crop Production including Improvement and Enhancement of Crop Productivity, Soil and Irrigation Management, and Food Safety Using Nuclear Techniques (ARASIA)	J.J. Sasanya M. Zaman
Latin America/ Caribbean	RLA5069	Improving Pollution Management by Persistent Organic Pollutants to Reduce Impact on People and the Environment (ARCAL CXLII)	B.M. Maestroni
Latin America/ Caribbean	RLA5079	Applying Radio-Analytical and Complementary Techniques to Monitor Contaminants in Aquaculture (ARCAL CLXXI)	J.J. Sasanya

Country/Region	Project No.	Title	Technical Officer
Latin America/ Caribbean	RLA5080	Strengthening the Regional Collaboration of Official Laboratories to Address Emerging Challenges for Food Safety (ARCAL CLXV)	B.M. Maestroni
Latin America/ Caribbean	RLA5081	Improving Regional Testing Capabilities and Monitoring Programmes for Residues/Contaminants in Foods Using Nuclear/Isotopic and Complementary Techniques (ARCAL CLXX)	J.J. Sasanya
Latin America/ Caribbean	RLA5084	Developing Human Resources and Building Capacity of Member States in the Application of Nuclear Technology to Agriculture	J. J. Adu-Gyamfi I. Naletoski W.R.E. Hoeflich C. Zorilla J.J. Sasanya A. Mihailova

Strengthening Food Safety Testing in Rwanda:Training on Veterinary Drug and Pesticide Residues s and Mycotoxins analysis

James Sasanya

Between 12 and 16 September 2022, Rwanda Standards Board (RSB) chemistry laboratory staff received training on veterinary drug residue analysis and monitoring. This started with a virtual meeting where Morocco's experiences and laboratory activities were shared. Later, international approaches for design of monitoring plans and discussion of Codex Alimentarius as well as the European Union approaches, and a range of relevant analytical methods, were covered. A veterinary drug residue monitoring plan on honey was presented to the counterpart institution and stakeholders. The need for appropriated budget to run a monitoring plan; expanding of analysis to other laboratories; and transfer of standard operation procedures between national laboratories were addressed. The counterpart was also guided on analytical methods under the African Food Safety Network platforms. The laboratory staff were then trained on method validation as well as sampling of fresh products (milk) and seasonal produce. Results of monitoring plans and how these are handled and reported, were also covered. The laboratory also received training on confirmatory analysis of 50 veterinary drug residues. Two analytical methods were established in the process.

Staff of Rwanda Standards Board training on chemical hazard testing. (Photo courtesy of Mr S. Darkaoui, 2022)

The capacity building at RSB continued 5-9 December 2022 with training on analysis of mycotoxins in food and related matrices, with the focus on aflatoxins. Additional training was then conducted on pesticide residues from 17–21 April 2023. The training helped analysts understand the purpose of each stage in the BS EN 15662 method (Foods of plant origin - Multimethod for the determination of pesticide residues using GC- and LC-based analysis following acetonitrile extraction/partitioning and clean-up by dispersive SPE), the importance of following the methods exactly as described and of noting any unavoidable deviations and to evaluate and interpret data produced. Training on the Codex recommended methods of sampling for the determination of pesticide residues for compliance with maximum residue limits (CAC/GL 33-1999) was provided to enable staff to know the type, number and quantity of samples they need to receive from customers for laboratory analysis. The handling, preparation and storage of samples were also presented.

Enhancing Food Safety Testing in Bangladesh

James Sasanya

Bangladesh continues to place great emphasis on improving food safety including the need to strengthen testing laboratories and implementation of relevant standards. One of these laboratories is the Institute of Food and Radiation Biology (IFRB), Bangladesh Atomic Energy Commission. The IAEA is supporting IFRB to enhance its analytical capabilities. The Bangladesh government recognized the importance of this partnership with the IAEA and established a new laboratory infrastructure, now equipped with at least four radiometric and state-of-the-art confirmatory tools. The Joint FAOA/IAEA Centre is providing continued technical support to ensure effective use of these capabilities, and this includes on-site interventions such as the visit to the country by Mr. Sasanya 20-24 November 2022.

Bangladesh food safety laboratory staff during training on chemical hazard analysis, 2022.

Analysts received assistance and support, including improving the performance of at least three analytical detection methods for a range of drug residues and mycotoxins, during this visit. The institution has an ambitious plan to expand its capacity. It is now ready to extend its analytical capabilities for inorganic contaminants with a soon-to-be-established inductively coupled plasma mass spectrometry system. It also intends to attain accreditation in due course to ensure better service delivery. The IFRB and the Bangladesh Food Standards Authority (BFSA) are working closely together to provide analytical services in the country according to Codex and national standards. The IFRB is participating in an IAEA CRP on depletion of veterinary drugs and the analysis of associated residues with the aim of contributing data for the setting of Codex maximum residue levels. A new poultry house was established for this purpose and associated studies are underway. It is pleasing to see the growth of the IFRB to a state where it nowconducts tests routinely as well as

participating actively in the process of setting national and international food safety standards.

Strengthening Human Resource Capability for Food Safety Testing in Cambodia

James Sasanya

Between the 5th and 16th December 2022, training on the analysis of veterinary drug residues in food was provided at the food safety laboratory at the National Animal Health and Production Research Institute, General Directorate of Animal Health and Production. This included presentations and practical work in the basic principles and application areas of radio receptor assay test techniques. Analyses were carried out using the techniques to screen for veterinary drug residues in foods. The analytes and matrices included tetracyclines and sulphonamides in tissue; aminoglycosides, beta lactams and sulphonamides in eggs; beta lactams, sulphonamides and tetracyclines in milk and finally streptomycin in honey. Field samples including pork muscle, chicken egg, chicken liver, honey and cow milk samples were also obtained from local markets and analyzed. Chicken liver samples were suspect positive for tetracycline residues. Although the institution has liquid chromatography-mass spectrometry system, it is not functional. Without the radio receptor assay system, the laboratory would have faced difficulties in performing food safety tests. Finally, to facilitate the setting up of a pilot residue monitoring program in Cambodia, experiences elsewhere, such as Turkiye's national residue monitoring program, was transferred to the laboratory. Related maximum residue levels in foods of animal origin used by Türkiye were also shared.

Food safety training in Cambodia (Photo courtesy of Mr N. Kiry, 2022)

Responding to Food Safety Capacity-Building Needs in Mongolia

James Sasanya

The IAEA recently received a request to help two laboratories in Mongolia enhance their food safety testing capabilities. Support was particularly needed in relation to analytical tests to detect pesticides residues and to monitor veterinary drug residues in foods. The institutions involved were the Multiplex International LLC City centre and the State Central Veterinary Laboratory. In response, a week long training course was organized by the Food Safety and Control Section from 12–16 December 2022.

The support provided was designed to provide hands-on training in the development and validation of a method for analyzing multiple pesticides; advice on national residue monitoring, and better understanding of established guidelines and practices such as those of the European Union (EU). Specialists from The Ministry of Food, Agriculture and Light Industry benefited from lectures and discussions regarding the control of pesticides in food, monitoring the usage of pesticides in plants and plant products, tracking the quality, safety, and risk assessment of agricultural products. Relevant work done by the European Food Safety Authority was also covered. Activities also covered training in multi-analysis control programmes for pesticides: their scientific basis and development over the years, and analytical methods for determination of pesticides in food of plant and animal origin. The EU maximum residue level database, the Rapid Alert system for Food and Feed, international regulatory requirements, and proficiency testing, among other topics, were discussed. Training was then provided on analytical method development and validation according to SANTE 11312/2021. With this intervention, the institutions improved their knowledge and understanding on the use as well as limitation of three different types of equipment (high performance liquid chromatography, gas chromatography-mass spectrometry and liquid chromatography-tandem mass spectrometry). The request to support the two institutions is a good example of public-private partnership which is important for food safety in a country.

Food safety seminar on pesticide residues (testing and monitoring) in Mongolia(Photo courtesy of Mr D. Khurandaabaatar, 2022)

Coordination Meeting for the ARASIA Project 'Developing Climate Smart Crop Production including Improvement and Enhancement of Crop Productivity, Soil and Irrigation Management, and Food Safety Using Nuclear Techniques

James Sasanya

The meeting between 30 January and 3 February 2023, involving counterparts from Iraq, Jordan, Kuwait, Lebanon, Oman, Syria and Yemen and covering the three fields of work in the project, was organized to review activities implemented in 2022 and early 2023, as well as plan for 2023 and 2024. The event included presentations and discussions from the 24 counterparts while IAEA staff provided management, administrative and technical overview and guidance. The counterparts delivered presentations of the work done, challenges faced and needs to address. Breakout sessions for each output group were arranged to focus on their areas of work, followed by joint presentations in a plenary session. Implementation strategies for this project drawing together laboratory personnel involved in the food production chain, were finetuned.

Output three of this project is on food safety and control. The project identified a number of procurement-needs that are not possible to realize without extra budgetary funding. A recommendation was made to consider funding possibilities such as the peaceful uses initiative. Meanwhile, a regional training course on drug residue monitoring, targeted scientific visits to benchmark good laboratory and food safety practices as well as missions to support laboratory quality management systems are planned for the latter part of 2023.

Strengthening Food Safety Capabilities in Dominica

James Sasanya

The IAEA is supporting the National Centre of Excellence in Testing, Dominica Bureau of Standards to strengthen its capabilities for food safety control. The analytical chemistry and microbiology sections of the laboratory have now established a range of instrumentation including the radio receptor assay tool for screening a range of chemical hazards and ultra high performance liquid chromatography-tandem mass spectrometry for conducting isotope dilution-based confirmatory testing. The laboratory also has a gas chromatography-tandem mass spectrometry instrument for testing pesticide residues and an atomic absorption spectrometer for analyzing a small range of toxic metals. Efforts are underway to improve the limited sensitivity and scope. The current focus is on training more analysts onsite, such as during Mr. Sasanya's recent visit to the country, 11 - 18 March 2023. He provided training to laboratory staff on optimum use of the instrumentation as well as troubleshooting and provision of relevant literature, including standard operation procedures. The process to train more staff outside the country, including benchmarking good practices in established laboratories, is also ongoing. The laboratory is working towards accreditation and assistance to improve the quality management system is under implementation. Further, as a standards body, support has also been provided to the Dominica Bureau of Standards to actively participate in Codex meetings. Improving food safety testing requires collaboration with other institutes such as the Ministries of Agriculture, Environment, and Health. During the visit, Mr. Sasanya held a seminar attended by eight persons from the Ministry of Agriculture and Ministry of Health as well as the Bureau of Standards. As a result, awareness has been created among top management and policy makers such as the Permanent Secretary, Ministry of Agriculture, Fisheries, Blue and Green Economy, Commonwealth of Dominica Mr. Reginald Severin. According to the Permanent Secretary, the government plans to support the expansion and the development of the agriculture sector in the next three years, including establishment of an Agriculture, Plant Health and Food Safety Laboratory, for which the site has been identified. IAEA's continued support will be required in this regard.

Training in Dominica on confirmatory analysis of chemical hazards in food. (Photo courtesy Mr S. Lander, 2023)

Strengthening Laboratory Capacities for Monitoring Residues of Neonicotinoid Pesticides in Honeybees and Honey in Ecuador

Britt Maestroni

Under a national TC project, the FSCL is collaborating with Agrocalidad, the Ecuadorian Agency for the Regulation and Control of Phytosanitary and Animal Health, to help enhance national laboratory capacities to monitor residues of

neonicotinoid pesticides, which may affect the bee population and honey quality. Neonicotinoids have been alleged to be one of the factors that lead to the development of the honeybee colony collapse disorder syndrome, and loss of hives. Apart from its huge economic implications, the global decline in bee populations poses a threat to global food production and food security and must be acted upon. Several studies have shown that neonicotinoids may translocate to the nectar and pollen of plants treated with neonicotinoids formulations, which represents a potential risk to pollinators, and could also end up in honey.

Optimising LC-MS/MS conditions for neonicotinoids analysis in Ecuador, 2023

Currently in Ecuador there is an urgent need to control endemic diseases of bees and thus generate an optimal status of apiaries for the strengthening of beekeeping and the production chain (honey, wax, pollen, etc.). Therefore, it is necessary to make beekeepers aware of the negative impact that the misuse of pesticides entails to eliminate certain diseases and thus guarantee the safe international trade of bees and their derived products. Agrocalidad has been supporting the National Apicultural Health Programme since 2015, with the aim of promoting the expansion of beekeeping at an industrial and domestic level. To maintain biodiversity in different ecosystems and to ensure a high quality of the traded honey, it is important to control residues of neonicotinoid pesticides in bees and honey. The Agricultural Products Contaminants Laboratory of Agrocalidad provides analytical services through the determination of pesticide residues in food, soil and water, in compliance with national and international regulations, in support of the surveillance and monitoring programmes carried out by Agrocalidad.

The FSCL has developed, optimised and validated a stable isotope dilution assay using liquid chromatography tandem mass spectrometry for the determination of the neonicotinoids, 6-chloronicotinic acid, acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid and thiamethoxam. The method was transferred to the Agricultural Products Contaminants Laboratory, and it will be implemented and included in the scope of the laboratory upon the arrival of the stable isotope standards, which are currently being procured by IAEA. During a visit of the project's technical officer, Ms Maestroni, to Agrocalidad in March 2023, the entire laboratory team visited an association of honey producers located in the outskirts of Quito. The meeting was attended by 3 farmers, who explained the challenges of farming bees and carrying out good farming practices with the minimal use of agrochemicals. Because there is a flower business located in the same area as the beehives, the challenge is to promote the pollination and honey production but to avoid that bees are directly/indirectly contaminated with pesticides applied to flowers, that may kill or affect the bees and the quality of the corresponding honey. The collaboration that Agrocalidad established with honey producers is essential for the project beneficiaries, and will help the beekeepers to continue producing honey, wax, and pollen at its best standards.

Bee-keepers in Ecuador (Photo courtesy of Ms Britt Maestroni, FSCL, 2023)

Strengthening Food Safety Capabilities in St. Lucia

James Sasanya

St. Lucia is placing great emphasis on improving its food safety and control system through, among other activities, working towards enactment of a modern food safety act (a bill has been drafted) and development of relevant laboratory infrastructure as well as human resources. The laboratory intervention supported by the IAEA involves the Ministry of Agriculture, Fisheries, Forestry, Food Security and Rural Development. The Ministry has a very good facility with two sections, one in charge of crops and the other on animal-related work including food microbiology and analytical chemistry. Instrumentation for confirmatory testing of various organic chemical hazards in food and feed has been established and training of analysts initiated. For instance, between 16 and 21 April 2023, Mr. Sasanya undertook a mission to Castries, St Lucia, where the laboratory is located, to provide on-site technical support which included training of four analysts on the use of isotope-dilution based ultra high performance liquid chromatography-tandem mass spectrometry to analyze chemical hazards such as veterinary drugs and pesticides; analytical method development; and instrument-troubleshooting strategies. He also delivered analytical protocols and literature to the laboratories and guided them on site-preparation for additional equipment. While more training is being arranged outside the country, the laboratory

is now ready to start providing selected analytical services to end users including the Ministry of Agriculture, Ministry of Trade and Ministry of Health as well the Bureau of Standards. The laboratory recently received a new radio receptor assay system for quick and cost-effective screening of chemical hazards in different foods. As articulated by managers, including the Permanent Secretary in the Ministry of Agriculture, Fisheries, Forestry, Food Security and Rural Development, during interactions with Mr. Sasanya, IAEA's continued support is highly appreciated.

(Photo courtesy of C. Fnelon, 2022)

Supporting Analysis of Pesticide Residues in Agricultural Products in Nepal

Britt Maestroni

Under a national technical cooperation project, the FSCL is collaborating with the Plant Quarantine and Pesticide Management Centre (PQPMC) of the Ministry of Agriculture and Livestock Development (MoALD) of Nepal, to help implement the analysis of pesticide residues in agricultural products using screening and confirmatory approaches. The PQPMC is the main project counterpart and is currently dealing with pesticide management aspects, while waiting to start the pesticide residue testing in agricultural crops once the laboratory refurbishment is completed. The main instrument used at the PQPMC will be a gas chromatograph coupled to tandem mass spectrometry (GC-MS/MS). To be independent from events such as the worldwide helium shortage, for the first time in Nepal, the GC-MS/MS will be equipped with a hydrogen generator and run with hydrogen as the main carrier gas.

The National Reference Laboratory for Food and Feed located at the Department of Food Technology and Quality Control (DFTQC), which also belongs to MoALD, is the second project counterpart and will implement pesticide residue testing using liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) for the analysis of LC amenable pesticides and other food contaminants, such as mycotoxins. The DFTQC has a fully functional laboratory, has a business plan and an accepted operational budget, and most important, is about to receive accreditation from the Indian Accreditation Body for testing of pesticide residues in processed foods.

The collaboration between the two institutes will be fundamental to be able to cover the scope of pesticides monitoring and control in Nepal. The technical officer visited the current laboratory facilities of PQPMC and DFTQC, as well as the Institute of the Prime Minister Agriculture Modernization Project (PMAMP), which acts as the national extension service for the farmers in Nepal. She received information about issues related to vegetable farming in the Kathmandu Valley and visited a tomato farm in the Bhaktapur district of Kathmandu. There she discussed development issues with rural women, and challenges with pesticide applications and marketing of crops with farmers. Through a collaboration with the FAO office in Nepal, a capacity building programme will be started for rural women in Nepal in 2023. The objective is to contribute to sustainable development and empowering rural women as key agents for achieving the economic, environmental and social aspects related to food security and food safety.

The Rural community of women in the Bhaktapur district of Kathmandu, 2023

Ms Maestroni (left), visiting the FAO regional office, headed by Mr Ken Shimizu, FAO Representative for Nepal and Bhutan (centre). Mr Gc (right) is collaborating with IAEA on the organizational aspects, 2023.

Developments at the Food Safety and Control Laboratory

A New Method to Detect Added Sugar Syrups in Honey by Hydrogen Stable Isotope Analysis of Hexamine

An Li, Aiman Abrahim, Simon Kelly

"There is nothing new in the world except the history you do not know". This quote from the 33rd U.S. president, Harry S. Truman, can certainly be applied to food fraud. Food fraud is an old and recurring problem. A fourth century Roman cookbook details how "spoiled honey" can be turned into a saleable product by mixing one part with two parts of good honey. This is perhaps one of the first recorded examples of economically motivated adulteration of food. The CODEX Alimentarius defines honey as being a "natural sweet substance produced by honeybees" from plant nectar (Blossom Honey or Nectar Honey) or from the sugary secretions from plants or insects (Honeydew Honey). It is well known that relatively cheap food grade invert sugar syrups, produced commercially, for baking and confectionary products may be illegally added to honey to extend the product and increase profit margins. In March 2023 the European Union's Joint Research Centre (JRC) published a technical report detailing the results of an "EU Coordinated action to deter certain fraudulent practices in the honey sector". A combination of liquid chromatography, stable isotope ratio mass spectrometry (IRMS) and nuclear magnetic resonance (NMR) spectroscopy techniques were used by the JRC to detect the presence of exogenous sugar syrups in honeys. Random samples were taken from 320 honey consignments in 15 EU Member States and 147 (46%) were considered to be non-compliant with the provisions of the EU Honey Directive. Stable carbon isotope ratio analysis (SCIRA), first reported in the late 1970s has been an important technique for detecting honey adulteration with invert sugars syrups derived from corn or cane plants (e.g., high fructose corn syrup). These invert syrups were used extensively for adulteration because they are approximately 10% of the cost of honey, contain fructose, glucose, and sucrose in similar concentrations to that found naturally in honey, and are almost chemically indiscernible. However, the SCIRA method is based on the differences in carbon-13 enrichment between C3-plants (the predominant nectar sources of honey) and C4-plants (e.g. corn, cane) due to the different photosynthetic pathways used, to assimilate carbon dioxide and water, to synthesize sugars. In addition, the limit of detection of invert syrups for this method was further improved and lowered to 7% by using honey protein as an internal isotopic standard. This internal standard SCIRA method was validated for worldwide application and adopted by the Association of Official Analytical Communities (AOAC) for the detection of honey adulteration with C4-plant sugars. However, the AOAC method cannot be applied to detect adulteration of honey with C3-plant derived sugars such as invert syrups produced from hydrolysed beet, potato, and rice starch because of the similarity in both carbohydrate composition and bulk carbon stable isotope ratios. This limitation of SCIRA has been overcome by the use of liquid chromatography coupled with isotope ratio mass spectrometry (LC-IRMS). LC-IRMS allows the $^{13}C/^{12}C$ ratio of glucose, fructose, and oligosaccharides in honey to be individually determined and compared, to provide a more reliable method for the detection of C3- and C4-plant derived sugar syrups in honey. In addition, high-field Proton NMR (^{1}H-NMR) has been successfully used to characterise authentic honeys and invert syrups to identify chemical 'markers' indicative of the presence of C3-plant invert syrups. Whilst LC-IRMS and ^{1}H-NMR exhibit greater sensitivity for detecting invert sugar syrups, they are at the cutting-edge of honey testing technology and are not readily available to many laboratories with basic stable isotope equipment, such as an elemental analyser - isotope ratio mass spectrometer (EA-IRMS), and no high-field NMR facilities. However, bulk hydrogen stable isotope analysis, chromium reduction EA-IRMS, has been shown to be an effective technique to supplement carbon stable isotope analysis in many areas of food authentication. This is because hydrogen stable isotopes, protium (^{1}H) and deuterium (^{2}H) are more markedly fractionated and vary more widely in the environment. The technical challenge of using hydrogen stable isotope analysis of sugars present in honey is that it requires the measurement of the intrinsic or carbon-bound non-exchangeable (CBNE) hydrogen isotopes of carbohydrates, rather than the labile portion, which can readily exchange with ambient water vapour in the environment (i.e. hydroxyl hydrogen). FSCL has developed a new rapid method to permit measurement of the $^{2}H/^{1}H$ ratio of CBNE hydrogen in the main honey sugars, fructose and glucose. A solution of periodic acid is used to oxidise fructose and glucose to formaldehyde and formic acid (Figure 1).

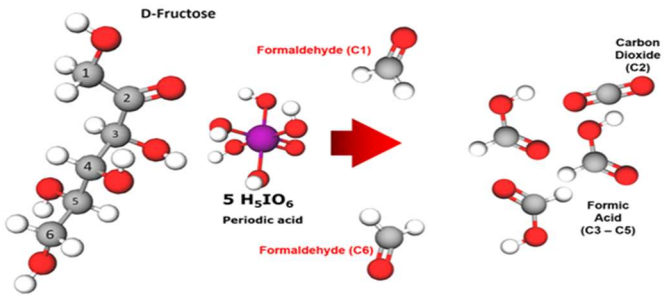


FIG. 1. The reaction of periodic acid with fructose from honey to form formaldehyde, formic acid and carbon dioxide. Glucose undergoes a similar reaction to form formaldehyde and formic acid.

The formaldehyde is then reacted with ammonia to form the tricyclic complex hexamethylenetetramine (hexamine), which retains position-specific carbon and hydrogen isotopic information from the carbon and nonexchangeable hydrogen atoms in the parent sugar molecules, respectively (Figure 2). The hexamine is isolated from the reaction mixture by solvent extraction with dichloromethane and dried before hydrogen and carbon isotope analysis in an EA-IRMS system.

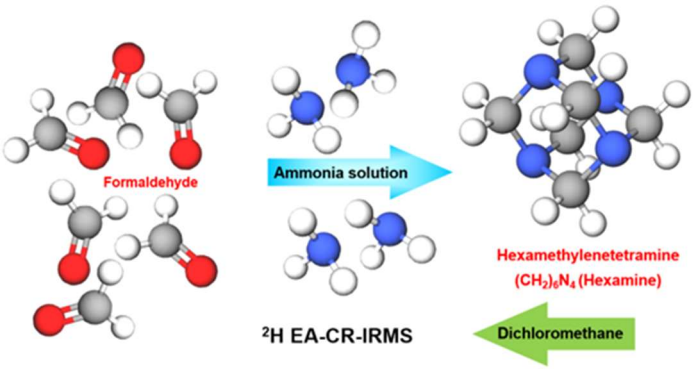


FIG. 2. The reaction of formaldehyde with ammonia in solution to form hexamethylenetetramine (hexamine). Hexamine is extracted into an organic solvent and then isolated for stable hydrogen isotope measurement by EA-Cr-IRMS.

Figure 3 shows the hexamine carbon and hydrogen stable isotope ratio reference zones for honey produced in tropical and colder climates compared to commercially available rice, corn, and agave invert sugar syrups. Because stable hydrogen isotope fractionation in plants is linked to botanical origin and influenced by variations in water sources, biochemical processes, and plant morphology and physiology, further work is needed to establish databases of honey and sugar syrups from various botanical and geographical origins, such as beet sugar and inulin (chicory).

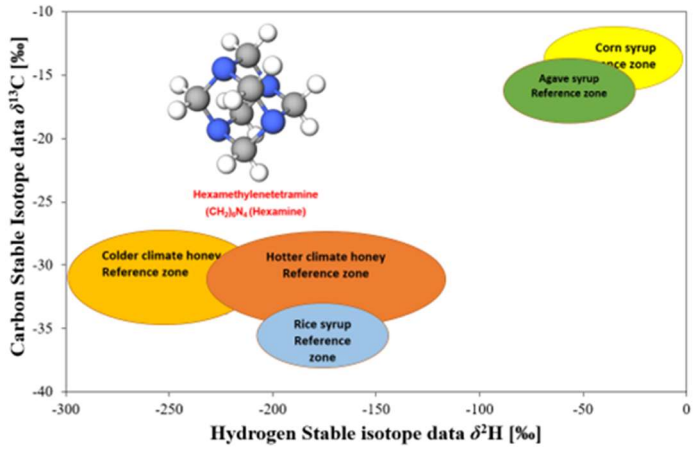


FIG. 3. X-Y plot illustrating the hexamine carbon and hydrogen stable isotope ratio reference zones for honey produced in hotter and colder climates compared to commercially available invert sugar syrups.

Thus, it will be possible to ascertain when the hexamine method can be reliably applied to detect C3 rice invert syrup in honey as it can be seen to overlap with honey used in this study produced in hotter climates in Malaysia and Chile. From the preliminary results obtained, it would appear that the method has potential to detect C3 rice invert syrup when applied to honeys that have been produced at higher latitudes and more inland areas shown in the colder climate reference zone (e.g. Canada), which possess more depleted hydrogen isotope values (δ^2H). Compared to existing methods, for determining δ^2H values of CBNE in honey sugars, the hexamine technique offers some significant advantages in terms of analysis time and accessibility.

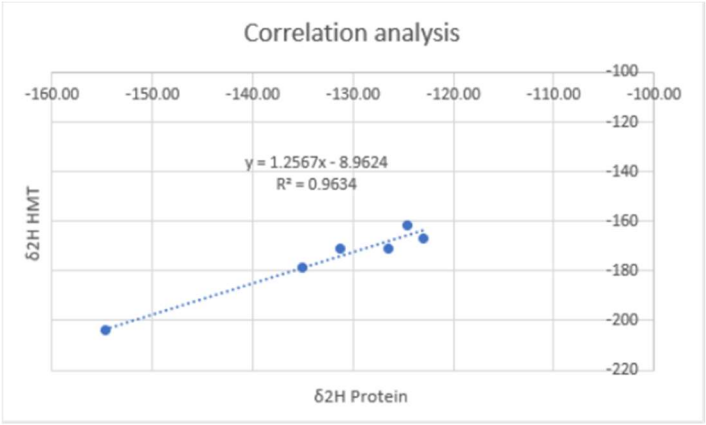


FIG. 4. Preliminary data showing the correlation between hydrogen stable isotope measurements of hexamine and protein derived from authentic Malaysian stingless bee honey.

Additional commercial rice syrup samples need to be evaluated to understand their natural hydrogen isotope variation as well. There is also possibility to examine the correlation between the δ^2H value of hexamine prepared from honey monosaccharides with the δ^2H value of extracted honey protein as an internal isotopic standard to improve the method sensitivity for rice invert syrup addition. Figure 4 shows preliminary data for the correlation between δ^2H values of hexamine and protein for authentic stingless bee honey produced in the forests of Malaysia. The honey protein hydrogen isotope values were determined by the dual-water equilibration technique.

The Year of Millets at the Food Safety and Control Laboratory

Britt Maestroni, Christina Vlachou

2023 was formally declared as the Year of Millets by the United Nations General Assembly at its 75th session in March 2021. The term “millets” refers to a huge family of small-grained crops, and about 6000 different varieties have been identified so far. Millets may represent a major source of energy, protein and minerals for more than a billion people in arid and semi-arid regions, thus, through increased global production and efficient processing, they may contribute to enhance food security worldwide. An important aspect of millets production is that they are considered as climate change-resilient crops, as they are tolerant to drought and other extreme weather conditions. They can also grow on many different soil types and require low chemical inputs such as fertilisers and pesticides. Moreover, millets are naturally gluten-free grains that can be consumed by individuals with celiac disease.

Millets are of high importance for Africa and Asia, where they are consumed in traditional diets in bread, popped or puffed breakfast flakes, or even beverages. Codex Standards, as well as some national ones, exist for millets grains and flour, specifying, among others, quality factors and tolerable contaminants levels, i.e., for heavy metals and mycotoxins. In 2023, the Food Safety and Standards Authority of India (FSSAI) has developed a comprehensive group standard that applies to the whole or dehulled millets, which, according to the standard, shall be free from poisonous, toxic, noxious, or obnoxious seeds and added coloring matter, rodent hair and excreta. Recent reports indicated that staple cereal grains may host many fungi, including mycotoxin producing ones, which negatively impacts health and trade.

To help address these issues the Food Safety and Control Laboratory initiated a project on food safety aspects of millets, including the characterization for the trace element profiling, to establish analytical methods for the detection of potential contaminants and residues that might be present in these crops, thus contributing to baseline information about food safety aspects for millets. A collaboration was started with the Food and Drugs Authority (FDA) of Ghana, and 38 samples of pearl millets were collected in various agricultural areas in Ghana, where millet is a staple crop, and sent to the IAEA for initial testing.

Further developments will be reported in due course.

Pearl millet samples received in FSCL from Ghana. (Photo Courtesy of Ms Britt Maestroni, FSCL, 2022)

Geographical Discrimination of Green Coffee from Costa Rica Using Portable and Benchtop Screening Techniques

Alina Mihailova, Marivil Islam, Simon Kelly

Coffee is one of the most popular beverages in the world. Its sensory properties are affected by the chemical composition of the raw coffee beans which, in turn, is influenced by the geographical region of coffee cultivation. There are considerable differences in terms of commercial value of coffee beans which is an incentive for fraud, e.g. mislabelling the geographical or botanical origin of the coffee beans or adulteration with cheaper types of coffee. Consequently, coffee producers, as well as industrial manufacturers, are increasingly interested in protecting the market reputation from the aforementioned socioeconomic issues and have highly encouraged the development of robust analytical methods to verify the authenticity and geographical origin of coffee.

Infrared (IR) spectroscopy approaches offer a non-targeted multi-analyte screening capability and have been reported to be suitable for the verification of authenticity and determination of geographical origin of different food commodities, including coffee. These analytical techniques can be used to analyse the samples in the laboratory and directly in the field, they offer high sample throughput, low operational costs, require little or no sample preparation, and no need for chemicals or specialized laboratory facilities.

FSCL has assessed the potential of rapid screening approaches, such as portable and benchtop infrared spectroscopy techniques and headspace gas chromatography - ion mobility spectrometry coupled with chemometrics for the geographical discrimination of green coffee from Costa Rica. This work supports CRP D52042, "Implementation of nuclear techniques for authentication of foods with high-value labelling claims".

A total of 94 green coffee samples, collected over two production seasons, were used in this study. The samples originated from two regions of Costa Rica: Region 1, which produces coffee of the highest quality and Region 2. Coffee beans were analysed as ground samples. In addition, coffee samples from the 2nd season were analysed as whole beans. Rapid screening analyses were performed using the following techniques: portable near-infrared (NIR), benchtop Fourier Transform near-infrared (FT-NIR) and benchtop Fourier Transform infrared spectroscopy with attenuated total reflectance (FTIR-ATR) module (spectral range: 13514 – 9346 cm^{-1}, 11550 – 3950 cm^{-1}, and 4000 - 450 cm^{-1}, respectively) as well as headspace gas chromatography - ion mobility spectrometry (HS-GC-IMS). For each of the used screening techniques different data pre-processing algorithms were applied and compared. In addition, low-level data fusion was performed and evaluated for the following techniques: a) FTIR-ATR + HS-GC-IMS and b) FT-NIR + HS-GC-IMS.

A supervised chemometrics approach, orthogonal partial least squares discriminant analysis (OPLS-DA), was applied to discriminate the two green coffee production regions. The comparison of the model performance was done using the goodness of fit and the predictive ability of the OPLS-DA (not shown here) as well as the correct classification rate of the samples from the test dataset (Table 1).

TABLE 1. Correct classification rate of the ground green coffee samples (OPLS-DA model, training dataset, n = 62) according to their geographical origin using an independent test dataset (n = 32).

Analytical technique	Correct classification rate of an independent test dataset, %		
	Region 1 (n = 15)	Region 2 (n = 17)	Total (n = 32)
Portable NIR	100	75	**87.50**
FTIR-ATR	94.12	86.67	**90.62**
FT-NIR	94.12	93.33	**93.75**
HS-GC-IMS	93.33	100	**96.88**
FTIR-ATR + HS-GC-IMS	86.67	100	**93.75**
FT-NIR + HS-GC-IMS	86.67	100	**93.75**

The above parameters showed that the best discriminative power of the OPLS-DA models was achieved using FT-NIR, HS-GC-IMS and the data fusion from FT-NIR or FTIR-ATR with the data from HS-GC-IMS. Considering the model performance, the correct classification rate of the samples from an independent test dataset, and the shorter analysis time required for the FT-NIR in comparison with FTIR-ATR, the fusion of FT-NIR and GC-IMS data would be advisable.

In addition to ground coffee, the study assessed if the coffee samples from the two regions could also be discriminated without sample preparation, i.e. as whole coffee beans. The analysis of whole coffee beans was performed using HS-GC-IMS and FT-NIR. The models showed a better performance in comparison with the use of the ground coffee samples. 100% correct classification rate of samples from the test dataset was achieved for both regions. The fused HS-GC-IMS and FT-NIR model resulted in the highest performance indicators. The score plots of the 7-fold cross-validated OPLS-DA models for the discrimination of two regions obtained using FT-NIR, HS-GC-IMS, and the fused FT-NIR and GC-IMS data are shown in Figure 1 (A, B and C, respectively).

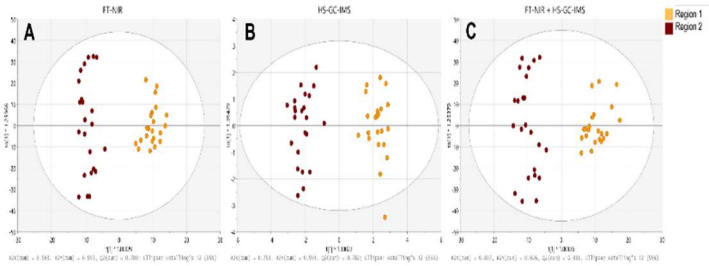


FIG. 1. Score plot of the OPLS-DA model demonstrating discrimination of the two regions, obtained using FT-NIR (A), HS-GC-IMS (B) and the fused FT-NIR and HS-GC-IMS (C) data of whole green coffee beans from two regions of Costa Rica: Region 1 (high-quality coffee) and Region 2. Yellow markers are region 1, red markers represent region 2.

A one-class discriminative model for the Region 1 (high-quality coffee) was generated using data-driven soft independent modelling of class analogy (DD-SIMCA) add-on in MS Excel. The model, built using the fused GC-IMS and FT-NIR data, achieved 100% sensitivity and 100% specificity. The acceptance plot of the DD-SIMCA model is shown in Figure 2. Future work will focus on the analysis of whole green coffee beans from new production season using FT-NIR and HS-GC-IMS approaches.

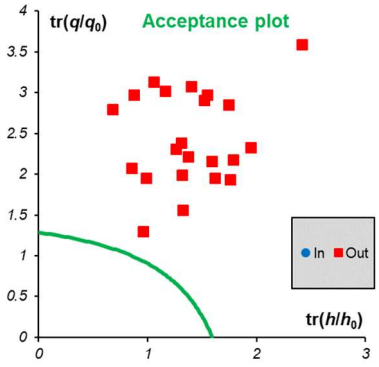


FIG. 2. The acceptance plot of the DD-SIMCA model for the whole green coffee beans from Region 1 (high-quality coffee). The green line indicates the acceptance boundary (95% confidence). Blue circles are the samples from Region 2 misclassified as Region 1 (no samples were misclassified in this experiment). The red squares are the samples from Region 2 correctly classified as outliers.

Geographical Discrimination of Rice from Myanmar, Thailand, China and Indonesia Using Near-Infrared Spectroscopy

Alina Mihailova, Marivil Islam, Simon Kelly

Rice is the staple food for over half of the world's population and plays a major role in global food security. Rice is an economically important crop in the economy of Myanmar, Thailand, China and Indonesia. There are considerable differences in terms of commercial value of rice, which is an incentive for fraud, e.g. adulteration with cheaper rice varieties and/or mislabelling its geographical origin. Authentication of rice is of high importance at all stages of its supply chain and, therefore, there is a need for the development of rapid and robust analytical methods that can verify the authenticity and geographical origin of rice.

Determination of geographical origin of rice requires a given sample to carry a characteristic chemical fingerprint that would reflect its place of cultivation. Various analytical techniques, such as isotope ratio mass spectrometry (IRMS), inductively coupled plasma mass spectrometry (ICP-MS), gas and liquid chromatography coupled with mass spectrometry (GC-MS, LC-MS) have been applied for the geographical discrimination of rice. The above techniques have a strong theoretical basis linking rice characteristics to climate and soil geochemistry, however, these approaches have high operational and maintenance costs, require specialised laboratory facilities and relatively lengthy sample preparation, which introduces a substantial delay between sampling and the generation of results. More rapid and cost-effective 'tier 1' methods, which can be applied to screen samples both in the laboratory and directly in the field, are required to verify geographical origin and underpin traceability systems of rice.

Near-infrared (NIR) spectroscopy offers a non-targeted multi-analyte screening capability and has been reported to be suitable for the verification of authenticity and

geographical discrimination of rice. This technique has several advantages, including low operational costs, rapid analysis, high sample throughput, little or no sample preparation, and no need for chemical reagents or specialized laboratory facilities.

FSCL has assessed the potential of benchtop Fourier Transform near-infrared (FT-NIR) spectroscopy coupled with orthogonal partial least squares discriminant analysis (OPLS-DA) for the discrimination of rice samples (n= 445) collected between 2016 and 2022 from four Southeast Asian countries: Myanmar (n = 193), Thailand (n = 170), China (n = 36) and Indonesia (n = 46). Furthermore, the above approach was also applied for the discrimination between high-value Pawsan rice, cultivated in the Shwebo township in Myanmar, and that from other provinces of the Ayeyarwaddy region of Myanmar. This work supports CRP D52042 "Implementation of nuclear techniques for authentication of foods with high-value labelling claims".

Near-infrared spectroscopy analysis was performed using the following spectral range: 11550 – 3950 cm^{-1}. Different spectral data pre-processing algorithms were applied and compared, and the best pre-processing approach was selected based on the model performance. OPLS-DA was able to discriminate the rice samples from four Southeast Asian countries (Figure 1). The NIR absorption bands, which were significant for the differentiation of the two regions were identified using the spectral data and the variable importance in projection (VIP) scores from the generated OPLS-DA model. These included spectral bands related to proteins, amylose and other polysaccharides.

The external validation of the OPLS-DA model was performed using an independent test dataset of rice samples from the above four countries (n = 149). The model was able to correctly classify all the test samples according to their geographical origin.

Further, the study assessed whether FT-NIR spectroscopy coupled with OPLS-DA was able to discriminate rice of different geographical origins within one country: the high-value Pawsan rice, cultivated in the Shwebo township in Myanmar, and the Pawsan rice cultivated in different provinces of the Ayeyarwaddy region.

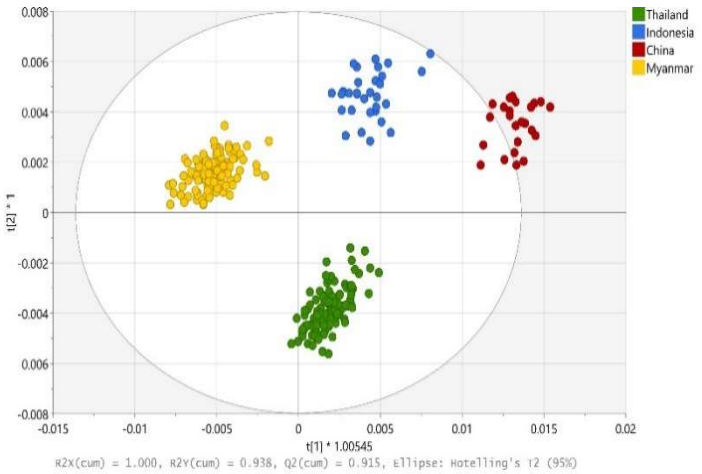


FIG. 1. Score plot of the OPLS-DA model (training dataset, n = 296) for the discrimination of rice from Myanmar, Thailand, China and Indonesia.

Good discrimination was achieved for the ground rice as well as whole rice grains (Figure 2). The discriminative model was built using the training dataset (n = 88) and validated using an independent test dataset (n = 44). The comparison of the model performance, done using the goodness of fit, the predictive ability of the OPLS-DA as well as the correct classification rate of the samples from an independent test dataset, showed no decrease in the performance and predictive ability of the model for the whole grain rice samples as compared to the ground rice. The total correct classification rates of Pawsan rice samples from the test dataset were 97.73% and 95.45% for the ground and whole grain rice samples, respectively. Both models achieved 96.88% correct classification of the Shwebo Pawsan rice from the test dataset. These results demonstrate that the FT-NIR spectroscopy is suitable for the analysis of Pawsan rice without the need of sample preparation, which makes this approach very time- and cost-effective.

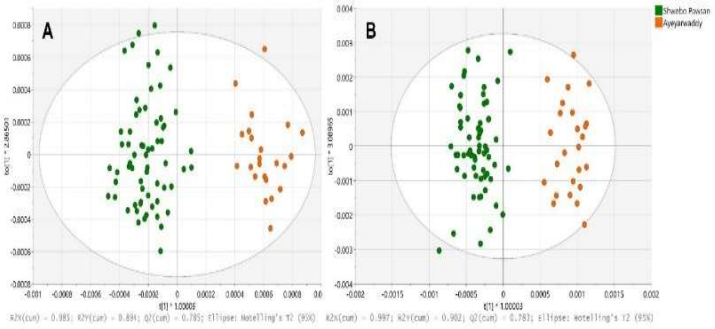


FIG.2. Score plot of the OPLS-DA model (training dataset, n = 88) for the discrimination of ground (A) and whole (B) Shwebo Pawsan (green markers) and Ayeyarwaddy (orange markers) rice samples from Myanmar using FT-NIR spectroscopy.

In addition, a one-class discriminative model for the verification of authenticity of Shwebo Pawsan rice from Myanmar was generated using data-driven soft independent modelling of class analogy (DD-SIMCA) add-on in MS Excel using FT-NIR data of whole grain rice samples. The model achieved 97% sensitivity and 97% specificity. The acceptance plot of the DD-SIMCA model is shown in Figure 3.

Taking into consideration the high performance of the OPLS-DA and DD-SIMCA models built using the FT-NIR data, the rapidity of the FT-NIR spectroscopy approach (analysis time: 16 sec per sample) and the possibility to omit sample preparation, it can be concluded that the FT-NIR analysis of whole rice grains is a time- and cost-efficient approach that can be successfully applied as a rapid screening tool for the geographical discrimination of Shwebo Pawsan and Ayeyarwaddy rice from Myanmar as well as for the discrimination of rice from four Southeast Asian countries: Myanmar, Thailand, China, and Indonesia.

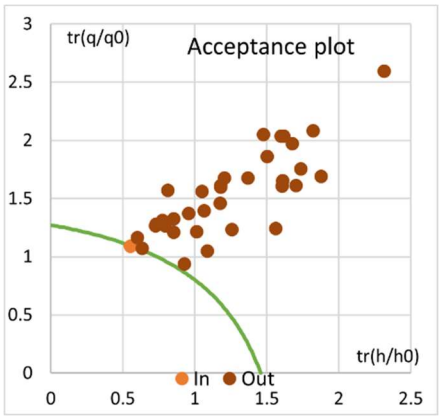


FIG. 3. The acceptance plot of the DD-SIMCA model for the whole grain Shwebo Pawsan rice samples. The green line indicates the acceptance boundary (95% confidence). The orange circles are the samples from Ayeyarwaddy region misclassified as high-value Shwebo Pawsan. The brown circles are the samples from Ayeyarwaddy region correctly classified as outliers.

FSCL Staff

Ms Florence Maxwell, who was supporting FSCL as a laboratory technician, took advantage of the Agency's staff mobility mechanisms to move to the Division of Physical and Chemical Sciences on a temporary development reassignment as a reference materials technician (sales). We wish Florence all the best on her new assignment.

Mr Islam Hamed joined the FSCL team in April 2023 on a temporary assignment, taking over Florence's duties as a laboratory technician. Islam has experience in similar positions in laboratories from the private sector. He has quickly integrated with the team and has made a very good start in Seibersdorf, supporting sample preparation for the development of analytical methods for food safety and authenticity assessments.

Ms Sofia Bussalino completed her 12-month internship in FSCL in January 2023. During her stay in our laboratory, Sofia made a valuable contribution to the team's work on the development of LC-MS/MS and ED-XRF methods for the analysis of contaminants such as mycotoxins and heavy metals, as well as residues of pesticides and veterinary drugs in food, including rapid screening applications. We wish Sofia all the very best for her continued studies and future career.

Mr Evans Rockson Tawiah completed his 12-month internship in FSCL in February 2023, and he resumed his duties as a Regulatory Officer at the Laboratory Services Department of the Food and Drugs Authority of Ghana in Accra. Rock made an excellent contribution to many aspects of the FSCL work on food authenticity and origin assessments using rapid benchtop and portable spectroscopic screening techniques. We wish Rock great success back at his institution and look forward to future collaborations.

Announcements

International Food Ionizing Processing Symposium (IFIS) Dallas, USA, 26-28 Sep 2023

In collaboration with the Joint FAO/IAEA Centre, a three-day food irradiation symposium will involve food, feed and the ionizing radiation industry. It will cover feed, food and phytosanitary uses. If you are interested, please visit the web page and register: https://ifis.world/

IFIS 2023 https://ifis.world/

The programme will include:

- acceptance/perception of ionizing technology in the food value chain;
- international regulatory climate for the adoption of food and phytosanitary irradiation;
- trends in the global adoption of ionizing technologies in the food and feed industries;
- status of commercially available technologies, and;
- technologies on the horizon, and; Case studies from around the world.

IAEA Nuclear Technology Review

The Food Safety and Control Section is happy to announce that it has prepared two articles for publication in the IAEA Nuclear Technology Review 2023. This publication is usually published during the IAEA General Conference which this year will be held from 25–29 September at the Vienna International Centre. Contributions on advances in food irradiation and on rapid responses to food safety crises provide an update in terms of the contributions that nuclear and related applications are making to food safety and control.

International Symposium on Food Safety and Control, Vienna, Austria, 27-31 May 2024.

The FAO/IAEA International Symposium on Food Safety and Control will be held in IAEA Headquarters, Vienna, Austria, 27-31 May 2024.

The purpose of the event is to bring together experts and stakeholders in food safety and food control systems to consider the protection of the integrity of the food supply chain and measures to improve its resilience to food security challenges such as the impacts of climate change, foodborne diseases, food fraud, antimicrobial resistance. It also includes methods to address external factors that may disrupt food control systems (e.g. caused by pandemics, conflict or other catastrophic events). Contemporary and novel applications of nuclear and complementary techniques will be presented, and future perspectives and opportunities discussed. The event will provide a forum for networking, facilitate a broad understanding of food safety and food control systems, and promote the peaceful use of nuclear technologies.

The symposium will address the following themes and topics:

- Food authenticity and fighting food fraud
- Food and phytosanitary irradiation
- Chemical residues and contaminants in food and feed
- Preparing for and responding to emergencies and incidents affecting the food supply
- Detection and characterization of pathogens in food
- Standard setting and risk assessment
- One Health

Participation is solicited from scientists, researchers, laboratory analysts, policymakers, regulators, food producers and others concerned with food safety and control systems and maintaining the integrity of the food supply chain.

Further information can be found in the symposium announcement and call for papers on the symposium web page (https://www.iaea.org/events/fsc-symposium-2024 and from the conference secretariat at FSC-Symposium-2024.Contact-Point@iaea.org).

The first important deadline is for the submission of abstracts, using the IAEA-INDICO system, by 17 November 2023.

Food Safety and Control E-Learning Courses

New e-learning courses are available in the IAEA's Learning Management System, Cyber Learning Platform for Network Education and Training (CLP4NET). The e-learning courses are available for free and can be completed at any time and at your own pace. There are both open and protected courses available.

The open courses available are:

1. Analytical Methods to detect and control Organic Contaminants in food
2. Chemometrics Add-in for Excel (CAFE)
3. Elemental Analysis for Isotope Ratio Mass Spectrometry

The list of open courses is available in the Course Catalogue – IAEA website. To access the full list of courses, visit CLP4NET.

How to enrol

To enrol in the courses, users need to create a NUCLEUS account and log-in to the CLP4NET platform. To register a new NUCLEUS account, click here.

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2023

Codex Committee on Contaminants in Foods (CCCF16), Utrecht, Netherlands, 17–21 April 2023.

https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-735-16%252FWDs%252Fcf16_04e.pdf

2022

52nd Meeting of the Radiation Safety Standards Committee (RASSC), 6–10 June 2022, Vienna.

14th Meeting of the Emergency Preparedness and Response Standards Committee (EPReSC), 7–9 June 2022, Vienna.

15th Meeting of the Codex Committee on Contaminants in Foods, 9–13 and 24 May 2022

2021

Report of the 25th Session of the Codex Committee on Residues of Veterinary Drugs Food.

https://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-730-25%252FREPORT%252FFinals%252FREP21_RVDFe.pdf

Report of the 52nd Session of the Codex Committee on Pesticide Residues.

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