CODEX ALIMENTARIUS COMMISSION

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Food and Agriculture Organization of the United Nations

World Health Organization

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JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX ALIMENTARIUS COMMISSION

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INFORMATION ON ACTIVITIES OF THE JOINT FAO/IAEA DIVISION OF NUCLEAR TECHNIQUES IN FOOD AND AGRICULTURE[1]

1. The Joint Food and Agriculture Organization of the United Nations (FAO) and International Atomic Energy Agency (IAEA) Division of Nuclear Techniques in Food and Agriculture (the "Joint FAO/IAEA Division") supports and implements activities related to the improvement of food safety and control systems. Its activities are therefore closely related to the work of the Codex Alimentarius Commission (CAC).

2. Through its Food and Environmental Protection Section and Laboratory, the Joint FAO/IAEA Division assists member countries of both FAO and IAEA in the peaceful application of nuclear techniques and related technologies for food quality, safety and control. Activities of interest to the CAC include the detection and control of various chemical residues and contaminants in food; food authenticity and analytical support for food traceability; food related radiation safety standards; preparedness and response to nuclear and radiological emergencies affecting food and agriculture; and food irradiation. These activities are carried out within the broad context of coordinating and supporting research worldwide; providing technical and advisory services; providing applied research, laboratory support and training through the FAO/IAEA Agriculture & Biotechnology Laboratories situated at Seibersdorf, Austria; and collecting, analysing and disseminating information for the effective transfer of skills and technology. The Joint FAO/IAEA Division also provides technical support for national, regional and interregional development work through IAEA's technical cooperation projects (TCPs).

Coordinated Research Activities

3. The Joint FAO/IAEA Division implements strategic research through coordinated research projects (CRPs) involving research institutes in both developing and developed countries. In the period covered by this report the Joint FAO/IAEA Division has been implementing five CRPs in the field of food and environmental protection. Most of these research projects result in analytical methods and procedures that enable countries to adhere to Codex food safety standards and provide quality assured data that can contribute to the development of future standards through the Codex mechanism.

4. Two CRPs focusing on food authenticity are currently in progress and a new CRP on authenticity testing for high/added value products is in the planning phase. The CRP on "Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety" (D52038), will be completed in late 2018. Its main objective is to develop a system for verifying the claimed origin of dairy products using stable isotope and trace element (SITE) profiling. This approach, as developed for dairy products, will be used as a template that can be applied to other food commodities. The project involves institutes in Argentina, Austria, Bangladesh, China, Italy, Lithuania, Morocco, New Zealand, Poland, the Russian Federation, Singapore, Slovakia, Sri Lanka, the United Kingdom and the United States of America. The participants have developed 11 sample preparation protocols (for milk, butter and cheese) and 7 analysis protocols using SITE profiling. A joint publication from the consortium on the validation of multi-element measurements on a common IAEA milk powder reference material (IAEA-153) is in press.

[1] This document was prepared by, and under the responsibility of, the Joint FAO/IAEA Division (please see http://www-naweb.iaea.org/nafa/index.html for additional details).

5. The CRP on "Field-Deployable Analytical Methods to Assess the Authenticity, Safety and Quality of Food" (D52040) is a collaboration between the Joint FAO/IAEA Division and the IAEA Division of Physical and Chemical Sciences, focusing on the exploitation of portable atomic and molecular spectroscopic screening technologies for front-line food fraud detection. The project has 14 participating institutes in 13 countries; Austria, Belgium, China, India, Malaysia, Morocco, the Russian Federation, Singapore, Sri Lanka Sweden, Uganda, the United Kingdom and the United States of America. Currently the project is implementing an inter-laboratory comparison exercise with 20 institutes worldwide, using a pocket-size near-infrared sensor to test the authenticity of oregano herb.

6. A consultants' meeting was held in May 2018 at IAEA Headquarters in Vienna, Austria, to develop a proposal for funding for a new CRP on the implementation of nuclear and related techniques to confirm the authenticity of foods with high value production chains and high value food property labelling claims. This is extremely important to member countries for foods that claim to comply with various agricultural, religious, ethical and nutraceutical labelling specifications that add value to the products[2].

7. Two CRPs are currently active in the field of the control of residues and contaminants in food. The first of these (designated D52039) focuses on residues/contaminants in aquaculture products and seafood, and involves participants from food safety and research institutions in Argentina, Belgium, Brazil, Cameroon, Canada, China, Ecuador, the Lao People's Democratic Republic, Lebanon, the Netherlands, Nigeria, Singapore, South Africa, Turkey, Uganda and United States of America. The 3rd Research Coordination Meeting was held from 30 May to 6 June 2018 in Pretoria, South Africa, in conjunction with an African food safety workshop. Amongst other outputs, participants in this research group have developed 15 analytical methods that were shared at the workshop and in the FAO/IAEA Food Contaminant and Residue Information System (FCRIS)[3] database.

8. The CRP "Integrated Radiometric and Complementary Techniques for Mixed Contaminants and Residues in Foods" (D52041), has participating research and regulatory institutions in Benin, Botswana, China, Colombia, Ecuador, Italy, the Netherlands, Nicaragua, Pakistan, Papua New Guinea, Peru, South Africa, Spain, the former Yugoslav Republic of Macedonia, Uganda and the United States of America. The research work will generate multi-class analytical methods and support systematic programmes for measuring mixtures of contaminants and residues. The overall aim is to leverage the advantages of nuclear, isotopic and complementary techniques to strengthen the capacity of analytical laboratories in member countries and therefore enhance national contaminant and residue monitoring programs. The outputs of this CRP are relevant to the work of the Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF), the Codex Committee on Pesticide Residues (CCPR), the Codex Committee on Contaminants in Foods (CCCF) and the Codex Committee on Methods of Analysis and Sampling (CCMAS).

9. One CRP on food irradiation is ongoing: "Development of Electron Beam and X-ray Applications for Food Irradiation" (D61024). The objective is to enhance capacity in member countries to irradiate foods using electrically generated ionizing radiation. The CRP has 16 participating institutions from 13 countries (China, Egypt, France, Indonesia, Japan, the Republic of Korea, Pakistan, Poland, Portugal, the Syrian Arab Republic, Thailand, the United States of America and Viet Nam). The project will accelerate research and development to facilitate implementation of practical techniques using electron beams (EBs) and X-rays to unlock the potential of machine sources for irradiation treatment of agricultural and food products. Outputs will include new concepts for machine source food irradiation that can be easily integrated into existing food processing lines; novel pre-packaged foods with improved safety and convenience through the use of EB or X-ray irradiation; data on the lethality of electronic irradiation against food-borne microorganisms, to support the treatment of food using EB and X-ray irradiation at low energies (i.e. below 300 keV) as well as surface irradiation techniques; the development of accurate and reliable dosimetry methods and tools for EB and X-ray machines that operate at low energies; and an evaluation of the pros and cons of the three technological options (gamma, EB and X-ray) for irradiating a range of food products.

Technical Cooperation

10. The Joint FAO/IAEA Division provided technical support to 49 IAEA TCPs in food safety and control in 2017, including 38 national, 10 regional and one inter-regional project. For the 2018-19 biennium, 26 new TCPs have commenced. With the successful or imminent completion of 17 of these projects, the Joint FAO/IAEA Division currently supports 58 TCPs in food safety and control.

[2] See the publication entitled *Strengthening sustainable food systems through geographical indications - An analysis of economic impacts* (Food and Agriculture Organization of the United Nations, Rome, 2018; ISBN 978-92-5-130389-4), which is available online at: http://www.fao.org/publications/card/en/c/I8737EN/.
[3] See http://nucleus.iaea.org/fcris/.

11. The Joint FAO/IAEA Division continues to promote the formation of sustainable regional food safety laboratory networks as a mechanism to enhance capacity building and food control capabilities. Regional food safety networks include the Latin American and Caribbean Analytical Network (RALACA), comprised of 54 laboratories in 21 countries in the Latin America and the Caribbean region; the African Food Safety Network (AFoSaN) of 66 laboratories in 33 countries, and the Food Safety Asia (FSA) network involving laboratories in 18 countries in the Asia/Pacific region.

12. Working with these networks has facilitated technology transfer through group training on analytical methods and techniques for food safety and control, enabling the Joint FAO/IAEA Division to provide training to more than 1200 food specialists in 2017. Complementary activities such as interlaboratory comparisons and proficiency testing have also been supported.

13. An interregional project, which provides the opportunity to forge links between these regional networks, has enhanced the interaction of a number of countries with Codex, complementing the Codex Trust Fund in supporting their participation in various Codex Committee meetings and contributing to the setting of international standards.

14. A recent example of a training activity is an African Food Safety Workshop to promote standards, reliable methods of analysis and inter-institutional cooperation, which was held in Pretoria, South Africa, 4–8 June 2018. The workshop was organized by the Joint FAO/IAEA Division in cooperation with the FAO Regional Office for Africa, the National Metrology Institute of South Africa and other stakeholders. Themes included the analysis of veterinary drug and pesticide residues, mycotoxins and related contaminants, and a food fraud and authenticity awareness-raising seminar sponsored by the European Framework 7 “FoodIntegrity” project. The workshop attracted interest from Asia, Canada, the European Union, Latin America and the United States of America.

15. During the period of this report, more than 15 other regional and national training courses and workshops were held in various countries, including Chile, Colombia, Costa Rica, Morocco, Panama, Singapore and Zambia. Subject matters included various aspects of sampling, screening and confirmatory methodology for the analysis of veterinary drug and pesticide residues, mycotoxins, heavy metals, radionuclides and emerging contaminants, as well as data quality and laboratory accreditation.

16. Capacity building to meet Codex standards is also supported through the Joint FAO/IAEA Division’s Food Contaminant and Residue Information System (FCRIS, http://nucleus.iaea.org/fcris/), which provides useful data on food contaminants and residues. FCRIS includes analytical method databases, continually updated with input from our laboratory networks, collaborating centres and member country laboratories, as well as methods from the Joint FAO/IAEA Division’s Food and Environmental Protection Laboratory. The methods databases for veterinary drug residues and pesticide residues were developed in response to request from CCRVDF and CCPR.

17. The Joint FAO/IAEA Division also provided technical support on antimicrobial residue monitoring in South-East Asia as part of the World Health Organization (WHO)-led Global Action Plan on Antimicrobial Resistance and the FAO Action Plan on Antimicrobial Resistance[4], during a technical workshop organized by the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand, from 13 to 15 November 2017 on the margins of the World Antibiotic Awareness Week. Twenty participants from Cambodia, Indonesia, the Lao People’s Democratic Republic, the Philippines, Thailand and Viet Nam attended.

18. Support was also provided to other countries, including identification and evaluation of potential reference laboratories that can carry out surveillance of antimicrobial resistance.

International Standards and Publications

19. The Joint FAO/IAEA Division continues to be involved in providing data to the Codex Alimentarius Commission and helping to develop Codex standards. A recent example is its participation in the electronic working group (eWG) on maximum levels for cadmium in chocolate and cocoa products. Joint FAO/IAEA Division counterparts and members of the networks have also contributed to the eWG and discussion paper on maximum level(s) for hydrocyanic acid and mycotoxin contamination in cassava and cassava-based products. The Joint FAO/IAEA Division also contributed to the Codex Committee on Food Import and Export Inspection and Certification Systems (CCFICS) eWG on Food Integrity and Food Authenticity definitions.

[4] See: http://www.fao.org/3/a-i5996e.pdf.

20. Regarding preparedness and response to nuclear and radiological emergencies affecting food and agriculture, an IAEA Emergency Preparedness and Response Series publication entitled *Operational Intervention Levels for Reactor Emergencies and Methodology for Their Derivation* was published as document EPR-NPP-OILs 2017 by the IAEA in March 2017[5]. This publication elaborates the methodology for deriving values for operational intervention levels (OILs). In general, OILs give specific values of measured quantities that indicate the need to implement predetermined emergency response actions, including food restrictions. The use of OILs as part of the protection strategy for nuclear and radiological emergencies is required by IAEA Safety Standards and addressed by IAEA General Safety Guides.

21. In November 2017, a new General Safety Guide entitled *Arrangements for the Termination of a Nuclear or Radiological Emergency*[6] was endorsed for publishing as IAEA Safety Guide Series No. GSG-11, with the joint sponsorship of 10 international organizations, including FAO and WHO. This publication provides detailed guidance on lifting and adapting protective measures and other response actions during a nuclear or radiological emergency, including guidance and criteria for adapting and lifting food, milk and drinking water restrictions as an emergency evolves.

22. The emergency preparedness and response guidelines, recommendations and mechanisms were tested in June 2017 through an international emergency exercise. Organized by the authorities in Hungary and colleagues at the IAEA, this exercise had the largest number of participants of any nuclear emergency exercise to date, with organizations in 82 different countries and the involvement of 11 different international organizations. The overall aim was to test responses to a simulated accident at a nuclear power plant. It was a Conventions Exercise at Level 3 (ConvEx-3), which simulated a significant release of radioactive material into the atmosphere and was based at the Paks Nuclear Power Plant in Hungary. According to agreed procedures, the Joint FAO/IAEA Division represented FAO at the Incident and Emergency Centre in Vienna, Austria, and our main channels of information were to Hungary, colleagues in the IAEA, WHO, World Meteorological Organization and European Commission (Hungary being a member of the European Union). Liaison with WHO was particularly important so that both organizations could coordinate public communications on food and agricultural products.

23. The Food and Environmental Protection Subprogramme's newsletter[7] provides a full list of the technical and scientific publications over the period of this report. These include 9 papers in the peer-reviewed scientific literature, 1 book published (2 additional books in press), 2 book chapters and 6 conference reports.

24. The Joint FAO/IAEA Division is pleased to continue to support, develop and promulgate the standards of the CAC and will continue in its efforts to work with member countries and Codex Committees to enhance food safety, quality and control and, in doing so, help facilitate international food trade.

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[5] See: https://www-pub.iaea.org/books/iaeabooks/11093/operational-intervention-levels-for-reactor-emergencies.
[6] See: https://www-pub.iaea.org/books/iaeabooks/12269/Arrangements-for-the-Termination-of-a-Nuclear-or-Radiological-Emergency.
[7] https://www-pub.iaea.org/books/IAEABooks/12333/Food-and-Environmental-Protection-Newsletter-Vol-21-No-1-January-2018.