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To the Reader

The Food and Environmental Protection Section of the Joint Division and the Agrochemicals Unit of the FAO/IAEA Agriculture and Biotechnology Laboratory in Seibersdorf comprise a subprogramme that provides assistance related to strengthening compliance with food and environmental safety standards through good agricultural and laboratory practices. These activities include cooperation and assistance in the elaboration and application of international standards related to processes, such as the use of irradiation as a sanitary and phytosanitary treatment for food and agricultural commodities, and on guidelines related to contamination, such as guideline levels for radionuclides in foods. Technologies and capacity building in the application of good practices for the management of food and environmental hazards is also an important aspect of our work. Assistance is provided through program activities related to coordination and support in research, providing technical and advisory services, providing laboratory support and training, and collecting, analyzing and disseminating information.

The success of these activities is reflected in part by our recently finalized report on the delivery of outputs and outcomes for 2004-2005. The recent updating of our database on approvals of irradiated foods clearly demonstrated that food irradiation is currently used by almost 60 countries worldwide, which reflects a 15% increase over the previous biennium. Recent data also indicates that there has been a considerable rise in the use of irradiation for phytosanitary purposes and over twenty countries have approved the use of this process for pest control and quarantine purposes.

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The subprogramme has also been successful in the implementation of activities related to the application of technologies and capacity building to improve good production and agricultural practices for the management of food and environmental hazards. Completed technical cooperation projects resulted in the establishment or enhancement of the capacity of seven food safety or environmental monitoring laboratories, three of which achieved accreditation in ISO/IEC 17025. Other technical cooperation projects and workshops/seminars have resulted in trained personnel in analytical methodologies, laboratory quality assurance/quality control, food safety requirements and good agricultural practices. This "train the trainers" approach has also enabled former participants in FAO/IAEA training workshops to initiate training courses in Cambodia, Nigeria, Thailand and Uganda.

Reliable and robust multi-residue methods of analysis for pesticides and for residues of the sulphonamide and macrocyclic lactone classes of veterinary medicines in food have also been made available to our Member States. Data from studies on reduced analytical portions in soil and mycotoxin analysis, which can greatly reduce the cost and environmental impact of these analyses, have also been produced. In addition, a study on the availability of pesticide residues in crops involving thirteen countries was completed and a technical report in support of sampling variability factor was published.

The Food and Environmental Protection subprogramme also welcomes the strengthening of current technical collaboration in inter-agency initiatives, including our activities related to nuclear preparedness and response and the application of agricultural countermeasures. These activities include the recent review and revision of the Joint Radiation Emergency Management Plan of the International Organizations (EPR-JPLAN 2004) and the Cooperative Arrangements (on nuclear emergencies) between IAEA and FAO. It is of paramount importance that these revised cooperative arrangements are finalized before the next full-scale international exercise (ConvEx-3) is held in 2008.

An update on our ongoing collaborative inter-agency efforts with subsidiary bodies of the Codex Alimentarius Commission is highlighted in the *Past Events* section of this Newsletter, including our participation at the 38th Session of the Codex Committee on Pesticide Residues, the 38th Session of the Codex Committee on Food Additives and Contaminants and the 16th Session of the Codex Committee on Residues of Veterinary Drugs in Foods. These activities include the finalization of the Codex Guideline Levels for Radionuclides in Foods Contaminated Following a Nuclear or Radiological Emergency for Use in International Trade as well as the uploading of the list of Codex methods of analysis for pesticide residues into our Food Contaminant and Residue Information System (INFOCRIS).

The future activities of the Food and Environmental Protection subprogramme highlight the importance of trained laboratory staff capable of establishing reliable sampling and analytical regimes for quantifying potential hazards as indispensable aspects of informed decision-making and improved food safety and environmental protection. In this regard, the Food and Environmental Protection Section has been assigned 42 proposed IAEA technical cooperation project concepts from 32 countries for the 2007-2008 biennium covering, among other areas, the use of irradiation for sanitary and phytosanitary purposes and the implementation of quality assurance and quality control procedures in both pesticide and veterinary drug residue laboratories.

The Food and Environmental Protection subprogramme has also initiated a coordinated research project (CRP) on *Integrated Analytical Approaches to Assess Indicators of the Effectiveness of Pesticide Management Practices at a Catchment Scale*. This CRP integrates risk assessment tools and targeted analytical monitoring as a cost-effective option for developing countries to identify specific water pollutants, their sources and occurrences. Nuclear and related techniques will assist in generating CRP outputs such as harmonized protocols for sampling and analysis of surface water.

In addition, the FAO/IAEA Training and Reference Centre for Food and Pesticide Control of our Seibersdorf Laboratories is organizing a training workshop on *Introduction to Quality Assurance/Quality Control Measures in Pesticide Residue Analytical Laboratories* in Seibersdorf, Austria, from 11 September to 6 October 2006. The workshop is aimed at qualified analysts who are working in laboratories performing official control on behalf of their Governments. The objective is to introduce and discuss in detail the QA/QC principles relevant to pesticide residue analysis. Practical examples and hands-on training will be used to demonstrate the general requirements outlined in ISO/IEC Standard 17025 and the OECD Principles of Good Laboratory Practices (GLP).

In closing, our subprogramme staff offers their heartiest congratulations to Britt Maestroni and the IAEA swimming team for their excellent performance and gold medal win at the recently held UN Inter-Agency Games.

Sincerely,

David H. Byron

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Feature Article

Members of the Food and Environmental Protection Subprogramme staff were invited to participate in a meeting on Risks and Benefits of Pesticides, Vienna, 30 March 2006, organized by the Austrian Agency for Health and Food Safety (AGES). The meeting was attended by officials from Austrian regulatory bodies and control laboratories and comprised presentations by international experts and discussion sessions. The presentations given by Mr. Josef Brodesser and Ms. Britt Maestroni are summarized below.

Pesticides in developing countries and the International Code of Conduct on the Distribution and the Use of Pesticides

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Vector control for disease prevention

Following the discovery of synthetic residual insecticides in the 1940s, large-scale programmes succeeded in bringing many of the important vector-borne diseases under control. By the late 1960s, most vector-borne diseases (except malaria in Africa) were no longer considered of primary public health importance. The result was that control programmes lapsed, resources dwindled, and specialists in vector control disappeared from public health units. Within two decades, many important vector-borne diseases had re-emerged or spread to new areas. The time has come to restore vector control to its key role in the prevention of disease transmission, albeit with an increased emphasis on multiple measures, whether pesticide-based or involving environmental modification, and with a strengthened managerial and operational capacity[1].

The Green Revolution

The "Green Revolution" boosted yields of key cereal crops with high yielding varieties and high inputs of water, fertilizers and pesticides. The techniques introduced to the developing world by the Green Revolution include extensive use of *chemical fertilizers*. Previously, the enhancement of soil conditions had relied only on techniques such as crop rotation, mixing of crops, or organic fertilizers. The major development of the Green Revolution in this field was the use of chemical fertilizers to adjust the soil pH balance and achieve the right levels of all the important chemical compounds needed for the plant to grow.

Irrigation: Although it has been in use in agriculture for thousands of years, the Green Revolution further developed irrigation methods to allow for more efficient irrigation. It was possible to have more than one harvest per year with reduced dependence on monsoon/rainy seasons.

Use of *heavy machinery*: Mechanized harvesters and other machinery were not new to agriculture, but the Green Revolution allowed a drastic reduction in the input of human labour to agriculture by extending the use of machinery to automate every possible agricultural process.

Pesticides and herbicides: The development of chemical pesticides and herbicides (including organochlorine and organophosphate compounds) allowed further improvements in crop yields by allowing for efficient weed control and eradication of insect pests.

Pest control

Pest control is critical to quarantine requirements and to meet market demands. Published estimates of losses for rice, wheat, maize, potatoes, cotton, soybean, barley, and coffee using FAO data for 1988-90 show that pre-harvest losses due to pathogens, animal pests, and weeds were 42%. Post harvest losses were estimated at an additional 10%. Therefore, despite all pest control procedures, *half of annual global food production is lost*[2].

Strong growth is evident in the trade of agricultural products in all regions except North America. Reduction in EU agricultural subsidies may create further opportunities for developed countries to benefit from trade liberalization. But without proper infrastructure and coordination in place to manage pesticides and other input, the rapid growth may lead to crises. Trade in food commodities can increase the spread of pests and diseases.

The initial increases in yield derived from insect pest control were dramatic, and the use of insecticides increased rapidly through the late 1940s. Usage expanded again with the Green Revolution introduction of high-yielding varieties, particularly of maize and rice, during the 1960s. Conservation farming, including no-tillage, enabled herbicides to replace the plough and thus reduce soil erosion and fuel costs.

There is very limited long-term data on the amount of pesticides used globally. US/EPA data show that the total amount of pesticide applied remained constant (or decreased) in terms of weight of active ingredients from 1979–97. One reason is that synthetic pyrethroids, sulphonylureas etc, have typical use rates of g ai/ha (active

[1] http://www.who.int/bulletin/volumes/83/12/942.pdf

[2] http://en.wikipedia.org/wiki/Green_revolution, http://www.fao.org/documents/show_cdr.asp?url_file=//docrep/004/y3557e/y3557e00.htm)

ingredient per hectare) whereas in the 1970s the organophosphates, organotins, carbamates, chlorinated hydrocarbons and triazines were applied at kg ai/ha.

Pesticide market in the USA and worldwide

US pesticide amounts used in both 2000 and 2001 exceeded 1.2 billion pounds, in proportions similar to those of world pesticide use, with a larger portion of total pesticide use as herbicides. US pesticide amounts used accounted for more than 20% of total world pesticide amounts used, more than 25% of world herbicide amounts used, less than 10% of world insecticide amounts used, and approximately 15% and 30% of world fungicides and other pesticide amounts used, respectively[3].

Long-term pesticide sales data are the main global & regional indicators of pesticide use. The market shares of herbicides, insecticides and fungicides have changed slightly over the last 25 years. The most noticeable trend is the reduction in the share of pesticides having high mammalian toxicity (insecticides).

Pesticide sales increased 30% between 2003 and 2004 in the Latin American region. Pesticide sales are projected to increase from US$ 5.4 billion in 2004 to US$ 7.5 billion by 2009. Average annual growth rate for this period is 5% per year. Many of the older, more hazardous, products account for a high proportion of sales in Latin America including 2,4-D, paraquat, methamidophos, methomyl, endosulfan and chlorpyrifos.

While globally fungicides account for 21% of sales, in Latin America they accounted for 35% of sales in 2003 (strobilurin and pyraclostrobin are major contributors). However, as product patents expire, more farmers may be using pesticides without their use necessarily being reflected in the pesticide sales figures. There is a need for Member States to contribute information to the FAO Pesticide Consumption database[4].

According to AGROW analysts, the following three factors contributed to this "spike"[5]:

- Genetically modified organisms (GMOs)
- No tillage
- Pest outbreaks

Genetically modified organisms (GMOs)

In 2004 GM technology was employed by 14 countries (with small areas in a further three). The area under GM crops in 2004 was 13.3 million hectares. The US acreage is the largest, followed by Argentina, Canada, Brazil, China, Paraguay, India, South Africa, Uruguay, Australia, Romania, Mexico, Spain and the Philippines.

In the USA in 2004, herbicide-resistant varieties were expected to constitute 86% of all soybean hectares and 40% of maize. The GM seed market could grow at 8.2% a year, rising from US$ 3,656 million in 2002 to reach US$ 5,776 million in 2007. Growth is expected to remain largely in North America, which currently accounts for 74% of GM seed sales, followed by Latin America and Asia. Expansion is likely to be based largely on glyphosate-resistance and insect-resistance based on the *Bacillus thuringiensis* (Bt) gene. Environmentalists and industry cannot agree on whether the increasing growth in GM crops will increase pesticide use. But there is some evidence that in the short term Bt crops have reduced the use of other insecticides while an increase in herbicide use is associated with the adoption of herbicide-resistant GM crops.

No till agriculture – the herbicide connection

No tillage, or conservation tillage agricultural strategies, which reduce or eliminate ploughing, have been rapidly adopted in Latin America over the last 15 years. In terms of hectares planted, it increased 20 times in Latin America between 1987 and 1997. As a percentage of national cropland, no-tillage has continued to grow, and by 2000 it accounted for 55% of cropland in Paraguay, 45% in Argentina and 39% in Brazil. No-tillage strategies can reduce soil erosion, sediment loading, fuel use, increase carbon sequestration and pesticide residues.

Disease outbreak

An outbreak of Asian soybean rust (*Phakopsora pachyrhizi*) first appeared in Paraguay in 2001 and has spread rapidly. Nearly all soybean growing areas in Brazil were affected where farmers are applying possibly twice in a season, thereby increasing fungicide usage by over sixfold in 2003/2004.

Climate change

Although the impact of climate change operates over a longer time scale the potential impact is profound if the region is unprepared[6]. Dengue, schistosomiasis, and Rift Valley fever are only three examples of major human diseases that may be influenced by global climate change. We can combat all three diseases with environmental sanitation and health education. In spite of these measures, we have not been successful in controlling them and we can expect local and world changes in temperature and rainfall to make their control more difficult[7].

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[3] http://www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf

[4] http://faostat.fao.org/faostat/form?collection=PesticidesConsumption&Domain=Means&servlet=1&hasbulk=0& version=ext&language=EN

[5] Gautam Sirur 2005 Latin American agrochemical growth assessed, Papers presented at IUPAC/CICA-UCR/SFE-MAG Workshop on Crop Protection Chemistry in Latin America, Costa Rica, 14-17 February 2005.

[6] http://www.ciesin.org/docs/001-367/001-367.html

[7] http://ciesin.columbia.edu/docs/004-138/004-138.html

Freeing trade in agriculture

The majority of people in poor countries are farmers, more than 70% of the populations of low income countries live in rural areas, and 97% of their rural populations are engaged in agriculture. Poor farmers generally earn meagre returns. Currently farmers lose about 42% of their crops to pests (weeds, diseases and insects). Without modern technologies crop losses would be nearly 70% of global production. Modern technologies improve the quantity and quality of food for consumers, and they have reduced malnutrition worldwide. Greater agricultural productivity and international trade[8] have made this possible.

Problems of infrastructure in developing countries

Almost half of the world's workers are involved in some way in agricultural production, with the greatest concentration of these in developing countries. While developing countries account for just one third of global pesticide consumption, the vast majority of pesticide poisonings occur in these countries. Studies conducted by the International Labour Organisation (ILO) suggest that pesticide misuse causes 14% of occupational injuries in agriculture and, in some countries, as much as 10% of fatalities.

There is a lack of appropriate pesticide control legislation and lack of a modern pesticides approval/registration procedure and/or inadequate resources to implement and enforce existing schemes, lack of legislation on working conditions and lack of post-registration monitoring of pesticides. Access to acutely toxic (cheaper) pesticides is easy (fish drying, committing suicide/perpetrating terrorist attacks). Faulty equipment, poor-quality products and adulteration render products more hazardous or ineffective and contribute to over dosing.

Problems facing developing countries:

- Lack of capacity (manpower and financial resources) to advise on and enforce national laws, approved codes of conduct.
- Inadequate management and storage of obsolete stocks and used packaging materials.
- Lack of facilities for proper waste management.
- Spray equipment in poor condition, including leaks and blocked nozzles; common use of "informal" application techniques (bucket and brush).
- Lack of washing facilities to shower after spraying and for regular washing of clothes; clothes may be washed in sources of drinking water.
- Reuse of containers for food and drink storage, no facilities for safe disposal.
- Supply problems caused by: repackaging in small containers without labels and instructions; limited range of products, and; quality of pesticide products.
- Lack of baseline and trend pesticide data in food (MRL) and water (MPL).
- Lack of pesticide resistance monitoring data and resistance strategies to prevent over dosing.
- Overlapping mandates and coordination of the necessary technical resources.

Contributing factors:

- Poor information leading to a lack of knowledge about pests and pesticides hazards (scientists, analysts, extension workers, decision makers and applicators).
- Complex label instructions, labels not in local languages, poor literacy and understanding of pesticide hazards.
- Lack of information record keeping at the small enterprise level (e.g. farms) on storage, handling, use of pesticides and disposal of waste pesticides and empty containers.
- Application without protection – farmers and farm workers lack of protective clothing, even if available, climatic conditions make it impossible to wear.
- No training in application procedures or hazard awareness, leading to: mixing with bare hands; combining different products; applying on crops for which a product is not intended (cotton pesticides on vegetables, public health insecticides on dried fish).
- Houses near fields, and non-target crops and biodiversity affected by spray drift.
- Inability to recognize pests, predators and to measure economic losses, thus leading to a "pesticide treadmill" effect when no alternatives are available.
- Difficulties for scientists in developing countries to quickly update their skills and move from a reactive fighting "bush fires" to a proactive prevention focusing on GAP and problems rather than symptoms.

Impact of pesticide resistance[9] and network for global pesticide resistance management is based on a regional structure. Growing problems with pesticide resistance[10]:

- Insects – more than 432 species resistant.
- Weeds[11] – 305 resistant biotypes, 182 species (109 dicots and 73 monocots).
- Fungi – 90 species resistant to 34 fungicides and bactericides (Ogawa et al., 1983).
- Lack of information on new technologies and analytical approaches.

Integrated pest management (IPM) Farmer Field Schools[12] are a solution to these problems.

[8] http://ipn.lexi.net/images/uploaded/-3f48eadfa03b5-agriculture_trade_f2t.pdf

[9] http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/W6437T/w6437t06.htm

[10] Proc. Natl. Acad. Sci. USA. Lewis et al. A total system approach to sustainable pest management. Vol. 94, pp. 12243–12248, November 1997

[11] http://www.weedscience.org/in.asp

[12] http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/006/ad487e/ad487e00.htm

Code of conduct (CoC) on the distribution and use of pesticides

The CoC serves as a point of reference for sound pesticide management practices, in particular for government authorities and the pesticide industry. It addresses:

- International organizations.
- Governments of exporting and importing countries.
- The pesticide industry, the application equipment industry.
- Traders, the food industry, users.
- Public sector organizations such as environmental groups, consumer groups, and trade unions.

The CoC emphasizes the shared responsibility of the many sectors of society and, in particular, the need for co-operative efforts between governments of pesticide importing and exporting countries to promote practices that minimize potential health and environmental risks associated with pesticides while ensuring their effective use. It aims to represent an up-to-date standard for pesticide management, focusing on risk reduction, protection of human and environmental health, and support for sustainable agricultural development by using pesticides in an effective manner and applying integrated pest management (IPM) strategies.

Way forward

Integrated pesticide management:

- Employing synergies between agriculture, profitability, conservation of natural resources and environmental protection.
- Applying multi-disciplinary team approaches requires a new way of working and learning together.

Addressing barriers:

- Environmental costs (correct pricing signals and exchange rates).
- Infrastructure deficiencies.
- Information deficiencies.

Knowing where and when to intervene:

- Catchment location / Environmental change / Land transformation / Critical zones / Hotspots / Flash-points / Fire points.

Why at catchment scale:

- Defines policies and regulations at national/ regional levels.
- Prevents costly national and regional disasters.
- Facilitates a “complete” water/contaminant balance, with possibility to scale up and down.
- Incorporates benefits and cost of interventions.
- Focuses scarce resources on the problems and not their symptoms.

How far have we come?

In the highly interrelated, interdependent world of modern technology and trade, the challenge of protecting crops and livestock from insects, diseases, weeds and other pests without hazards to humans, animals or their environment requires the combined and sustained efforts of scientists, technicians and administrators; producers, processors and distributors; industry and government; and of nations working together to establish and administer sound, acceptable standards of food safety and environmental quality (FAO 1985).

Where are we going?

- Markets and infrastructure are the best way to improve food security, improve consumer choice and enhance fair trade practices.
- An integrated approach to the management of land, water and external inputs, when fully developed, has the potential to value add to commodity trade and foster the adoption of GAP and agribusiness from farm-to-fork.
- Implementation requires education, capacity building and multidisciplinary teams to address barriers.
- Success depends on knowing where and when to intervene and the learning lessons identified from good and bad case studies.

Integrated approaches to assess indicators of the effectiveness of pesticide management practices: Challenges and opportunities for developing countries

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Background

Agriculture is a dominant component of the global economy, and the pressure to produce enough food for the world’s ever growing population has had a worldwide impact on agricultural practices and the environment. The challenge of securing a sufficient food supply was highlighted in Agenda 21 of the United Nations Conference on Environment and Development in 1992. As a result, the use of fertilizers and pesticides has steadily increased over the years to ensure and sustain high crop yields.

One challenge for developing countries is to evaluate the impact of the application of Good Agricultural Practices (GAP), including the identification and use of environmental indicators in, for example, water and soil. Water is the primary pathway by which pesticides are transported from their site of application to groundwater, streams, rivers, lakes, reservoirs, and oceans.

The economic, social, environmental and public health implications of decreasing water quality are a worldwide threat. Surface waters not only supply a large amount of drinking water to populations, they are also vital for aquatic ecosystems that provide important environmental and economic benefits. Fresh water is predicted to become the principal limitation for sustainable development within this century[13].

Preventing and controlling pollution of water resources, both surface and groundwater, is a government function that has lead to the adoption of a variety of legislative approaches[14].

Legislation has mainly dealt with the control of "point source" pollution, i.e., pollution that can be tracked to a specific entry point, such as industrial discharges, domestic sewage or municipal wastewater effluents or treatment plants.

Reduction of "non-point source" pollution, on the other hand, can be achieved economically through the application of precautionary measures, including GAP, and through adherence to national requirements on the safe use of pesticides in the field.

The new role of the analytical laboratory

The analysis made by Jill E. Hobbs in her paper on "Incentives and disincentives for the adoption of good agricultural practices (GAP)"[15] highlighted that one of the disincentives for farmers to adopt GAP is the lack of an adequate institutional infrastructure. For example, one of the current GAP systems (EUREPGAP) requires evidence of residue testing through national government laboratories accredited on the basis of a laboratory quality standard, such as ISO 17025, as well as traceability requirements related to the farm on which the product was grown. It also requires that farmers can access at any time the necessary institutional infrastructure to verify the input quality, output quality and source of the agricultural commodity. According to Hobbs, poor farmers, especially those in developing countries, may not have access to these types of services.

The role of the analytical laboratory is now being perceived as a critical point that needs to be addressed to create institutional infrastructures and reference points for farmers. Quality monitoring and certification could become a complementary activity to residue analysis currently carried out by laboratories, since certification involves the interpretation and extension of analytical results to whole lots or production batches. It is also often the case that in developing countries knowledge on the application of quality assurance systems is normally within the laboratories. The evidence provided by the laboratory of true product quality can help ensure the integrity of products according to GAP and add economic value for farmers. The analytical laboratory can also play a key role in strengthening IPM through monitoring of environmental indicators, which would lead to improved applications of GAP. With reference to fresh fruits and vegetables, animals and animal products, in some developing countries a possibility exists for establishing direct farmer support through farmer field schools (FFS), which is a technique used by the Global Integrated Pest Management (IPM) facility under the World Bank, FAO, UNDP and UNEP.

Membership of FAO is confined to nations; associate membership to territories or groups of territories. The European Union is a member as a regional economic integration organization and can vote on behalf of its Member States in certain matters.

UNEP and FAO started developing and promoting voluntary information exchange programmes in the mid-1980s. UNEP established the London Guidelines for the Exchange of Information on Chemicals in International Trade in 1987. In 1989, the UNEP and FAO jointly introduced the voluntary Prior Informed Consent (PIC) procedure, to help to ensure that governments had the necessary information to assess the risks of hazardous chemicals and to take informed decisions on their future import.

Annex III of the Rotterdam Convention lists hazardous pesticides and certain pesticide formulations, but also asbestos and industrial chemicals which are concerned under the convention.

Effective analytical monitoring of environmental indicators

To monitor environmental indicators, such as pollution in water and particulates/sediments, requires quality data since one can only base management decisions on reliable and scientifically sound measurements. Effective monitoring schemes are necessary to identify specific pollutants, their sources and occurrences, to develop preventive measures, and to assess the efficacy of corrective actions. Developing countries face many problems in establishing appropriate monitoring schemes to evaluate surface/ground water pollution by pesticides, and in producing valid analytical results.

With respect to contaminants in water, the US Geological Survey (USGS)[16] stated that "there is the need for long-term monitoring studies which include a larger number of pesticides and their transformation products". The major difficulty, as pointed out by Ongley (1994)[17] is that "a common observation amongst water quality professionals is that many water quality programmes, especially in developing countries, collect the wrong parameters, from the wrong places, using the wrong substrates and at inap-

[13] FAO Irrigation and Drainage Paper Nr 55, D.Ongley, 1996.

[14] FAO Legislative Study paper Nr 80, S.Burchi and A. D'Andrea, 2003

[15] J. Hobbs, " Incentives for the adoption of good agricultural practices", Background paper for the FAO consultation on Good Agricultural Practices, Rome, November 10-12 2003

[16] USGC web page: http://ca.water.usgs.gov/pnsp/rep/fs97039/index.html

[17] E.D. Ongley, Global water pollution: challenges and opportunities, Pub. 3, Stockholm Water symposium, 10-14 Aug. 1993, Stockholm, Sweden, pp.23-30, 1994.

propriate sampling frequencies, and produce data that are often quite unreliable".

The tools available for the laboratory

The Commonwealth Scientific and Industrial Research Organization (CSIRO - Australia), with initial funding from IAEA, developed a "Pesticide Impact Ranking Index" (PIRI) software package to rank pesticides in terms of their relative pollution potential to soils, ground and surface water, and to compare different cropping systems in catchment areas in terms of their relative impact on water quality. The PIRI software can use generic pesticide sorption/degradation data and process pesticide-use data to provide a first-tier assessment of the pollution risks to surface and groundwater. The expansion of the scope of the PIRI software will require laboratories to obtain and calibrate the PIRI risk assessments with water monitoring data. The scope of the software could be expanded if laboratories could provide local soil-pesticide sorption/degradation parameters and water monitoring data to update the PIRI risk assessments

LabPal[18] is a database that manages laboratory information and processing of samples. The system does not log raw information from instruments but is a powerful tool to simplify compliance with analytical quality management standards. LabPal is based on the Drupal Open Source Content Management System. Another open source tool for laboratories is the FAO/IAEA eLearning system[19] based on a-Tutor. A survey commissioned by the Commonwealth of Learning concluded that a-Tutor took best advantage of new LAMP open source technology (Apache, PHP, mySQL) and SCORM standards for exchange of content[20]. Experience gained since the February 2005 launch of the eLearning system in Costa Rica confirms the value of eLearning in accelerating capacity building. The FAO/IAEA eLearning system draws on an integrated set of databases, including the FAO/IAEA International Food Contaminant and Residue Information System (INFOCRIS[21]), which is being used by IUPAC to improve global availability of information on agrochemicals[22].

Laboratory outputs

Developing countries should ensure the safe use of agrochemicals to provide an adequate and safe food supply whilst ensuring environmental sustainability under the agricultural production system applied. This will require pesticide registration and post-registration monitoring to produce evidence of the application of Good Agricultural Practices, including well documented pesticide application records and access to agricultural extension services or crop manuals[23].

The analytical laboratory can provide first-tier pesticide impact ranking and targeted analytical monitoring as a cost-effective option for developing countries to identify specific water pollutants, their sources and occurrences.

LabPal and harmonized protocols for sampling and analysis of surface water will aid the implementation of analytical quality management. Georeferenced data, guidelines, and access to eLearning courses will accelerate capacity building and lead to three major outcomes: (1) cost-effective and sustainable catchment targeted monitoring schemes for surface water; (2) mechanisms to feed back the results of laboratory analysis to the primary producers through community/extension services; and (3) information exchange on harmonized analytical methods and water monitoring schemes to improve pesticide management practices and the production of safe food.

Meeting regulatory and market expectations

Knowledge on analytical quality management should be used to establish transparent and sound business plans for sustainable laboratory based monitoring schemes. Recently two options have become available to render pesticide monitoring sustainable at the laboratory level: one uses a pesticide surcharge, set in the national legislation with support from national agrochemical associations. This serves as a mechanism to obtain funding for training, IPM and pesticide monitoring. The second option deals with generating funds by charging for analytical services and adding value to products through the application of GAP. Success depends upon the involvement of rural credit officers as stakeholders in the farm-to-fork approach, and ensuring that small producers have relevant information regarding the possibilities for production according to GAP. Ideally, this could lead to a mechanism (e.g. a recognized label) to add value to the crops produced according to the GAP and sustainable development strategy. Farmers would receive economic benefits by enabling them to trade their products internationally and by adding value to their commodities. As an example of economic incentives for farmers, "fair trade" initiatives have been launched in a number of developing countries and are receiving growing support from consumers. Advantages in the use of integrated approaches to assess indicators of the effectiveness of area-wide pesticide management practices[24], or in other words in well-maintained farm-to-market routes, include not only expanded market opportunities for cash crops but also enhanced ecotourism.

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[18] LabPal was developed by the IAEA Animal Production & Health and Plant Breeding subprogrammes but is now being adapted for use by the Agrochemicals Unit and residue laboratories.

[19] http://elearning.iaea.org/

[20] http://www.col.org/Consultancies/03LMSOpenSource.pdf

[21] http://www-infocris.iaea.org/

[22] http://www.iupac.org/projects/2001/2001-022-1-600.html

[23] http://www-infocris.iaea.org/en/w3.exe$ShowRef?Ref=3362

[24] This could include sterile insect technique to control the major multi-host pests and near real-time soil water monitoring to optimise crop water-use efficiency and minimize pest/pesticide problems.

Forthcoming Events

Workshop on Certification of Irradiation as a Phytosanitary Treatment for Fresh Fruits and Vegetables; 14-16 June 2006; Bangkok, Thailand

Technical Officer: Tatiana Rubio-Cabello

Under the IAEA Technical Cooperation project entitled "Application of Food Irradiation for Sanitary and Phytosanitary Certification", the Food and Environmental Protection Section in conjunction with the Thailand Department of Agriculture (DOA) and National Plant Protection Organization (NPPO) are organizing a Workshop on Certification of Irradiation as a Phytosanitary Treatment for Fresh Fruits and Vegetables at the Maruay Garden Hotel in Bangkok, 14-16 June 2006.

The objectives of the Workshop are:

1) To analyze several key activities of the NPPO responsible as certifying authorities for irradiated fresh fruit and vegetables for export.

2) To inform, stipulate and assist Thailand NPPO officers (plant quarantine officer), owners of irradiation facilities, stakeholders [involved in utilizing irradiation as a sanitary and phytosanitary treatment for food and agricultural commodities (e.g. industrial irradiators, fruit and vegetables exporters and importers)] and related organizations to work out a set of recommendations as specified in the International Standards for Phytosanitary Measures Number 18, "Guidelines for the Use of Irradiation as a Phytosanitary Measure".

3) To strengthen capacity building of the plant quarantine officers from NPPO in their responsibility for the phytosanitary aspects of evaluation and verification systems, certification systems, management systems and safeguards.

It is expected that approximately 20 participants will attend this Workshop. The participants will be researchers/officers from relevant organizations, stakeholders interested and/or participation in irradiation as phytosanitary treatment in food and agricultural commodities.

11th IUPAC International Congress of Pesticide Chemistry; 6-11 August 2006, Kobe, Japan

Technical Officer: Ian G. Ferris

The Congress will be held in Kobe, Japan, 6–11 August 2006. The theme "Evolution for Crop Protection, Public Health, and Environmental Safety," aims to bring together scientists who study chemistry, biology, and environmental health issues to present technical achievements and exchange opinions about pesticide chemistry and bioscience. Keynote addresses and plenary lectures will give an overview of emerging agriculture, agrochemicals, and environmental health issues from different perspectives. Session lectures and posters will provide an update on topics of current scientific interest. Finally, the luncheon and evening seminars will provide a discussion platform to help participants understand the issues affecting agriculture, environmental, food safety, and corresponding regulations. For more details visit (http://www.iupac2006.jtbcom.co.jp/).

IAEA/FAO/IUPAC Workshop on Pesticide Management Practices and Enhancing Laboratory Capacity; 14-16 August 2006, Jeonbuk-Do, Rep. of Korea

Technical Officer: Ian G. Ferris

The second regional workshop on the theme of accelerated capacity building for pesticide management will take place in Jeonbuk-Do, Republic of Korea, 14-16 August 2006. The Asia and Pacific workshop aims to build up regional expertise on pesticide analysis and management that improve the sustainability of laboratory operations and feedback results to stakeholders. Presentations will be made by IUPAC and other experts while participants will give a country situation report on the status of pesticides and good agricultural practice.

The workshop and related eLearning materials will be provided free of charge by FAO and IAEA. The accommodation, living expenses and the travel cost of the participants shall be borne by the nominating participants. Limited funds are available to support participants from least developed countries. For further information visit http://elearning.iaea.org/ATutor/bounce.php?course=70 as user "student" password "student".

Workshop on New Trends on Food Irradiation; 17-18 August 2006, Daejong, Rep. of Korea

Technical Officer: Tatiana Rubio-Cabello

The Food and Environmental Protection Section will be organizing a National Workshop on "New Trends on Food Irradiation" in conjunction with the Korea Atomic Energy Research Institute (KAERI) this autumn.

Training Workshop on QA/QC Measures in Pesticide Residue Analytical Laboratories, Seibersdorf, Austria; 11 September-6 October 2006

Technical Officers: A. Cannavan & B. Maestroni

This training workshop will take place at the FAO/IAEA Training and Reference Centre for Food and Pesticide Control at Seibersdorf, Austria, 11 September-6 October 2006. The workshop is aimed at qualified analysts who are working in laboratories performing official control on behalf of their Governments. The objective is to introduce and discuss in detail the Quality Assurance/Quality Control (QA/QC) principles relevant to pesticide residue analysis. Practical examples and hands-on training will be used to demonstrate the general principles outlined in ISO guide 17025 and OECD GLP guidelines. Detailed information is available on our website. The closing date for nominations is now past and the participants for the workshop have been selected, so no new nominations will be considered. Readers may be interested in the eLearning modules on pesticide residue analysis, pesticide management and laboratory prerequisites which candidates are recommended to study before participating in the workshop (http://elearning.iaea.org/aTutor/login.php). For more information, contact Andrew Cannavan or Britt Maestroni (Official.mail@iaea.org).

Saskatoon International Workshop: Regulatory Analysis of Residues in Foods

Proposed dates: June 3-7, 2007
(or June 10-14 to avoid overlap with ASMS)

Venue: Saskatoon, Canada

Scientific Committee:
Dr. Joe Boison (Canada); Dr. Wolfgang Korth (Australia); Dr. Andrew Cannavan (IAEA); Dr. Jack Kay (United Kingdom); Dr. Adriana Fernandez-Suarez (Argentina); Dr. Jim MacNeil (Canada) Dr. Leen van Ginkel (Netherlands); Prof. Carlos van Peteghem (Belgium); Ms. Valerie Reeves (United States of America)

Purpose: The meeting is intended to discuss validation of analytical methods used in residue control programmes and the subsequent use/acceptance of the results if challenged by producers or courts of law. Associated regulatory issues, such as residue program design and sampling, will also be considered. The primary focus is on veterinary drug residues in foods, but related residue control issues will be considered for inclusion.

Target audience: Analysts and regulators.

Major topics: Program Design - Risk analysis, Risk Management; Quality Management of Residue Control Program; Sampling Issues and Strategies; Current International Initiatives; Development and Validation of Analytical Methods; New Analytical Methods.

Format: Each session will have a theme with an invited key speaker and selected presenting speakers, supplemented by posters. Papers for oral presentation will be selected from the submitted abstracts by the scientific committee to provide a range of perspectives to complement the keynote presentation for each session, while remaining abstracts will be assigned as posters to facilitate small group discussions. Each technical session will include an open discussion to explore the topics presented.

Registration: The registration fee will be structured to include the cost of attendance at technical sessions, an opening reception, breakfast and lunch on the 3 days of technical sessions and a conference dinner, plus hotel for the nights of June 3-6. June 7 will be available for laboratory tours or travel. A reduced registration will be available for accompanying persons who will include the opening reception and the conference dinner.

Travel: Saskatoon International Airport is served by two international carriers, Air Canada (Star Alliance), with international connections via Toronto, Calgary and Vancouver, and Northwest Airlines (Skyteam Alliance) with twice daily connections via Minneapolis. A domestic airline, WestJet, provides service from most cities in Canada.

Past Events

International Expert Appraisal on the Application of International Radiation Protection Standards for Members of the Public in the Area of the Ezeiza Atomic Centre; 4-9 December 2005, Buenos Aires, Argentina

Technical Officer: David H. Byron

The report of the International Expert Appraisal (IEA) on the Application of International Radiation Protection Standards for Members of the Public in the Area of the Ezeiza Atomic Centre describes the background information, development and conclusions of an appraisal of the radiological protection of the population surrounding the Ezeiza Atomic Centre (CAE) located in Buenos Aires province, Argentina. The IEA was carried out by relevant organizations in the United Nations system and competent non-governmental international professional organizations following a request of the Government of Argentina. The International Atomic Energy Agency (IAEA) organized the IEA in accordance with the functions established in Article III.A.6 of the IAEA Statute, namely to provide for the application of its international safety standards for radiation protection of the public and the environment.

On the basis of the request of the IEA stipulated by the Argentine Federal Judicial Authority to the Nuclear Regulatory Authority in its note dated 18 May 2005, the IEA adopted the following objectives:

- To determine whether there is any contamination due to the presence of radioactive elements in the topsoil, in the under-soil in the surface waters and groundwater, or in the air, in the area encompassing the districts of Ezeiza, Esterban Echeverria and La Matanza in the province of Buenos Aires, Republic of Argentina, in such a way that a health hazard has been generated and, if so, the nature of the hazard caused.
- To verify whether the water for consumption (human and/or industrial) supplied to the population of the aforementioned localities has been contaminated with radioactive elements and thereby rendered harmful to health.
- If contamination is present, to determine whether it could be attributed to activities that have been and/or are being carried out on the site of the Ezeiza Atomic Centre and whether they have been carried out in such a way as to have generated a health risk. In the event that contamination under the given circumstances is detected and it cannot be attributed to the activities at the atomic centre, its origin should be investigated.
- To evaluate the work done by Argentina's Nuclear Regulatory Authority, in relation to the case in question, as regards the international best practices in protection from exposure to ionizing radiation and the current international safety standards.

With reference to the above objectives, the IEA concluded with a high degree of confidence that:

- There is no anthropogenic (i.e. human made) contamination with radioactive elements in the topsoil, or in the under-soil, or in the surface waters and groundwater used for drinking water supply in the area encompassing the districts of Ezeiza, Esteban Echeverria and La Matanza of the province of Buenos Aires, Argentina. In particular, there is no presence of either enriched uranium or depleted uranium.
- Natural uranium is present in the Puelche aquifer as a result of natural geochemical processes.
- The measured levels of radioactivity of the groundwater meet the international radiation protection standards and therefore do not represent a radiological hazard to human health.
- The water for consumption supplied to the population of the aforementioned localities does not contain radioactive elements at levels that would cause harm to human health.
- In view of the results of water sampling measurements, no adverse health effects due to exposure to ionizing radiation are expected. Health statistics data are in support of this.
- As there is no anthropogenic contamination with radioactive elements, no such contamination could be attributed to activities that have been and/or are being carried out on the site of the Ezeiza Atomic Centre.
- The Argentinian Nuclear Regulatory Authority is adequately regulating the activities of the Ezeiza Atomic Centre.

The full report of the appraisal is available at http://www-ns.iaea.org/downloads/rw/fileshare/rts/default.asp?fd=97.

FAO/WHO Meeting on Enhancing Developing Country Participation in Scientific Advice Activities; Belgrade, Serbia, 12-15 December 2005

Technical Officer: Josef Brodesser

The meeting, with the participation of 21 international and national experts, was convened by FAO and WHO. The background of the meeting was that new approaches to enhance the availability of data and expertise from all parts of the world in the preparation of FAO/WHO scientific advice were to be explored.

The meeting represented one activity in a series of efforts by FAO/WHO to respond to the request of the Codex Alimentarius Commission to carry out "a review of the status and procedures of the expert bodies in order to improve the quality, quantity and timeliness of scientific advice".

FAO/WHO initiated a consultative review on this matter in 2003. To date, an electronic forum and a workshop were convened to discuss several aspects of the process with a wide number of stakeholders. The Joint FAO/WHO Workshop on the Provision of Scientific Advice to Codex and Member Countries recommended that FAO and WHO should make every effort to achieve full participation of developing countries in the provision of scientific advice.

Specifically, the Meeting endeavoured to identify

- Potential mechanisms to better reach out to qualified experts and institutions in developing countries, including mechanisms to search for information/experts which may not be easily accessible through normal channels, such as peer reviewed journals.
- Suggested plans to strengthen the capacity of experts from developing countries to participate effectively in expert meetings, including training efforts at international and national level, involving governmental, non-governmental and scientific institutions.
- Processes at regional level to generate scientific data from developing countries and facilitate its input to international FAO/WHO scientific advice.

The meeting took place at the facilities of the Institute of Bromatology in Belgrade. The overall program consisted of plenary discussions, presentations of the participants and working group sessions. The participating experts presented papers in their related fields of expertise and experience in relation to the overall topic of the meeting.

A series of recommendations were developed and discussed to improve the situation in favour of improving the contribution of experts from developing countries in international decision-making regarding food safety, harmonization of regulations and improvement and establishment of universal requirements for the quality of data generated. Various proposals towards improving the situation were brought up e.g. how to approach potential experts and how to make them interested in joining the respective programmes, how to generate other than financial incentives for contributions, how to overcome language barriers and obstacles deriving from weak national infrastructures, how to handle situations of missing or weak laboratory data and incomplete quality management systems, etc.

Based on the background documents and the outcome of previous activities and the working group deliberations further recommendations were developed for improving the access of experts to international forums such as Codex to improve the insufficient and unproportional share of experts from many developing countries.

A draft report was elaborated and a comprehensive final report was published and made available on the FAO website (see http://www.fao.org/ag/agn/proscad/index_en.stm).

International Meeting on Radiation Processing (IMRP); 26 February – 3 March 2006; Kuala Lumpur, Malaysia

Technical Officer: David H. Byron

The Joint Division, in collaboration with the IAEA Division of Physical and Chemical Sciences, participated in the International Meeting on Radiation Processing (IMRP) and presented remarks on the Agency's role and activities in support of radiation processing applications for medical, industrial, food and agricultural products.

The IMRP is an important series of meetings covering all the major aspects of radiation processing technology and an ideal forum for source and equipment suppliers, radiation plant service providers, users of the services, academia and researchers. IAEA extended cooperation through the participation of two IAEA officers and partial support for 6 participants from developing countries.

The Joint Division representative made a presentation on their activities related to the use of irradiation for sanitary and phytosanitary purposes, including current elements of the sub-programme related to the reduction of food safety hazards, the use of quarantine measures and the application of international standards through coordinated research project and technical cooperation activities. This also encompassed a discussion of training and education programmes related to the application of, and compliance with, harmonized international standards as well as efforts to enhance consumer acceptance of various applications of the technology. The relationship and collaboration between the Joint Division and other international standardizing bodies (Codex, IPPC) was also highlighted.

The Joint Division representative also chaired the session devoted to food research, which covered the following presentations:

- H.M. Khan, Professor, University of Peshawar, Pakistan: DNA comet assay – a rapid, simple screening technique for unirradiated and irradiated foods.

- S.F. Sabato, Radiation Technology Center, São Paulo, Brazil: Shipping simulation of irradiated papayas.
- Z.I.Koenari, National Nuclear Energy Agency, Jakarta, Indonesia: The role of medium radiation dose on microbiological safety and shelf-life of traditional soups.
- M. Gao, Chinese Academy of Agricultural Sciences, Beijing, China: Overview of food irradiation in China.

Additional information on IMRP 2006 is available at http://www.imrp2006.com/.

TC Latin American Regional Project: Improving the assessment of good agricultural practices at a catchment scale using laboratory analytical support; 27 February – 3 March 2006; Mendoza, Argentina

Technical Officers: Ian G. Ferris & Britt Maestroni

National experts from Argentina, Bolivia, Chile, Costa Rica, Cuba, Ecuador and Uruguay met in Mendoza, Argentina, from February 27 to March 3, 2006 to undertake logical framework training and to formulate a regional project that would strengthen laboratory capacity to assess the implementation of Good Agricultural Practice (GAP). In addition, Colombia provided input via a dedicated website. The workshop provided a unique opportunity to obtain practical experience in logical framework methodology and to review regional pesticide problems along with possible solutions. The participants formulated a regional project proposal that would provide an important step towards building a comprehensive "safety net" to prevent pesticide misuse in Latin America. The proposal redefines the role of the analytical laboratory and identifies new Stakeholders to support the implementation of GAP at a catchment scale. Likely benefits include: increased trade and revenues; improved conditions for farmers and those impacted by pesticide misuse; improved food safety nationally and regionally; improved knowledge on pesticide management practices; and laboratory capacity to support the implementation of GAP.

Meeting of the FAO Nuclear Emergency Crisis Network of Technical Experts (ECN); 22 March 2006; FAO Headquarters, Rome, Italy

Technical Officer: David H. Byron

FAO headquarters works directly with the Joint FAO/IAEA Division in terms of response to a nuclear or radiological emergency. The FAO Special Emergency Programmes Service is the operational focal point for response to these events. In 2005, a Nuclear Emergencies Crisis Network of Technical Experts (ECN) was established with members from 11 units across FAO, representing technical divisions and information specialists with special expertise who can be called upon to provide guidance in the case of an event.

The ECN has been given a mandate to prepare a proposal on the establishment of an Incident Command System (ICS) for responding to nuclear and radiological events. As the ICS provides a structure that can be used flexibly to respond to different types of emergencies, a single system within FAO for response to a range of emergency situations is being developed. Funding from USAID has been made available to initiate development of the system and start training. Funding is also being sought to assist member countries in development of their own preparedness capabilities.

The representative of the Joint Division, in collaboration with a representative of the IAEA Incident and Emergency Centre (IEC), briefed the Meeting of the FAO Nuclear Emergency Crisis Network of Technical Experts (ECN) on the expectations of IAEA from FAO in the event of a nuclear emergency or radiological event, particularly in the application of agricultural countermeasures to mitigate the affects of these incidents. Participants were also informed that the Joint Radiation Emergency Management Plan of the International Organizations (EPR-JPLAN 2004) and the Cooperative Arrangements (on nuclear emergencies) between IAEA and FAO were due for review and in this regard, it was agreed that the ECG (Emergency Coordination Group) would review and revise both the JPLAN and Cooperative Arrangements for transmission to the IAEA/IEC.

Additional information on FAO activities related to preparedness and response to nuclear accidents and radiological events is under http://www.fao.org/reliefoperations/emergency_nuclear_en.asp.

First Session of the Commission on Phytosanitary Measures (CPM); 3-7 April 2006; Rome, Italy

Technical Officer: Tatiana Rubio-Cabello

The Food and Environmental Protection Section presented a statement on activities of the Joint FAO/IAEA Programme related to Phytosanitary Applications of Irradiation under Conference Room Paper 7.

During the Session, the IAEA emphasized that following the approval of ISPM No. 18 (Guidelines on irradiation as a phytosanitary measure) in 2003, the Joint Programme received an increased number of requests to support members states in issues related to irradiation as quarantine treatment. These requests were mainly from countries which are trying to replace methyl bromide (MB) as a phytosanitary treatment. It was also noted that the Joint Programme has seen a need to increase capacity building in these issues.

The IAEA also emphasized the need to include in the CPM work plan for 2006 the development of the Annex 1, ISPM 18, in order to facilitate the international trade of food and commodities which need a phytosanitary treatment. As a result of this intervention, the representatives of 15 countries supported this proposal (Argentina, Bangladesh, Brazil, Chile, Guatemala, India, Jordan, Mexico, Paraguay, Rusia, Sri Lanka, Thailand, Togo, United States and Uruguay) and the subject was included in the CPM work plan for 2006 with a high priority.

Codex Committee on Pesticide Residues (CCPR); 3-8 April 2006, Fortaleza, Brazil

Technical Officer: Josef Brodesser

The 38th CCPR Meeting was held in Fortaleza, Brazil, from 3-8 April 2006. The Food and Environmental Protection Section, together with FAO and WHO, is playing a vital role in assisting Member States in the elaboration of international and Codex standards related to food safety. The finalization of the IAEA initiated draft guideline for applying the Measurement Uncertainty concept, particularly to pesticide residue analysis, was of particular interest within the Working Group on Analytical Methods. The guideline was discussed in great detail and was substantially revised by the Working Group based on various comments provided by several countries. Subsequently the Measurement Uncertainty guideline was forwarded by the CCPR for final adoption by the JOINT FAO/WHO Codex Alimentarius Commission (CAC).

The CCPR meeting report can be downloaded from http://www.codexalimentarius.net/download/report/655/al29_24e.pdf).

Codex Committee on Food Additives and Contaminants; The Hague, The Netherlands, 24-28 April 2006

Technical Officer: David Byron

The Joint Division, in collaboration with the IAEA Division of Radiation and Waste Safety, continues to take the lead in the revision of the current Codex Guideline Levels for Radionuclides in Foods Following Accidental Nuclear Contamination for Use in International Trade (CAC/GL 5-1989).

Most recently, the 38th Session (April 2006) of the Codex Committee on Food Additives and Contaminants (CCFAC) considered revisions to the Codex guideline levels for radionuclides in foods under document CX/FAC 06/38/38, including comments submitted by Canada, Lithuania (subsequently withdrawn), the United States and Venezuela (CX/FAC 06/38/38 – Add. 1), Cuba (Conference Room Document 10) Japan and UNEP (Conference Room Document 22).

As a result of these discussions, the 38th CCFAC agreed (ALINORM 06/29/12, paras. 195 – 198 and Appendix XXXI) to forward the newly-named proposed draft Guideline Levels for Radionuclides in Foods Contaminated Following a Nuclear or Radiological Emergency for Use in International Trade to the 29th Session of the Joint FAO/WHO Codex Alimentarius Commission (Geneva, 3-7 July 2006) for final adoption. The full report of the 38th CCFAC is available at http://www.codexalimentarius.net/download/report/657/al29_12e.pdf.

Compilation of internationally applied residue analytical methods in food on the IAEA/ FEP website

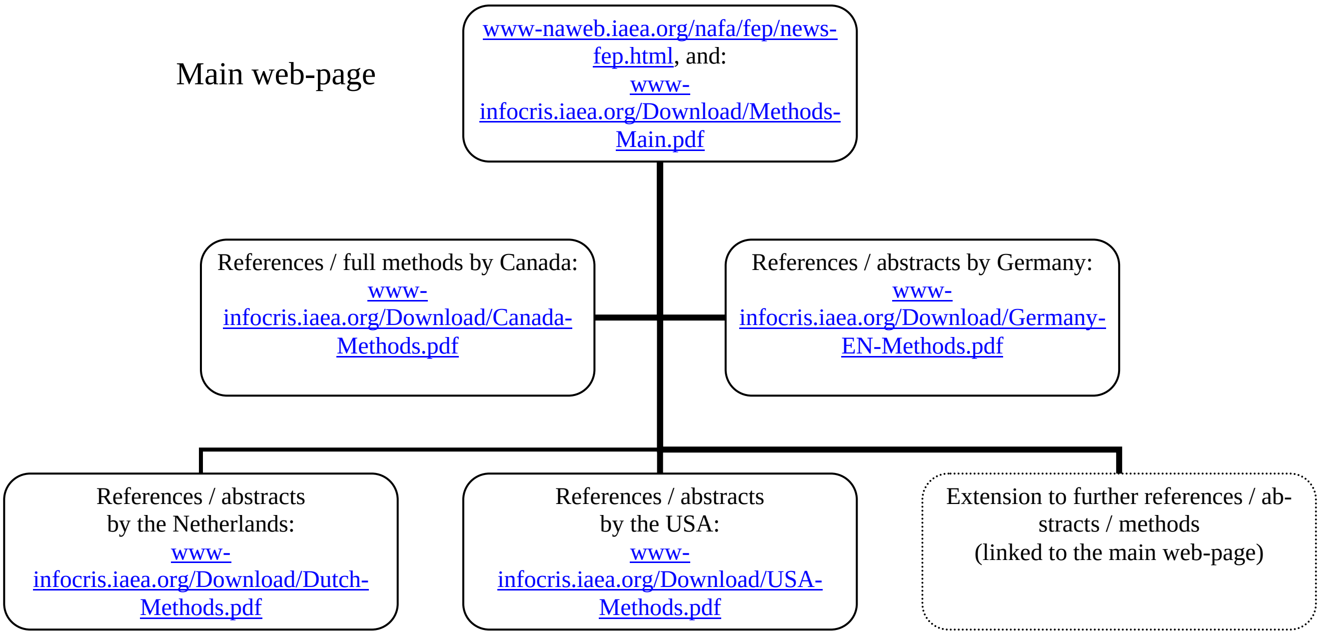
At the 31st Session of the CCPR in 1999, method descriptions were provided by many countries, but it never was formally adopted or compiled to make it accessible on a broad basis. Recent contributions were provided for the 38th CCPR Meeting in CX/PR 06/38/9-Add.1. Analytical methods for the determination of food contaminants available to Codex as submitted were transferred to the IAEA/FEP website to make it universally accessible to interested parties and laboratories. These methods can be accessed on the IAEA website: http://www-naweb.iaea.org/nafa/fep/Methods-Main.pdf. It was agreed in the CCPR that the set-up of broad web based references and resources for food analytical methods will be continued and expanded.

The web page has currently been expanded with new contributions from more countries. Currently inputs by Argentina, Costa Rica, Germany, UK, USA, Canada and the Netherlands have been integrated on the website, further contributions will be added. In some cases full methods are available for downloading, others provide contributions ranging from short descriptions up to extended abstracts.

The database and download capabilities is open for expansion and for future additions. Countries/interested parties willing to contribute in building up a web based methods data bank with method abstracts or preferably full methods may submit their methods to: J.Brodesser@iaea.org.

Note: Only peer verified and fully validated methods will be taken into consideration for publishing on the website.

Structure of the CODEX residue analytical methods resources on the IAEA/FEP website:



12th Meeting of the Inter-Agency Committee for Radiation Safety; 8-9 May 2006; Geneva, Switzerland

Technical Officer: David H. Byron

The International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS) are endorsed and published jointly by the six cosponsoring organizations[25]. In September 2005, the General Conference of the IAEA, by resolution GC (49)/RES/9A, requested the IAEA Secretariat to undertake a review of the BSS. The Inter-Agency Committee for Radiation Safety (IACRS) agreed on the establishment of a joint secretariat (BSS Secretariat) at its meeting in October 2005. The IAEA invited representatives of the UN and other intergovernmental organizations to jointly coordinate the review of the BSS through the BSS Secretariat. These cosponsoring organizations collaborate to promote a common basis for radiation safety by key international and regional organizations.

The representative of the Joint Division presented remarks concerning the agreement of the 38th Codex Committee on Food Additives and Contaminants (see above) to forward the newly-named proposed draft Guideline Levels for Radionuclides in Foods Contaminated Following a Nuclear or Radiological Emergency for Use in International Trade to the 29th Session of the Joint FAO/WHO Codex Alimentarius Commission for final adoption, especially in regard to possible implications for the revision of the Basic Safety Standards. The Joint Division representative also participated in other discussions of the 12th IACRS related to the revision and adoption of the minutes of the BSS Secretariat Meetings held on 3 and 7 April 2006; the status of the BSS Review, including terms of reference for the Secretariat to coordinate the review and possible revision of the BSS and the WHO report on health effects of the Chernobyl accident.

In view of ongoing collaborative work between the FAO and the Inter-Agency Committee on Radiation Safety and the BSS Secretariat in the possible revision of the Basic Safety Standards, it is envisioned that the Joint Division will continue to be represented at future meetings of the BSS Secretariat.

Additional information on activities of the Inter-Agency Committee on Radiation Safety can be found at http://www.iacrs-rp.org/.

[25] FAO, IAEA, ILO, OECD/NEA, PAHO, WHO

Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDF); 8-12 May 2006

Technical Officer: Andrew Cannavan

At the 16th meeting of the CCRVDF (May 2006), the Representative of IAEA presented a summary (Conference Room Document 5) of the activities of the Joint FAO/IAEA Programme related to residues of veterinary drugs in food. The Committee was informed of a

FAO/IFAH project with inputs from the FAO/IAEA Joint Programme to build capacity in sub-Saharan Africa for the quality control of trypanocidal drugs and that, in the future, the scope of the project would be expanded to include the development and transfer of methods for quality control to a range of other veterinary drugs and methods for their residues in foods.

The Committee also noted that, in response to a recommendation of the Joint FAO/WHO Technical Workshop on Residues of Veterinary Drugs without ADI/MRL, the FAO/IAEA Joint Programme was planning to hold an inter-regional training course for developing countries on screening and confirmatory methods for veterinary drugs residues.

The Committee also welcomed the offer to include on the Joint Division’s website, Codex analytical methods for veterinary drug residues in order to enhance the capabilities of developing countries to identify and implement suitable methods in support of residue monitoring plans. In response to this, Canada has already offered the method protocols in their method compendium, and UK has tentatively offered access to selected methods.

The Joint Programme also volunteered to become involved in *ad hoc* working groups on Risk Management (electronic working group to identify work topics and options), Residues of Veterinary Drugs without ADI/MRL and Methods of Analysis and Sampling. The full report of the 16th CCRVDF is available at: http://www.codexalimentarius.net/download/report/659/al29_31e.pdf.

Status of Coordinated Research Projects

Final Research Coordination Meeting (RCM) of the Coordinated Research Project Irradiation to Ensure the Safety and Quality of Prepared Meals; D6.20.07

Technical Officer: Tatiana Rubio-Cabello

The Research Coordination Meeting (22-26 May 2006) was held at the Jia Yuan Hotel in Beijing, and was attended by Research Contract/Agreement holders from China, Ghana, Hungary, India, Indonesia, Israel, Republic of Korea, Syrian Arab Republic, South Africa, Thailand, United Kingdom and United States of America. Argentina is also a Research Contract holder but the investigator could not attend the meeting, however a report was submitted and the abstract was included as part of the meeting's report. The meeting was opened by Dr. Gong Xifeng, Deputy Directory General of the Department of International Cooperation, Chinese Academy of Agricultural Sciences (CAAS).

The main objective of the meeting was to evaluate the achievements of the CRP since 2001. All participants presented a report on the work they had undertaken with special emphasis on the research carried out since the 2nd RCM held in South Africa.

The participants carried out research on more than 50 different prepared meals and the main conclusions of their work are summarized below.

The Coordinated Research Project (CRP) demonstrated that radiation processing of prepared meals results in safer food by eliminating pathogens and extends the shelf-life by decreasing the number of spoilage organisms without significantly jeopardising the overall quality. Radiation treatment thereby offers opportunity for a wider utilisation and marketing of such high quality meals including many ethnic food products.

Strict hygienic practices during the manufacture of prepared meals are a prerequisite for the successful application of irradiation in order to ensure product safety, quality and extended shelf-life. The safety of radiation processed products was demonstrated using challenge tests / inoculated pack studies with various pathogenic test organisms or their surrogates. However, proper storage temperature and maintenance of the "cold chain" is a crucial factor of food safety and stability. On the other hand, oxidative changes are sometimes enhanced by radiation treatment but counteracting such changes by proper packaging conditions and using efficient antioxidant additives has been demonstrated.

In view of the increasing trend in consumer demand for safe prepared foods, the importance in the use of radiation pasteurization is likely to increase in the future. This was confirmed by the consumer studies carried out in the USA, the results of which were reported during the course of this CRP. Provision of information about the nature of food irradiation increases consumer acceptance and willingness to pay a premium for enhanced product safety and quality.

This technology could potentially be advantageous for consumers, food manufacturers, and traders world-wide as the foods are safer, have an extended shelf-life and high quality.

Although this CRP demonstrated that radiation processing can facilitate the production of safer and extended shelf-life products, the work also highlighted the complexity and technological challenges of using radiation processing for multi-component food systems such as prepared meals. In view of the insight gained about the quality changes that occur in the irradiated foods investigated under this CRP and emerging needs, further research activities were recommended.

Integrated analytical approaches to assess indicators of the effectiveness of pesticide management practices at a catchment scale; D5.20.35

Technical Officer: Ms. Britt Maestroni

This is a new 5-year Coordinated Research Project which has just been approved for the Food and Environmental Protection Subprogramme.

Agriculture is a dominant component of the global economy, and the pressure to produce enough food for the world's ever growing population has had a worldwide impact on agricultural practices. To ensure and sustain high crop yields, fertilizers and pesticides are widely applied and their use has steadily increased over the years.

Inappropriate use of pesticides and other agricultural inputs has caused discharges of pollutants (pesticides, fertilizers, etc.) to the surface and/or groundwater. These can have adverse effects on food safety, human health and the environment and consequently also affect countries' economies and trade. The Agency, through its Joint FAO/IAEA Division, has initiated a coordinated research project (CRP) on "Integrated analytical approaches to assess indicators of the effectiveness of pesticide management practices at a catchment scale". This CRP integrates risk assessment tools and targeted analytical monitoring as a cost-effective option for developing countries to identify specific water pollutants, their sources and occurrences. Nuclear and related techniques will assist in generating CRP outputs such as harmonized protocols for sampling and analysis of surface water. Georeferenced data, guidelines, and access to eLearning courses will accelerate capacity building and lead to three major outcomes: (1) cost-effective, sustainable and catchment targeted monitoring schemes for surface water; (2) mechanisms to "feed back" the results of laboratory analysis to the primary producers community/extension services; and (3) information exchange on harmonized analytical methods and water monitoring schemes to improve pesticide management practices and the production of safe food whilst protecting the environment. The first activity envisaged for the coordinated research project is a consultants' meeting, having the objectives of elaborating the protocols and activities for the CRP. The meeting will take place in Vienna from 6-9 June 2006.

Quality Control of Pesticide Products; D6.10.23

Technical Officer: Josef Brodesser

The CRP deals with analytical methods based on peer verified CIPAC and AOAC methods. The aim of the CRP is to broaden the scope and simplify time consuming and resource-intensive single component analytical methods. The main aim of the CRP finally is to demonstrate the validity and equivalence of those with commonly used methods.

In the Third Research Coordination Meeting held in Yangon, Myanmar, from 28 November to 2 December 2005, it was decided that some outstanding technical questions would have to be resolved. Also the multi method approaches developed during the CRP were to be verified in two interlaboratory comparison trials. Real and synthetic formulation samples will be distributed and analyzed by participants. The results will be compared to verify how wide this approach could be applicable. Results are expected by August 2006 when the CRP is expected to be closed and the overall results evaluated and summarized for publication.

Final Research Coordination Meeting for the Coordinated Research Project; Development of Strategies for the Effective Monitoring of Veterinary Drug Residues in Livestock and Livestock Products in Developing Countries; D3.20.22

Technical Officer: Andrew Cannavan

The fourth and final RCM for this CRP will be held at Munich Technical University, Germany, 27 Nov-1 Dec 2006. All Research Contract Holders, Agreement Holders and Technical Contract Holders will be invited to attend. Contract holders will be asked to present the results of their work over the period of the CRP and to produce a paper for publication in the IAEA Technical Document series in 2007.

Testing the Efficiency and Uncertainty of Sample Processing for Analysis of Food Contaminants; D6.10.23

Technical Officer: Josef Brodesser

The CRP work programme for the current biennium in the final phase is being carried out by the CRP participants. The work focuses on new food commodities and new pesticide active ingredients, but also on the differences between cryogenic processing and under ambient temperature conditions. Particular attention is paid to large crop commodities, where the concentration of residues can vary considerably in one fruit, as well as between individual crops. A systematic investigation is in progress for filling gaps with regard to different processing methodologies and their associated variability.

The final Research Coordination Meeting is planned for 2007.

Current Technical Cooperation Projects

Project Number	Title	Technical Officer
ANG5003	Veterinary Drug Residue Monitoring Programme	D. H. Byron
BEN5003	Veterinary Drug Residue Monitoring Programme	D. H. Byron
BGD5024	Phytosanitary Treatment for Insect Pests Infesting Fresh Fruits and Vegetables	T. Rubio-Cabello
BOL5015	Developing Pesticide Residue Monitoring Capabilities in Support of Cash Crops	I.G. Ferris
BKF5005	Regulatory Control and Monitoring of Contaminants and Residues	J. Brodesser
BRA5058	Applying Ionizing Radiation for Food Security and Health Care	T. Rubio-Cabello
CHI5022	Detection of Pesticide Levels in Water and Agricultural Soil Using Nuclear Techniques	I.G. Ferris
CHI5046	Certification of Exported Animal Products Using Nuclear and Other Analytical Techniques	D. H. Byron
COS5026	Management and Appropriate Use of Insecticide-nematicides	I.G. Ferris
CPR5016	Strengthening the Quality Assurance System for Food Irradiation	T. Rubio-Cabello
GUA5015	Establishing a Food Irradiation Plant	T. Rubio-Cabello
HAI5003	Enhancing Crop Productivity through the Application of Isotope Nuclear Techniques	I.G. Ferris
JAM5009	Developing Soil Fertility Management	I.G. Ferris
MAK5005	Upgrading of Food Safety System	J. Brodesser
MON5012	Monitoring of Residues in Livestock Products and Surveillance of Animal Diseases	A. Cannavan
MOR5024	Industrial Application of Irradiation	T. Rubio-Cabello
NIC5007	Determining Drug Residues in Bovine Meat Exports	D.H. Byron
NIR5030	Regulatory Control and Monitoring of Contaminants and Residues in Fresh Produce	J. Brodesser
NIR5033	Improvement of Quality Management and Food Safety Monitoring Using Isotope Techniques	J. Brodesser
PAN5015	Quality Assurance in Pesticide Residue Analysis for Agriculture Production	K. Gross
RER9074	Long-term Countermeasure Strategies and Monitoring of Human Exposure in Rural Areas Affected by the Chernobyl Accident	I.G. Ferris
ROK5034	Nutrient Efficient Crops and Safe Use of Pesticides in Sustainable Crop Production	I.G. Ferris
SEN5027	Regulatory Control and Monitoring of Contaminants and Residues in Fresh Produce	J. Brodesser
SLO5002	Protecting Groundwater and Soil Against Pollutants Using Nuclear Techniques	I.G. Ferris
SRL5037	Assessing Impact of Pesticides on Water Catchments and Groundwater	J. Brodesser
SRL5039	Monitoring of Chemical Residues and Food-borne Pathogens	A. Cannavan
SYR5018	Pesticide Degradation in Food and Environment	I.G. Ferris
SYR5020	Implementation of Quality Assurance and Quality Control Procedures in Pesticide Residue Analysis Laboratories	J. Brodesser
THA5047	Application of Food Irradiation for Sanitary and Phytosanitary Certification	T. Rubio-Cabello
YEM5005	Monitoring of Veterinary Drug Residues	A. Cannavan

FAO/IAEA Agriculture & Biotechnology Laboratory, Seibersdorf

Adaptation of the IAEA-Ethylacetate Multiresidue Method to Determine Pesticide Residues in Wheat Flour

Aysal, P., Mushi, G[1] and Cannavan, A.

[1] Ministry of Health Government Chemical Laboratory, Dar es Salaam, United Republic of Tanzania

The IAEA ethyl acetate method, an adaptation of the popular QuEChERS multiresidue method, was further modified to allow the analysis of pesticide residues in wheat flour. The method is currently being validated by analyzing wheat flour samples spiked with 25 pesticides at levels between 0.03 and 3 mg/kg. According to the modified procedure, a portion of 20 g flour was vigorously mixed with 20 ml of water and 10g sodium hydrogen carbonate, and then 40 ml ethylacetate was added. The mixture was warmed to 35°C for 5 minutes in a water bath with thorough mixing using a glass rod during the incubation period. Anhydrous sodium sulphate (20 g) was then added and the mixture was immediately homogenized using an Ultra Turrax blender. After centrifugation, removal of residual water and clean-up were performed simultaneously by dispersive solid-phase extraction of 10 ml of the ethyl acetate extract with 1g anhydrous $MgSO_4$ and 0.17 g primary secondary amine (PSA) sorbent. Samples were analyzed by GC-ECD and GC-NPD.

For quick review of the method performance and to evaluate the individual analysis steps, ^{14}C-Chlorpyrifos was also applied at all fortification levels.

The average ^{14}C-Chlorpyrifos recovery for wheat flour was 88% with a relative standard deviation of 6% (Table 1). GC evaluation of the data is ongoing.

Table 1. ^{14}C-Chlorpyrifos recoveries (Q) and repeatability (as RSD) at three different levels and at each step of the method

Fortification level,	Extraction		Clean-up		**Total**	
mg/kg	Q %	RSD %	Q %	RSD %	**Q, %**	**RSD, %**
0.03	89.4	6.14	94.0	1.53	**84.1**	**6.16**
0.3	94.5	2.95	95.1	0.59	**89.9**	**3.00**
3	94.8	2.05	96.5	1.41	**91.5**	**1.38**

Transfer of a Multi-Residue Sulphonamide Method to LC-MSMS

Technical Officer: Andrew Cannavan

Sulphonamides are antimicrobials that are used widely in food producing animals for the treatment of infections of the central nervous system, respiratory tract, gastrointestinal tract and the urinary tract. They are also commonly used in animal production at sub-therapeutic levels as feed additives for prophylaxis and to maximize feed conversion. To protect the health of the consumer and permit international trade in animal-derived foods, maximum residue levels (MRL) for these substances in food have been set by Codex and also by many individual countries and trading blocks. It is necessary for countries wishing to trade in such commodities to have analytical methods to test for compliance with these MRLs.

In late 2005, the Agrochemicals Unit validated a HPLC-UV method for the determination of seven sulphonamides (sulfadiazine, sulfathiazole, sulfapyridine, sulfamerazine, sulfamethazine, sulfamethizole and sulfamethoxypyridazine) in various animal matrices. Work is now under way to transfer the method to liquid chromatography-tandem mass spectrometry (LC-MSMS) to provide a method that will meet international criteria for confirmation of veterinary drug residues. This activity is expected to be completed before the end of 2006 and will be reported in more detail in the next issue of this newsletter.

A Lysimeter Experiment to Investigate the Influence of Climate Change on the Environmental Behaviour of s-Metolachlor in a Soil-Plant-Water-System

Technical Officer: A. Cannavan

This is a collaborative project between the Agrochemicals Unit and the Department of Environmental Research of the Austrian Research Centre (ARC) at Seibersdorf. The lysimeter facility of the ARC is a useful tool which can be used to investigate the behaviour of pesticides within the soil-plant-water-system. By using undisturbed soil monoliths, lysimeter experiments yield valuable data for site-specific hydrological models and the leaching behaviour of substances under conditions closely approximating those in the field. The current study aims to investigate how the climatic changes anticipated by many scientists, in particular an increase of heavy rain events and a slight increase of average temperatures, will affect the environmental behaviour of the pesticide s-metolachlor. The study will provide information on whether such climatic changes will have a significant influence on the leaching behaviour, degradation velocity and plant uptake of the selected substance. Possible effects on the soil water balance will also be investigated.

In May 2005, ARC staff implemented an experimental setup designed to simulate climate change on the monoliths of the ARC lysimeter facility. Soy was planted and sprayed with s-metolachlor. Leachate water and interim harvests of non-mature plants were collected. The main harvest of plant material took place in September and the plant material was prepared for chemical analysis. From November 2005 the lysimeter soil was sampled to investigate the depth distribution of s-metolachlor in the soil profile. Since the beginning of 2006, analytical methods for quantifying the target analyte in the required matrices (water, soil and plants) have been developed and validated in the Agrochemicals Unit. Method validation for each matrix was based on 3 levels of fortification in 5 replicates performed on 3 occasions. The laboratory work was carried out under the supervision of Ms. Mariana Schweikert by Mr. Elmar Kaltenbrunner, a student at Fachhochschule Wels (University for Biotechnology and Environmental Engineering), who was assigned to the project through the ARC. The analytical quantitation of s-metolachlor in the samples by GC-NPD and GC-ECD is ongoing.

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