Quality Assurance and Safety of Crops & Foods

ICC MoniQA

Quality Assurance and Safety of Crops & Foods 2010, **2**, 149–153

MEETING REPORT

Report from the 2nd MoniQA International Conference

Emerging and Persisting Food Hazards: Analytical Challenges and Socio-Economic Impact

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Keywords
Food quality; Food safety; Food security; socio-economy.

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Received 28 June 2010; revised 09 July 2010; accepted 09 July 2010.

Abstract

Held in Krakow from 8–10 June 2010, the 2nd MoniQA International Conference was an inter- and cross-disciplinary event, which formed a bridge between the daily concerns of citizens, economic considerations and food and nutrition science. In nine technical sessions the conference set out the state-of-the-art concerning food safety standards, mycotoxins and phycotoxins, food allergens, chemical contaminants, microbiological contaminants, food additives, emerging technologies for food safety assessment and food authenticity.

doi:10.1111/j.1757-837X.2010.00075.x

Spichtinger D, Astley S, Cauvain S (2010). Report from the 2nd MoniQA International Conference - Emerging and Persisting Food Hazards: Analytical Challenges and Socio-Economic impact. *Quality Assurance and Safety of Crops & Foods*, **2**, 149–153.

Introduction

The interdisciplinary nature of the conference was highlighted in the opening session, which featured presentations on *EU legislation for food safety and socio-economic considerations* (Frans Verstraete, DG Sanco, European Commission), *safety considerations of engineered nanoparticles in food* (Karen Tiede, FERA) *the implications of risk perception for managing and communicating food safety risks to the public* (Gene Rowe, IFR), and a presentation about *MoniQA, the global Network of Excellence contributing to reliable food safety analysis and better regulations* (Roland Poms, ICC). Other sessions included cross-disciplinary aspects as well, such as the impact of food safety standards on international trade and developing countries (Session 2), the impact of the Irish dioxin crisis (Session 5) as well as the question whether food contamination can and has been used as a terrorist weapon (Session 6), to name but a few. The presentations are available for download at the conference website (www.moniqa.org/krakow2010).

Photo: Roland E. Poms

The different angles and approaches of the many presentations that were given during the three conference days highlight the fact that the event brought together a diverse audience of about 180 food quality and safety scientists and trainers, food safety managers from industry, academia and regulatory bodies as well as representatives from food manufacturers, retailers and providers of rapid and high throughput analytical methods and instruments. In all, some 35

countries from five continents were represented. The event was also of interest to food quality and HACCP practitioners, standardization and validation organizations as well as representatives of consumer and trade organizations. Also included were poster presentations and a 'MoniQA Best Poster Award'. Additionally, the conference featured results from the related projects BioCop (http://www.biocop.org) and CON ffIDENCE (http://www.conffidence.eu), which increased the cross-fertilization of ideas and ultimately will help deliver greater benefits to stakeholders around the world.

The 2nd MoniQA International Conference is a direct follow-up to the very successful 1st MoniQA International Conference which took place in Rome, Italy, 2 years ago and which focused on increasing trust in rapid analysis for food quality and safety. In Rome, the participants had the opportunity to discuss the most recent challenges for avoiding and controlling unwanted substances in the food production chain as well as to listen to the latest developments and innovations in rapid and reliable analysis of food contaminants. Clearly, these issues were also discussed in Krakow and will certainly remain a focus for the upcoming 3rd MoniQA International Conference in Varna, Bulgaria (27–29 September 2011). The meeting included a number of presentations with a cereals theme and showed the significant value of cross-fertilization and exchange of ideas emanating from close collaboration between MoniQA and ICC partners.

In short there was something for everyone at the Krakow Conference. Some of our personal highlights include presentations about fumonisins as the 'hidden menace' (session 3), the corporate challenge of Allergen management (session 4), 6 days that shook Ireland (session 5), who are we validating analytical methods for? (session 5), a precautionary tale of food borne outbreaks (session 6) and 'lost without trace' (new analytical approaches to tracing the origin of food, session 9). But make your own choice by reading the summary of the technical sessions below!

Session 2: Food safety standards/ managing food safety – standards, regulation and the society

Chaired by Mario Mazzocchi (University of Bologna, Italy) the session provided an overview of the diverse approaches to the socio-economics of food safety. Spencer Henson (University of Guelph, Canada) highlighted the impact of food safety measures on trade in agricultural and food products and in particular on exports from developing countries. Eleonora Dupouy (Food and Agricultural Organisation) described the contribution of food standards to food security and the activities of the FAO and the Codex Alimentarius Commission to the standardization process. Liana Giordi (ICCR, Austria) presented research conducted within the MoniQA Project (together with Martin Rose, FERA) on the strong versus weak regulatory logic for official controls targeting dioxins and PCBs in food. While a variety of legislation for these substances on the EU level exists, the implementation of these regulations is left to the member state – which has resulted in large variation in the extent to which regular and systematic monitoring and official controls are carried out in the EU countries. Finally, Fabio Bartolini (University of Bologna, Italy) introduced the concept of multi-criteria evaluation and analysis of regulation (MCA). In contrast to cost-benefit analysis, MCA allows for a more robust evaluation, since it takes physical and economic indicators into account and is not limited to monetization of impact. MCA can therefore cover a wide range of impacts (environmental, social and economic).

Session 3: Mycotoxins and phycotoxins

The session, chaired by Michele Solfrizzo (CNR, Italy) started off with an overview of recent developments in the EU on mycotoxins, which was provided by Joerg Stroka from the Joint Research Centre (IRMM, Belgium). He stressed the importance of sound risk assessment which is based on sound analytical results, in order to impose regulatory measures (where needed), such as guidance limits, regulatory risk and even temporary bans in addition to guidelines for the reduction of mycotoxins. Anton J. Alldrick from Campden BRI (UK) presented the case of fusarium mycotoxins in the 2007 and 2008 UK wheat harvest. During the relevant period the precipitation in the UK was significantly higher than usual which led to a higher level of deoxynivalenol (DON) and zearalenone (ZEA) contamination. These events demonstrate that natural forces outside of human control can have significant implications in terms of the occurrence of DON and ZEA in staple food crop even in the developed world, vindicating the considerable investment made by stakeholders and the UK government to acquire a clear understanding of the occurrence of these mycotoxins. The presentation reinforced the value of a collaborative and pragmatic approach to dealing with challenges of this nature. Hayrettin Ozer from the TUBITAK MRC Food Institute (Turkey) presented mycotoxin issues in Turkey, as well as the regulatory impact and future research needs. Maddalena Ragona from the University of Bologna provided a socio-economic angle on mycotoxins, presenting a toolbox for impact assessment of food safety regulatory proposals and the draft application of this tool box

in a case study on setting maximum levels of T-2 and HT-2 toxins in cereals and cereal products. The last talk of the session focused on fumonisins, the 'hidden menace', as Gianni Galaverna (University of Parma) called them in his presentation. He emphasized that analytical methods often underestimate the levels of fumonisins in corn and derived food products because of low recoveries. Collectively this session was laden with important message for producers and users of cereals and other crops, these are not issues which will 'go away' but collaborative efforts can reduce the risk to consumers.

Session 4: Food allergens

The first presentation of the food allergens session, which was chaired by Bert Pöpping from Eurofins (Germany), focused on clinical thresholds and their application in risk assessment and risk management in food allergy. Geert Houben (TNO, the Netherlands) explained that while allergens may be present in some food products without labelling (due to cross-contamination), other products contain precautionary labelling ("may contain") to warn consumers for the possibility of unintended presence of allergens. As a consequence there are many products with a warning but a very small (negligible) risk and at the same time others without any warning, which may contain (sometimes very high amounts of) allergens. Risk analysis principles can be applied to solve this problem and to bring guidance, harmonization and transparency in information delivery. Jayne Hipkiss from MARS Chocolate Europe, focused on the corporate challenge in allergen management and discussed the allergen control plans utilized by MARS to minimize allergen contamination. In his talk about emerging multi-screening methods Bert Pöpping pointed out that allergens are typically detected using ELISA methods and sometimes PCR – however, both of these methods have their drawback. The ideal method would offer multiple screening abilities and direct detection of proteins (or peptides). Mass spectrometry offers a potential solution: it has the ability to screen for all 26 protein-based allergens listed in annex IIIa of the European Allergen directive and offers direct detection of the peptides derived from tryptic digestion. Philippe Delahaut from CER (Belgium) focused on reference materials for food allergens analysis, pointing out that very few validation data are available for the comparison of allergen detection methods. Because there is an urgent need for recognized and confident materials the MoniQA working group on Food Allergens will provide incurred reference materials with egg and milk proteins at various concentrations in two food matrices. Cookies were selected as the first foodstuff to be incurred and a pre-ring trial was performed with three labs. Christine Gutschelhofer (R-Biopharm, Germany) stressed the need for fast and reliable processes to check for allergen contamination in food production. Immunochemical test methods have become established due to the ease of preparation and their increased efficiency. Lateral flow tests are quantitative immunochemical methods using test strips. Because they are fast and sensitive, lateral flow tests can be applied for allergen screening and hygiene controls in food companies.

Session 5: Chemical contaminants

Chaired by Martin Rose (FERA, UK) the session started out with a focus on Ireland. Wayne Anderson from the Food Safety Authority of Ireland provided a narrative of 'six days that shook the nation', namely the discovery of dioxin contamination of pork and beef products and the largest recall of food products ever seen in the country. Because of the rapid identification of the source of contamination contaminated meat and meat products could be removed from sale very quickly and consumer protection was ensured. In his contribution Roy Mcarthur (FERA, UK) posed the question of who we are validating analytical methods for: regulators, analysts or the consumer? He demonstrated how a graphical representation of measurement uncertainty can be used as a tool for describing the performance of methods which is suitable for analysts, enforcement authorities, policy makers, producers and consumers. In the sessions final presentation Michele Suman talked about the physical removal of acrylamide from food products, an innovative approach which removes the molecule after the heat process has been completed (by considering different combinations of pressure, temperature and time).

Session 6: Microbiological contaminants

Wolfgang Kneifel (BOKU, Austria) chaired the session on microbiological contaminants which started with a 'precautionary tale' on foodborne outbreaks: surveillance and socio-economic impact, presented by Lisa O'Connor (Food Safety Authority of Ireland). The Food Safety Authority of Ireland had a first hand experience with the socio-economic impact of an international foodborne outbreak in 2008, when an outbreak of *Salmonella agona* was identified in 10 European countries. Laboratory based surveillance proved vital in the early detection of the outbreak and identification of its source. Berndt Appel from the Federal Institute for Risk Assessment (Germany) dealt with the issue of food as a potential factor for international contamination in the contest of bio/agro terrorism. The EU is currently working on a list of biological agents (and toxins) of

security concerns. In this context it is vital to evaluate the criteria for an agent (or toxin) to be considered a threat to food chains (and therefore humans). The Federal Institute for Risk Assessment is therefore developing an information and database platform for governmental and industrial partners. Steve J. Forsythe (Nottingham Trent University, UK) presented on genome sequence comparison of cronobacter species and related organisms. A seven loci multilocus sequence typing of cronobacter has been developed using strains which were widely distributed according to geography, time and resources. The sequence typing reveals that many clinical isolates form a separate lineage to those from infant formula finished product. This may indicate that the more virulent cronobacter strains have originated from a currently unidentified ecosystem or may have additional virulence traits from horizontal gene transfer. In the session's last presentation Hanna-Leena Alakomi (VTT, Finland), provided an overview of experience and innovations concerning the detection of *Salmonella* in food. The traditional detection and isolation of *Salmonella* spp. from food and feed utilizes a multi-step protocol. Several rapid methods have also been developed to speed up the detection of *Salmonella*.

Session 7: Food additives

Chaired by Vasso Oreopoulou (NTUA, Greece) the initial presentation of this session focused on emerging and persistent issues with artificial food colours. Mike Scotter (FERA, UK) talked about methods of analysis for natural colour additives, which are increasingly used as alternatives to synthetic colours in food and drink. However, natural colours include a wide range of chemical structures and physiochemical properties so the increasing use of natural colours requires the availability of a range of suitable extraction and analytical methods for testing food and drink. Vural Gökmen (HCTU, Turkey) presented computer based image analysis for the rapid detection of acrylamide in heated foods. In Gökmen's study digital images of potato chips and biscuits (cookies) to extract a meaningful parameter to be correlated with acrylamide level. Results confirmed that the computer vision system provided explicit and meaningful description. Acrylamide in foods was also the topic of Zuzana Ciesarová's presentation (VUP Research Institute, Slovak Republic). Her study was concerned with the estimation of acrylamide exposure: 45.5% of acrylamide exposure comes from foods, including cereal-based foods, sweet snacks, salty snacks, potato-based foods and drinks (coffee, cocoa, etc.). Ciesarová's study found women take most of their acrylamide from sweets (49.47%) while with men there is a more equal distribution between cereal foods, sweets and salty snacks. Concerning age, 14–20 year olds are most at risk. Fatma Basinci (HCTU, Turkey) followed up on this topic with her presentation about the mitigation of acrylamide formation during malt processing. Dark roasted malt is used for aroma and colour in dark beer production and bakery products and may contain acrylamide. Basinci found that asparaginase and/or glycine applications had a limiting effect on acrylamide formation. The mixture of enzyme and glycine was the most effective way to reduce the acrylamide content of dark roasted malt samples. It was possible to mitigate acrylamide formation without deterioration in colour properties. Mieczyslaw Obiedzinski from the Warsaw University of Life Sciences (Poland) finished the session with his overview of methods for determination of trans-fatty acids in foods, including the trans-fatty acids contents in different food products monitored in Poland.

Session 8: Emerging technologies for food safety assessment (BioCop, CONffIDENCE)

This session, chaired by Hans van Egmond (RIKILT, the Netherlands) included results from the EU-funded projects BioCop and CONffIDENCE. Gaud Pinel (LABERCA, France) presented on targeted and untargeted profiling for xenobiotics. Classical detection strategies for growth promoting practices fail when faced with new xenobiotic growth promoting agents or new ways of application, such as the administration of low doses cocktails. In this context, screening strategies allowing detection of the physiological response resulting from anabolic compounds are promising approaches. Profiling biological matrices to reveal biological effects of a drug can either be performed in a targeted focus on a particular class of compounds or in an untargeted way using global strategies such as transcriptomics, proteomics or metabolomics. Luis M Botona (Universidade de Santiago de Compostela, Spain) highlighted the advance in the detection of marine toxins in his presentation, discussing the progress in the advance of alternative methods to the current legal method in Europe, the mouse bioassay. Available technologies include LC–MS–MS, receptor-based methods, antibody-based methods and binding-based methods. Anne-Catherine Huet (CER, Belgium) provided an overview of a range of dipstick and electrochemical-based biosensor devices as well as surface Plasmon resonance biosensor methods, which have been recently developed for the rapid detection of antibiotics in food and animal feedstuffs. Jana Hajsolv from the Institute of Chemical Technology (Prague, Czech Republic) showcased innovations in pesticide analysis, in particular ambient mass spectrometry, which allows for the ionization of samples in the ordinary atmosphere. She used direct analysis in real-time for soft ionization of a wide range of

both polar and non-polar residues in QuEChERS extracts obtained from cereals and other food matrices. Detection techniques were also discussed by Danila Moscone (University of Rome, Italy) who focused on cell-based and sensor-based assays used for heavy metal detection. In the CONfffIDENCE project bacterial cells engineered by luciferase reporter genes controlled with specific genetic regulating elements were used to determine the presence of inorganic arsenic and methyl mercury (mHg) from fish food and feed. Within BioCop a system for lead detection was developed, evaluated and validated for practical application in milk and baby foods.

Best poster awards

Scientific posters introduce specific areas of work, and they should be eye-catching and thought-provoking. There were 70 posters presented at the 2nd MoniQA International Conference encompassing the broad scope of MoniQA with topics ranging from food additives to ZEA contamination. The posters were reviewed for science content by members of the scientific committee (Anton Aldrick Campden-BRI, Martin Rose FERA, Hans van Egmont RIKILT, Michele Solfrizzo CNR), and communication skills by Daniel Spichtinger (RTDS) and Siân Astley (IFR). There was some debate about how the two areas could be considered separately; is good science poorly communicated of less value than poor science well communicated? It is an interesting intellectual debate but in practice, good science well communicated always stands out and demonstrates the value of pan-European, multidisciplinary research. The authors of the top six posters were asked to present their work in a special session held on Thursday lunchtime (10th June 2010). Chaired by Siân Astley, this session was well attended and the support for senior and junior colleagues alike clearly evident. The winners were Zsuzsanna Bugyi from BUTE (HU) with 'Development of reference material for gluten quantification' (1st); Lucie Markova from VÚP (SK) with 'Dietary exposure of acrylamide in high school student group (2nd); and Mirena Ivanova from UFT (BG) with 'Priorities and needs for implementation of updated HACCP systems and modern monitoring technologies at the Bulgarian food sector' (3rd), and they received a range of funding from the MoniQA bursary scheme to support their 2010–2011 training and career development activities.

Session 9: Authenticity and traceability

'Author lost without trace' – this was the title of the first presentation in the authenticity session chaired by Marina Carcea from INRAN (Italy). Under this heading Paul Bereton (FERA, UK) described new analytical approaches to tracing the origin of food. The EU-funded TRACE project has linked geochemistry spatial mapping, information technology and analytical chemistry to provide solutions in the provencening area. Micha Horachek (ARC, Austria) presented the use of isotope analysis as a novel method for the control of the geographic origin of Tyrolean milk while Shin Lu (China Grain Products R&D Institute, Taiwan) showcased a rice traceability system used in Taiwan. Simon Kelly (FERA, UK) asked what existing food authentication techniques have to offer regarding the question whether a product is organic or not. Techniques that have been advocated as having the potential to discriminate between different facets of organic and conventional cultivation to verify labelling claims include: pesticide and veterinary drug residue analysis, stable nitrogen isotope analysis, trace metal analysis, metabolite profiling, florescence microscopy and other relevant techniques. Aly F.El Sheikha (Minufiya University, Egypt) presented the use of a biological bar code for the determination of the geographical origin of fruits. A molecular technique using 28S rDNA profiles generated by PCR-DGGE was used to detect the variation in fungal community structures of the Shea fruit tree from Ghana, Senegal, Mali and Cameroon.

Satellite events

The 2nd MoniQA International Conference provided ample opportunity for networking and discussion among the participants. Before the official start of the conference the MoniQA management board convened to review the progress of the project. On Monday a meeting of the editorial board of the ICC/MoniQA journal *Quality Assurance and Safety of Crops & Food* took place, where the annual Publisher's Report for 2009 was presented and discussed. Additionally, several of the MoniQA working groups took the opportunity for informal meetings during the conference. The Working Group priorities, outputs and future plans were also discussed in a separate meeting which brought together representatives of all working groups and the work package and consortium leaders.

Acknowledgements

The MoniQA Network of Excellence is funded by the European Commission (contract No FOOD-CT-2006-36337) within the Sixth Framework Programme Topic T.5.4.5.1: Quality and safety control strategies for food.

