Speaker Abstracts

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International Association for Food Protection®

Workshop1 - *ComBase Sponsored*
Predictive Modelling: Principles and Tools

Instructors*, Aline Metris and Jozsef Baranyi*

The www.combase.cc is an electronic hub for predictive microbiology resources, consisting the ComBase database and their browser as well as various predictive modelling software tools partly, based on the database, technical documents, training and support material and links to other relevant web sites. It is a product of the collaboration between the Food Standard Agency and the Institute of Food Research in the UK, the USDA Agricultural Research Service and its Eastern Regional Research Center from the United States and the University of Tasmania Food Safety Centre (FSC) in Australia. These partners and ComBase Associates as well as other collaborators worldwide have well-documented expertise in predictive modelling and committed to make food microbiology data and expertise available on the internet.

In the ComBase database, response data of foodborne microorganisms are recorded as a function of various environmental factors such as the temperature, pH and water activity. The database contains more than 40,000 records, such as growth or survival curves, for >30 organisms and for ca 20 food categories. The data can be browsed freely, in a fast and efficient manner. Some data are from the published literature while other data were produced specifically to create predictive models.

The hub provides modelling tools where the growth or survival of specific pathogens can be predicted in culture medium as a function of environmental factors. The predictions can be generated on the web site or the raw data can be downloaded and the user can generate their own model.

On this workshop we will investigate how to use a combination of the database and the modelling tools to predict the growth and survival of pathogens in food. We will also analyse the performance of the predictive models and the bias and accuracy associated to the predictions.

Workshop 2 - *ILSI Europe Sponsored*
Risk Assessment approaches to Setting Thermal Processing

Introduction to ILSI Europe
Nico van Belzen

The International Life Sciences Institute (ILSI) is a non-profit, worldwide foundation established in 1978 to advance the understanding of scientific issues relating to nutrition, food safety, toxicology, risk assessment, and the environment. By bringing together scientists from academia, government, industry, and the public sector, ILSI seeks a balanced approach to solving problems of common concern for the well being of the general public.

ILSI Europe was established in 1986. It shares the values and mission of ILSI, but has its own membership and Board of Directors. ILSI Europe is funded primarily by its industry members, and partially by project grants from the European Commission (EC) RTD Frameworks.

ILSI Europe works mainly in the areas of food safety and nutrition, currently managing over two dozen task forces and two EC-funded projects.

The talk will introduce ILSI Europe, and briefly mention some of its work in food safety that is not addressed elsewhere in the meeting.

Introduction to the ILSI thermal processing activity
Andy Davies

This ILSI activity is the latest of a series of successful projects undertaken by the ILSI Europe Risk Analysis in Microbiology Task Force (TF). The objectives of the TF are (i) to contribute to the development of a conceptual framework and an agreed terminology for microbiological risk assessment, and (ii) to develop and improve tools to manage safety hazards and risks in food production systems. For this activity, a group of experienced academics and industry experts have been brought together to demonstrate how risk-based concepts and risk assessment techniques can be used in the setting of thermal processes in food manufacturing. The group is developing an ILSI monograph that includes chapters on the history of thermal processing and the development of safe harbours and then describes modelling and risk based processes that allow us to challenge these safe harbours. These approaches and their impact on commercial processes and the full supply chain are described by reference to examples.

History of thermal process and development of safe harbours
Francois Bourdichon

When setting thermal process criteria, a quantitative risk assessment is conducted by the food business operator to demonstrate the safety of its product when implementing effective process control – associated with defined performance criteria.

Established heat treatment procedures were also addressing safety issues, but taking in consideration mainly technological, as well economical issues.

Thermal processing procedures are still predominantly governed by these safe harbors, historically set generally recognized time/temperature combinations or reduction targets to provide “safe” food. Most currently used thermal processes are significantly 'fail-safe'. This can lead to greater quality deterioration than necessary.

The origins of the choices made are sometimes lost. Time/temperature combinations widely accepted today were historically set taking into account at the time often limited available knowledge on the microbial hazard, its expected levels and its thermal resistance. They represent the inheritance we still rely on to develop performance standards for alternative thermal processes.

Better risk characterization helps to define modified heat treatment scenarios, and eliminates the need of setting thermal processes based upon worst-case situation. The hurdle concept of food chain safety management provides now an acceptable degree of protection to the consumer, where heat process is not anymore the main critical point.

The place of thermal processing in a full chain approach

Mieke Uyttendaele

Safe harbours in thermal processing focus on a single step in the supply chain. By understanding and adapting relevant factors that impact safety in the full chain, the processor has flexibility in management approaches to achieve the same objective. This concept can be illustrated with full chain Quantitative Microbiological Risk Assessments (QMRA) in which all factors impacting the safety objective, including the effect of thermal processing, are described. Although useful, full QMRAs are very labour and data intensive and would only be carried out to address complex or significant issues. A more streamlined approach that can be easily applied to a specific process or product has been proposed by the ICMSF (2002) summarized in the following equation: H0 - □R + □□ < FSO or PO. In the ICMSF equation the initial contamination (H0, logarithm of concentration) minus the sum of all the reductions (□R, in decimal reductions) plus the sum of all the growth and/or recontamination (□I, in log increase) should be lower than a set Food Safety Objective (FSO) or Performance Objective (PO). This approach can be also subdivided over different parts of a food chain. Examples of safe harbours set within the new food safety management context will be presented. Additional considerations while moving beyond current safe harbours using this approach will be discussed.

Quantification of microbial inactivation and examples

Jeanne-Marie Membre

In the context of risk assessment approaches for setting the thermal processes in food manufacturing, mathematical modelling is a tool to extract the information present in experimental data and to translate this information into a tangible format.

Basically, two types of models are used subsequently.

Primary models describing the time-dependent course of microbial inactivation are applied. The simple and widely used model to describe bacterial inactivation is the first order model (log-linear effect of the time, introducing the D-value parameter).

Secondary models describing the influence of temperature on the decimal reduction time are applied. Again, one of the simplest one (log-linear effect of the temperature, introducing the z-value parameter) is the most commonly used in industry.

Combining these two models lead to universal rules such as using a D_{ref}-value of 0.21 min at 121.1°C and z-value of 10°C for *C. botulinum* (A&B) for ambient stable, low-acid product.

However, in some specific cases, for instance when the inactivation clearly deviates from a linear curvature, or when the food/heating menstruum properties impact on the decimal reduction time, more complex and resource intensive approaches based upon data and/or alternative models, are valuable.

Illustration of trade-off between needs and levels of complexity will be provided through examples.

Achieving the food safety objective with the thermal process

David Bresnahan

Often one of the primary objectives of a food thermal process is to ensure the safety of the product over its shelf life. Different products have varying food safety objectives that are required to be achieved through the thermal process. Consistently delivering the food safety process offers challenges for some products. For other products there are opportunities for reducing the over-processing that sometimes results from conservative setting of process parameters. The challenges and opportunities in delivery the minimum food safety process will be discussed and examples given.

Validation and acceptance of thermal processes

Tim Jackson

One advantage of safe harbour processes is that they limit the validation efforts necessary by the processor to a confirmation that the processing parameters can be achieved in the industrial process. Where new or alternative thermal processes are developed, sufficient validation is needed to confirm, both for the food processor and the regulatory authority, that the process is sufficient to meet performance objectives.

Seminar 1
Cronobacter (*Enterobacter sakazakii*)

Chairs*, Patrick Wall and Hilde Kruse*

Molecular detection methods for *Cronobacter*

Seamus Fanning

Historically, the ancestry of the genus *Enterobacter* can best be described as nebulus and confusing. Currently, the genus *Enterobacter* comprises a large and heterogenous group of organisms within the Enterobacteriaceae family being accounted for by several distinct species.
Enterobacter sakazakii (*E. sakazakii*) is one of these species and the only recognised a food-borne pathogen. Following a taxonomic revision, a new genus, *Cronobacter,* was devised which is synonymous with *E. sakazakii. Cronobacter* consists of a least five distinct species and an additional genomospecies, *Cronobacter sakazakii* (*C. sakazakii*), *C. dublinensis, C. malonaticus, C. muytjensii, C. turicensis* and *C.* genomospecies I. A further three sub-species of *C. dublinensis* are also recognised.

Correct identification of these organisms is important in order to improve our understanding of the broader epidemiology of the members of this new genus. In recent years there have been rapid improvements in the provision of microbiologically-based culture approaches to isolate and identify these organisms. A number of molecular identification methods have also been proposed, however, the recent recognition of multiple species that share less than 70% DNA-DNA similarity has important implications for the sensitivity and specificity of these methods.

In this paper, some examples of the application of molecular-based detection strategies for the identification of *Cronobacter* will be presented. These will include protocols to identify the genus, using specific targets and the development of a molecular-based approach to define the various serotypes of *C. sakazakii.* The development of appropriate molecular methods will facilitate not only a rapid identification of an isolate, but in addition complement the more traditional microbiological-based methods.

Best practice in powdered infant formula manufacturing facilities

Matthias Fischer

Cronobacter spp. is an opportunistic pathogen which causes rare but severe infections in new born and preterm infants during the first weeks of life. Therefore *Cronobacter spp.* is mainly an issue in infant formula production. The bacterium has been moved in the focus of baby food industry within the recent years. The main approach is the improvement of manufacturing conditions to avoid the contamination powdered infant formula. This requires a detailed knowledge about the ecology and reservoirs of *Cronobacter spp.* These characteristics differ significantly from those of *Salmonella* spp. and therefore the required measures are different from the already established hygiene programs. *Cronobacter* is a ubiquitously occurring bacterium which can be seen in materials and vectors of nearly every origin. Also the niches of the bacterium differ from those of other Enterobacteriaceae. *Cronobacter* has been seen extremely dry resistant and can survive for long periods in powder production plants and in powders with low aw-values.

Due to the epidemiology of the pathogen, *Cronobacter* is only a concern for infant formula manufactures, while the bacterium is non pathogenic for older children and adults. This is why a lot of raw material suppliers are completely unaware of the problem. The close relationship to suppliers and the assistance in the adaptation of production conditions to the requirements of infant formula manufacturers are a crucial part of the *Cronobacter* elimination strategy.

The number of *Cronobacter* contaminations in powdered infant formula has been declined dramatically over the recent 5 years, nevertheless it is necessary to apply an integrated approach from the supply chain to the packing of the product to make *Cronobacter* contaminations of infant formula as rare as *Salmonella* contaminations are today.

FAO/WHO risk assessments on *Cronobacter* spp. in powdered infant formula and follow-up formula

Sarah Cahill

Cronobacter spp. is one of the primary pathogens of concern in powdered formulae. Although its' identification as a pathogen of concern is relatively recent, the severity of the illness caused, particularly in neonates and infants less than two months of age, and the relatively high mortality rates, stimulated the international community to react quickly to facilitate the implementation of protective and preventive actions to minimize the exposure of infants and young children to this hazard. Such actions include the adoption of *a Code of Hygienic Practice for Powdered Formulae for Infants and Young Children* by the Codex Alimentarius Commission, and the development of *Guidelines for the Safe Preparation, Storage and Handling of Powdered Infant Formula* by WHO and FAO. The availability of a sound scientific foundation was critical to their development. FAO and WHO facilitated a process of expert consultation and risk assessment with the aim of converting the knowledge and information available from scientists, regulators, the medical profession, care providers, industry and others into scientific advice for risk managers, both at the international and national levels. The role of both producer and end-user in managing the risks associated with *Cronobacter* spp. must be highlighted. An important output of the FAO/WHO work was the development of a web-based user-friendly risk assessment model. This allows users to compare the impact of a range of risk management options, for example the application of different sampling plans at the end of production, and practices that could be

employed in the preparation and use of powdered formulae such as reconstitution temperature and cooling and storage conditions. The output is provided in terms of relative risk reduction and product loss. Such a tool aims to make risk assessment more accessible as a decision support tool to risk managers.

Communicating the safe PIF message
Cliodhna Foley-Nolan

A number of outbreaks have been traced to contaminated powdered infant formula (PIF) milk. This association is established and the presence of *Cronobacter* in PIF products "constitutes a considerable risk if conditions after reconstitution permit multiplication". *Cronobacter* ranks with *Salmonella* as organisms of "greatest concern" in PIF based on an EFSA risk assessment (2004). However, because the quality of production of PIF products is so high there is a considerable challenge in communicating the core messages related to the safe use of PIF.

This presentation describes the work undertaken in Ireland, informed by neonatal epidemiologic data, to communicate the safe PIF message.

Trends in birth rate, prematurity/ gestational age, maternal age, birth weight and social indicators were reviewed. In addition, breastfeeding rates and duration related to maternal age and social class were described. This information underpinned the approach taken to communication.

Using technical guidance (Information relevant to the development of Guidance Material for the Safe Feeding of Reconstituted Powdered Infant Formula, Food Safety Authority of Ireland 2007), multidisciplinary multiagency group devised safe, clear, practical information for the general public. Three core messages were identified: PIF is not sterile; use water at > 70 degrees and "30 Minute" cooled boiled water rule.

End user qualitative research and testing identified specific wording and practical issue and these were addressed in the final booklet and fridge poster.

Seminar 2
Methods and Method Validation
Chair, *Stefano Colombo*

Overview of standard methods development of ISO and CEN
Alexandre Leclercq

Numerous microbiological methods for detection and enumeration of microorganisms in food have been developed and are extensively used worldwide in routine. However, the development of international trade and the linked food safety and the requirement for quality assurance in laboratories have stressed the need for harmonisation of these methods. That's why standardisation has been established at European level (European Committee for Standardisation: Cen) and International level (International organisation for Standardisation: ISO).

Recently, ISO standard about microbiological examinations have been revised to take into account new technologies and microorganisms. New fields of microbiology of food or the food chain have been investigated by standardization:

- Microrganisms and their toxins: Enumeration and serotyping of *Salmonella* spp., Virus (Norovirus and Hepatitis A), parasites (*Trichinella*), fungi according to water activity of products, *Bacillus anthracis, Clostridium botulinum, Alicyclobacillus acidoterrestris, Bifidobacteria, E. coli* STEC non O157, *Cronobacter* spp., enterotoxins of *Bacillus cereus* and *Staphylococcus aureus*, contaminants in starter culture and probiotics;
- Quality assurance of analysis: Proficiency testing, measurement uncertainty, rules for immunological methods, performance characteristics of molecular methods and culture media, description of sampling techniques;
- New samples from primary production stage, and
- New technologies (real-time PCR, DNA biochips, chromogenic media, etc.).

Moreover, European Commission (EC) investigated a mandate to CEN to validate the 15 principal reference methods of food microbiology used in EC regulations.

Finally, the revision of the standard EN ISO 16140 for validation of alternative methods with an active link with AOAC and the development of standards only based on expected performance of the method without its description, open a new area without limits for adaptation of standardization to rapid evolution of microbiology of the food chain.

AOAC versus ISO validations – commonalities and differences
Michele Smoot

ISO methods are commonly considered as the "world golden standard" to which food microbiology laboratories refer for their testing activity. However, there are at many national entities and organizations publishing analytical methods locally recognized as standard methods. The existence of multiple methods for the same target analytes poses the problem of mutual acknowledgement based on method equivalence.

Internationally recognized standard methods and validated methods are needed for enforcement of regulations, global trade, laboratory accreditation and related testing services. Since the publication of the ISO16140 (2003) and of the AOAC Guidelines (1999 and 2002) on the validation of microbiological methods, both organizations

have engaged in joint development of revised standards and great efforts have been made to provide mutually recognized harmonized validation protocols, bringing benefit to all stakeholders.

However, commonalities and differences exist between the ISO and AOAC validation protocols, the requirements of which still need harmonizing. Such differences include for instance:

-the design of the precollaborative and collaborative studies, known as “method comparison”;
-the number and types of food matrices for which the validation will be obtained;
-the number and type of strains used to spike the tested samples;
-the levels of inoculation of spiked samples and the number of replicates per level of inoculation;
-the quantity of uninoculated replicates;
-the total number of data points to collected at the end of the study.

Last but not least, the reference methods used to describe method equivalence today are not the same: FDA/BAM, AOAC, ISO,...

The equivalence of microbiological methods can be demonstrated by means of a validation process which represents a complex, arduous and costly undertaking. This has led microbiological experts to review the ISO16140 to develop new standards only based on expected method performances rather than method comparison, thus drawing a new path to method standardization.

Advancement in method validation standard (ISO16140)
Paul in‘t Veld

The ISO 16140 was published in 2003 after ca 10 years of discussion. This standard describes the procedure for the validation of proprietary methods against international standards. Separate procedures are described for the validation of quantitative and qualitative methods. This standard proved to be quite successful which is demonstrated by the number of methods that have been validated according to this standard and certified by a third party (e.g., Afnor, Microval). Besides being used for the validation of proprietary methods this standard was also used as a basis for other kinds of validation studies such as single laboratory validation. Unfortunately, some parts of this standard are quite difficult to interpret and there of no clear objective criteria for acceptance of the alternative (proprietary) method. In 2006, it was therefore decided by ISO TC34/SC9 to start up the revision of this standard already 3 years after the official publication. For this revision, WG3 of ISO TC34/SC9 was created. The purpose of this group is to revise the current standard and to extent the applicability of this standard. Several project groups are formed for the different types of validation such as single lab validation, validation of standard methods, method verification, validation with a limited number of laboratories. In this presentation the ideas of the different project groups and the objectives of the different types of validation will be presented.

It is expected that the revised protocol for the validation of proprietary methods will be available in ca 3 years time. The other types of validation will be published after that.

From local to EU regulation: adapting to a rapidly changing regulatory environment – the Polish model
Krzystof Kwiatek

In pre-accession period (1996 – 2003) the EU food law was progressively implemented, which was one of the conditions of Poland accession to the European Union structures. The integral parts of implemented methodology of official control were laboratory analyses. In the scope of laboratory analysis many changes were done, which consist in: introducing into food and feed analyses internationals (ISO) and European (EN) norms, validations and accreditations of methods. The National Reference Laboratories were established in the range of food and feed analysis, which started regularly cooperate with adequate Community Reference Laboratories (CRL). It ensured implementation into practise the European analysis methods and permanent participation in proficiency tastings. The restructuring and modernization of laboratory centres of Sanitary and Veterinary Inspections were done by contribution and finance support of European Union. As a good example of the great UE support can be National Veterinary Research Institute and a new laboratories recently built in it. Which allowed increasing credibility of achieved analyses results and food safety, moreover free trade of products was secured. It is now seem as rapid increase of the food products production and export in Poland. According to a new report "Processed Food Market in Poland Outlook 2012" by RNCOS: “Poland has one of the most dynamic food processing industries in East Europe. Presence of large number of enterprise involved in processing of food products, availability of domestic and imported raw material and Poland's accession into the EU has given a new dimension to the food processing business in Poland.” Also, Poland's EU accession boosted exports from the country's food processing industry - meat and dairy sectors - mainly to EU countries and as to new markets in Asia. The expectation is that this trend will carry through in the coming years. The most important sectors of the food processing industry in Poland are meat, dairy, and alcohol, followed by confectionery and food concentrates.

Keynote Address

Microbial Risk Assessment: Old and New Challenges
***Bernd Appel*, German Federal Institute of Risk Assessment**

No abstract

Plenary Session 1

Chair, *Sarah Cahill*

Food Safety in Germany

Eberhard Haunhorst, Lower Saxony State Office for Consumer Protection and Food Safety

Food control and tasks of public veterinary control are regulated according to the act 882/2004 within the European Union. As a result of the federal structures of Germany the accomplishment of all official controls is within the responsibility of the 16 German Federal Land "German Länder". The implementation according to the act 882 will be descriped within the lecture.

Heterogeneous and federal structures exacerbate partly a risk oriented surveillance and analysis. The food safety through official controls can be ensured only by comprehensive networking and agreements of corporate standards.

Within the European Union, federal structures exacerbate the conversion of the generically aims for consumer protection and food safety.

Federal built-on countries will have to deal with the question if consistent and tight organizational structures are better able to fulfill the tasks and responsibilities of consumer protection and food control also against the background of curt finacial funds

The Safety of Imported Foods – EU Perspective

Wolf Maier, European Commission Delegation

No abstract

Plenary Session 2

Chair, *Michele Storrs*

Food Safety in the European Union: ECDC's Role in Tracking the Burden of Disease and Trends *Andrea Ammon,* ECDC

No abstract

The Irish Dioxin Crisis: Six Days that Shook the Nation

Wayne Anderson, Food Safety Authority of Ireland

In December 2008 the Irish food sector faced a major food crisis that had public health, political and economic consequences. All pork products produced from animals slaughtered In Ireland between 1st September and 6th December 2008 were recalled from both the domestic and international markets; the largest recall of foods in the history of the State. The reason for this recall was the finding that some pork products were contaminated with dioxins and dioxin-like polychlorinated biphenyls at levels up to 200 times the legal limit. This resulted from the consumption of animal feed that was contaminated with a specific dioxin congener profile that suggested the source was transformer oil. Swift action taken by the Irish authorities saw the removal of contaminated products from the market and within six days these were replaced with safe products. Faced with this crisis of an unprecedented scale the Irish food safety control programme worked and the country was back in business in less than one week. This presentation will discuss how the initial contamination was discovered, the actions taken and challenges faced by the Irish authorities in dealing with this national food crisis.

S1 - *Salmonella* and Low-moisture Foods

Chair, *Peter McClure*

Vulnerability and control options in the chocolate supply chain

Jeff Banks

As one of the biggest players in the global confectionery space, Cadbury has worldwide sourcing, manufacturing and markets. In 2006, the company was impacted by a contamination event in one UK manufacturing site that lead to a review and improvement programme for the global business. The specific elements of vulnerability will be shared as well as the steps taken to build a robust quality management platform that focused on managing risk towards growing a food safety culture within the business.

The presentation will focus on how vulnerability exists in systems, conditions, accountability and behaviours at all levels in an organisation. It will examine the events leading up to a site-specific problem that caused $50,000,000 worth of cost. The sporadic occurrence of a rare *Salmonella* Montevideo in dry chocolate crumb that entered a dry chocolate ingredient through a tiny hole in a pipe intermittently leaked will be examined and the root causes and learnings, discussed.

The recovery path will be presented with useful pointers for others both in the confectionery and other food segments who may be embarking on a similar path, of who wish to make a step-wise improvement in food safety systems in their businesses.

Control of *Salmonella* in peanuts and peanut products
Paul Hall

Peanuts and peanut products are big business in North America. In the United States over 1.2 million acres of farmland are devoted to peanut cultivation. Peanut butter is about a billion dollar per year business in the US alone and about 50% of the U.S. peanut crop is used for peanut butter production. The value of US worldwide peanut exports was about $210MM in 2007. Peanuts, as with most raw agricultural commodities, can be contaminated with salmonellae and over the past 15 years there have been a number of salmonellosis outbreaks around the world linked to the consumption of peanut products. Many peanut products such as peanut butter are made from peanuts that have been subjected to a lethality step such as roasting. Contamination of these products with *Salmonella* is primarily through recontamination after the lethality step. The low water activity in peanuts and most peanut products precludes the growth of *Salmonella*, but the pathogen can survive for long periods of time in these products. Control of *Salmonella* in these products is dependent upon a number of factors including effective separation of raw product and finished product including physical separation, control of traffic flow (both people and materials), and effective dry cleaning procedures, among others. It is critical that manufacturers and processors invest in infrastructure to ensure that equipment and the associated physical surroundings are designed to prevent product recontamination. It is imperative that manufacturers have a strong, aggressive Pathogen Environmental Monitoring (PEM) program in place targeting *Salmonella* control in order to identify problem areas and to ensure that actions are effective.

Validation of industrial processes with respect to food safety
Anett Winkler

Although low-moisture food products do not support growth of *Salmonella*, they've been involved in several outbreaks related to that pathogen. Epidemiological investigations found a low infective dose, i.e. very low numbers of *Salmonella* in those foods caused illness. Investigations, where the *Salmonella* contaminated the products, concluded that raw agricultural materials (like nuts and seeds) used in production are a source. In conjunction with findings of an increased heat resistance of *Salmonella* in low moisture foods many industrial processes have been / are being reviewed with respect to their effectiveness to control this microbial hazard. However, apart from some very specific guidance documents there are not many information available of how to do that. In order to validate that effectiveness, first, necessary processing parameters have to be defined to fulfill the required purpose. Due to the generally low contamination level found in low-moisture foods, naturally contaminated materials cannot be used to establish processing parameters. The use of artificially contaminated materials needs careful consideration with respect to contamination levels, adaptation of *Salmonella* to the respective environment, as well as the strains of *Salmonella* chosen for the studies. Further thoughts are given to the process itself - and the determination of the critical process parameters in order to control that hazard. Once all those conditions and parameters are established, the next step would be the validation of the industrial process itself. Up to now, there are two main approaches generally used: one is using the scientifically (laboratory) defined conditions to validate the process by the parameters defined as critical, the other approach uses so called “surrogate” microorganisms and monitors their behavior in the industrial process environment. The advantages and disadvantages of both approaches will be discussed in the presentation.

S2 - Chemical Contaminants in Foods

ILSI Europe Sponsored
Chair, *Ib Knudsen*

Emerging issues in chemical contaminants – historical issues, current and future topics
Benoit Schilter

With the advancement of science, significant developments have been achieved on various sensorial, safety and nutritional attributes of food. Parallel to this evolution, food has also been found to be a source of public health problems. Illnesses may be caused by infectious (microbiological) or toxic (chemical) agents entering the body during the ingestion of contaminated food or water. Because of the globalization of food trade, intensive agriculture and environmental pollution, this hidden aspect of food quality has become an increasing concern for consumers, regulatory authorities and food industry. In the presentation, a brief historical background will be provided on chemical versus microbiological food safety evaluation. Then, examples of new challenges to be faced in chemical safety, such as dealing with chemicals for which no adequate toxicological information is available, or the assessment and management of process-related contaminants and food adulterants will be discussed. Other significant challenges in the chemical area are on risk assessment basic principles such as on the evaluation of the risk associated with genotoxic carcinogens and on the consideration of both risks and benefits in a single integrated assessment.

Overview of heat processing contaminants in food – a case study on 3-MCPD esters
Ib Knudsen

3-Monochloropropane-1,2-diol (3-MCPD) and other chloropropanols such as 2-monochloropropane-1,3-diol (2-MCPD) have for a long time been known as contaminants in various foods like liquid seasoning and bakery goods.

In 2001, SCF derived a Tolerable Daily Intake (TDI) for 3-MCPD at 2 μg/kg bw and in 2002 JECFA established a Provisional Maximal Tolerable Daily Intake (PMTDI) for 3-MCPD, also at 2 μg/kg bw.

Recently the findings of fatty acid esters of 3-MCPD have been reported in various types of foods and food ingredients, especially vegetable oils. Although there is no evidence to suggest any adverse effects from 3-MCPD esters in food, an indirect toxicological concern is raised by the potential release of free 3-MCPD through the action of gut lipases. Exposures up to 20 fold the TDI of 3-MCPD have been estimated from infant formulae.

The health significance of dietary MCPD esters is complex and warrants in depth scientific investigations, which need to be defined. With this purpose in mind ILSI Europe in cooperation with the European Commission and the European Food Safety Authority organised a workshop on the 5-6 February 2009 in Brussels.

The presentation will summarize the main outcomes of this workshop as well as the direct follow-up plans.

Risk-benefit assessment of heat processing contaminants – example of acrylamide
Jeljer Hoekstra

Some foods or food substances can exert both beneficial and adverse health effects. The risks and benefits need to be balanced. Within the EU-FP6 project BRAFO a methodology is developed to perform a benefit-risk assessment. The method consists of a tiered approach that stops as soon as the risk-benefit question is sufficiently answered. The method start with framing the question, then follow 4 tiers in which the risks and benefits are identified and characterized and eventually benefits and risks are expressed in a common health metrics and compared.

S3 - Round Table – Dealing with Global Regulations, The *Listeria* Case

Chairs, *Michael Brodsky and Ciaran Conway*

Increased cases of Listerosis in the EU
Alexandre Leclercq

No abstract

S4 - Food Packaging Safety and Emerging Issues

Chair, *Benoit Schilter*

Novel food packaging technologies and emerging safety issues
Natalie Gontard

The presentation will focus on safety issues arising from speculative but reasonable hypothesis on food packaging technologies development scenarios.
R&D efforts were in the last decades mainly dedicated to the huge development of convenient versatile petrochemical plastics, related additives, recycling processes and safety assessment. Future packaging will have to respond to the evolution of societal needs and concerns in term of health, quality, environment, cost, sustainability, worldwide raw materials availability, information etc. It could be anticipated that concepts such as in-package food treatments, active, intelligent, bio-based, biodegradable, nano-structured materials etc. will develop. More complex food/packaging interactions could be anticipated e.g. for biodegradable materials because of their sensitivity and variability, active and intelligent systems because of the complexity of reactive substances and reaction products, nanotech based materials because of the gap of knowledge to fill in potential migration. To cope with these emerging issues, specific analytical and toxicological skills should be developed. Examples will be briefly presented and analyzed.

Mycotoxins and recent legislations
Simon Edwards

Mycotoxins are fungal metabolites that are toxic to animals at low concentrations. Mycotoxins cover a diverse range of chemistry and can result in a diverse range of clinical symptoms. Mycotoxins are routinely present within animal feed and human foodstuffs at sub-clinical concentrations but there presence at clinical concentrations is rare, particularly in developed countries. Within the European Union the general principal is to set guideline limits for mycotoxins in animal feed and legislative limits for mycotoxins in food. The most potentially harmful mycotoxins present within the human diet are aflatoxin and ochratoxin. These mycotoxins are genotoxic carcinogens and very low legal limits exist based on the ALARA (As Low As Reasonable Achievable) principle. More recently European legislation has been introduced or will be introduced in the near future for a number of fusarium mycotoxins. These mycotoxins are produced as a result of fungal diseases within field crops of cereals. These mycotoxins are less toxic than aflatoxin and ochratoxin and they are difficult to control as the disease is largely dependent on weather. The introduction of this legislation has had a large cost to the European cereal industry and yet may have had no benefit to the consumer. In fact, as the mycotoxin load is greater within high fibre/wholegrain products, the impact of legislation may have increased the cost and reduced the availability of high fibre/wholegrain products, which are acknowledged as beneficial within our diet. There is a need for a holistic cost/benefit analysis of mycotoxin legislation.

S5- Water Quality and its Relation to Food Quality and Safety

ILSI Europe Sponsored

Chairs, *Michele Storrs and Fabrice Peladan*

The significance of water in food production, processing, and preparation

Mieke Uyttendaele, Professor, Ghent University

It has become apparent that the design and operation of food supply chains is increasingly the subject of strict control measures with respect to management of food safety. In addition food companies are subject to more stringent environmental regulations. In this framework the focus is increasing on the use of water in the food industry and its potential as a vehicle for microbial contamination. Water is important in food production, processing and preparation. Water is used at primary production e.g., for irrigation but also in processing e.g. for washing and cooling purposes or it might be considered as an ingredient. Especially since the use of tap water is under pressure because of cost and sustainability concerns, other water sources such as rainwater and recuperated process water are being applied. This creates difficulties and new challenges in food safety control. This will be exemplified with some case studies.

Little specific information in quality assurance standards and guidelines on the practical implementation of "Good Practices" for use of water in the food supply chain. If standards are set for water they are usually worked out on an ad hoc basis, based upon a risk profile. They may differ considerably dependent upon the exact function of "water" used in the food supply chain and the type of food industry. Some examples will be given with regard to the development of defined and specific (national) recommendations on the use of water in food processing as worked out by some industry associations

Emerging water quality issues which may have substantial impact on food safety

Lee-Ann Jaykus

Water quality (and availability) invariably impact food safety. Several common themes underlay this statement. The first is our continued need to assure the absence of fecal contamination (animal or human) and adequate disinfection of all water sources used in food production, processing, and handling. Since water is a critical component at all phases of the farm-to-fork continuum, availability to high quality water is necessary to grow, clean, process and prepare food. Finally, for some products (fisheries), the aquatic environment is the production environment itself. In all cases, failure to provide an adequate source of safe water can result in contaminated food, and in some ways, waterborne disease is foodborne disease, and vice versa. In this presentation, we will discuss emerging issues which threaten water quality and availability as they impact food safety. Using specific examples, we will first identify the means by which contaminated water results in contamination of food products. We will then discuss factors which will likely impact the assurance of an ample quantity of high quality water in the future, including the effects of global climate change and the need for international harmonization of water quality standards, including alternative microbiological indicators. Differences in resources and priorities across the globe make assurance of safe and abundant water a complex endeavour but one for which immediate dialog is imperative.

S6 - Novel Processing Technologies and Food Safety

Chairs, *Helmut Steinkamp and Dietrich Knorr*

Novel technologies and legislation

Chris Jones

The novel food regulation (EC) 258/97 applies to any food or food ingredient that has not been consumed to a significant degree in the EU prior to 15 May 1997. This regulation requires that all novel foods undergo a comprehensive safety evaluation before they can be legally sold anywhere in the EU. This regulation also requires that foods produced using a new production process not used in the EU prior to the same date also undergo a premarket safety assessment.

In the UK, the Food Standards Agency is responsible for novel foods, and since 1997 has carried out more novel food assessments than most other Member States. This presentation will deal with the regulatory requirements for novel foods and technologies and offer an insight as to how to submit an application.

Examples of novel technologies, high pressure and pulsed electric fields

Stefan Toepfl

During food processing chemical, biological and physical mechanisms are used. At present mainly thermal energy is used for food preservation, but in addition to temperature also the impact of other driving forces such as electric or magnetic fields or pressure can be utilized. Techniques, where temperature is not the major principle of action are considered as non-thermal.

Pressure can be applied for preservation of heat sensitive premium products in a final package. At present 130 industrial installations are in use. Dependent on processing conditions an inactivation of pathogenic and spoilage microorganisms, enzymes, viruses and spores can be obtained. The impact of pressure on biopolymers such as

starch or proteins allows a targeted structure modification. Nevertheless also side effects and undesired actions need to be taken into account with regard to food safety and quality.

Electric field application causes permeabilization of cell membranes. Pulsed electric fields can be utilized to enhance mass transport in plant or animal tissue as well microbial inactivation. Due to its minor impact on proteins and nutrients the continuous preservation technique is particularly applicable to heat sensitive media. The technique is commercialized at present. Besides the desired actions electrochemical reactions might cause electrode erosion as well as changes in product quality.

In addition to understanding of desired process-product interactions successful industry adoption requires knowledge on potential undesired actions. Scalability, industrial applicability and adoption as well as process control options will be discussed, exemplarily.

S7 - Prepared but Not Ready-to-Eat Foods

Chairs, *Han Joosten and Andy Davies*

Microbiological safety issues with prepared but not ready-to-eat foods: a category doomed for extinction?

Paul Hall

Prepared but not ready-to-eat (NRTE) foods are made with ingredients that are not fully cooked and require further cooking to assure microbiological safety. NRTE products are being recognized as a vehicle for foodborne outbreaks. There have been several salmonellosis outbreaks associated with these types of products. There are several commonalities with these foods including many are frozen and many can be cooked in the microwave oven. An analysis of the contributing factors to these outbreaks show that the consumer is often confused over the raw versus cooked nature of the product and that consumers often did not follow package cooking instructions. It is critical that consumer cooking instructions for NRTE products be simple to follow and that they be properly validated by the manufacturer to deliver the proper level of lethality against target pathogens. Microwave heating is known to be variable in nature and presents unique challenges to properly validating consumer heating instructions. Even if cooking instructions can be properly validated, there is still the significant challenge of ensuring that the consumer will follow them. Recognizing the challenges and complexities surrounding the safety of NRTE foods, regulators are moving closer to treating these foods like ready-to-eat foods (RTE) requiring, for example, that NRTE ingredients be free of pathogens. It is apparent that the distinction between NRTE and RTE foods is becoming blurred and the whole category of NRTE foods may fade away.

Salmonella in prepared but not ready-to-eat foods

Ian Williams

An estimated 1.4 million *Salmonella* infections occur annually in the United States with approximately 30,000 culture-confirmed cases reported each year to the Centers for Disease Control and Prevention. In the past several years a number of prepared, but not ready-to-eat foods have been implicated in *Salmonella* outbreaks including stuffed chicken products, chicken nuggets, chicken strips, frozen pizzas, and frozen pot pies. In particular, frozen, microwavable foods are increasingly being recognized as a vehicle for *Salmonella* outbreaks. This presentation will review the epidemiology of these outbreaks including the recent outbreak of >350 *Salmonella* I4,[5],12:i:- infections in 39 States linked to a single brand of commercially produced frozen pot pies. Approximately 70% patients in this outbreak reported cooking the pies in a microwave. Of case-patients who ate a pot pie cooked in a home microwave, only one-third reported knowing the wattage of their microwave oven. Of the case-patients who ate a pot pie cooked in microwave outside of the home, approximately 10% reported knowing the wattage. These outbreaks have identified consumer confusion over the raw or cooked nature of these products and have revealed issues with inadequate labeling as well as consumer responses to labeling information which affect food safety. These outbreaks highlight the need for frozen foods that are not ready-to-eat to be thoroughly cooked; such foods should be clearly labeled and cooking instructions should adequately address how variability in output wattage of microwaves affects cooking times.

S8 - Allergens in Food

Chair, *Sigrid Haas-Lauterbach*

Patterns and prevalence of food allergies – implications for food allergen management

Clare Mills

Concerns about food allergies have increased over the last 20 years, and in response to this the European Commission, through the Directorate Géneral for Research, has funded a series of projects focused on food allergy under successive tranches of funding known as Framework Programmes (FP). The lack of good quality data on how many people suffer from food allergies, which foods they react to, how much of a food can cause a problem, has been hampering the development of effective management strategies to optimize the quality of life for allergic patients. There is also no data on the impact of food allergies on quality of life or an estimate of its cost to society. The EuroPrevall project, funded through FP6, brings together a multidisciplinary partnership to address these issues. Cohorts spanning the main climatic regions of Europe have been developed in infants through a birth cohort, community surveys in school-age children and adults and an outpatient clinic study and a meta analysis undertaken on epidemiology data already available in the literature. Confirmatory double-blind placebo controlled food challenge diagnosis has being

undertaken using foods as they are eaten with titrated doses to allow no-effect and lowest-observable effect levels for allergenic foods to be determined. The cohorts are also facilitating validation of novel *in vitro* diagnostics through the development of the EuroPrevall serum bank. Complementary studies in Ghana, Western Siberia, India and China are allowing insights to be gained into how different dietary patterns and exposure to microorganisms affect patterns and prevalence of food allergies. This also builds on networks developed through an allied project, Glofal, led by Maria Yazdanbakhsh which is taking tools and approaches developed in EuroPrevall and other EU-funded projects, to study food allergies in Ghana, Gabon and Indonesia with particular reference to the role parasitic infections and parasitic diseases may play in development of allergies. New instruments to assess the socioeconomic impact of food allergy have been developed and are now being applied in the EuroPrevall cohorts, which will allow an assessment to be made of the burden this disease places on allergy sufferers and their communities.

Harmonisation of food allergen testing
Roland Ernest Poms

In recent years various allergen detection methods have been published and test kits have become commercially available. Due to the nature of the analytes (usually allergenic proteins, specific marker proteins, or specific DNA markers) and their susceptibility to various processing effects, reliability and comparability of results has posed a great challenge. Often processing and matrix effects hamper the extraction efficiency and the quantitative analysis of allergens or markers in food products. Both Reference Methods and Reference Materials are urgently needed in the field of allergen testing. For the time being, ELISA based methods and Lateral Flow Devices will remain the major tools in routine analysis. However, it is imperative for testing laboratories to validate the method that is employed for their specific purpose and the specific food product. Currently the EU-funded Network of Excellence, MoniQA (www.moniqa.org), is working towards the harmonisation of monitoring and control strategies for food quality and safety assessment, and thus focuses on performance criteria for methods used to analyse foods and food products for safety and quality. The main focus of the Network is rapid methods and their applicability and reliability in routine testing for safety of foods and food products. The presentation will give an overview of the first harmonised validation protocol on food allergen detection via quantitative ELISA (MoniQA and AOAC), the design and production of urgently needed Reference Materials RMs (new are incurred RMs of egg and milk in baked products), recently initiated method validation studies, and a user-friendly database as a practical decision making support tool.

Plenary Session 3

Chair, *Hilde Kruse*

Nanotechnology: its Safety Impact on Food Production
Mohammad Qasim Chaudhry, Central Science Laboratory

Like other sectors, recent advances in nanotachnology are promising to revolutionise the food and healthfood sectors. Although the level of current nanotechnology applications in the EU's food sector is only marginal, an increasing number of products is available worldwide. Nanotechnology applications in the food and healthfood sector are also anticipated to grow rapidly in the coming years. The new technological developments have, however, also raised certain concerns over the safety of nanomaterials to consumers' health. This presentation will highlight the current state of nanotechnology developments in this area, and will discuss the likely benefits and potential risks of nanotechnology applications for food and related sectors.

More Foodborne Outbreaks – Does it Indicate the Food is Less Safe?
Ian Williams, Centers for Disease Control and Prevention

Foodborne illnesses are an important health burden in the United States. Though most illnesses are sporadic, more than 1,200 foodborne disease outbreaks resulting in more than 27,000 illness are reported annually. Most of these illnesses are preventable. Prompt and effective outbreak investigations are necessary to not only remove contaminated food from the market and prevent further illnesses, but also to focus prevention strategies on critical contamination points in the path from farm to table. The epidemiology of foodborne disease outbreaks continues to change as a result of increased centralization, industrialization, and globalization of the food supply. Major improvements have been made to the United States public health laboratory infrastructure in the past decade with the implementation of PulseNet, the national molecular subtyping network for foodborne disease surveillance. PulseNet participants perform standardized molecular subtyping (or "fingerprinting") of foodborne disease-causing bacteria by pulsed-field gel electrophoresis (PFGE). Recently Enteric Diseases OutbreakNet, a national network of epidemiologists and other public health officials who investigate outbreaks of foodborne, waterborne, and other enteric illnesses, has been formed in the United States. Both of these systems have made it easier to identify foodborne disease outbreaks including a number of high profile investigations linked to items such as fresh produce, frozen pot pies, peanut butter containing foods, and prepacked cookie dough. In particular, these systems have indentified an increasing number of outbreaks resulting from industrial contamination events effecting persons in multiple states and countries. This presentation will review changes to the food safety system, as well as our ability to detect and investigate foodborne disease outbreaks, to examine if our food is less safe today.

Food Safety versus Food Security: A Global Challenge

Sarah Cahill, Food and Agriculture Organization of the United Nations

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The world produces sufficient food to feed its population, but many millions in developing countries are undernourished. While global food security remains high on the international agenda it faces a range of challenges from climate change to soaring food prices. The United Nations has stated that access to a safe and secure food supply is a basic human right. Thus food safety should be considered an integral part of food security. Risk analysis plays an important role in balancing food safety and food security whereby the risk of food insecurity associated with food safety measures must be considered. More often, ensuring safe food has positive implications for food security. It lowers the risk of food-borne illnesses and the associated health, social and economic consequences. The application of measures such as GAP, GMP and GHP lead to improvements in both food safety and quality, result in reduced food losses, and thereby increase food availability. However, food safety regulations often have associated compliance costs which may be prohibitive for some producers and may raise food prices with negative consequences for poor consumers in terms of access to food. When food is in short supply policy makers might think it necessary to consider accepting lower food safety standards to protect food security. Thus, the challenge is to use the risk based tools available to us to ensure that food security and food safety remain firmly integrated.