Opening Session Wednesday, 18 May, 9.00-10.30

Welcome Speech
Wim Schreuders, Inspector General, Food and Consumer Products Safety Authority, The Netherlands

Wim Schreuders joined the new Food and Consumer Products Safety Authority in September 2009, having previously worked as Director General Social Services of the City of Amsterdam. Prior to that, Wim has worked as a consultant and in a number of public sector roles in the Tax and Customs Administration from 1977 to 2002, including several regional management positions. Wim has a background in running very large and high-volume services, as well as merging public organizations and realizing down-sizing operations. As Inspector General, he's responsible for safeguarding the health of animals and plants, animal welfare and the safety of food and consumer products.

Introduction to IAFP and the Symposium
David Tharp, Executive Director, International Association for Food Protection, United States

David Tharp serves as Executive Director of the International Association for Food Protection (IAFP) with offices located in Des Moines, Iowa, USA. David began his association career in 1993 as the Director of Finance and Administration with a promotion to Executive Director taking place in 1997.

David has served many food safety related organizations including the 3-A Sanitary Standards, the Food Allergy and Anaphylaxis Network, the Partnership for Food Safety Education and the UL Environmental and Public Health Council among others. His degree in Business Administration was earned from Drake University in Des Moines with a major in Accounting and he is a Certified Public Accountant (CPA). In addition, David achieved the Certified Association Executive (CAE) designation from the American Society of Association Executives.

# # #

IAFP provides food safety professionals worldwide with a forum to exchange information on protecting the food supply. This is achieved through two monthly journals; the *Journal of Food Protection* and *Food Protection Trends*, an online newsletter titled the *IAFP Report* and through an Annual Meeting in North America where research topics on food safety issues are presented. IAFP also holds a symposium in Europe each year and a separate international symposium.

Global Burden of Foodborne Disease

Arie Havelaar, Deputy Head of the Laboratory for Zoonoses and Environmental Microbiology, National Institute for Public Health and the Environment (RIVM), The Netherlands

The real public health impact and cost of foodborne disease globally is unknown. The Initiative to Estimate the Global Burden of Foodborne Diseases was launched out of the need to fill this data gap by WHO, to enable policy-makers and other stakeholders to set appropriate, evidence-informed priorities in the area of food safety. Supported by the Foodborne Disease Burden Epidemiology Reference Group (FERG), the Initiative aims to:

- Strengthen country capacity for conducting burden of foodborne disease assessments in parallel with food safety policy analyses.
- Provide estimates on the global burden of foodborne diseases according to age, sex and regions.
- Increase awareness and commitment among Member States for the implementation of food safety policy and standards.
- Encourage countries to use burden of foodborne disease estimates for cost-effectiveness analyses of prevention, intervention and control measures.

To estimate the global human health burden (expressed in Disability-Adjusted Life Years (DALYs), FERG will focus on microbial, parasitic, zoonotic and chemical contamination of food with an emphasis on diseases whose incidence and severity is thought to be high, and on pathogens and chemicals that are most likely to contaminate food and which have a high degree of preventability.
This presentation will review the technical background and challenges of assessing the burden of foodborne diseases, based on national and international studies. The overall plans of FERG at the global level as well as current achievements will be discussed.

Plenary Session Wednesday, 18 May, 11.00-12.00

Chair, Stefano Colombo

The Effect of Climate Change on Microbial Ecology and Food Safety

Lee-Ann Jaykus, Professor of Food Science and President, IAFP, North Carolina State University, United States

There are many ways in which anticipated changes in climate may impact the safety of the world's food supply. It is well recognized that climate has a significant effect on agricultural production; however, it also has carry over effects on food processing, preparation and trade. The purpose of this presentation is to cover the possible effects of climate change to food safety. We will begin by introducing the various environmental impacts of global climate change, and the locations of the world at higher risk for severe outcomes. Then, specific examples of impacts to food safety that occur as a consequence of extreme weather events will be given. Major themes include the following: (i) seasonality and temperature effects; (ii) interplay of ecological factors; (iii) microbial evolution, stress and pathogen emergence; (iv) effects of climate change on water quality and availability; (v) human population

dynamics; and (vi) impacts on international trade. Although the consequences of climate change on food safety may be difficult to predict, there are efforts in this regard. Together, we can raise awareness of the issue and facilitate international cooperation in an effort to minimize the impact of climate change on the world's food supply.

Sustainable Livestock Production and Food Safety
Joost De Jong, Food and Consumer Products Safety Authority, The Netherlands

- This conference is a useful tool to learn from each other through the exchange of 'best practices'
- A global increase of food production (9 billion people in 2050) in a sustainable manner is necessary.
- We need to manage the risks of food safety and animal health. Ensuring food safety is an important role of the governments.
- A few trends are relevant: With the climate change, the international trade and the intensification of agriculture we will meet an increase of animal diseases; Much more animal diseases are related to human health; And the risks for human health are getting bigger if we don't take the necessary measures.
- Antimicrobial resistance (AMR) might become a top issue in the prevention of livestock related human health. Our minister wants to reduce the use of antibiotics with 50% in 2013.
- Regulation is not always the best approach to tackle the problems. We like a Dutch 'polder' approach (parties working together).
- There are a lot of things to do to increase the food production in a sustainable manner. Ensuring food safety and preventing animal diseases are very important for our food security in the future. With a good global cooperation we will tackle the problems we are facing.

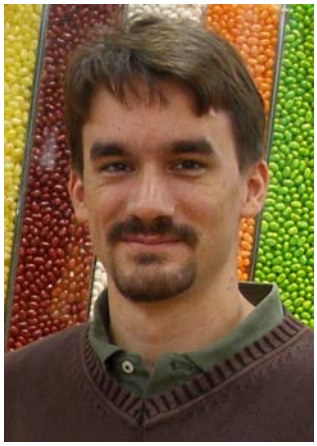
Parallel Session Wednesday, 18 May, 13.30-15.00, Schouwburg Room
Food Safety Management

Chairs, John Bassett and Marcel Zwietering

Food Safety Management, A U.S. Perspective
Robert Buchanan, University of Maryland, United States

The state of risk management as applied to microbial food safety and food protection issues is currently in a state of transition, in part reflecting both the globalization of the food supply chain and the gradual adoption of risk analysis by both industry and competent authorities. Strong drivers in the United States have been the increased conduct of formal risk assessments in support of new federal public health regulations and other regulatory decisions, the adoption of risk analysis frameworks by intergovernmental organizations such WHO, FAO, and OIE, the emergence of risk management metrics concepts and techniques and the increased use of performance criteria for verifying compliance. This has resulted in the increased efforts to more directly relate food safety programs' performances to public health

outcomes. However, this evolutionary process is being challenged by several trends. For example, new regulations just approved include exemptions for small businesses or small farms from food safety risk management programs. Another example is the continuing risk communication challenges associated with the microbiological testing programs set at the limit of detection. Such "zero tolerance" programs would benefit with a much more transparent discussion of the risk reduction actually achieved. In addition there are going to be large conceptual challenges such as how do manufacturers develop HACCP plans that are consistent with risk management concepts and goals. Despite these challenges, risk management will increasingly become part of the food safety lexicon if the food industry and its regulatory agencies are going to deliver on the promise to develop risk-based, science-based, cost effective food safety systems.



Food Safety Management Driven by Food Safety Assessment, An Industry Perspective

François Bourdichon, France

Under the 178/2002 European Regulation know as general food law, a food business operator (FBO) is best placed to devise a safe system for supplying food and ensuring that the food it supplies is safe. (Consideration #30)

Food must not be placed on the market if it is unsafe. In determining whether any food is unsafe, general principles of food law consider to take into account:

- the normal conditions of use,
- the information provided to the consumer,
- the likely immediate or delayed effect on health,
- the cumulative toxic effects (both microbial and chemical contaminants)
- where appropriate, the particular health sensitivities of a specific category of consumers (i.e., from allergy to metabolic syndrome)

At all stages of the food production chain, FBO ensures that food satisfies the requirements of food law and that those requirements are being adhered to. If food that is unsafe forms part of a batch, lot or consignment, the entire quantity is presumed to be unsafe and is rejected for consumption.

To meet the requirements of food safety management options, FBO must anticipate the risks of one food product/process from its conception, and therefore, under the principles of risk analysis, conduct a food safety assessment based on existing scientific evidence. Based on examples of "traditional" fermented food products and functional food products, we present the interaction between food safety assessors and food safety management to apply the risk analysis process from WHO (1995) to ensure conformity and safety.

Food Safety Objectives Validation
Marcel Zwietering, Wageningen University, The Netherlands

Validation is the collection and evaluation of scientific and technical information to determine if the processes in a food chain, when properly applied, will effectively control the microbiological hazard, or in other words, if the process criteria can reliably deliver a specified performance or food safety objective. In this paper, the ICMSF equation for the prevalence and levels of microorganisms from the initial contamination (H_0), reduction (ΣR), growth and recontamination (ΣI), and factors influencing these are considered throughout food production until consumption, and in their role in meeting the FSO. The impact of taking into consideration both the level and the variability of these factors on the proportion of product meeting the FSO has been investigated. In this manner it can be examined where in the process the main factors are found to control the proportion of product meeting the FSO. Furthermore, equivalence in performance, either by reducing the level or the variability in a level, is investigated. Both experimental and statistical aspects are described that can together be combined to support the confidence that a process can conform to a set FSO.

Parallel Session Wednesday, 18 May, 13.30-15.00, Calluna Room
Emerging Risks in Food, from Identification to Communication
Chair, Wayne Anderson

The Development of a Process for the Identification of Emerging Risks in the Food Chain
Tobin Robinson, European Food Safety Authority, Italy

The European Food Safety Authority (EFSA) is establishing a data monitoring capacity, data filtering methodology and networking structures to identify emerging risks and drivers of emerging risks in a timely fashion and to communicate these to the risk manager.

Three principle sources of information, that is, the RASFF, media and trade data have been identified and assessed. In addition, the scientific literature is monitored. While the current data sources monitored are limited, they have been sufficient to enable the elaboration of the procedures for the next steps in the emerging risks identification process. As more data sources become accessible, the process will become more effective.

Networking with stakeholders, MS, EU and international agencies is seen as a key step in developing the effectiveness of this process, and the structures for carrying this out effectively are being developed.

Apollon: An Emerging Risk Detection Support System for Food and Feed Safety

Hubert Noteborn, Food and Consumer Product Safety Authority, The Netherlands

Detection of emerging risks requires access to a large amount of information from incident data, research and surveillance programmes. Moving from detecting to predicting 'surprising' threats is an even more intensive exercise. It requires, for instance, sharing intelligence drawn from specialists, stakeholder networking, root cause analysis and 'business' rules. VWA is currently exploring a systemic technology-based approach to identify emerging risks in the food and feed chain: Apollon. The core intelligence is being derived from using drivers inside and outside the pork meat production chain, classified in categories such as STEEP, which can either amplify or attenuate the magnitude or frequency of the emergence of foodborne hazards. The harvesting of data and information relies principally on their detection through the use of signals of indicators as primary markers of emergence. Therefore, appropriate sources within and outside VWA are screened electronically by means of a real-time central data collection facility (Data Integration Component of Palantir). Data are accessible to various analysts for a first evaluation of threats by custom-made 'business' rules. It is intended that this methodology will also be rolled out to industry and other Authorities including EFSA. The solution will strengthen the synergy between the intuitive and methodical approaches adopted by risk assessors, inspectors and policy officers.

Understanding Emerging Issues – An Industry Perspective

Rachel Ward, PepsiCo Europe, United Kingdom

A broad range of issues can impact and disrupt the food manufacturing industry, ranging from insufficient supply of raw materials, differing regulatory controls between source country and market of sale, growth in use of agricultural land for non-food uses, new analytical test methods, and changes in consumer susceptibility to foodborne hazards. Issues can present risks and therefore need to be characterised to determine whether they represent real significance to health and/or impact on consistent production of safe food. Integration into day-to-day business of approaches to capture emerging issues and generate review by multi-disciplinary experienced groups can support effective and sustainable risk management. Earlier issue identification coupled with scientific risk evaluation enables development of focused risk prevention activities for consumer protection and prevention of business disruption. Stakeholder discussion **fora** can augment understanding of the scope and scale of the impact of emerging issues, confirm risk significance to health and disseminate timely advice on best practice for risk prevention.

Parallel Session Wednesday, 18 May, 15.30-17.00, Schouwburg Room
Review of Outbreaks
Chair, Michele Storrs

Difficulties in Outbreak Control: Duck Eggs and *Salmonella*
Wayne Anderson, Food Safety Authority of Ireland, Ireland

Duck eggs are a known source of *Salmonella* and many reports exist, particularly from the UK, from the 1940s and 1950s. One such report by Sir William Savage appeared in the *British Medical Journal* (Savage, 1956), in which he reviewed outbreaks of *Salmonella*. He attributed 21% (n = 45) of *Salmonella* outbreaks in UK between 1951 and 1953 to duck eggs. In 1952 Miller reported a detailed investigation of an outbreak due to duck eggs in which he isolated *Salmonella* Typhimurium for the ovaries and the faeces of the suspect ducks. Talking to older people from the UK, they recollect government warnings about eating duck eggs around the post war period. Today we seem to have lost that memory, and there has been resurgent interest in duck eggs in Ireland, driven in part by celebrity chefs, and in part by and renewed interest in 'backyard' food production. Today, in Ireland, there are approximately 3,000 'backyard' duck flocks registered with the Department of Agriculture, Food and Marine (DAFM).

From August 2009 to December 2010 there were 33 reported cases of illness caused by a particular strain of *Salmonella* Typhimurium DT8/30. Twenty-eight of these cases occurred in 2010, and sparked a major outbreak investigation that year led by the Health Protection Surveillance Centre (HPSC), in collaboration with DAFM, the Food Safety Authority of Ireland (FSAI), the Health Services Executive (HSE) and the Local Authority Veterinary Service (LAVS). In all, 22 duck farms were found positive for the outbreak strain, and one hatchery was positive for a different phage type of *S*. Typhimurium. Farmers with positive flocks were prevented from placing duck eggs on the market and many flocks were depopulated. Three press releases were issued to warn the public over the year and point of sale warnings were displayed in retail shops. A code of practice was developed to address hygiene and safety in duck egg production and leaflets were distributed to commercial and 'backyard' flock owners. New legislation was drafted by DAFM to require duck flock owners selling eggs to have a *Salmonella* control plan including periodic flock testing.

In September 2010, the UK also notified the public of an ongoing outbreak of *S*. Typhimurium DT8, tracking human cases back as far as 2008. Duck eggs were again the vehicle for infection and clearly many duck flocks in UK and Ireland were infected with the same pathogen. Although there were no more reported cases in Ireland after October 2010, we did not consider the outbreak ended.

This paper will describe the difficulties in investigating this outbreak and show the complexities of a food distribution chain that until 2009 was not considered large enough to warrant specific controls.

Miller A.A. (1952) Human *Salmonella* Typhimurium infection due to duck eggs. BMJ, July 19, 125–127.
Savage, W. (1956) Problems of *Salmonella* food-poisoning. BMJ, Aug 11, 317–323.

Multi-state Outbreak of Human *E. coli* O145 Infections Linked to Shredded Romaine Lettuce from a Single Processing Facility

Jack Guzewich, U.S. Food and Drug Administration, United States (to be presented by Robert Buchanan)

Federal, state and local public health agencies in the U.S. investigated a multi-state foodborne disease outbreak involving 33 cases of *E. coli* O145 infection in five states in the spring of 2010. An epidemiologic investigation found that the illnesses were associated with the consumption of shredded romaine lettuce processed at one firm in Ohio. FDA's investigation at the processor did not identify a likely source of contamination at the firm. FDA conducted a traceback investigation from the processor that led to the farm near Yuma, Arizona.

The suspect romaine lettuce was grown in four fields of a farm. Significant potential sources of STEC were not identified in the initial on-farm investigation of the growing fields. The subsequent investigation initially identified six potential sources of STEC in the area; three Concentrated Animal Feeding Operations, one housing development with a co-located sewage treatment facility, one recreational vehicle (R.V.) park with multiple septic leach systems, and the seasonal grazing of sheep on harvested wheat and alfalfa fields.

The R.V. park is located on a knoll directly above the lateral irrigation canal that supplies water to the suspect fields. The R.V. park is serviced by eight on-site septic leach systems. During this investigation we found evidence of drainage from the R.V. park property directly into the lateral irrigation canal. Soil samples from these moist drainage areas and the adjacent canal contained non-O157 STEC Shiga toxin 2 (Stx2)-producing *E. coli*, but none were the O145 Shiga toxin 2-producing outbreak strain. We determined that the R.V. park is a reasonably likely potential source of the outbreak pathogen.

***Salmonella* Bareilly Outbreak in the UK Associated with Bean Sprouts**

Paul Cook, Food Standards Agency, United Kingdom

Bean sprouts are commonly used in stir fry dishes and are sometimes eaten raw in salads. Although bean sprouts appear to have been associated with fewer outbreaks than other sprouted seeds (e.g., alfalfa), outbreaks have occurred in both Europe and North America dating back to the 1980s.
In September 2010 a national outbreak control team was established following an outbreak of *S.* Bareilly associated with a wedding reception in Northwest England and an increase in the number of sporadic *S.* Bareilly infections in Scotland and England. Pulsed Field Gel Electrophoresis showed the emergence of an outbreak strain, and between early August and mid December there were over 240 laboratory-confirmed isolations of *S.* Bareilly across the UK and from all age groups.

A case control study found a significant association between cases of illness and the consumption of bean sprouts. The outbreak strain of *Salmonella* Bareilly was first isolated from bean sprouts in October, and subsequent testing found further evidence of bean sprout contamination, albeit at low levels. Although contaminated seed was the most likely source of *S*. Bareilly contamination, the supply chains linking seed, bean sprouts, retail, catering and cases of illness were complex. Variation with respect to handling, washing and cooking of bean sprouts was highlighted by the outbreak and national agencies issued advice to both consumers and food businesses.

Parallel Session Wednesday, 18 May, 15.30-17.00, Calluna Room
Topical Microbiological Issues

Chair, Marcel Zwietering

Persistence and Survival of Pathogens in Dry Processing Environments

Roy Betts, Campden BRI, United Kingdom

Drying of foods has been used throughout time as an effective method of preservation, allowing products that would otherwise perish, to be stored over long periods. Although very effective at preventing microbial growth, drying also provides an environment that is ideal to preserve microorganisms in a viable state, ready to grow either within that food or within a suitable host, as soon as adequate water becomes available. Because of this there have been many issues of recalls and food poisoning linked with dried foods. One of the issues that is often seen is the ability of pathogenic organisms to survive for long periods within the dried food processing environment. Drying helps to enable organisms to resist some stresses, e.g., heat, this together with a reluctance for dried food manufacturers to 'wet clean' dry areas, can make the dry processing environment a 'safe haven' for some organisms.

The challenges manufacturers now face is the understanding of the risks associated with such organisms, together with an understanding of how to control that risk, and both prevent such pathogens from entering processing areas, and effectively destroying any that may be close by.

Impact of Microbial Distributions on Food Safety

John Bassett, Unilever, SEAC, United Kingdom

Not much is known about how microorganisms are physically distributed in foods, yet these distributions determine both the likelihood that a foodstuff will cause illness and the consequential public health burden. When food is sampled in an effort to reduce the risk of causing illness, the effectiveness of the sampling programme is related to the spatial distribution of the microorganisms that are being sampled for. In the absence of exact knowledge, generalising assumptions are often

made as to the nature of the distributions. Better insight into the actual microbiological distributions may help to improve food safety management decision-making.

This presentation is a summary of the 2010 ILSI Europe report "Impact of Microbial Distributions on Food Safety" and discusses mechanisms impacting on physical distributions of microorganisms in foods, characteristics and suitability of frequency distributions employed to model microbial distributions and the impact of both physical and frequency distributions on illness risk and food safety management criteria. Conclusions and recommendations from the report will be presented.

Measuring the Safety of the Food Chain in Belgium: Development of a Food Safety Barometer
Mieke Uyttendaele, Ghent University, Belgium

The use of indicators and measurement tools has become popular in the current era. The development of a concept to measure and follow up the safety of the food chain based on the 'Pressure-State-Response' model will be presented. Food safety, as became clear in the selection of the indicators, is a complex concept to measure. Although food safety and the impact of the food safety policy is often measured in terms of effects on consumers' health, the main focus of the food safety barometer are related to the aspect of exposure and takes into account direct and indirect food safety management systems as defined by the General Food Law (EU Regulation 178/2002). This is also reflected in the barometer by composing a basket of multiple food safety indicators targeting all stages in the food chain, and both including product analysis and preventive systems such as inspections and self checking systems, as well as aspects such as notifications and traceability. These indicators were weighted by key stakeholders in order to determine their relative weight to be considered in the barometer. The food safety barometer was elaborated to look for trends in food safety status over the years 2007 to 2009. The pros and contras of this concept of a food safety barometer will be discussed.

Reference: Baert, K., Van Huffel, X., Wilmart, O., Jacxsens, L., Berkvens, D., Diricks, H., Huyghebaert, A. and Uyttendaele, M. 2011. Measuring the Safety of the Food Chain in Belgium: Development of a Barometer. Food Research International. In Press.

Parallel Session Thursday, 19 May, 9.00-10.30, Schouwburg Room
Foodborne Viruses

Chair, Mieke Uyttendaele

The Role of Viruses in Foodborne Human Disease
Marion Koopmans, National Institute of Public Health and the Environment (RIVM), The Netherlands

The possible contamination of food by viruses by now has been recognized as a problem requiring specific control measures. Noroviruses and hepatitis A are the most commonly recognized foodborne viruses, but multiple other viruses sharing the fecal-oral route of transmission occasionally cause foodborne disease as well. Detection of outbreaks is hampered by frequent secondary

transmission (in the case of noroviruses), and by the long incubation period making food histories notoriously unreliable (in the case of hepatitis A and E). Therefore, collaboration between infectious disease physicians, public health laboratories, food inspectors and food microbiological laboratories is necessary for timely detection of contamination events. Coordination of responses and agreement on protocols for virus detection and typing is important, but not intuitive given the differences in focus between clinical, public health and food microbiology laboratories. The globalization of the food chain adds another layer of complexity to this task, as will be illustrated through recent examples of hepatitis A and hepatitis E. Despite these hurdles, progress has been made in estimating the proportion of illness that can be attributed to food consumption, for noroviruses and for hepatitis A. This work will be reviewed, and discussed, including current data gaps and needs.

Norovirus from an Industry Viewpoint
Sophie Zuber, Nestlé, Switzerland

The characteristics of viruses present new challenges for the food industry, as enteric viruses such as Norovirus tend to persist in the environment and are resistant to several commonly used food processes, such as mild pasteurisation. It is not always straight forward to assess the impact of a certain production process on virus survival as important knowledge gaps remain, especially regarding the impact of the matrix composition. The data found in the literature are sometimes contradictory and make risk assessment difficult.

Detection of foodborne viral contamination is based on molecular PCR-based techniques. These methods are costly in comparison with the detection of foodborne bacterial pathogens and are unable to discriminate between infectious and non-infectious viruses, making the interpretation of positive results problematic for the food industry.

The current trend toward the greater use of minimally processed ingredients is heightening the risks from viruses. In this context it is necessary for the food industry to put more emphasis on the prevention of contamination before and during processing at the supplier's and by specifically addressing viruses in HACCP studies. To do this, more prevalence data and comprehensive risk assessment studies linking outbreak data with levels of viral genome copies are needed.

The Challenges of Detecting Viruses in Food
F. Loisy-Hamon, CEERAM, France

Recent years have shown an increase in foodborne poisoning due to human enteric viruses, especially norovirus and hepatitis A virus.

In 2004, the European Committee on Standardisation (CEN) tasked a technical advisory group (TAG) with the development of a standard method for the detection of these viruses in foodstuffs, including molluscan shellfish, soft fruits, salad crops, food surfaces and bottled water. This standard method includes a qualitative and a quantitative part. The key methodology principles adopted, the controls and other quality

insurance measures supporting the method will be described. Performance criteria of the method have been evaluated by CEERAM on artificially contaminated food matrices.

CEERAM has developed and validated routine analytical procedures based on the standard method. Since 2007, these methods have tested on more than 1000 food samples potentially presenting a risk for human health. The observed prevalence data will be discussed.
These methods have also been applied to foodborne disease investigation. Different example of outbreaks will be illustrated; in particular the worldwide outbreak due to dried tomatoes contaminated with hepatitis A virus.

As the methods for virus detection in food samples are available for routine diagnostic, the virus food safety issue can be integrated in HACCP of food industrials. More than analytical methods, procedures are necessary for food process impact validation. Examples of virucidal effect of food process will be presented.

Parallel Session Thursday, 19 May, 9.00-10.30, Calluna Room
Potential of Nanotechology for Food Applications

Chairs, Pradip Patel and Stefano Colombo

Nanotechnology: Potential for the Food Industry
Frans Kampers, Wageningen University, The Netherlands

Food materials basically are nanostructured materials. Creating new functionality in a food product therefore means making modifications at the nanolevel. The need for new functionality often arises from global challenges that mankind faces with regard to food and food production. These include: feeding the world population, providing safe foods, contribute to the health of consumers and increasing the sustainability of the food sector.

In many of the applications of nanotechnologies in food the nanostructured materials do not end up in the food product. Improved sensing devices to ensure quality and safety of foods and improved processes that also enable product innovation are examples of these. But there are applications in which engineered nanomaterials get eaten.

The food industry develops novel food products that are fortified with specific ingredients. Nanotechnology can provide micro-sized structures that can contain various nutrients. The supramolecular structures can mask undesired flavors that would spoil the flavor of the product, can protect the substances from inactivation, can improve the bio-availability of the nutrients and can deliver them to specific parts of the gastrointestinal tract where they are most effective.

Our planet is not big enough to produce the animal proteins to meet the demand of the growing and wealthier world population. Based on nanotechnologies, new processes can be developed to produce protein rich food products in a sustainable way.

Nanotechnologies are used to improve packaging materials in such a way that the quality of the packaged products is maintained for longer periods in time. These package materials sometimes include nanoparticles that could migrate into the food product.

Trends in Nanotechology-based Diagnostics: An Overview

Pradip Patel, bioMérieux, France

Diagnostic methods are central to all industries, including healthcare, agrifood and environment. Developments in innovative technologies have been significant over the past decade to help real-time analysis, whether for provision of diagnosis at an affordable cost for delivery of efficient and timely patient care, or for provision of safe food of high quality and wholesomeness. Despite this progress, fit-for-purpose technologies and platform developments are still in their infancy, and there is significant scope for new innovation in this field to deliver solutions for physicians, and central and contract testing laboratories, to name but a few.

The aim of this brief presentation is to give an overview of how developments in the nanotechnology sector are helping to change the face of the diagnostics sector, although many well-known technical principles of immunoassays, molecular biology and vibrational spectroscopy are still exploited in so doing. The talk will also briefly explore some key bottlenecks to overcome, and will consider future prospects.

Models of Regulation for Food Application of Nanotechologies

B.M.J. van der Meulen, Wageningen University, The Netherlands

Based on comparative analysis, elements are presented that could contribute to a regulatory system capable of dealing with nanotechnologies in the context of food safety.
The elements build on internationally agreed principles of food safety regulation and the interpretation of these principles at national and regional levels. The ambition is to build a regulatory system capable of addressing the risks connected to nanotechnology applications in food production, despite the fact that profound knowledge on the impact of nanotechnologies is still lacking. The primary objective of the proposed regulatory system is to protect the health and safety of consumers of foods that are likely to contain substances obtained by nano-scale chemosynthesis or engineered nano-particles. This relates to substances included in the food but also to substances that may leave traces in food due to their use at various stages of the food chain. Examples of such substances may be pesticides, equipment and packaging materials.

There are existing and generally agreed principles on which regulatory approaches to food safety regulation are based. The proposed structure chooses responsibility, including liability of food businesses, as an underlying principle. Likewise, nanotechnologies applied to foods – nanomaterial in packaging or nanoproducts used in food preparation – may require appropriate safety studies. The core of nano-food safety regulation may be a case-by-case premarket approval requirement for foods to which nanotechnologies have been applied. Where pre-market approval is required, the sponsor of the product to which nanotechnology has been applied must provide methods of detection and scientific proof of safety of the

product at issue. The scientific community and public authorities must develop and agree on methods of risk assessment. To ensure that this principle can be implemented in the context of problems stemming from the foods applications of nanotechnology, registration is desirable of at least all those businesses that bring such foods to the market. Furthermore businesses are required to have systems in place that enable the traceability of such foods. To protect property rights and enable food businesses to benefit from approved applications, applicants should enjoy an exclusive right for a certain period from the moment of approval on. After this exclusivity period, the approval should become generic to avoid obstruction of innovation.

The leading risk assessment authorities and the international community would be well-advised to come to understanding regarding cooperation and mutual recognition that ensure world-wide market access for approved applications of nanotechnologies in the food sector and protect businesses from the need to submit to multiple approval procedures. Taken together, the proposed models may contribute to a regulatory framework capable of ensuring the safety of foods to which nanotechnology has been applied.

Parallel Session Thursday, 19 May, 11.00-12.30, Schouwburg Room
Antibiotic Resistance in the Food Chain

Chair, Christine Rozand

Veterinary and Zoonotic Aspects Concerning Extended-spectrum Beta-lactamases (ESBL) in Poultry

Anders Miki Bojesen, University of Copenhagen, Denmark

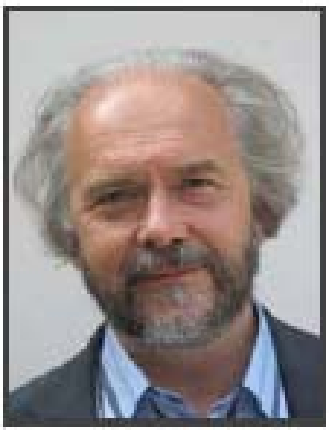
β-lactam-resistant *Escherichia coli* are isolated at increasing frequencies among healthy and diseased hosts in different countries. Especially resistance to β-lactams mediated by extended-spectrum β -lactamases (ESBL) is not fully understood.

In the broiler and layer industries, we have detected highly variable frequencies of β-lactam-resistant *E. coli* in different generations of healthy flocks in Denmark and Italy. No cefotaxime resistant strains were detected in broiler parent flocks and their offspring reared in Denmark, which have not been treated with antimicrobials. Assessing healthy Italian broiler flocks that had been treated with antimicrobials showed that resistance to ampicillin and cefotaxime were widely distributed among the flocks sampled. Genes encoding CTX-M-1, CTX-M-32 and SHV-12 β-lactamases were identified on IncI1, IncN or IncFIB plasmids. Overlap between the ESBL variants detected in this study and those described in humans in Italy, suggest that poultry could be a reservoir for zoonotic transmission of ESBL-producing *E. coli*.

We also examined healthy organic layer flocks reared in Denmark and with no history of antimicrobial usage. Surprisingly, *E. coli* resistant to ampicillin and cefotaxime were detected. Cefotaxime-resistant *E. coli* isolates producing CTX-M-1, -2, -9 group β-lactamases occurred in approx. 3% of chickens.

The obtained results indicate that, in the absence of antimicrobial selective pressure, i) ampicillin resistant *E. coli* are vertically transmitted between different levels of the poultry production system, and ii) plasmids harboring ESBL encoding genes are horizontally transferred among multiple *E. coli* lineages within poultry flocks.

Further epidemiological research is likewise needed to assess the extent of a possible transmission of ESBL-producing *E. coli* from poultry to humans.



Probiotics and Antibiotic Resistance

Atte von Wright, University of Eastern Finland, Finland

Probiotics are live microorganisms that are intended to improve the welfare of the host (human or animal) by improving the functions of the gut microbiota. Probiotics are commonly used as feed additive, and concerns have been raised, whether – although the additive strains themselves are not pathogenic – they might carry transmissible antibiotic resistance determinants, which could then spread in the food chain and eventually into pathogens of veterinary or medical importance.

Consequently, the Scientific Committee on Animal Health (SCAN) introduced in 2001 an opinion defining the criteria used to assess the presence or absence of resistance determinants to antibiotics in microbial feed additives. This opinion was updated in 2008 by the Panel on Additives and Products or Substances used in Animal Feed of the European Food Safety Authority, taking into account the findings of the EU-project ACE-ART, devoted to the assessment of the antibiotic resistance transferability in the food chain.

The experiences with these guidance documents have, in general, been satisfactory. However, the increasing data on the background resistances create in certain cases difficulties in defining the borderline between the intrinsic (thought to be physiological and of minor concern regarding the transferability) and truly acquired resistances. For example, the wide occurrence of *tet(W)* in bifidobacteria, begs the question, whether the presence of this gene in a probiotic bifidobacterium would significantly add to the risk of the spreading of this gene. While the concern of the transmission of antibiotic resistances by probiotic or other microbial cultures introduced in the food chain is justified, better understanding of the existing background resistances will undoubtedly help to focus the attention to relevant species and antibiotics.

Altered Tolerance to Biocide: Links to Antibiotic Resistance?

Shea Fanning, University College Dublin, Ireland

Biocides play an essential and effective role in limiting the spread of infectious agents. However, concern has been raised over their increasing use in various settings, including the food industry. Specifically, the emergence of bacteria demonstrating increased tolerance to one or more biocide formulations used in the food industry and the potential for the development of a cross-resistant phenotype to clinically important antimicrobial compounds, needs to be carefully evaluated.

In this presentation, we report on the findings of a study involving 189 *Salmonella* including more than 40 serotypes. All were tested against a panel of eight commercially available biocide formulations used in the food industry. The ability of *Salmonella* to adapt to these formulations and their active biocidal agents was explored, after sequential rounds of *in vitro*

selection. Susceptibility to these formulations/agents was evaluated during planktonic growth, when the bacteria were surface dried and when present in a biofilm. Finally, cross-tolerance between different categories of biocidal agents and whether or not this co-selected for resistance to clinically important antimicrobial compounds was investigated.

Data showed that all food-grade biocide formulations tested were effective against planktonic *Salmonella* but these compounds demonstrated a reduced ability to eradicate surface attached *Salmonella*. High-level tolerant mutants could be selected only against single active biocidal compounds but not to food industry biocide formulations. Tolerance to individual biocidal agents alone, can impart a reduced susceptibility to clinically important antimicrobial compounds.

Parallel Session Thursday, 19 May, 14.00-15.30, Schouwburg Room
Risk Assessment

Chair, Paul in't Veld

A Swift Quantitative Microbiological Risk Assessment (sQMRA) Tool

Eric Evers, National Institute for Public Health and the Environment (RIVM), The Netherlands

Classical extensive QMRA is time consuming, data needs are substantial and it requires modeling expertise. We developed a simplified QMRA model especially aimed at comparing the risk of pathogen – food product combinations, and education. The swift Quantitative Microbiological Risk Assessment (sQMRA) – tool is implemented in Microsoft Excel and, like classical QMRA, pathogen numbers are followed through the food chain, which in this case starts at retail and ends with the number of human cases. The model is deterministic and includes cross-contamination and preparation (heating) in the kitchen and a dose-response relationship. The general setup of the sQMRA tool consists of consecutive questions for values of each of the 11 parameters, always followed by intermediate model output broken down into treatment categories. In a separate sheet, model input and output are summarized, and exposure as well as cases are attributed to treatment categories. As a relative risk measure, intermediate and final model outputs are always compared with results from an extensive QMRA of *Campylobacter* in chicken fillet. First, calculations with the sQMRA-tool were done for all combinations of *Campylobacter* spp., *Salmonella* spp. and *Listeria monocytogenes* with chicken fillet, filet americain and table eggs. The predicted risk was highest for *Salmonella* spp. in table eggs. The sQMRA-tool proves to be useful for quickly obtaining relative risk estimates of pathogen – food combinations, which can serve as a guide for risk management or selection of combinations for applying classical QMRA. A probabilistic sQMRA version is being developed at present.

FAO/WHO Web-based Decision Support Tool to Assess the Performance of Microbiological Sampling Plans

Kazuko Fukushima, World Health Organization, Switzerland

Microbiological testing of food products are conducted at various points in the food chain to control the quality of food produced, to ensure that the products comply with regulations or international standards and thus to mitigate the risk of microbiological hazards in food. In order to achieve maximum effect from microbiological testing with reasonable efforts and costs, properly designed sampling plans are critical. However, this generally requires a certain level of statistical knowledge and continues to present a challenge to the risk managers of member countries of FAO and WHO.

In 2009, FAO/WHO released the web-based risk assessment tool for *Cronobacter* spp. in powdered infant formula (http://www.mramodels.org/ESAK/default.aspx) which enables users to assess the impact of the implementation of sampling plans, their efficacy in terms of risk reduction and the amount of product rejected. Using this as a basis, FAO/WHO have developed a stand-alone tool for the evaluation of the effectiveness of different microbiological sampling plans as applied to other pathogen-commodity combinations.

The tool has a web-based and user friendly interface to facilitate ease of use, and it can be applied in the context of end product testing or ongoing monitoring of performance of a food safety system. Also, the tool can address both presence/absence-based and concentration-based plans. Before the completion and public release of the tool in 2011, the development of case studies is planned to illustrate how the tool can be utilized.

An Integral Model for Safety, Quality and Logistic Performance for Leafy Vegetables

Eelco Franz, National Institute for Public Health and the Environment (RIVM), The Netherlands

Fresh vegetables, especially salad vegetables, have been increasingly associated with foodborne illness. Relatively little focus has been placed on risk modeling of produce safety. In recent years, we developed several models in order to study the microbial risk associated with fresh produce, focusing on primary production. However, although vegetables generally become contaminated with bacterial pathogens during primary production, the post-harvest processing and distribution can play an important role in the dissemination of pathogens. In addition to temperature abuse, storage times in the chilled distribution chain might have a significant influence on food safety since psychrotropic pathogens like *Listeria monocytogenes* have the ability to grow at refrigerated temperatures. Storage times in the supply chain are determined by the applied planning and ordering mechanisms and consumer demand. These mechanisms are probabilistic in nature and are usually not accounted for in quantitative microbial risk assessments since measuring storage time is not feasible. We developed a quantitative microbial risk assessment for *L. monocytogenes* contamination in salads sold at company restaurant salad bars, which included probabilistic modeling of the applied logistic concept and consumer demand. The

model was parameterized by data from a salad bar at one specific company restaurant. The model showed that the estimated contamination level and estimated number of disease cases increased when including the modeling of storage times compared to assuming fixed storage times. In addition to the effect on microbial safety, management decisions with respect to the applied logistic concept may also have their impact on product loss and product quality. We extended the previous model with an integrated simulation with respect to microbial safety, logistics performance (product loss and product availability) and sensory product quality in order to investigate the effect of strategies aimed at reducing product loss at salad bars on food microbial safety, product availability and product quality. These models are of value in the assessment of logistic strategies in an integral manner with respect to safety, quality and logistic performance.

Parallel Session Thursday, 19 May, 16.00-17.30, Schouwburg Room
Food Safety Initiatives

Chair, Seamus Fanning

FP7 EU Veg-i-Trade: Selection of Case Studies Based on the Vulnerability of Fresh Produce to Food Safety Hazards and Climate Change in a Globalized World

Liesbeth Jacxsens, Ghent University, Belgium

International concerns have emerged with regard to safety of fresh produce in response to recent outbreaks, alerts and identified emerging microbiological and chemical hazards linked to fresh produce and derived food products. Enteric bacteria such as *Salmonella* spp. and *E. coli* O157:H7 and more recent, but no less relevant, also enteric viruses such as Norovirus and protozoa such as *Cryptosporidium* have been identified as concern in fresh produce. Based on scientific papers, grey literature, databases and alert systems, contacts with stakeholders and a multidisciplinary team of experts in the field being part of the Veg-i-Trade worldwide consortium, the vulnerability of fresh produce items toward microbial and chemical hazards as well climate change was determined. This work, together with information on trade flows and trade values of fresh produce and knowledge on consumption patterns and partner countries' priorities, served as a basis for the selection of case studies and the supply chains of fruits and vegetables to be studied in various work packages in the Veg-i-Trade project.

Veg-i-Trade is funded from the European Community's Seventh Framework Program (FP7) under grant agreement no 244994. For more info: www.veg-i-trade.org or info@veg-i-trade.org

ACROPOLIS Project: Cumulative Risk of Pesticides

Jacob van Klaveren, National Institute of Public Health and the Environment (RIVM), The Netherlands

Current risk assessment of pesticides and MRL setting does not sufficiently account for cumulative and aggregate exposure (EU Directive 396/2005). The central aim of the project is to improve risk assessment strategies in Europe. The project will develop a framework for cumulative and aggregate risk assessment of

pesticides that is scientifically sound and accessible for all actors involved in the European risk assessment and risk management.

This work consists of:

1) studying the data needs, data availability and organization, including uncertainties for cumulative exposure and effect assessment in a probabilistic risk assessment framework;
2) integrating models describing various routes of exposure into an aggregate exposure model;
3) setting up new toxicological testing for identifying possible additive or synergistic effects and developing a strategy for refinement of cumulative assessment groups;
4) integrating cumulative and aggregate risk models, including uncertainty analyses in a web-based tool, including accessible data for all stakeholders;
5) improving risk assessment strategies in Europe by analysing stakeholders attitudes, by training and by discussing the new methodology in several stakeholder conferences.

The project brings together the key experts and key risk models in Europe, such as dietary exposure (MCRA), dermal and inhalation exposure (ConsExpo, EUROPOEM and UK POEM) related to professional and non-professional use. The new risk model will be validated and tested in different countries to ensure its usability at the international level. Cumulative pesticide risk assessment is a multi-stakeholder issue. European consumer groups have raised their concern and the pesticide industry has an urgent need for clear criteria in order to justify the enormous investments in producing new pesticides. The ACROPOLIS project will therefore organize stakeholder conferences to address the complex issue of cumulative and aggregate risk assessment, and the usability and user-friendliness of the models will be tested.

STEC – United States Update
To Be Determined

Parallel Session Thursday, 19 May, 16.00-17.30, Calluna Room
Food Safety Education – Food Safety for School Children
Chair, Wayne Anderson

Changing Needs for Food Safety Education: An Academic Perspective
Lee-Ann Jaykus, North Carolina State University, United States

Despite increasing recognition of the importance of food safety to assuring public health and contributing to the success of global economies, there remains a limited supply of well trained food safety professionals. In part, this is due to an insufficient number of scientists being trained in our discipline, particularly individuals whose training involves significant exposure to related disciplines (e.g., veterinary medicine, public health, agricultural economics, biotechnology, etc.). Further, because of rapid societal changes, young children are often not exposed to the rudimentary principles of food safety that traditionally have been learned by working closely with a caretaker in the kitchen. In short, there appears to be a personal and professional "brain drain" with respect to food safety. In this presentation, we will outline the challenges to assuring that personal and professional training in food safety is fostered so as to produce knowledgeable young people who

routinely put that knowledge into practice. We then discuss some of the current U.S. initiatives aimed at promoting food safety education and training through the lifespan, including our future food safety professionals. Common themes include the need to (1) engage children from K-12 to increase knowledge of the origin of our food supply and introduce/reinforce safe food handling practices; (2) promote food safety as an exciting professional career and recruit young people into food safety-related programs of study; and (3) foster multidisciplinary training of graduate students so as to produce highly trained professionals having the background and critical thinking skills necessary to address the complex food safety problems of the future. Attention to food safety NOW will assure that we can maintain and even improve upon the international "culture" of food safety that has been growing over the last century.

Food Safety Training in Developing Countries: The ICD Experience

Peter McClure, Unilever, United Kingdom

In 1990, the Industry Council for Development (ICD) was established with the mission to improve public health through practical partnership projects in food safety and nutrition. ICD has been implementing a programme for training in food safety since 1993. The programme started with a training course on Food Safety for Nutritionists in the framework of a M.Sc. in Nutrition. Today it consists of a wide range of training courses, including HACCP, Microbiological Risk Assessment and food safety courses for catering establishments. During the last two decades, awareness and scientific knowledge in food safety have greatly increased and today, most cases of foodborne disease could be prevented if this knowledge was better shared and implemented. The purpose of ICD's new initiative is to contribute to the capacity building and transfer of know-how to food safety and nutrition professionals in the Sub-Saharan Region, in order to prevent incidence of foodborne illnesses, improve management of food safety in the supply chain, and promote a common understanding of food safety among different sectors (i.e., industry, governmental organisations). The primary activity of the Centre in the University of Legon, Accra, Ghana, is to organise and carry out training courses based on pre-defined training material developed jointly or in collaboration with international organisations such as FAO and WHO. This presentation will describe the various activities carried out by the Centre with the aim of extending the network of contacts and reach of the ICD for capacity building in the area of foods safety.

***safefood* for Life: Food Safety Skills for School Children**

Fiona Gilligan, safefood, Ireland

The safety of our food is an important issue for today's young people. The acquisition and practice of food safety knowledge and skills is a basic pre-requisite in education for life and health. Children and young people need to understand the role of food in promoting health, the need for food hygiene and the opportunities that food provides for employment. Schools can make an important contribution to this understanding. They provide a captive setting for changing behavior because they work with young people over long periods of time while also

working with parents and influencing the whole community.

An initiative developed by the **safefood** in partnership with the Environmental Health Officers' Association in the Republic of Ireland and the Chartered Institute of Environmental Health in Northern Ireland and funded by the European Union has closed the apparent void between learning for life and training for work.

'***safe*food** for Life' is a course designed to educate second level students in the general principles and simple practicalities of food safety. This course delivers practical information that will significantly reduce the risks taken by young people when working with food. But this course is not just about work. It provides the student with skills and knowledge that will benefit them daily for the rest of their lives, whether or not they ever choose to work with food.

Students who are successful in the course and examination are awarded a certificate by the EHOA or the CIEH in association with ***safe*food**. The presentation will give the details of the course and where it fits in the education system in both the north and south of the island of Ireland.

Closing Session Friday, 20 May, 11.00-13.00

Chairs, Stefano Colombo and Lee-Ann Jaykus

Global Foodborne Infections Network (GFN)

Danilo Lo-Fo-Wong, World Health Organization, Switzerland

In 2000, WHO initiated WHO Global Salm-Surv (GSS), now called ***Global Foodborne Infections Network (GFN)***, to enhance countries' capacity to conduct integrated surveillance for foodborne and other enteric infections from the farm to the table. The network fosters intersectoral collaboration and communication among professionals in human health, veterinary and food-related disciplines. GFN has five main programme components: international training courses, a passive *Salmonella* surveillance system, an annual External Quality Assurance System (EQAS), focused regional and national projects and reference testing services.

To date, GFN has held over 75 international training courses in Chinese, English, French, Portuguese, Spanish and Russian for more than 1,300 microbiologists and epidemiologists from over 120 countries. More than 80 countries have provided data to the Country Databank on over 1.5 million human isolates and close to 400.000 isolates from non-human sources to help us provide a global overview of the epidemiology of *Salmonella*. The GFN EQAS is one of the world's largest annual proficiency tests with more than 180 laboratories participating worldwide.

In August, 2010, GFN convened a meeting to discuss current and future capacity-building needs for foodborne and other enteric infections and how GFN and partners could respond to these needs. Participants included 80 people from WHO, FAO, OIE, GFN steering committee, technical partners, industry and potential sponsors worldwide. Following the success of this meeting, GFN is actively looking for partnership with colleagues in academia,

government, research and the private sector with the common goal of building this technical capacity.

Food Quality and Safety from a Food Industry Perspective

Rian van der Doelen and David Bean, Mars Snack Food, The Netherlands