



SESSIONS FOR 2020

FOOD SAFETY

S1. Systemic Approaches to Counter Food Fraud

Fraud in the food chain has shattered the confidence consumers have in their food supply and has serious effects on the reputation of honest food business operators. Prevention of fraud and promotion of authentic agri-food products is key to assure the commercial success of high-value agri-food products on international markets. While international collaboration on food safety is already well established, this is not yet the case for food authenticity. There is a great need for international harmonization in order to be able to detect and, more importantly, prevent or at least minimize fraud. Therefore, the fight against food fraud calls for an international and systemic approach involving cooperation and consultation among all stakeholders at all levels of the food chain. Early warning systems, horizon scans, vulnerability assessment tools and appropriate analytical methods are among the critical elements for equipping regulatory agencies as well as industry in the fight against food fraud.

S2. Is My Food Product Authentic? How Will I Know?

The labelling of food products is essential to inform consumers what kind of products they are buying. However, this approach does not always ensure that the product is, in fact, the genuine article. Consumers and producers alike place a high value on accurate and defensible labelling, and providers are now proactively providing consumers with clear labelling, traceability, and transparency. There are a range of analytical techniques utilised by food producers, backed by credible science and a range of example applications. This session will include consumer science research into the importance of food authentication, examples of applications of technology to prove authenticity, the science behind the technologies available for authentication, and proving authenticity through interaction with the consumer.

S3. Food Traceability: Leveraging Technology as a Global Supply Chain Enabler

The time has come for global food traceability. The global food industry is developing capability to trace products through the supply chain to improve food safety, diminish risk, avert devastating health consequences, and economic loss to the food system. New traceability technologies and interoperability are key focus areas. This session will present and discuss the latest advancements, technologies, and platforms being developed to address the world's food traceability challenges. Example topics would explore data sharing frameworks, data analytics and AI, innovations in traceability standards, and blockchain advancements.

S4. Traceability and Provenance for Food Safety – Experiences from Major Exporting Countries

Food traceability is important for multiple reasons, including provenance, safety, regulation and consumer differentiation. Despite its importance, there does not appear to be a coordinated and systematic approach to traceability across food sectors. This session will provide insight into how traceability is being approached by food sectors globally, identify what research is needed and determine how industry can maximise value for their efforts.

S5. Development of New Tools for Food Safety Decision-Making

New DNA sequencing technologies provide a relatively low-cost approach to characterising foodborne pathogens for public health purposes, and for determining the microbial flora of food and processing environments. This has revolutionised our approach to determining the sources of human foodborne illness and of microbial contamination in the supply chain. This session will bring together experts in microbiology, bioinformatics, genomics and modelling to outline the latest developments in sequencing technology and the application of new tools to aid food safety decision-making aimed at minimising risks associated with microbial hazards. Issues related to data sharing, commercial sensitivity and standardisation of techniques will also be highlighted.

S6. Generating and Applying Behavioural Insights to Food Safety Messaging and Risk Communication

Understanding the food safety concerns and behaviours of different stakeholders (consumers, producers, processors, retailers and regulators) and assessing how to effectively deliver food safety information or risk communication messaging that leads to behaviour change will be the focus of this session.

S7. Food Safety Issues in Fresh Food Supply Chains in Developing Countries

Low- and middle-income countries (LMICs) especially those of sub-Saharan Africa and South/South East Asia bear the greatest burden of food borne diseases (FBDs) with fresh produce including fruits and vegetables and foods of animal origin including meat, fish and milk often the major causes of FBDs. Poor handling practices along the fresh food supply chains from farm to table and from rural to urban areas, poor infrastructure including transport and market infrastructure and lack of refrigeration capacity in a tropical environment promote the growth of pathogenic organisms. Apart from FBDs, zoonotic infections, antimicrobial resistance, and the unregulated use of chemicals including pesticides and such unwholesome chemical-related practices as the use calcium carbide to stimulate ripening in fruits are among the major issues related to fresh food supply that adversely impact public health in LMICs. Interventions aimed at addressing these issues will promote food safety and public health in LMICs.

S8. Resurgence of Less Recognized and Presumptive Pathogens: Food Safety Implications

Reported incidences of emerging, less recognized and opportunistic pathogens linked to outbreaks of food and waterborne illness in Europe and the U.S. have been increasing. It is increasingly recognized that many otherwise commensal organisms can become pathogens under the right conditions, in a right host and, if consumed in sufficient quantities. Recent outbreaks are linked to *Cyclospora cayetanensis*, *Toxoplasma gondii*, *Hepatitis E*, and other less recognized/presumptive food borne pathogens and their food safety implications. The global sourcing of food and ingredients, especially fresh produce, fruits and vegetables as well as RTE, minimally processed foods and

supply chain issues have allowed emergence of some of these pathogens with opportunistic tendencies to come to the forefront of food safety. More troubling is the incidence of these pathogens in novel food sources. Speakers from industry, academia and regulatory agencies will review less recognized emerging pathogens and discuss their food safety implications.

S9. Emerging Trace-Level Contaminants in the Global Food Chain and Mitigation Strategies

Ensuring food safety without compromising nutritional value and organoleptic property has always been one of the most important areas for the food industry and scientific community. Management of trace-level contaminants, especially those associated with emerging food processing methods in the global food chain is challenged by the masking effect of complex food matrices, in particular due to binding or trapping in proteins and/or polysaccharides. This session will present the rapidly advancing research to improve food safety that focuses more on comprehensive assessment than unilateral analysis of the levels of single contaminants. Emerging sources of trace-level contaminants/toxicants, recent developments in detection and quantitative analysis, innovative mitigation strategies, and the challenges being faced will also be discussed.

S10. Food Safety - The Weakest Link to Ultimate Food Security in Africa

For food security to be fully realized, the population must be able to access not only affordable and nutritious foods, but also have it as wholesome and safe. Even though there are diverse definitions of food safety, in all contexts, there is convergence to the fact that it can only be said to be achieved when there is assurance that food will not cause ill health when consumed. It therefore looks at the handling, preparing and storing food in a way to best reduce the risk of individuals becoming sick from foodborne illnesses. A number of achievements have been realized towards assuring safety in food supply chains in Africa. A lot of effort is, however, required for African population to realize its goal of feeding the population with safe food. Presentations in this session will include an overview and development of food safety across the continent; link between food safety and health burden as well as how food safety contributes to general food insecurity in the continent.

S11. 'The Last Mile' – New Challenges for Modern Distribution Channels

The 'last mile' distribution channels are changing enormously with the increase in consumers' demand for home delivery. This creates new challenges for assuring food safety, quality and integrity through the food chain. Warehousing and the traditional supply chain channels may not meet the current needs of new and evolving delivery processes that consumers select and obtain their food. The consumer dynamic has also changed, particularly in large cities. For example, Gen Y may rarely step inside a supermarket. Quality assurance of the food supply is jeopardised through systems that may not keep perishable products in an optimum condition, compromising brand integrity. This session addresses the new distribution channels used to complete 'the last mile' to the consumer. This focuses upon the challenges faced in assuring the food safety, quality and integrity of the food systems in our modern cities.

S12. Dealing with a Safety Regime Where Analytical Zero No Longer Exists

There is a growing consumer expectation that our food is uncontaminated and true to label. Recent cases of deaths from allergens have highlighted the difficulty of creating food in

environments where cross-contamination is unavoidable. In addition, modern methods in chemistry and microbiology effectively mean we can find anything in everything. Zero effectively no longer exists. There is a growing demand for reducing packaging on food, which challenges a key part of supplying safe food, while avoiding cross-contamination along the food chain. This session will show the challenges involved and explore the regulatory and legal options that are evolving around the world.

S13. Next Generation Sequencing Methods for Analysing Food Microbes

Next generation sequencing (NGS) methods have been quickly adopted and used in food poisoning outbreak investigations in many countries. The cost, speed and analysis methods have improved to the point where they are replacing less discriminatory DNA typing methods such as pulse-field gel electrophoresis as well as biochemical-based identification approaches. NGS can also be used to characterise microbial communities in foods without the need for culturing. They are also able to identify a large proportion of the population that would have proved difficult using culture-based methods. Complete genomes from food bacteria are now able to be assembled from DNA extracted from food which provides insight into the functional capability of a microbial community. This session will explore how NGS methods have been used to better understand food spoilage, food fermentation and food safety.

S14. Global Challenges of Food Safety - on the occasion of the 30th anniversary of Food Control

Food Control, established in 1990, is an official scientific journal of IUFoST and also the European Federation of Food Science and Technology (EFFoST). It is an international journal dedicated to food safety and process control. This session will address the globally ever-increasing challenges of food safety, including the following topics, all from a global perspective: chemical contaminants and rapid detection, microbiological contaminants and rapid detection, food safety risk assessment and risk-based food safety management, food safety laws and regulations, consumer science of food safety, and emerging food safety issues. Selected presentations in this session will be invited for full paper submission to a special issue of the journal commemorating its 30th anniversary.

S15. Innovative and Emerging Approaches for Microbial Risk Modelling in the Food Supply Chain

The presence of pathogenic microorganisms in the food supply chain is a major global food safety concern. Innovative microbial models adopting emerging approaches are critically needed to better monitor, predict, and control foodborne pathogens across the food supply chain. This approach would help us systematically assess and understand the risk of foodborne diseases. The microbial risk along the supply chain is affected by a number of different factors associated with food production, processing, distribution, storage and retail, and also influenced by the microbial behaviour, management strategies, government regulations, and industrial standards. Given the advancement of artificial intelligence and machine learning along with generation of massive amounts of molecular data (whole genome sequencing), there is an unprecedented opportunity for novel approaches in food safety using big data analytics. This session focuses on the development and use of innovative modelling with multidisciplinary approaches for predictive microbiology and risk assessment of foodborne pathogens.

S16. Plastic Waste and Its Impact on Food Safety, Food Security and Public Health

Plastic waste is a complex and multidimensional environmental problem challenging food safety across the supply chain. Plastic particles and microplastics have been identified as the most serious emerging hazardous pollutant jeopardizing food safety, food security, public health and the economy. The objectives of this session are 1) to outline the sources of marine plastic litter and its impact on marine ecosystems and the livelihoods of those populations; 2) identify its impact on food safety and public health; 3) highlight its impact on the economy and food security; 4) present how countries dealt or are dealing with this issue; 5) show how cooperation among industries can have a great impact; 6) present how food safety and quality standards are evolving around this issue; 7) suggest consumer awareness interventions; and 8) highlight the most up-to-date and emerging studies on this matter.

S17. The Safety of Food Contact Materials: From Known to New Challenges

The contamination of substances originating from materials used for handling, transportation, production and packaging of food evolved from a problem specific to plastics to a global challenge crossing the entire supply chain and borders. The recurring crises involving non-specifically regulated materials (coatings/varnishes, printing inks, adhesives, paper and board, etc.) as well as the growing concern for endocrine-disrupting substances and cocktail effects acting at low doses contributed to the recent attention. The more than nine thousand substances found in the composition of seventeen groups of food contact materials represent a very significant contribution – if not the largest – to the total human exposome. The session will review the crises, current challenges (e.g. cross-contaminations, recycled materials), future of regulations particularly in Asia (i.e. new Chinese regulations) and Europe, the methodologies to evaluate risks (experiments, mathematical modelling), new safe-by-design approaches, and new online training tools to bridge food and material science.

FOOD SECURITY

S18. 'Cellular Agriculture' to Feed Burgeoning Global Population – Opportunities and Challenges

The world's population will likely reach ~10 billion people in only 30 years. Nourishing these people presents a substantial challenge to the food industry. Consumers are also demanding more and more high-quality animal protein, and to meet this demand an additional ~40 billion kg of protein will be needed by 2050. Traditional animal agriculture will struggle to meet this challenge (~70% expansion needed) and is not the best choice from a sustainability standpoint (e.g. land/water use, greenhouse gases, nitrogen and phosphorus pollution). The food industry must therefore explore and embrace alternative technologies to meet the challenge. One such technology is 'cellular agriculture' in which animal cells, or engineered yeast or bacterial cells coded for one or more animal proteins, are grown in culture to produce animal proteins without the animal. This session will explore the opportunities and address the challenges (technical, regulatory, consumer acceptance) of 'cellular agriculture'.

S19. Low-Tech Processes to Curb Food Insecurity

Modern food technology is characterised by the development of more and more sophisticated methods, centralisation of processes, and sophisticated and extended distribution ways to name a few. Traditional methods of food processing are largely neglected or even forgotten. There are many efficient low-tech processes available starting with local production and consumption. Another simple way is a reduction/utilisation of waste. In more general terms, an important line of low-tech methods with a high potential in many aspects especially in sustainability are fermentation processes. Fermentation can be applied to a great variety of produce and carried out locally as a low environmental impact method. Another opportunity with high potential is storing fruit and vegetable produce locally for short times in ventilated stacks and/or ventilated wet porous jars. Solar drying of a variety of produce in simple hygienically safe units is a further technology which would help improve food security in disadvantaged areas.

S20. Leveraging the Regional Circular Economy Through New Food Sources and Ingredients

It is estimated that the world wastes about 1.6 Gtonnes of food, where 1.3 Gtonnes represent the edible portion of the food lost, which could otherwise be recovered and diverted into high value products. The horticulture chains undergo 10-60% losses before retail, depending on the country and region, valued at least at USD 320 bio. The next food revolution underpins regional circular economy strategies for decentralised near-farm food processing for loss diversion and transformation into high value products. This session will present the advances in diagnosing horticultural losses and the initiatives for the creation of regional hubs for food loss value capture into ingredients and alternative protein sources and products. It will also address the latest opportunities for transformation into insect and algal food products using inedible portions and other biowaste.

S21. Strengthening Food Value Chains for Food Security and Sustainable Agricultural and Rural Development in Africa

Agriculture plays a major role in the economy of sub-Saharan Africa (SSA) and majority of the people derive their livelihood from agriculture. Agricultural productivity is low with small, resource-poor farmers accounting for the bulk of food production. Poverty is pervasive and food insecurity is widespread. High post-harvest food losses and challenges faced by small farmers and small-scale food industries including limited access to finance and regional and international markets constrain agricultural development and food security in SSA. Sustainable agriculture is based on a commodity value chain approach from primary production through processing and marketing. Strengthening food value chains would stabilize food supply by reducing post-harvest losses; ensure safe, wholesome food through control of pathogenic microorganisms and chemical contaminants; ensure adequate intake of nutrients including micronutrients by vulnerable groups (children, women and the elderly); increase food export earnings; enhance small farmers' income; generate employment; alleviate poverty and promote sustainable rural development.

S22. The Potential of Microalgae as a Food Source

Microalgae have a great potential for food (including nutraceuticals and functional foods) production, as they contain large amounts of carbohydrates, long-chain polyunsaturated fatty acids, proteins and carotenoids. Compared with the traditional sources like higher plants, microalgae possess many advantages including fast growth, high biomass

productivity and relatively small land area requirement for cultivation. However, commercial microalgal food production is still not well developed and is insufficient to fill the demand for human consumption. Therefore, more efforts are needed to overcome the challenges so that sufficient supply of microalgae as a food source can be obtained to support healthy and balanced diets. In this session, recent progresses in improving microalgal food production as well as the nutritional values and bioactivity of microalgal products will be discussed. In particular, the innovative large-scale culture, extraction strategies, exploitation of novel species, bioactivity, and physiology and metabolic engineering of microalgae will be addressed.

S23. What Can Food Science Do to Mitigate Obesity?

There is a global pandemic of overweight and obesity. Processed foods, particularly calorie-dense foods, are regularly implicated as important drivers of obesity trends. What is the role of food science in developing and promoting healthier foods and in mitigating unhealthy foods? What is the positive offer that food science will make in the battle against obesity? This session will facilitate an exchange of information and dialogue between food science, nutrition and public policy. Presentations would include public health nutrition; public policy to review different policy and regulatory experiments in different countries, and food science and nutrition practitioners working on healthier food innovations and interventions (both public and private).

S24. Food System Transformation and the Evolving Role of Food Science

Much of the food security literature focuses on agriculture and nutrition but not the role of food processing. As food systems transform from traditional systems of low-income countries to transitioning systems in lower-middle income countries and modernizing systems in middle- and high- income countries, the contribution of food science to food and nutrition security needs to evolve. This session will highlight the evolving role of food processing at different stages of food system transformation and how this influences food security, quality and safety.

S25. NOVA: Clearing Up the Confusion About Processed Food and Health

Nearly a decade ago, the NOVA movement, originating in Brazil, questioned the public and personal health value of processed foods. Classifying processed foods into four categories (unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods and drinks), they not only question the value of processed foods, but contend that these foods contribute to chronic non-communicable diseases, and even cancer. In fact, NOVA advocates state that such foods are not a solution, but actually contribute to unhealthy dietary patterns that lead to poor health. On the other hand, counter arguments indicate such foods enhance food quality, remove potential innate toxins, and improve nutrient bioavailability. These latter characteristics are particularly important as health-minded organisations reach out to address food security issues among underserved populations. This session will present arguments within this controversy, while engaging the audience to consider the dynamics of food processing and health outcomes.

S26. Consumer Preference: A Forgotten Element of Food Security

The WHO/FAO definition of food security was expanded to include “preference” as an integral requirement. We emphasize adequate supply, safety and nutrition, but not

preference. To understand the preferences of any population, we must involve consumers and their choices. Quality Function Deployment and Voice of the Consumer are sophisticated approaches to establish quality standards, but they are not accessible to small producers. This session will consider the evolution of sensory quality methods and introduces a simple method to translate consumer evaluation of quality into actionable data for commercial risk reduction. Rigorous application throughout the food chain's critical control points delivers the dimension of preference to food security. Our efforts to feed the world are wasted when consumers do not recognize, eat and enjoy the foods we create.

S27. Food Fortification: A Critical Tool in Food Security

Approximately a third of the world's population suffers from micronutrient deficiencies that lead to many serious diseases and maternal and infant mortality. The Copenhagen Convention identified food fortification and specifically iron fortification among the ten most cost-effective means of achieving international development. Food fortification presents numerous technical, social and regulatory challenges. This session will highlight recent developments in food fortification technologies, and report on scale-up, technology transfer and field deployment aimed at reaching all of the affected populations in selected developing countries. The session will focus on technologies of salt fortification with combinations of iodine, iron, zinc, vitamins B₁, B₉ and B₁₂, and applications of the technology to address multiple deficiencies in India, thiamine deficiency in South East Asia and birth defects in East Africa.

FOOD SUSTAINABILITY

S28. Overview of Sustainable Food – the Challenge

The global food system of the future will be shaped by the shifts in thinking that we make today. A 'thinking failure' today will lead to a 'system failure' tomorrow. The global food system is complex, heterogeneous and involves multiple inputs, outputs and feedback loops. Understanding it and identifying opportunities for improvement requires a comprehensive view of the whole system, including its socio-economic and environmental dimensions. This session will focus on critiquing our understanding of sustainable food systems, what we know, what are the knowledge gaps, and how do we have constructive conversations when views can be so polarised. What actions can we take now with confidence that there will not be unintended negative consequences and what are the priorities for research and innovation?

S29. Sustainable Processing of Value-Added Foods

The transformation of raw agricultural products into food that is safe to eat, nutritious, and with an appropriate shelf life until consumed requires post-farmgate resources such as transportation, storage under conditions that maintain stability, heating and other preservation methods, extraction and combination technologies, and retail distribution. These all have an associated energy usage, production of by-product streams that are subsequently discarded or processed into new products, use of water and resultant cleaning and disposal issues, and a contribution to climate change due to greenhouse gas emissions. These issues will be discussed in relation to the types of processing inputs, such as plant and animal-based raw material protein sources, and the sustainability compromises that must be made when extracting value from processing streams in a food manufacturing environment to produce new food ingredients.

S30. Sustainable Nutrition – Marrying Nutritional Needs with Sustainable Food Production

The session will cover both the plant (production) and food (nutrition) and will explore shifting to nutrient-dense options, including lean and lower sodium options, improving the nutritional quality of protein food choices and supporting healthy eating patterns. As well, the animal production industry will discuss the advantages of plant-based foods augmented with animal ingredients and explore ways the meat industry is balancing nutritional needs versus sustainability.

S31. Analysing Sustainability of Complex Food Systems

Processing of food emerged long before the establishment of agriculture. Food processing technologies went through evolution and optimisation and rely on a minor fraction of energy compared to initial prototypes. Emerging processing technologies (HPP, PEF, ohmic heating, shockwave) and novel food systems (cultured biomass, 3D bioprinting, cyber-physical chains) challenge the existing chains by developing potentially more nutritious and sustainable food solutions. However, new food systems rely on low TRL and estimation of their potential future benefits or drawbacks is a complex task mostly due to the lack of integrated data. This session aims to reflect on algorithms for the design and sustainability assessment of novel food production chains based on cyber-physical approaches and developed conceptual sustainability assessment models. The cyber-physical nature of modern food is a key for the engineering of more sustainable paths for novel food systems.

S32. Advances in Aquaculture Sustainability and Food Safety

This session will profile leading research that supports the aquaculture industry. It will feature current research on food safety, sustainability and emerging technology. Possible topics include advances and challenges in open ocean shellfish and seaweed aquaculture structure development; precision farming aquaculture applications to assist with sustainability; the changing needs of the aquaculture industry; a Maori perspective on sustainable aquaculture in NZ; and an industry perspective on creating high value marine products for export.

S33. Valorisation of Side Streams in the Food Supply Chain

The efficient utilisation of food chain side streams can achieve significant benefit for the food industry and the consumer. Current research is identifying valuable components, such as protein, fibre and carbohydrates, that can be derived from side streams, which presents the opportunity for decreased waste generation, alongside increased value and sustainability. This session will focus on the science and technologies needed to characterise side streams and then to fractionate and process them into new products. The session will also consider the potential scientific, social and regulatory barriers to exploitation of side stream derived products.

S34. Zero Waste Food Processing

Zero waste food processing is the amalgamation of sustainable and judicious apprehension of food processing technologies for waste and by-products utilisation from the farm to the fork. Utilisation of the straw and hay in paddy at the time of harvesting till extraction of rice bran oil after milling, and preparation of silica from husk are classic examples of zero waste food processing. This session will explore the various components and cutting edge

technologies for by-product development and recycling while exploring various sectors of food processing viz. extraction and value addition from fruit and vegetable wastes, postharvest and milling waste product development from grains, affluent utilisation from dairy industry, rendering valued-added products from meat, poultry, fish and aqua waste processing and value addition. The objective of this session is to inspire the scientific community and industry to intensify its efforts towards the valorisation of all kinds of food industry by-products.

S35. Sustainable Cleaning and Sanitation to Mitigate the High Environmental Impacts

Fouling of food process plant surfaces and the subsequent cleaning needed is a significant industrial problem, and as the cost of water and chemical disposal increases, the problem is becoming more significant. In parallel consumer demands combined with the arrival of new regulations to mitigate the subsequent environmental impacts present challenges. This session will explore the opportunities and address the challenges (technical, regulatory, consumer acceptance) of sustainable food processing focusing on fouling and related cleaning and sanitation aspects. Topics to be explored are in relation to innovative strategies based on a better understanding of underlying mechanisms. This comprises surface engineering and/or development of processing technologies towards no fouling, environmentally friendly hygiene procedures, development of novel sensors and hygienic design of machinery.

S36. Alternative Proteins: New Sources, New Processing Technologies and New Applications

Protein is a main nutrient for humans and animals and serves as a valuable ingredient that imparts some functional properties to food and feed. It is also an important industrial material. The world population is currently 7.7 billion and estimated to be 9.8 billion by 2050. Ensuring enough protein to meet the need of the growing population is crucial and challenging. Animal products are major dietary sources of protein. Increasingly, however, they are partly replaced by sustainable sources which include oilseeds, legumes, grains, and more intriguing ones such as insects, algae and novel crops. Speakers from different regions and countries will present the latest research and trends in discovering new or minor protein sources, developing improved or new processing methods to separate, concentrate or modify proteins from existing and new sources, understanding physicochemical and nutritional properties of new proteins, and exploring improved or novel applications for value addition and sustainability.

S37. Insects as Food: Challenges and Opportunities

This session will address the factors that determine the importance of insects in people's diet and livelihoods, and the role of technology transfer to assist people to utilise traditional knowledge to improve the value of insect foods. Also addressed will be the nutrient flow and important quality triggers and impacts along the production chain; the socio-economic and ecological relevance of edible insects as alternative protein sources; and the demand, markets and regulations as current pillars for industry growth. Other topics to be discussed will include the development of sustainable technology such as automation processes at affordable costs, detection, identification and mitigation of microbial contaminants, development of protocols for quality control, and processing methodologies that affect digestibility and nutritional composition of insects. Because food safety and legislation are

intimately related and consumer attitudes are strongly dependent on the perceived safety of insects as food, these aspects will also be addressed.

S38. Shelf Life and the Food Supply Chain

Control of shelf life is important and critical for ensuring the safety and quality of foods delivered to consumers through the supply chain. Efficiency of the food supply chain can be enhanced by wise management of shelf life. Because shelf life depends on the food supply chain, their interactive relationship needs to be considered for improving food security and building sustainable food systems. With the food supply chain changing rapidly in a globalised and digitalised marketing environment, new technologies to determine, manage and control shelf life dynamically are emerging. Intelligent packaging provides a great opportunity to save resources and deliver safe and quality foods to the consumers. This session will discuss new technologies to harmonise the food supply chain; tools and methods to predict, monitor and indicate food quality and remaining shelf life, and global trends in adopting food shelf life for protecting consumers.

S39. Old and New Ways: Strategies Generated by Food Scientists and the Food Industry to Protect the Environment

The need to increase food production and reduce food waste by using traditional food waste and converting it into food ingredients and food, and to reduce the adverse impacts of food packaging are current issues in the world. In this session, the alternatives that are being implemented in Latin America, like the strategies applied in Costa Rica and Colombia, designing new packaging, offering less polluting and sustainable options working hand in hand with their food industries, strategies needed to reduce food waste, transforming them into economic resources, as well as managing in an appropriate way food packaging waste by recycling will be presented.

CONTEMPORARY FOOD SCIENCE, TECHNOLOGY & ENGINEERING ISSUES

S40. Contemporary Consumer and Sensory Science for a Future

Society is facing increasingly rapid change and is met with growing global challenges, which has led to consumers placing ever-evolving demands on food manufacturers. More than ever, they want food that is delicious, sustainable, personalised for them, delivers shareworthy experiences, contributes to their health and wellbeing, and comes in formats that meet their ever-busier lifestyles. Manufacturers also need to meet the needs of consumers in increasingly diverse and cross-cultural global markets. This session will reveal how consumer and sensory science is adapting and evolving to support the successful development of food products and beverages for tomorrow's consumers.

S41. Something to Chew On: How Food Sensory Cues Can Influence Reformulation and Improve Dietary Behaviours

Sensory cues inform palatability but also signal nutrient density and guide energy intake and dietary patterns. Food odours, tastes and textures influence portion selection, oral-processing and post-ingestive satiety and collectively inform dietary behaviours. Eating behaviours are moderated in response to sensory experiences during consumption, affording new approaches to support reformulation while enhancing satisfaction. This session will provide an update on developments at the interface between sensory research,

food oral processing and nutrition. Opportunities to use sensory enhancement to support energy density reduction; the role of food structure and lubrication on oral processing and satiety; a role for olfaction in food reward and energy consumption and research, and opportunities to integrate metabolomics in understanding consumer preferences will all be addressed.

S42. Food Bioactives in Providing Safety and Improving Health

Bioactive compounds in food belong to both primary and secondary metabolites and although mostly originating from plants, such as amino acids and phenolic compounds, some may also belong to animal sources such as certain proteins and bioactive peptides. While the nutritional role of such commodities may be important, their effects on safety of the food as well as their potential health effect upon consumption is most important. The interest in these areas has culminated in the introduction of functional foods and nutraceuticals or natural health products to the marketplace. In this, the role of research as well as industrial development leading to production and packaging and eventually consumer acceptance is of interest. The session will cover a range of topics related to both fundamental and applied work on bioactive proteins and peptides, food phenolics and related products and will shed light on their importance and multifunctional roles in food, nutrition and health.

S43. CRISPR: Practical Applications and Health Implications

CRISPR, an acronym for “clustered regularly interspaced short palindromic repeats” is a gene-editing technology that may facilitate the reduction of diseases in humans, plants, and other organisms. This technology may prevent genetically inheritable diseases, and present opportunities to ensure and improve the global food supply as the agricultural and scientific communities strive to increase the quality of that food supply to meet the needs of a growing population while being attentive to environmental challenges associated with less water, energy, land and excessive edible food and production waste. Some argue that the technology may produce genetic errors, thereby requiring additional research. The production of non-browning mushrooms, mildew resistant wheat, better tasting fruits and vegetables, and drought-resistant crops may be possible through CRISPR. This session will outline the possibilities associated with CRISPR technologies and discuss potential unintended consequences.

S44. Muscle to Meat - What are the Future Challenges?

Red and white muscle meats can be a concentrated source of nutrients in the diet. Tenderness of fresh meat is a major quality criterion and depends on animal factors and, more importantly, on pre-slaughter and post-slaughter processing conditions. Papers in this session will present the most recent findings on the biochemistry of meat tenderness along with modern methods for ensuring fresh meat reaches the consumer in optimum condition in terms of tenderness. It will cover processing any type of animal (beef, sheep, poultry, deer, poultry, etc.), automation, post-slaughter methodology, storage, etc.

S45. Emerging Technologies: From Academic Research to Industrial Adaptation

Promising results have been reported in the literature on the potential applications and benefits of innovative food processing techniques. However, these scientific achievements are not always appreciated by the industry, especially whenever there is a lack of up-scaled

units with technological and economic benefits. Hence, this session will present examples of industrial adaptation of emerging technologies to point out the considerations required in future research to better promote emerging technologies in the food industry. It will highlight technological, engineering, and economic issues involved in the implementation of emerging technologies and include an overview of the current status of emerging technologies in the food industry; high-pressure processing as a successful example of emerging processing in the industry; ohmic heating: up-scaled units and associated challenges; considerations for industrial adaptation of cold plasma; and the future role of artificial intelligence in food processing.

S46. Novel Food 3D Printing Technologies

3D printing is an innovative manufacturing process whereby an object is built up layer by layer, from a 3D computer design using a variety of printing technologies. 3D Printing of food allows enormous freedom of design not only in terms of 3D shape but also the composition (the ingredients and their ratios), structure, texture and, perhaps most importantly, taste. 3D printing technology can create unique new products and structures that other methods simply cannot emulate. The objective of this session is to present the latest developments and innovations in novel food 3D printing technologies, covering aspects related to the advantages and challenges of 3D printing in terms of suitable printing materials, printing process optimization and modelling and 4D printing.

S47. Impact of Digital Technologies on Food Purchasing and Nutrition

Modern digital technologies are beginning to change the way we purchase food and how we manage our diet. Mobile technologies and wearable devices, artificial intelligence, smart appliances and big data will all change the way food is selected, purchased, managed and prepared and will potentially improve health. This session will explore these changes, including the potential for wearable and mobile technologies to monitor and manage diet and health; health guidance in food purchasing online, in the supermarket and in food service situations; the potential for the integration of nutritional advice into the e-Health systems that are rapidly developing worldwide (e-Nutrition); and the integration of digital systems into personalized nutrition and the evolution of the personal digital nutritionist.

S48. Food Engineering for Optimal Nutrient Delivery

The microstructural and molecular nutrient components of food such as minerals, fat, carbohydrates, and proteins, as well as specific individual molecules, are essential for human nutrition. These components interact to form food structure and this has a profound effect on digestibility. The release of nutrients and bioactive compounds under digestive conditions is dictated by the mechanical and chemical environment of the digestive system, from the mouth, stomach, small intestine, and eventually the large intestine. Nutrients are absorbed at different stages during digestion, the rate and extent of which depends upon the degree of structural breakdown and molecular interactions that may inhibit passage through intestinal epithelial cells. The effect of processing technologies upon microstructural arrangements within a food structure will be explored, and the resultant impact upon digestibility and nutritional delivery. The concept of the whole food matrix will be introduced and how this can be altered through processing conditions.

S49. Interfacing Science and Gastronomy

The connection between science and cooking has resulted in innovative products, introduction of novel culinary techniques and utensils, as well as the utilization of indigenous raw materials that are changing the ways to cook foods. Terms such as gastrophysics, neurogastronomy, ethnogastronomy, techno-emotional cooking and gastronomic engineering are now commonly used to refer to variants of this approach. In academia, science and gastronomy have merged into attractive undergraduate courses about the science and engineering inside our foods, combining practical experiences in kitchens and laboratories. This session will present current developments in food and gastronomy including innovative cooking techniques (sous-vide, cryo-cooking), novel fermentations with gastronomic applications, use of indigenous food sources, the introduction of novel appliances and digital technologies in the kitchen, and advances in sustainable culinary practices.

S50. Trends in Smart Food Packaging Technology

Smart food packaging involves both active and intelligent packaging and is useful to enhance and assess the quality of foods. Active packaging provides some additional functions that not only protect the food but also extend shelf life. Intelligent packaging communicates the quality of the food and include biosensors, chemical sensors, and gas sensors, indicators, time-temperature indicators, integrity indicators; and freshness indicators, RFID technology and barcodes as well as holographic technology. This session will discuss the current trends in research and development of smart packaging technology from bench to commercial level and the challenges to be overcome so that these technologies can be more widely adopted in the food sector. The scope of this session includes the possible combination of active and intelligent packaging technologies as a fully smart packaging system for foods that can extend shelf life and communicate the food quality and safety inside the package.

S51. Using Life Cycle Analysis (LCA) to Guide Sustainable Food Package Design and Material Selection

Because reducing food waste has a more significant environmental impact than increasing recycling and using recycled packaging, efforts to address package sustainability are often diminished. More sustainable packaging is a way to achieve a more secure food supply as well as reduce the environmental impact of using packaging and food. While much attention has been paid to alternative materials for more sustainable packaging, after an assessment of the suitability of the materials to protect food, the alternative material cannot be an effective drop-in solution to replace existing packaging. More sustainable packaging is achieved using sustainable sourcing - the use of recyclable and recycled packaging and sustainably sourced biomass-derived polymers - as well as design innovation, to enable reuse and collection of packaging. This session will explore sustainable package design in the value chain, recyclable and biomass-derived packaging for more sustainable materials, and the use of LCAs to guide package sustainability decisions.

S52. Food Packaging: Balancing Functionality with Environmental Legacy

There is a grotesque disparity between the life of a food product and that of the packaging in which it is contained. In comparison with the food, the packaging seems to last eternally. A solution to this problem is to make packaging from more sustainable materials such as biodegradable or compostable materials. The main issue with such materials is their poor performance as a packaging material. This session will focus primarily on the performance of

a variety of biodegradable and compostable materials for various packaging applications with a view to improve packaging functionality while lowering environmental impacts.

S53. Emerging Food Packaging Technologies to Add Value to the Supply Chain

Emerging food packaging technologies are currently being developed that have the potential of adding value to the supply chain within the next five to ten years. As our society enters the 4th industrial revolution era (characterised by the fusion of technologies such as internet of things, robotics, and biotechnology that is blurring the lines between the physical, digital and biological spheres), an important emerging technology is the “fusion technology of food packaging”. This fusion technology builds on the digital revolution, representing new and more effective ways of delivering food to the consumer. It involves the fusion of intelligent packaging, active packaging, traditional packaging, and food science to enhance the functions of food packaging, in order to meet the changing needs (globalisation, food safety, food security, sustainability, home meal delivery, etc.) of the increasingly complex food supply system.

S54. The Gut Microbiome and Health for Life

The microbial community that inhabits the large intestine of humans has immense capacity to degrade and metabolise components of food that are undigestible in the small intestine. In addition to energy harvest from these otherwise undigested materials, the microbiome synthesises micronutrients and chemically transforms molecules to bioactive forms. The relatively intimate contact between the microbiome and the epithelium lining of the intestine provides opportunities for microbe–host interaction. The metabolic activities of the microbiome not only shape this ecosystem but also influence the human host systemically through the release and absorption of bioactive substances. For example, it is now well recognised this microbiota and its metabolites affect the peripheral and central nervous system and influence brain biochemistry and function. The complex metabolic activities and interactions with a profuse and highly complex commensal microbiome are essential functions related to digestion and human health that will be explored in this session.

S55. Creating a Modern Food System Innovation Environment

Effective development of innovative, creative, sustainable, healthy and commercially successful food products must involve a closer integration of Universities, Research Associations and the food industry. This provides great opportunities for entrepreneurs, innovators and spin-offs to bring forward new products, services and technologies that can deliver positive societal impact, together with the creation of jobs along the entire food chain. This boosts the attractiveness of the local and global food system as an employment destination for the brightest and best talent. Government encouragement has resulted in the emergence of novel integrated innovation models around the world. They serve to encourage and support innovation that can address the way we produce, deliver, consume and recycle our food to build a resilient and effective global food system. This session discusses the evolution of these models, their performance and their effectiveness supporting innovation in a modern and complex food environment.

S56. New Zealand Applications for Emerging Low-Carbon Food Technologies

This session will present the output of five research projects undertaken under the FIET programme of research, each a collaboration within a group of three New Zealand universities and their research institutes. All five projects apply emerging, primarily electricity-driven, food technologies to one or more New Zealand foods. The five projects to be reported are:

- Tenderising meat by synergy between sous vide and emerging techniques
- Reduced heat treatment for flowing liquids by synergy with non-thermal technologies
- Pulsed Electric Field in wine and damaged tubers
- Rapid validation of microwave food sterilisation processes
- Even application of UV over the surface of fresh berries

In each case, the fundamentals are addressed, and industrial approaches determined that seek to improve product quality and minimise energy use and carbon emissions. In each case company participation and real applications are used to drive the research.

S57. Industry 4.0 – The Benefits and Risks of Artificial Intelligence

Artificial intelligence (AI) is evolving dynamically and rapidly. The world is far more connected through the Internet of Things, ‘big data’, machine learning, intelligent robotics and supporting connectivity such as fibre, 3G, 4G and 5G. Cyber-security is a serious threat because weak links (old or redundant technologies, unsupported software, etc.) can jeopardise modern high security systems. Managing the risks and benefits, evolving existing systems in small companies or large conglomerates and isolating operations from global interference have become significant components of a manager’s portfolio. This session addresses awareness of the state of the art in 2020 and discusses the benefits and risks offered by AI in the modern food industry.

S58. Modelling the Interactions of Food Molecules

The key role that molecular interactions play in foods suggests they should be investigated in detail. However, the resolution limit of most experimental techniques prevents a detailed understanding of molecular association and hampers the rational design of new functional foods. Computational techniques are powerful tools for investigating the interactions between molecular components. They can provide an understanding of the molecular interactions, and thereby link physico-chemical properties of active molecules to their function in food and nutrition. This session will cover computational techniques for studying the macromolecular interactions found in foods. It will provide an overview of computer methods ranging from sequence-based molecular design techniques to methods assessing biophysical properties of food molecular systems in complex environments. The session will describe methods of great potential to interface with experiments. This will especially promote cross-collaboration between experimental and computational researchers.

S59. Bioinformatics of Food Compounds and their Biofunctionalities

Aside from their nutritional qualities, food-derived compounds play a significant functional role in diets. These functionalities can range from biological properties (e.g. antioxidative, antihypertensive, immune enhancing, etc.) to physicochemical functionalities such as foaming, gelling, emulsifying behaviour, and water-holding capacity. The biofunctional properties of food compounds is as a result of the high degree of structure–activity traits that these compounds carry. This makes it possible to use in silico and computational tools

to predict the biofunctionalities of food compounds, thus reducing the time and cost for the development of functional food compounds/ingredients. This session will explore advances in the use of computational/in silico tools for the modelling, prediction and structure-activity relationship studies of food compounds.

S60. Innovative Processing for Dairy: Opportunities and Challenges

Consumers are nowadays demanding 'miracle foods' that meet a myriad of criteria including safety, nutrition and health promotion, convenience, minimally processed, 'natural', and 'green'. These demands pose serious challenges for traditional, usually heat-based, processes used in dairy manufacturing. As such, the dairy industry must explore and embrace new technologies that unequivocally maintain safety but at the same time address the many demands of the modern-day consumer. Low/non-thermal, non-traditional processing technologies, including high pressure, pulsed light and electric field, and various manifestations of ultrasonics (e.g. megasonics) represent technologies that have potential application in dairy fluid/product processing, and that will likely meet many of the consumer demands. These technologies also have the added benefit of capturing cost-effectiveness and efficiency not currently possible. This session will explore opportunities for adaptation/application of innovative processing technologies in dairy fluid manipulation/transformation, and the challenges (technical, regulatory, consumer acceptance) that must be addressed prior to widespread use.

S61. Indigenous and Traditional Foods: Their Reinvention for Modern Consumers

Indigenous foods constitute an important part of the diet of many communities in the world. The majority of the indigenous foods are produced through fermentation technologies. In the early days, the foods were prepared using rudimentary technologies, but over the years the traditional processing technologies have evolved into large scale productions producing foods with unique sensory profiles. In the current environment of clean technologies and functional foods, indigenous foods are now being reinvented to play bigger roles in modern markets. This session will consider the place of indigenous foods, and the traditional knowledge of preparation and efficacy behind them, in the modern industrial world. It will also address the industrialisation for the modern supply chain of a traditional food by studying the fundamentals underpinning its artisanal production. Modern demand for new fermented foods makes this challenge current today. The challenge has food safety, regulatory and technical components.

S62. Electronic Sensors for Food Quality and Safety Assessment

The food industry needs robust, non-destructive, precise, accurate, rapid, reproducible, sensitive, portable, stable, easy to operate and inexpensive approaches to ensure food quality (i.e. safety and sensory). A variety of new techniques such as artificial electronic sensors are emerging which have potential applications in the food industry and research. These are e-nose, e-tongue, e-eye, e-ear, and e-touch, and they mimic the five human sense organs. These sensors are important for robotics and process automations. This session will discuss the construction and function of different sensors including their calibration, reproducibility, stability, sensitivity (i.e. detection thresholds), portability and ability to incorporate them in on-line quality control. Furthermore, the advancement of machine learning and artificial intelligence for these sensors will be focused on pattern recognition,

prediction and modelling. Finally, the applications and challenges of e-sensors in the detection of food spoilage and sensory quality will be addressed.

S63. Engineering Food Structures for Optimal Nutrient Delivery

The science of nutrition has created an important knowledge base of the vitamins, minerals, amino acids and fatty acids that are essential to human health. All foods are composed of some or all of these elements, but they are contained within complex food matrices and structures which may be of natural origin (i.e., dairy, meat, fruits and vegetables) or created via interactions of macromolecules through formulation and processing. New interest has arisen on the impact food structure on digestive behaviour and its relationship to human nutrition. The release of nutrients and bioactive compounds under digestive conditions is dictated by how food structures behave under the mechanical and chemical environment of the digestive system, from the mouth, stomach, small intestine, and eventually to the large intestine. This session will discuss recent developments in understanding food structure breakdown dynamics during food digestion, and the resultant impact upon digestibility and nutritional delivery.

S64. Food Structure and Functionality

Food quality and functionality are much dependent on their physical, chemical, and biological structures. Structuring of food tailored towards end-user functionality, such as healthcare/medical care, texture improvement, taste perception, and longer shelf stability has attracted much attention. This session will focus in particular on food structuring/de-structuring in food product design for functionality, digestion and nutritional release in the gastrointestinal tract. It will give significant opportunity for participants to update themselves on recent developments in this fast-developing field and to network with international colleagues.

S65. Recent Advances of Nanoscale Science in Food Applications

Over the past two decades, innovations in nanoscale science and technology have transformed a number of industrial sectors. In the food sector, considerable progress has been made in the development of smart food packaging materials, precise bioactive delivery systems, nanosensors for detection of pathogens and shelf life extension. However, little progress has been made in translating research advances into commercial practice and consequently there are very few “nano-foods” in the market. The major issues are the unclear regulations and consumer concerns about the potential negative impacts of nanotechnology on food quality, environment and human health. Clearly much more scientific evidence is needed to address safety and quality issues of “nano-foods”. This session will be hosted by ISFASNS, a special interest group of IUFOST and will provide a forum for exchanging new discoveries and developments based on nanoscale science for various applications in food system.

S66. Non-Thermal Processing of Solid and Liquid Foods

Non-thermal processing such as high pressure, pulsed electric field, UV and cold plasma are technologies applied in food processing to minimise thermal damage caused in existing thermal processing. They all work at temperatures well below normal pasteurisation temperature and hence retaining the food’s nutritional values and freshness. Some of these technologies such as high pressure have reached commercialisation with a large number of

liquid and solid foods available in the market, while others are still in the research and development phase. Also, the combination of one of these technologies with thermal processing could lead to new product/process development, aiming to produce high quality food at reduced temperatures but with an extended shelf life or even shelf-stable. The advances which has been made in this area have been dramatic and hence the presentations in this session will focus on the innovative use of these technologies for the production of safe and nutritional food.

S67. Current and Future Tools in e-Learning and Distance Education of Food Science and Technology

Globalisation of the food system, traceability and food safety concerns around the food consumers are purchasing has resulted in an increased need for education and training in the discipline and principles of food science and technology. Education is needed, not only for the scientists developing new foods, but also the workers in production, food handlers in retail and the consumer on the street. Technology and the internet of things has brought many innovations to the sphere of education, with audio-visuals, webinars, podcasts, live-streaming and e-learning software. Teaching an applied, hands-on, often laboratory-based subject like food science and technology can, however, provide challenges in delivering the necessary content and assessing the learning outcomes. This session will explore the innovations and future possibilities that e-learning can provide to enhance learning and increase the reach of food science and technology education.

S68. Status of Food Science, Food Technology and Food Engineering Programmes Worldwide: Curriculum Development and Accreditation

Food Science, Food Technology and Food Engineering degree programmes around the world differ in their length and also the modules which are taught in them. Most include similar foundational modules such as chemistry, physics, mathematics and biology and are followed by modules providing further depth in microbiology, chemistry, biochemistry and applied food science. Differences often exist in the additional modules which are included, such as food engineering, business management, marketing, finance and economics. Some benchmarking of minimum content requirements for food science, food technology and food engineering programmes exists in the form of curricula guidelines, and some accreditation systems have been launched to verify these minimum requirements. This session will seek to highlight the status of these curricula and the different accreditation programmes that exist, as well as shedding light on whether there is a need for further refinements to these guidelines and additional accreditation systems.

S69. High Selenium Food Ingredients and Their Applications in Functional Foods

Selenium (Se) is an essential trace mineral and deficient intake causes health issues such as Keshan disease. Scientific evidence indicates that Se has an antioxidative effect, promotes the immune system and may help reduce the risk of cancer, especially prostate cancer. While certain areas in the world have soils rich in Se including Enshi (China), Canada and parts of the USA, there are areas with soils deficient in Se including Finland, New Zealand, parts of Australia and Africa. Enrichment of foods with Se is therefore important to meet the recommended dietary allowance in deficient areas. Selenium metabolism is dependent on the chemical form or species of Se in the diet and some forms are better than others. This session will discuss the development of high selenium food ingredients and their

applications in functional foods, as well as the benefits of selenium-enriched foods in relation to human health.

S70. Market Access, Compliance and Harmonisation: The Case of the MENA Region

Global trade of food is diverse and complex, yet most countries strive to take part. Many developing nations are on the edge of facing trade wars with developed nations such as the USA and Japan. There is a huge tendency to renegotiate trade agreements towards more protectionist ones. These new facts affect directly MENA countries that need to enhance their intra/extra-regional trade harmonisation to better address challenges related to food safety and security. During this session, speakers will focus on the main obstacles to exportations to the Lebanese diaspora. Speakers will address CODEX, SPS, TBT and TRIPS agreements and lack of knowledge of target market requirements. The multidisciplinary speakers will present relevant experiences from different countries about enforcing compliance with target market standards. Also, they will highlight the importance of harmonising food laws and standards within the MENA region to minimise food deficit and consequently reach economic and social development.

S71. China-New Zealand Young Food Scientists Interaction Session

Since the establishment of diplomatic ties between China and New Zealand in 1972, China-New Zealand economic and trade relations have been developing steadily and healthily. The food industry of the two countries has taken an active part in the construction of "Belt and Road", improved the level of exchanges and cooperation, and moved forward towards the goal of mutual benefit and common safety. Among them, the role of technology in driving the health of the industry cannot be underestimated, and young food scientists are one of the most active and dynamic forces. This session will build on the exchange platform for China-New Zealand young food scientists. Outstanding young food scientists from the two countries will share the latest research progress and conduct in-depth discussions on technical innovations.