



Global Challenges in Food, Nutrition & Environment Symposium

6-8 December 2018, University of Hong Kong

Programme Book



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Congratulatory Message from the President, University of Hong Kong

THE UNIVERSITY OF HONG KONG

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Message

Global Challenges in Food, Nutrition & Environment Symposium

On behalf of the University of Hong Kong, I would like to offer a very warm welcome to all participants at the Global Challenges in Food, Nutrition & Environment Symposium.

The symposium will be a platform for you to discuss the knowledge, ideas and innovations related to food security and population health. It will bring together experts and professionals from around the world to share the latest developments on related issues – including public health, new technologies, regulations, harmonization and law – and be an opportunity to foster collaborative partnerships with international peers.

The international, interdisciplinary and innovative approach of the symposium is one we very much support at the University of Hong Kong. Impact is the aim of everything we do; we all want our efforts to make a difference to society and humanity.

I would like to commend all those who have worked so hard to make this symposium possible, and my congratulations to the School of Biological Sciences on what promises to be a productive and successful event.

Professor Xiang Zhang
President and Vice-Chancellor

November 2018

Congratulatory Message from the Director, School of Biological Sciences

According to World Health Organization's report on '*WHO Estimates of the Global Burden of Foodborne Diseases*', there are 31 foodborne hazards causing 32 diseases which totally cause about 600 million foodborne illnesses and 420,000 deaths around the world each year. The foodborne diseases agents include virus, bacteria, protozoa, helminths and chemical contaminants. Just foodborne diarrheal disease agents alone result in about 230,000 deaths per year. The highest burden of foodborne diseases occur in Africa, followed by Southeast Asia and Eastern Mediterranean. To address this global challenge, the United Nations has specified two Sustainable Development (SD) Goals, namely:

SD Goal 2, Zero Hunger: The food and agriculture sector offers key solutions for development, and is central for hunger and poverty eradication.

SD Goal 3, Good Health and Well-Being: Ensuring healthy lives and promoting the well-being for all at all ages.

Hence, eating healthily with healthy and nutritional food and with less sugar, salt and chemical contaminants is an apparently important element for achieving these SD goals.

The Global Challenges in Food, Nutrition & Environment (GCFNE) Symposium is, therefore, very timely and essential. We gather together renowned scientists and practitioners from overseas, China and Hong Kong to discuss and address pressing global issues regarding sustainable food supply, healthy diet, food safety and environmental health, in the hope of applying a multidisciplinary approach to establish some practical and technological solutions for reducing foodborne illnesses, promoting healthy diet and improving environmental health.

The School of Biological Sciences of the University of Hong Kong (HKU) is dedicated to promote sustainable nutrition and environmental health in Hong Kong, China and Southeast Asia, and play a key role in these important research areas. In 2014, we fruitfully organized the International Conference on Food Safety: From Experience to Perspectives which was well attended by over 150 delegates from different parts of the world. This GCFNE Symposium expands the food safety scope to also encompass the aspects of sustainable nutrition and environmental health and further promote transdisciplinary research collaboration. Our invited speakers, thus, include experts in food and nutritional science, functional food, food technology, toxicology, environmental health, sustainable development and public policy, respectively.

On behalf of the HKU School of Biological Sciences, I would like to thank the chairperson and members of the Symposium Organizing Committee for making this meeting a success, and especially thank the AB Sciex (Hong Kong) Ltd, HKU SPACE, Lavazza Hong Kong, Sartorius Hong Kong Ltd, Vita Health, and the HKU Faculty of Science for their generous sponsorships and supports to the GCFNE Symposium. Lastly, I am very grateful to all of you for your

participation and contribution to the fruitfulness of this Symposium. I sincerely hope you will find this Symposium scientifically productive and enjoyable.



Professor Kenneth Leung, JP, FSETAC
Director, School of Biological Sciences

Congratulatory Message from the Director, The Swire Institute of Marine Sciences



The Swire Institute of Marine Science

太古海洋科學研究所

Congratulatory Message from the Director, The Swire Institute of Marine Science, The University of Hong Kong

Our natural systems and the resources we rely on are facing unprecedented pressures from anthropogenic sources. Pollution, urbanization and climate change are pervasive, often acute and obvious stressors, but there are also insidious, more unseen impacts from nano-pollutants, persistent organic pollutants, endocrine disrupting chemicals and synergistic chronic impacts from multiple stressors. As scientists there is no doubt that one of our major roles is to try and mitigate against these multiple influences, both to conserve natural systems, but also to provide a sustainable environment for human habitation. This effort takes us outside the safety of our individual scientific disciplines and challenges us to join forces and skills to tackle these issues.

The Global Challenges in Food, Nutrition & Environment (GCFNE) Symposium is a great example of such interdisciplinary effort and brings together food scientists, chemists and marine biologists. At the Swire Institute of Marine Science (SWIMS), we are proud to co-organize such a gathering of internationally renowned scientists and to contribute to building a multidisciplinary approach to tackle the challenges represented by our changing planet.

As a research facility of The University of Hong Kong, one of SWIMS' missions is to provide an interdisciplinary research environment to train young scientists who will play a leading role in the management and conservation of marine resources. We think that the participation of SWIMS experts in the GCFNE Symposium will help foster the discussion on how to integrate the future development of food safety with the sustainable conservation of our natural environment.

On behalf of SWIMS, I would like to thank the chairperson and members of the Symposium Organizing Committee and all the sponsors for making this meeting such an interesting and multidisciplinary event. I am also very grateful to all of you for your participation and contribution to the Symposium and welcome all the conveners, and especially the many young scientists, to HKU. I hope that you will make the most of this excellent opportunity and contribute towards the challenge of ensuring a sustainable environment for future generations.

Professor Gray A. Williams



The Swire Institute of Marine Science, The University of Hong Kong, Cape d'Aguilar Road, Shek O, Hong Kong

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Congratulatory message from Global Challenges University Alliance



The Global Challenges University Alliance (GCUA) is a rapidly growing alliance of life science universities, currently 10 from around the globe, that are committed to contributing to the Sustainable Development Goals (SDGs) of UN's Agenda 2030. GCUA serves as a forum and a collaborative network for knowledge sharing, identification and formulation of research questions and concerted efforts aimed at finding sustainable solutions to the global challenges.

We are very pleased to have University of Hong Kong as one of our members and we are excited to be part of this symposium addressing the Global Challenges in Food, Nutrition and Environment. We are convinced that this will be an important milestone event that will prove impactful and will provide a foundation for collaborative efforts and supporting the mission towards a sustainable global future.

We would like to congratulate the organizing team for putting together an interesting and multifaceted program and look forward to an exciting and fruitful event!

On behalf of the GCUA General Assembly

Ylva Hillbur
Pro vice-chancellor, International Relations
Swedish University of Agricultural Sciences (SLU)
Uppsala, Sweden

Welcome Message from the Symposium Chair

On behalf of the Organising Committee, we take a great pleasure in welcoming you all to the Global Challenges in Food, Nutrition & Environment Symposium.

The School of Biological Sciences and the University of Hong Kong are consigned and committed to safeguard and sustain our resources from farm to table and into the community. The increasing population, the advancement of agriculture practices, climate change and global food supply has put to danger to global issues in our health and environment. Through the exchange of greater scientific knowledge about fundamental conditions for life, it will allow us to translate the understanding into relevant action through dedicated international co-operations. In pledge to this, HKU has officially joined the Global Challenges University Alliance led by the Swedish University of Agricultural Sciences in 2017.

Over the three-day Symposium, a panel of distinguished guest speakers from Greater China and across the world will update the participants on recent developments and information on global challenges in Food Security & Nutrition, Nanomaterials, Supplements & Pharmaceuticals and Persistent Organic Pollutants.

Such Symposium is the first to be organised in Hong Kong and we look forward to more in the future in the region. We hope your participation, communication and discussion will bring fruitful outcome to this meeting.

Lastly, we are greatly indebted to all experts, contributors and sponsors for the generous and enthusiastic support for this Symposium. We also hope, you will take time after the Symposium to explore the dynamic Hong Kong, *“A city that has a kaleidoscope of life, a sophisticated fusion of East and West, a city of diversity where new and old meet at every turn.”*



Jetty Chung-Yung Lee
Symposium Chair

Members of the Organizing Committee



Dr. Jetty C. Y. Lee
Chairperson



Dr. Hani S. El-Nezami
Vice Chairperson



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Louie**
Committee



Dr. Bayden Russell
Committee



Dr. M. F. Wang
Committee

Programme Rundown

<u>Thursday, 6 December 2018</u>	
11:00	Registration
<u>Opening Remarks and Keynote Presentation</u> Opening Ceremony - MC: Dr. Jimmy C. Y Louie	
13:00	Opening remarks <i>Professor W. John Kao, Vice-President and Pro-Vice-Chancellor (Global)</i>
13:15	Opening remarks <i>Professor Matthew R. Evans, Dean, Faculty of Science</i>
13:30	Welcoming remarks <i>Dr. Jetty C. Y. Lee, Conference Chairperson</i>
13:35	Group photo
13:50	Keynote speaker: "Facing challenges of processed food" <i>Prof. Pingfan Rao - Professor and Director of the Chinese Academy of Science (CAS), Shanghai Institutes of Biological Sciences (SIBS) Joint Center of Food and Nutrition Research, Zhejiang Gongshang University, China</i>
14:35	Tea break
<u>Food Security and Nutrition</u> Chairperson: Dr. Jimmy C. Y. Louie	
15:00	Invited speaker: "Nanobiotechnology for agriculture, water quality and food security" <i>Prof. Collin Barrow - Chair in Biotechnology, Deakin University, Australia</i>
15:30	Invited speaker: "Marine-derived foods and nutrients - how much do we need and how much is available?" <i>Prof. Bankje de Roos - Rowett Institute of Nutrition & Health, University of Aberdeen, UK</i>
16:00	Global Challenges University Alliance Ms. Marnie Hancke
16:10	Tea Break
16:30	Invited speaker: "Governing the water-energy-food nexus:

	Insights from new institutional economics” <i>Dr. Terry Van Gevelt - Politics & Public Administration and Civil Engineering, The University of Hong Kong, Hong Kong</i>
17:00	Invited speaker: “Influence of probiotic fermented fruit and vegetable on intestinal health” <i>Prof. Mingyong Xie - Director of the State Key Laboratory of Food Science and Technology, Nanchang University, China</i>
17:30	Oral presentation: "The Effect of Polyphosphate on advanced glycation end products (AGEs) and Heterocyclic Amines (HAs) Formation in Roast Meat Patties" <i>Dr. Yong Li - Jiangnan University</i>
19:00	Dinner (by invitation only)

<u>Friday, 7 December 2018</u>	
Time	Programme
<u>Nanomaterials</u> Chairperson: Dr. Hani El-Nezami	
10:30	Invited speaker: “Systems Toxicology - Towards reliable hazard prediction” <i>Professor Harri Alenius, Institute of Environmental Medicine, Karolinska Institute, Sweden</i>
11:00	Invited speaker: “Analytical challenges in the detection and quantification of engineered nanomaterials in food products” <i>Professor Ralf Greiner, Max Rubner-Institut, Germany</i>
11:30	Tea break
11:50	Oral presentation: "Gold Nanoparticle Aggregation Based Visible Detection of Food Biology Hazards" <i>Professor Young Jin Choi - Seoul National University</i>
12:10	3- Minute Presentation
12:35	Lunch break
<u>Supplements & Pharmaceuticals</u> Chairperson: Dr. C.B. Chan	
14:00	Invited Speaker: “Perspectives on integrative urbanization, water, and food security” <i>Professor Bryan Brooks - Environmental Science and Biomedical Studies, Baylor University, USA</i>
14:30	Invited Speaker: “Probiotics, prebiotics and human gut microbiota modification: Achievements and future challenges” <i>Professor Seppo Salminen - Professor in Food Development, Director of Functional Foods Forum, University of Turku, Finland</i>
15:00	Tea break
15:20	Oral presentation: “Innovative Thermal and Non-thermal control methods to ensure food-safety” <i>Professor Dong-Hyun Kang - Seoul National University</i>

15:40	Oral presentation: "Prevention of chronic inflammation by food functionalities targeting omega-6 PUFA arachidonic acid metabolic pathway" <i>Professor Toshiko Suzuki-Yamamoto - Okayama Prefectural University</i>
16:00	Oral presentation: "Anti-diabetic mechanism of dietary polysaccharides based on their gastrointestinal functions" <i>Dr. Jielun Hu - Nanchang University</i>
<u>Public forum "The Future of Food"</u> Chairperson: Dr. Stefano Cannicci & Ms. Marnie Hancke (GCUA))	
17:30	Light Refreshments
18:00	Invited Speaker: "Competition for food resources -the biorefinery solution" <i>Professor Wolfgang Kneifel - Department of Food Science and Technology, BOKU, Austria</i>
18:30	Invited Speaker: "Use of traditional staple foods for health benefits in developed and developing countries" <i>Professor Perry Ng, Associate Chair of the Department of Food Science and Human Nutrition, Michigan State University, USA</i>
19:00	Round table discussion

<u>Saturday, 8 December 2018</u>	
Time	Programme
<u>Persistent Organic Pollutants</u> Chairperson: Dr. Bayden Russell	
09:30	Invited speaker: "POPs in us – Status and challenges in environmental health" <i>Professor Kyungho Choi - Environmental Health Sciences, Seoul National University</i>
10:00	Invited speaker: "Joining the dots between omics and environmental management" <i>Professor Kenneth Leung - School of Biological Sciences, The University of Hong Kong, Hong Kong</i>
10:30	Oral presentation: "Molecular mechanism for recognition of sanitizers by food-borne pathogens" <i>Professor Nam-Chul Ha - Seoul National University</i>
10:50	Tea break
11:10	Oral presentation: "Effects of catechins on Nε-(carboxymethyl)lysine and Nε-(carboxyethyl)lysine formation in green tea and model systems" <i>Ms. Ye Jiao - Jiangnan University</i>
11:30	3 Minute Presentation
11:55	Prize presentation for 3-Minute Presentations
12:10	Closing remarks



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Abstracts

Keynote Speaker

Facing Challenges of Processed Food

Pingfan Rao

Zhejiang Gongshang University, Hangzhou, China

Food processing enables effective preservation of agriproducts in the industrial scale at low cost. It is the key technology that secures safe and abundant food supply to the growing population. It is common sense that the same food ingredient interacts with body differently when prepared differently. For example, fish before and after cooking may contain similar nutrients but their interaction with body is different. When food is prepared by industrial processes, it is reasonable to assume that the products will interact with body differently even they possess similar sensory properties of home prepared food. Those differences, however, have neither been scientifically investigated, nor can they possibly be explained by the existing approaches of nutrition science or toxicology. They have not even been recognized as a food issue by the industry in spite of the increasing public outcry against it. The ostrich approach to the issue will not lead to any solution but only result in increasing conflicts between consumers and food manufacturers. It is time for food science to seriously address the issue of processed food, and we should be confident that food science can resolve any issues resulted from food processing.

Invited Speaker

Nanobiotechnology for agriculture, water quality and food security

Colin J. Barrow

Chair in Biotechnology, Deakin University, Geelong, Australia

The application of nanotechnology to biotechnology enables improved agricultural practices leading to enhanced food security. For example, nanoencapsulation of pesticides can provide more efficient delivery and uptake of these bioactive compounds with lower environmental impact. In addition, nanosensors are being developed for selective and sensitive detection of environmental contaminants including heavy metals and organic compounds in agricultural run-offs and other waste-water. In conjunction with the TERI-Deakin Nanobiotechnology Centre we are developing a range of nanobiotechnologies for sustainable agriculture, water quality, bioremediation, food processing and food security. Here I will present selected projects, including nanopesticide delivery, sensors for water quality, micro- and nano-encapsulation for stabilization and delivery of sensitive food ingredients, biological production of agriculturally useful nanoparticles from mining waste, and nanomaterials for improved enzyme bioprocessing.

Invited Speaker

Marine-derived foods and nutrients - how much do we need and how much is available?

Baukje de Roos

Deputy Director, The Rowett Institute, University of Aberdeen, Aberdeen, United Kingdom

Fish and fishery products not only play an important role in the provision of dietary needs for omega-3 fatty acids, protein, vitamins and minerals, they also play a critical role in food security of people living in developing and developed countries. In the past five decades, the total supply of fish for food consumption has increased mostly due to population growth, rising incomes, urbanisation and a strong expansion of global production and distribution of fish products. The role of aquaculture in global fish production has significantly increased since the nineties, and its products have become a major contributor to omega-3 fatty acids and other nutrients in the diet. However, the actual content of omega-3 fatty acids in farmed salmon has nearly halved in the last decade due to the substitution of the fish meal and fish oil in fish feeds to more sustainable alternatives of terrestrial origin. In addition, levels of vitamin D have declined in aquaculture fish feeds, and farmed salmon contains only around a quarter of the vitamin D content of wild salmon.

Since fish and seafood are the main dietary source of omega-3 fatty acids in the human diet, changes in fish feed practices will result in a significant decrease in the intake of fish fatty acids world-wide. This may have consequences for its health giving properties. Fish consumption is linked to a significant reduction in the risk for coronary heart disease and stroke, potentially by their ability to alter eicosanoid metabolism and induce inflammatory resolution. Therefore, many countries have dietary recommendations for fish intake. However, our intake of omega-3 fatty acids, but also of vitamin D and selenium from fish, is likely to decrease in the next years, unless, for example, microalgae and genetically modified oilseed crops that have been engineered to synthesise the omega-3 fatty acids EPA and DHA, are applied for fish feed. If the current trend of decreasing levels of omega-3 fatty acids, vitamin D and micronutrients in farmed fish continues, we may well need to eat more fish in order to obtain the health benefits.

Invited Speaker

Governing the Water-Energy-Food Nexus: Insights from New Institutional Economics

Terry Van Gevelt

*Assistant Professor, Department of Politics and Public Administration &
Department of Civil Engineering
University of Hong Kong, Hong Kong*

There is unprecedented pressure on global water-energy-food (WEF) resources, a situation that will likely be exacerbated by climate change. It is now widely acknowledged that in order to meet the resultant environmental and socio-economic challenges, the interconnections between each of the three WEF sectors needs to be understood and accounted for. This has led to calls for a radical overhaul of the current system of policy- and decision-making to avoid the current practice of compartmentalized government policy and regulation. While the form of this ‘radical overhaul’ is not always spelled out, there is an underlying expectation that current governance frameworks should be replaced by centralized and technocratic decision-making processes that aim to draw on objective science. Building on over three decades of scholarship in New Institutional Economics, I will use a nexus case-study as a vehicle to show how a governance framework built around the principle of procedural justice and that recognizes the concepts of interdependence and transaction costs has the ability to generate efficient outcomes and consider trade-offs among the sectors of the WEF nexus.

Invited Speaker

Key technology of producing probiotic fermented fruits and vegetables as well as evaluating their safety and functionality

Qianqian Guan, Tao Xiong, Shaoping Nie, Mingyong Xie
State Key Laboratory of Food Science and Technology, Nanchang, PR China

Chronic diseases, such as cardiovascular disease, cancer, diabetes and hypertension, are seriously threatening the health of people. The disorder of intestinal flora and the insufficient intake of dietary fiber are two important causes of the occurrence of chronic diseases. Intake of probiotics and prebiotics may help to improve the structure of intestinal flora. Probiotic products such as probiotic fermented yogurt, probiotic capsules, probiotic powder etc, are currently popular all over the world, while there are few probiotic fermented fruit and vegetable products on the market. We introduced for the first time the fermentation technology into fruit and vegetable processing and developed an innovative technological system to solve the problems in fruit and vegetable fermentation industry such as lacking bacterial strains specific for fruit and vegetable fermentation, less developed technology of bacterial agent preparation, and limited sorts of fruit and vegetable fermentation products. This system comprises upstream, midstream, and downstream of the industrial chain, which has broken through the technology bottleneck of high-density culture and industrial agent preparation. By this technology, a series of probiotic fermented fruit and vegetable products have been developed, promoting the establishment of entire new industry of fruit and vegetable fermentation. On this basis, the safety and functionality of these probiotics and their fermented fruit and vegetable products were studied. Due to the combination of probiotics and prebiotics, fermented fruit and vegetable products have the functionality of improving intestinal health, relieving chronic disease. Thus, the products are of great market potential and will bring the revolutionary influence on probiotics as well as fruit and vegetable processing industry.

Invited Speaker

Systems Toxicology - Towards Reliable Hazard Prediction

Harri Alenius

Systems Toxicology Unit, Institute of Environmental Medicine, Karolinska Institutet, Sweden

Department of Bacteriology and Immunology, University of Helsinki, Finland

Classical toxicological testing paradigms still rely heavily on *in vivo* testing, despite ethical pressures to change to *in vitro* alternatives. The 21st century toxicology paradigm calls for a shift away from descriptive toxicology, based to a large extent on animal testing one by one towards a predictive toxicology grounded in a more solid understanding of the relevant toxicity pathways in humans.

Systems toxicology aims to change the way in which adverse effects of chemicals or other toxicants are characterized, from isolated empirical end-points to integrated pathways of toxicity. In the context of nanosafety, systems toxicology promises to shed new light on the interactions of ENM with biological systems and reveal the causal connection between changes in the expression of genes, proteins or metabolites and the biological pathways. Key challenges are how to link reliably gene profiles to toxicological phenotypes, and how to demonstrate prediction accuracy of computational models in real life.

Huge amounts of information are generated in omics experiments. In order to identify the hazard-relevant molecular features (signatures), one needs to be able to isolate the relevant information while taking into account the statistical dependency between the variables. In such a context, the group of features that best predicts the safety of ENM might not be composed of elements derived from only one data layer, but also by features with a combinatorial effect derived from multiple layers of data. Thus, by systematically integrating multiple layers of experimental data together with information extrapolated from the relevant literature, a more robust hazard predictions can be achieved.

The NANOSOLUTIONS FP7 project aimed to generate a computer algorithm capable to predict the safety of ENM based on a minimal but most informative set of features selected across multiple data layers. Based on integration of data from several different omics layers (i.e., transcriptomics, proteomics, epigenomics) and physicochemical properties, along with *in vitro* and *in vivo* toxicity data for a panel of more than 30 ENM, a classifier algorithm designated the ENM SAFETY CLASSIFIER, composed only of 16 most important/most informative hazard associated features, was generated that is capable of predicting ENM toxicity with high accuracy.

Computation predictive tool approach is a major leap forward and may enable progressing towards faster predictive hazard classification based on relatively small amount of toxicity studies to be carried out for hazard evaluation of ENM.

Invited Speaker

Analytical Challenges in the Detection and Quantification of Engineered Nanomaterials in Food Products

Ralf Greiner

Federal Research Institute of Nutrition and Food, Max Rubner-Institut, Department of Food Technology and Bioprocess Engineering, Haid-und-Neu-Straße 9, 76131 Karlsruhe, Germany

Current and potential future applications of engineered nanomaterials (ENMs) in foods have been reported in the scientific literature and in press releases. According to the Regulation (EU) No 1169/2011 on the provision of food information to consumers, foods containing ENMs must be labelled accordingly. Furthermore, a proper risk assessment of the nanomaterials present in foods need to be performed. Thus, suitable detection and characterization methods for ENMs need to be available.

Many different techniques to detect and quantify nanomaterials are currently available, among others electron microscopy, laser diffraction, field-flow fractionation, spICP-MS, and disc centrifugation. These techniques work quite well in simple matrices. A number of challenges however, arise when analyzing foods for the presence of ENMs. In contrast to simple matrices, food has a complex composition, is hetero-dispersed and may contain more than one type of ENM. Besides nano-scale ingredients or additives, nano-scale contaminants from the environment or from food contact materials may be present in foods. When analyzing ENMs in foods, not only their particle-size distributions are of interest, but also their chemical composition and their physical and chemical properties. The choice of the detection method depends on the nanomaterial to be analyzed and the food matrix it is incorporated in. All available techniques have their strengths and drawbacks and an extensive sample preparation is in general needed. While developing detection methods for ENMs in foods, the following problems have been identified. It is in general neither possible to distinguish between engineered and natural occurring nanomaterials nor to determine the particle size distribution and the chemical composition of a nanomaterial in a single analytical run. Moreover, several of the analytical techniques available are destructive and therefore a certain sample cannot be analyzed by more than one technique. In addition, the method-intrinsic size detection limit (D_{\min}) was determined to be significantly above 1 nm. Thus, the size range between 1 and 100 nm is not fully covered by the analytical methods available. Furthermore, it is impossible to quantify all particles of the same chemical identity from the nano to the

micro or mm range with the same analytical system. Different analytical methods may also result in different particle size distributions or average particle sizes due to the different principles used for particle size determination. Last but not least, sample preparation may lead to artefacts and the nature of the ENMs present in a food may change over time.

With the available techniques detection and quantification of an ENM in a food is feasible when it is the only chemical identity in the nano-scale present or existing in excess with a particles size between D_{\min} of the method applied and 100 nm. Especially electron microscopy, atomic force microscopy or their combination are promising tools to detect and quantify particularly inorganic ENMs in foods. Quantification of unknown nanoparticles in real foods will therefore be at least a challenge.

Invited Speaker

Perspectives on integrative urbanization, water, and food security

Bryan Brooks

*Distinguished Professor, Environmental Science and Biomedical Studies
Baylor University, Texas, USA*

By 2050 70% of human populations will reside in urban areas with a majority of them along the coasts. Such high population densities result in a high demand for food, energy, and water and other resources, chemical uses and subsequent wastes, which are then concentrated in these urban areas. Changing climate and sea level rise introduces uncertainty to how cities prepare for and respond to these challenges. Environment and health implications of global megatrends, including environmental quality intersections with the food – energy – water nexus, present palpable challenges and unique opportunities to achieving the United Nations Sustainable Development Goals. Global food production must increase by 50% in the next few decades to meet the increasing population demands. Aquaculture, which is growing 3-5 x faster than land-based agriculture, will play an important role to meet these needs. However, 80% of the global sewage production is not treated, but returned to the environment and then subjected to reuse. Judicious water reuse will become increasingly critical because 50% of the world population will live in water stressed regions by 2025. Unfortunately, environmental quality implications of water security and food safety are not routinely examined, particularly within the context of global climate change and urban stressors. For example, changes in physical conditions of the coastal waters could in turn modify ecosystem services, reduce food production or alter the nutritional value of aquaculture products. These water-food safety considerations are critical also to human health as evidenced by the increasing frequency of harmful algal blooms and concerns associated with antimicrobial resistance (AMR). AMR, one of the leading global health threats, can increase when water security is compromised and subsequently threaten food safety. Clearly, urban water – food security challenges represent an emerging frontier in integrative global environment and health studies, which requires transdisciplinary engagement to identify and manage environmental determinants for disease outcomes.

Invited Speaker

Probiotics, prebiotics and human gut microbiota modification: achievements and future challenges

Seppo Salminen

Functional Foods Forum, Faculty of Medicine, University of Turku, Finland

The natural model for probiotics and prebiotics can be found in human milk. Breast milk provides a significant source of bioactive compounds including live and inactive bacteria and oligosaccharides. Recent studies highlighted the impact of geographical location and lifestyle in milk composition. Specific human and microbial metabolites in human milk might play a role on infant gut development. However, the metabolic profile of human milk is influenced by factors such as geographical location. Shifts in certain milk metabolites and microbes might lead to differences in infant or infant gut microbial development. These are factors that should be considered when selecting probiotics and prebiotics for specific targets.

Understanding microbial colonization during pregnancy and early infancy is still one of the key targets for science. The first 1000-day window comprises the most critical stage for programming of later health. The key elements include the mother's genetic background, environment, nutritional state, microbiome in the gut and mucosal surfaces, and antibiotics administered either to the mother or the infant or both. The collective composition and the compositional development of the indigenous intestinal microbiota, co-evolves with the development of the neonate. Following delivery, human milk contains both viable microbes and human milk oligosaccharides as well as fatty acids, which can influence gut colonization in an infant (Cabrera-Rubio et al 2012, Gomez-Gallego et al 2016, Kumar et al 2016).

The progress in human microbiome research has created a need to define effective strategies and treatment modalities to create a healthier microbiota and to modulate microbiota for long-term health. Well-controlled human intervention trials and systematic reviews and meta-analyses continue to be reported and they provide convincing evidence of the benefits of probiotics and prebiotics during pregnancy and lactation, adulthood and with valuable public health implications (Hill et al. 2014, Isolauri et al 2016, Vähämäki et al 2018).

Evidence-based recommendations demonstrate the benefits of specific probiotics and prebiotics in microbiota modulation on infant health, including treatment and risk reduction of acute gastroenteritis and antibiotic associated disturbances. Several other areas appear promising and challenges for future applications. However, it is important to focus on overall diet and consider the exposure of each of us to microbes and their substrates. The diminished exposure to microbes can be overcome by fermentation

which produces both increased numbers of bacteria, bacterial cells and fermentation by-products to our diet with several health benefits (Marco et al 2016).

The composition of the gut microbiota, and thus also the modification of the gut microbiota by probiotics and prebiotics has been shown to have an impact on disease risk. Such effects have been attributed to restoration to normal of increased intestinal permeability, improvement of the intestinal barrier functions, alleviation of the intestinal inflammation and modulation of dysbiosis. Evidence from experimental and clinical studies demonstrates that modifying gut microbiota is also associated with the control of body weight and energy metabolism. Specific gut microbiota components may also directly influence energy extraction from different dietary components and energy storage in the human body. Both functions can contribute to insulin resistance and the inflammatory state characterizing obesity. Thus, the focus of future research is on further identifying and characterizing specific and safe novel probiotics, prebiotics and food matrices including fermentation products to counteract detrimental microbiota deviations (Broadman et al 2018). Such products will form the basis of future treatment and prevention modalities and also future foods for infants, children and the adult and elderly population.

Public Forum

Competition for Food Resources – the Biorefinery Solution

Wolfgang Kneifel

*Department of Food Science and Technology,
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Nowadays we are facing several factors as well as ongoing developments that are leading to the depletion of fossil and natural, of renewable resources and also to the problem of sufficiently securing food and feed supplies worldwide: growing world population in defined regions, growing demand for more fuel, more energy, more demand for meat, changes in lifestyle, tourism, globalisation, climate change etc. Thus it is essential that the already ongoing competition for food resources needs to be combated in a tailored way, although experts are telling, that alternatives to raw materials for fuel and energy production are either limited or further research and development is needed. Regarding food, we may interestingly observe geographically driven particularities: areas with growing population numbers are suffering from problems in terms of food security, while food quality and safety problems possess no high priority there, and in the industrialized countries food safety and food fraud problems are a central issue. Among the different strategies antagonizing or compensating for the competition of food-relevant resources, the use of building blocks resulting from valorized side streams of food industry has gained considerable interest. The aim is to utilize side products and even effluents and waste in a sustainable way and to avoid certain forms of rivalry for renewable resources in an intact environment. Biorefinery concepts increasingly form the basis for a useful utilization of side products, as they take into account different modern and optimized processing technologies. This presentation demonstrates the strategies of biorefineries and the idea behind, particularly addressing the principles of a wheat bran biorefinery. Wheat bran is a valuable side product of the milling industry that accrues to about 150 million tons per year. The economic background, technological features and challenges, analytical, technological issues as well as the circulatory and cascade principle will be introduced.

Public Forum

Use of Traditional Staple Foods for Health Benefits in Developed and Developing Countries

Perry K.W. Ng

Professor and Associate Chair

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Michigan State University, East Lansing, Michigan, USA

A number of chronic diseases and health disorders, e.g., diabetes and obesity, are generally more prevalent in developed countries and now are also emerging challenges in developing countries. In recent years, “food as medicine” and “food for health” have become popular topics for discussion, not only among food scientists and medical professionals, but also within the general public, especially among those with upper middle-class incomes around the globe. How can certain staple foods be of health benefit to humans and what are the mechanisms of these benefits? Abundant research studies reported in the literature have provided evidence that regular consumption of high-fiber-content foods, e.g., dry beans and whole grains, could improve human health by reducing the incidence of health disorders such as hyperglycemia, hyperinsulinemia, obesity, cardiovascular diseases, and cancers. The food industry has been increasing its demand for plant-based ingredients with diverse functionalities, for the development of high-quality, nutritious and healthy food products. Research has focused on utilizing extrusion, fermentation, hydrothermal treatment, high-pressure treatment, germination, and enzymatic modification to modify food ingredients from different plant materials (e.g., cereals and pulses). Targeted functional properties include thermal and pasting properties, water holding capacity, oil binding capacity, protein solubility, emulsifying ability, foaming capacity, gel formation, and starch digestion rate. In this presentation, some of these research foci will be discussed. Selected studies conducted in our laboratory to prepare value-added food ingredients from cereals and pulses, with anticipation of using these foods for health benefits, will be presented.

Invited Speaker

POPs in us – Status and challenges in environmental health

Kyungho Choi

School of Public Health Seoul National University

Persistent organic pollutants or POPs persist in the environment and the biota including human bodies. Diet does bridge environment and humans, and serves as a major exposure source for POPs. Numerous POPs have been associated with many adverse health and ecological consequences and have been subject to the global bans. However, POPs have been detected in valuable dietary sources, e.g., breast milk, even decades after their bans and cause significant societal concern due to their potential health effects. It is a role of environmental health scientists to provide appropriate body of knowledge that can be used to make a balanced public health advisory on such concerns. In this talk, I will use the examples of Korea and present the status of POPs contamination in various environment, ecosystem, and dietary media, along with the human exposure levels. The importance of diet as an exposure source will be highlighted. In addition, a range of adverse health effects that have been associated with the current levels of POPs in humans will be presented. Several approaches that can be applied to public health issues of POPs will be proposed and discussed.

Invited Speaker

Joining the dots between omics and environmental management

Kenneth M. Y. Leung

The Swire Institute of Marine Science and School of Biological Sciences, The University of Hong Kong, Hong Kong, China

The Partner State Key Laboratory in Marine Pollution, Hong Kong, China

With the rapid advancement of DNA sequencing technologies and the substantial reduction of their running costs, environmental genomics and transcriptomics become more affordable and popular in environmental toxicology. In parallel, there are also speedy improvements of mass spectrometry and nuclear magnetic resonance spectrometry, enabling high-throughput analyses of proteins and metabolites in biological samples and promoting research studies in proteomics and metabolomics. By applying these high-throughput omics technologies, researchers can quickly generate an unprecedentedly vast amount of biological data that may be useful to environmental management. However, the current pace of applying omics information in environmental management is still very slow, and lags well behind the rapid development of omics-based research. In this presentation, recent concerted efforts on promoting the use of adverse outcome pathways (AOP) will be highlighted. I will explore how omics can contribute to risk assessment and management of chemical contaminants, and recommend what we can do to facilitate and promote the use of omics information in environmental management. This presentation aims to call for joint efforts to increase this pace and join the dots between omics and environmental management, turning omics into practical tools.

Oral Presentation

The Effect of Polyphosphate on advanced glycation end products (AGEs) and Heterocyclic Amines (HAs) Formation in Roast Meat Patties

Yong Li, Maomao Zeng, Zhiyong He, Jie Chen

State Key Laboratory of Food Science and Technology, Jiangnan University, Wuxi, China

Mutagenic/carcinogenic heterocyclic amines (HAs) and advanced glycation end products (AGEs) are formed during the cooking of meat. AGEs contribute to the development of cardiac dysfunction. Roast meat patties were selected as the model food item, as they are a common meat dish in the Western diet. Effect of Polyphosphate on the formation of AGEs and heterocyclic amines (HAs) in roast meat patties were investigated using ultra performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS) combined with principal component analysis (PCA).

HAs including 2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (PhIP), 2-amino-3,8-dimethylimidazo[4,5-f]quinoxaline (MeIQx), 2-amino-3,4,8-trimethyl-3H-imidazo[4,5-f]quinoxaline (4,8-DiMeIQx), 1-methyl-9H-pyrido [3,4-b]indole (harman) and 9H-pyrido[3,4-b]indole (norharman) were detected and quantified in beef patties.

The addition of NaCl/sodium tripolyphosphate to the beef burgers reduced the cooking loss. The formation of PhIP, Harman, norharman, MeIQx were significantly ($P < 0.05$) enhanced by adding PP-0.3%. Harman, norharman were enhanced both by adding PP-0.3% and TPP-0.3%. However, high concentration of polyphosphate (PP-0.3%, HMP-0.3% and TPP-0.3%) (significantly ($P < 0.05$) enhanced CEL formation, while low concentration of which (eg: PP-0.05%, TPP-0.05%) inhibited CEL.

The formation of HAs and AGEs are affected by the addition of NaCl, PP and TPP. The addition of NaCl and TPP to beef patties improves the water holding capacity, and it is an important way of reducing cooking loss and probably also reducing or enhancing the amounts of HAs and AGEs formed during roast.

Oral Presentation

Gold Nanoparticle Aggregation Based Visible Detection of Food Biology Hazards

Jungwoo Hahn ^{1†}, Eunghee Kim^{1†}, Young Jin Choi^{1,2,3}

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Food safety is still one of the global issues. In particular, the detection of bio-hazards in foods has been studied in various ways. Among these, fast, simple and accurate on-site detection is needed as epidemiological investigation of a foodborne outbreak. In this study, we have developed the visual detection system that can analyses the target materials rapidly by controlling the aggregation of gold nanoparticles. Using this system, less than 10 cfu of *Salmonella* were detected in tomato paste and 10² cfu/mL of *E. Coli* were detected in milk. Ara h1 as a representative peanut allergen was also detectable to the limiting level (0.25 µg / µl) in peanut extract visually. In addition, to detect various targets in complex food matrices and to improve the stability of the detection system, the aptamer-based linker was applied. We coated complementary DNA (an aptamer with target and affinity) on silica nanoparticles and gold nanoparticles, respectively, to be used as linkers to induce selective aggregation of gold nanoparticles. As a result, visual signal due to selective aggregation of gold nanoparticles in buffer was identified. With this designed linker, applicability of the detection system can be expanded to various hazardous targets in foods.

Oral Presentation

Innovative Thermal and Non-thermal Control Methods to Ensure Food Safety

Dong-Hyun Kang

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The interest in food safety among people has been increasing lately. While the interest in food safety has increased, it is true that food safety is losing its reliability. Every year, large scale foodborne outbreak occurs, and the number of foodborne outbreaks and illnesses shows steady increase. Usually conventional heating is used as a control method for reducing foodborne pathogens in food. But, unfortunately, conventional heating leads to quality deterioration of food, such as color change, so the development and application of innovative, effective control methods are necessary in order to ensure food safety and maintain food quality.

The control methods can be divided into 2 categories: thermal treatment and non-thermal treatment. Innovative thermal treatment contains Ohmic heating (OH), Radio Frequency (RF), Superheated Steam (SHS), Infrared heating (IR) and Microwave heating (MW). While conventional heating provides severe quality loss during processing, the innovative heat generating systems such as OH, RF, SHS, IR and MW can increase the temperature of food sample rapidly and thus minimize quality loss. Non-thermal treatments such as UV and gas treatments reduce foodborne pathogens effectively while maintaining acceptable quality. Lamp type UV treatment (Hg lamp) is sensitive to temperature change and has mercury leakage risk when the lamp is broken. UV-LED can overcome these disadvantages. Compared to lamp type UV, UV-LED shows longer life span, higher efficiency, stable efficacy maintenance with less sensitivity to temperature change and no heavy metal leakage. Furthermore, excimer lamp is a putative technology to replace the UV lamp, which can effectively inactivate foodborne pathogens. In various gas compositions, the excilamp can emit several peak wavelengths; more specifically, the KrCl excilamp produces 222 nm UVC light. Gas treatments such as chlorine dioxide (ClO₂) and hydrogen peroxide vapor (HPV) are typical non-thermal treatment methods. Similar to other non-thermal treatments, ClO₂ gas and HPV can control the level of pathogen in food and also result in less quality loss after treatment. Furthermore, the combination of thermal and non-thermal treatment provides synergistic bactericidal

effect. For example, combination treatment with IR (NIR) which is thermal treatment and UV which is non-thermal treatment shows synergistic effect.

Food has complex structure and the characteristics of each food are different. Therefore, selecting suitable technology is important according to each food property. Innovative heat generating system, gas treatment and UV as non-thermal treatment are able to inactivate foodborne pathogens without quality deterioration and with minimal quality changes. Innovative control methods and combination treatments are therefore crucial to ensure food safety.

Oral Presentation

Prevention of chronic inflammation by food functionalities targeting omega-6 PUFA arachidonic acid metabolic pathway

Toshiko Suzuki-Yamamoto, Izumi Tsukayama, Keisuke Toda, Yuki Nagasaki, Asako Tamenobu, Yuka Konoike, Yuki Kawakami, Yoshitaka Takahashi

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Japan has been a super-aged society with more than 21% of the population of 65 years or older. Some East Asia countries including China and Korea are also facing the issue. The key to a long and healthy life is prevention of chronic inflammation underlying chronic diseases. Our research takes aim to discover the food functionalities to prevent chronic inflammation targeting the metabolic pathway of omega-6 polyunsaturated fatty acid (PUFA) arachidonic acid, which is the precursor of pro-inflammatory lipid mediators, prostaglandin (PG) D₂, PGE₂ and leukotrienes (LTs). In this report, we introduce the findings of novel functionalities of *Dioscorea japonica*, a wild yam native to Japan, which has down-regulation of PGE₂ synthesizing enzymes, that is, cyclooxygenase (COX)-2 and microsomal PGE synthase (mPGES)-1, and has prevention of carcinogenesis. *Dioscorea japonica* extract (DJE) dose-dependently suppressed COX-2 and mPGES-1, and inhibited COX-2 activity and PGE₂ production in human non-small cell lung carcinoma A549 cells. DJE induced the translocation of NF- κ B as a COX-2 transcriptional factor to cytosol, and decreased COX-2 promotor activity. In squamous cell carcinoma model mouse exposed to DMBA and TPA, *Dioscorea japonica*-containing feed and DJE application inhibited tumor formation, and suppressed COX-2, mPGES-1 and the inflammatory cytokines. *Dioscorea japonica* decreased PGE₂ and PGD₂ compared with carcinogenic control in lipid metabolome analysis, and inhibited hyperplasia and inflammatory cell infiltration in histopathological analyses. These results suggest that *Dioscorea japonica* down-regulates COX-2 and mPGES-1, and the topical application and oral intake *in vivo* exhibit anti-carcinogenesis through down-regulation of PGE₂ synthetic pathway.

Oral Presentation

Anti-diabetic mechanism of dietary polysaccharides based on their gastrointestinal functions

Jielun Hu, Shaoping Nie*, Mingyong Xie

State Key Laboratory of Food Science and Technology, China-Canada Joint Lab of Food Science and Technology (Nanchang), Nanchang University, Nanchang, China

Diabetes mellitus (DM) is an impaired carbohydrate, fat and protein metabolic syndrome induced by insufficient insulin secretion or decreased tissue sensitivity to insulin. DM is attracting global attention, which has severely affected the quality of life of human and is related to several severe complications.

It has been realized that the optimal selection of food and dietary factors play key roles in preventing and reducing the risk of lifelong Type 2 diabetes mellitus (T2DM). In terms of food and dietary factors, the polysaccharide shows protective effect on T2DM. Dietary polysaccharides were mainly from natural sources, namely plants, fungi, algae, and etc. They were resistant to human digestion and absorption in human small intestine with complete or partial fermentation in the large bowel and have shown anti-diabetic ability. In this presentation, we aimed to provide information on anti-diabetic mechanism of the dietary polysaccharides, based on the whole gastrointestinal process, which was a new angle of view for understanding the anti-diabetic mechanism of dietary polysaccharides. The dietary polysaccharides could attenuate diabetes by the mechanisms of gastrointestinal viscosity, gastrointestinal satiety, large bowel fermentation, and gastrointestinal anti-inflammation effects. Thus, it could slow down gastric emptying, reduce fat and carbohydrate digestion, inhibit α -amylase and α -glucosidase activities, lower glucose absorption efficacy and postprandial glycemia, raise satiety, alter microbiota and short-chain fatty acid production, and attenuate inflammation in diabetes. Further researches could take efforts on the mechanisms of the polysaccharide action through host-microbiota interactions targeting diabetes.

Oral Presentation

Molecular mechanism for recognition of sanitizers by food-borne pathogens

Inseong Jo, Nam-Chul Ha

Department of Agricultural Biotechnology, Research Institute for Agriculture and Life Sciences, Seoul National University, Seoul, Republic of Korea

Oxidizers, such as H_2O_2 and NaOCl , are widely used in sanitization process of foods. However, many pathogens, including the food-borne bacteria, have the resistance to the oxidizers by their sophisticated sensing and defense systems. OxyR, a bacterial peroxide sensor, is a LysR-type transcriptional regulator (LTTR) that regulates the transcription of defense genes in response to a low level of cellular H_2O_2 . Consisting of an N-terminal DNA-binding domain (DBD) and a C-terminal regulatory domain (RD), OxyR senses H_2O_2 with conserved cysteine residues in the RD. However, the precise mechanism of OxyR is not yet known due to the absence of the full-length (FL) protein structure. HypT, a bacterial hypochlorite sensor, is also LTTR in response to hypochlorite. However, the structure and sensing mechanisms are also unknown. Here, we determined the crystal structures of the full length OxyR from *Pseudomonas aeruginosa* and the HypT from *Salmonella typhimurium*. The biochemical studies are also proceeded based on the structural information. The full-length crystal structures revealed that OxyR has a tetrameric arrangement assembled via two distinct dimerization interfaces. Based on the OxyR structure, we suggest the H_2O_2 -driven oxidation mechanism of OxyR, providing novel concepts for answering key questions regarding OxyR in the H_2O_2 -sensing and oxidation-dependent regulation of antioxidant genes. The full-length structure of HypT reveals a new type of tetrameric assembly in the LTTR family. Based on HOCl-bound and oxidation-mimicking structures, we identified a HOCl-driven methionine oxidation mechanism. An understanding of the OxyR and HypT-mediated mechanism would be helpful for controlling many pathogenic bacteria by counteracting bacterial defense mechanisms against the oxidizers used in the food processing.

Oral Presentation

Effects of catechins on N^{ϵ} -(carboxymethyl)lysine and N^{ϵ} -(carboxyethyl)lysine formation in green tea and model systems

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²*International Joint Laboratory on Food Safety, Jiangnan University, Wuxi, China*

N^{ϵ} -(carboxymethyl)lysine (CML) and N^{ϵ} -(carboxyethyl)lysine (CEL) are major markers in food that reflect the overall occurrence of advanced glycation end products (AGEs), which are thought to adversely affect human health. Catechins, the predominant class of polyphenols in tea, are abundant in fresh tea leaves and are considered to be potential AGEs inhibitors due to their antioxidant activity and ability to trap reactive dicarbonyl species. Our previous work has shown that CML and CEL are common in green tea, so the influence of green tea processing procedures and catechins on CML and CEL levels was investigated in this study. After the completion of each green tea processing procedures, the leaves were taken as samples, and then their CML, CEL and catechins levels were analyzed. Model systems were developed to analyze the effects of catechins, including (-)-epicatechin gallate, (-)-epigallocatechin, and (-)-epigallocatechin gallate. The levels of CML, CEL and their intermedia in the model systems were determined. During green tea processing, drying had the greatest effect on CML and CEL formation. The total catechins content was kept at a high level at each stage of tea processing. The model systems showed that the tested catechins inhibited the formation of CML, but not for CEL. Although the greatest accumulation of CML and CEL occurred during drying, the other processing steps also influenced their formation. Catechins inhibited the formation of CML in the model systems, though the inhibitory efficient may be reduced by the processing and some components in a real tea system. CEL production was not reduced by the addition of catechins, while the production of its intermediate, MGO, was. Therefore, the dominant pathway of CEL generation may not be only through MGO under green tea processing conditions.

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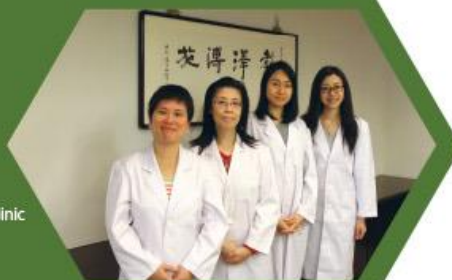
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3 Minutes Presentation

Red rice proanthocyanidin inhibits leukotriene B₄ synthesis and has a preventive effect on psoriasis

Keisuke Toda, Yuki Nagasaki, Izumi Tsukayama, Asako Tamenobu, Yuka Konoike, Natsuki Ganeko, Hideyuki Ito, Yuki Kawakami, Yoshitaka Takahashi and Toshiko Suzuki-Yamamoto

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The hulls of red-kerneled rice (*Oryza sativa*) is abundant in polyphenols, and recently the details of the chemical structure were identified as proanthocyanidin composed of catechin octamer (average molecular weight 2338, N. Ganeko *et al.* ICPH2015). Recently, we found that the red-kerneled rice proanthocyanidin (RRP) inhibited arachidonate 5-lipoxygenase (5-LOX) *in vitro*. 5-LOX is a key enzyme for synthesis of LTB₄ (regulation of immune response and chemotaxis) and cysteinyl LTs (induction of allergic inflammation) from arachidonate, and the produced LTs are involved in several inflammatory diseases such as psoriasis, asthma, and atherosclerosis. Therefore, we investigated novel functions of RRP on inflammation. We demonstrated that RRP (catechin octamer) and catechin monomer inhibited 5-LOX *in vitro*. RRP and catechin monomer had IC₅₀ of 7.0 and 9.0 μM against 5-LOX, respectively. Michaelis-Menten kinetics and Lineweaver-Burk plots indicated that RRP and catechin monomer had mixed non-competitive inhibition on 5-LOX. However RRP did not inhibit cyclooxygenase-1 and -2 which also metabolize arachidonate. Then we demonstrated the effects on psoriasis, one of the chronic inflammatory skin diseases. We used psoriasis model mouse induced by an application of imiquimod (IMQ, 3.125mg/ear). The lipid metabolome analysis by LC-MS/MS showed that RRP application decreased only LTB₄ among the arachidonate metabolites in the psoriatic mouse skin. Consequently, the pathological and immunohistochemical analyses indicated that RRP treatment suppressed the hyperplasia, and decreased inflammatory cell infiltration in psoriatic skin. In addition, quantitative RT-PCR showed that RRP down-regulated the psoriasis-associated genes, *Il17a* (IL-17a), *Il22* (IL-22), *S100a9* (S100a9) and *Krt1* (Krt 1).

RRP inhibits 5-LOX activity causing decrease of LTB₄ production, and down-regulates psoriasis-associated genes. Therefor RRP may improve skin inflammation in psoriasis.

3 Minutes Presentation

Effects of pre- and probiotic on fatty acid metabolism on gut-liver-brain axis in high fat diet-fed mice

¹Yu Fung Yau, ¹Zuzanna Ostrowska, ²Jean-Marie Galano, ²Thierry Durand, ¹Hani El-Nezami, ¹Jetty Chung-Yung Lee

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High fat diet (HFD) is prevalent in the world and is known to induce metabolic syndrome. Recent studies suggest that HFD induces these disorders by proliferating the gram-negative bacteria in the gut microbiota, which leads to endotoxemia, thereby induces systemic inflammation and metabolic syndrome. Consequently, two supplements come into researcher's interest as potential food that help to attenuate the development of metabolic syndrome by modulating the gut microbiota. Firstly, prebiotics are indigestible carbohydrates such as β -glucan that could proliferate short chain fatty acid (SCFA) producing bacteria in the gut microbiota. SCFAs could regulate host lipid and energy metabolism, maintain gut barrier function and potentially prevent colorectal cancer. On the other hand, probiotics, such as *Lactobacillus* could attenuate inflammation and maintain healthy balance of the gut microbial community. A comprehensive profiling of fatty acid including pro- and anti-inflammatory ones along the gut-liver-brain axis could provide valuable information about the etiology, and the effect of diet. Hence, this study aims at investigating the effects of HFD on the fatty acid profile, and how could prebiotic and probiotic act against it. Targeted lipidomic was employed to quantify polyunsaturated fatty acid (PUFA) and its mediator contents in caecum, liver and brain tissues using liquid chromatography tandem mass spectrometry (LC-MS/MS). Results reveal that the HFD caused higher weight gain and fatty liver. Probiotic attenuated the fat accumulation in the liver and lowered the percentage of the liver weight. HFD reduced n-3 PUFAs and the LOX-producing anti-inflammatory PUFA mediators while increased the CyP450-producing pro-inflammatory PUFA mediators in the caecum. For the effects of pre- and probiotics, although they did not support the reduction of pro-inflammatory CyP450 products, the anti-inflammatory LOX products were restored. However, these effects were not as profound in the liver. The study suggests that HFD could induce inflammation by modulating the enzymatic production of PUFA metabolites in caecum and liver. Pre- and probiotic could help to attenuate the effects in the caecum but lesser in the liver.

3 Minutes Presentation

The Study of Pesticide Waste Recycle in rural area of northwest China

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Pesticides are widely used in the rural China. However, pesticide wastes, including pesticide bottle, bag, and syringe, are often recklessly dumped in the countryside or improperly burned. Although pesticide wastes with chemical and toxic residuals create the severe impact on the environment and residents' health, the management of such hazardous waste has not been established. This paper conducts an analysis of the legal framework to identify loopholes in the regulatory institutions, manufacturers' responsibilities, and users' practices. In a pilot village, we conducted a series of training sessions, workshops on waste management for the villagers. Also, we conducted participant observation and surveys to measure changes in the villagers' environmental awareness and environmental health behaviors. The research investigated the type, brands, and amounts of pesticide usage through household surveys. We also calculate the economic costs and incentives needed to resolve pesticide wastes. The legal review shows the central government had enacted regulations to require pesticide producers and sellers to be responsible for recycling, but there has been a significant enforcement gap. Training workshops have raised the villagers' awareness of the necessity of pesticide recycling from 30% to 68%. 90% of children can identify hazardous wastes from other types of debris, an improvement from 36% in the baseline survey. Every household in our study uses pesticide and herbicide extensively, the amount of usage depends on the planting area. On average, about 50 ml pre-dilution pesticide and herbicide are applied per mu. A total of 6657 pesticide bottles and bags were recycled in our year-long study. We found 0.2 CNY per bottle and 0.1 CNY per pack are sufficient incentives to promote bottom-up hazardous waste initiatives. Recycling of pesticide wastes is feasible when the government and the producers provide the right incentives to promote bottom-up management of hazardous waste.

3 Minutes Presentation

Neuroprotective effect of pinosylvin against oxygen and glucose deprivation/reperfusion damages in PC12 cells through inducing PINK1/Parkin mediated mitophagy

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Neuroprotection, a therapy that aims to decrease the damaging events in neurons has been regarded as an effective way for prevention or treatment of ischemic stroke. Stilbenes are potential neuroprotective agents. In the present study, we compared the neuroprotective effects of four stilbenes and clarified the functional mechanism of the one with the strongest neuroprotective effect. Oxygen and glucose deprivation/reperfusion (OGD/R) damages in PC12 cells was used to mimic the ischemic damages *in vitro*. Mechanistic studies were performed in PC12 cells using fluorescence staining and western blotting methods. Among the four stilbenes tested, only pinosylvin (10 μ M) showed strong protective effects against OGD/R damages in PC12 cells through inhibiting necrotic and apoptotic cell death, demonstrated by the reduced LDH release, down-regulated cleaved-caspase 3 level and increased ratio of BCL-2/Bax expression after pinosylvin treatment. As mitochondria plays important role in the development of OGD/R induced damages, the impact of pinosylvin on mitochondria was further investigated. Pinosylvin was observed to partially restore OGD/R induced mitochondrial membrane potential decrease, thus reducing cell apoptosis by decreasing cytochrome c release and ameliorating the mitochondrial superoxide and intracellular oxidative stress. Furthermore, to response to the damaged mitochondria, cytoprotective mitophagy was induced by pinosylvin, as evidenced by the increased protein levels of LC3 II, Beclin1, PINK1 and Parkin in cells exposed to pinosylvin. Accordingly, blockade of autophagy by Bafilomycin A1 resulted in significantly aggravated cell death in response to OGD/R and weakened the neuroprotective effect of pinosylvin. Apart from improving mitochondrial function that could reduce the superoxide generation, pinosylvin was discovered to enhance the cellular anti-oxidative ability by activating Nrf2 pathway to up-regulate the expressions of GCLM, NQO1 and HO-1. Pinosylvin exhibited neuroprotective effects through inducing PINK1/Parkin mediated mitophagy to remove OGD/R damaged mitochondria and activating the Nrf2 pathway to enhance the cellular antioxidative defense.

3 Minutes Presentation

Zearalenone promote colon cancer cell proliferation via GPER

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Colon cancer (CRC) is one of the leading cause of cancer related deaths worldwide and the second leading causes of death in Hong Kong. Over the past 5 year, the survival rate of CRC patient has doubled, however, more than half of the survivor only survived less than 5 years after the diagnosis. The statistics highlight the need for understanding agent that might be involved in the advancement in carcinogenesis. It is widely believed that environmental factor contributes an important role in colon cancer development. There has been a growing interest on the involvement of xenoestrogen. ZEA is a non-steroidal estrogenic mycotoxin produced by *Fusarium* fungi. It can competitively bind to estrogenic receptor (ER), due to its structural similarity to 17- β -estradiol. ZEA can be widely found in our diet and animal feeds. ZEA enters human body mainly through oral intake, and has been reported as being linked to tumorigenesis in many on hormone-sensitive cancer. However, the association between ZEA intake with colon cancer has received less attention. Subsequently, the objective of this study is to investigate the effects of ZEA on colon cancer cells and its underlying molecular mechanism.

The effect of ZEA on CRC proliferation was investigated using cell viability and proliferation assay. We further investigated the involvement of hippo and MAPK/ERK1/2 pathways through the activation of GPER using PCR and western blotting. ZEA increases CRC proliferation in a dose-dependent manner by promoting the G1-to-S phase transition. The growth promoting effect was further demonstrated by the increased level of the proliferation-related cyclin D1 gene and protein in CRC cells. Our preliminary result suggests it activates G-protein coupled estrogen receptors which trigger the MAPK/ERK1/2 pathway and decreasing phosphorylation of YAP1. Taken together, our results demonstrated that effect of ZEA may contribute to the development of colon cancer by upregulating colon cancer related genes.

3 Minutes Presentation

Transformation and utilization of components of ginseng in Changbai Mountain areas

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Panax ginseng is a well-known herb in the oriental countries and has been widely consumed in healthy food and traditional medicine. The therapeutic effects of *P. ginseng* can be attributed to ginsenosides, which are regarded as the foremost bioactive components in *P. ginseng*. Our group focused on the research of ginseng bioactivity mechanism, biotransformation of ginsenosides and development of ginseng products. In the work of computational and experimental characterization of estrogenic activities of 20(S, R)-protopanaxadiol and 20(S, R)-protopanaxatriol, it may provide insight into the chemical and pharmacological screening of novel therapeutic agents from ginsenosides. In the work of screening lactobacillus on the conversion of ginsenosides, the transformation of ginsenosides by *Lactobacillus rhamnosus* had a better effect. These results above provide the basis for the systematic utilization of ginseng resources in Changbai Mountain.

3 Minutes Presentation

Biomimetic sensors based on metal-organic frameworks and its application in food analysis

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At present, metal organic frameworks (MOFs) have attracted wide attention as a new material with many advantages and functions. MOFs are a class of crystalline porous materials composed of metal nodes (i.e. metal ions or clusters) and organic connectors connected by coordination bonds. They have the characteristics of customizability, controllability of porosity and high crystallinity. At present, MOFs are mainly used as gas storage, light-induced materials, drug delivery and sensors. Metal-organic frameworks are mainly used in food analysis as adsorbents for detecting harmful substances in food and as mimetic enzymes for catalysis. We mainly studied the construction of biomimetic sensor based on MOFs, simulated the properties of natural enzymes through metal-organic framework, and explored its potential application in food analysis.

3 Minutes Presentation

Structure-switching aptamer application in sensitive biosensor based on FRET for antibiotics detection

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The strategy of structure-switching aptamers promotes the application of DNA aptamers to design a sensitive biosensor, due to its simplicity and potential generality. Based on these characteristics, two fluorescence resonance energy transfer (FRET)-based structure-switching aptamers are designed to detect antibiotics. The structure switch is composed of target-binding DNA aptamers and complementary strands, fluorophore and quencher are labeled on different DNA single-strands respectively. In the absence of target, aptamers bind to complementary strands, and the fluorophore gets closed to the quencher accompanied by the fluorescence efficiently quenched because of the FRET. In the presence of target, aptamers specifically recognize target, the complementary strands are dissociated, and the fluorescence is recovered. Under optimal conditions, two methods all have good selectivity and low detection limit. They are successfully applied to detect antibiotic in milk samples, and the whole procedure could be accomplished within 1 h. Moreover, the developed methods are simple, universal, low-cost, and could be applied for the detection of other targets by changing the aptamers.

3 Minutes Presentation

Application of fluorescence sensing technology based on conversion of quinone and phenol in food analysis

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The phenolic structure can be converted to quinone structure, and the quinone can be reduced to a phenolic hydroxyl group in the presence of a reducing agent. Based on this transformation, the fluorescent turn-on and turn-off of the nanomaterial can be controlled. Therefore, some column detection methods can be established for analysis and detection. New fluorescent nanomaterials: conjugated polymers, graphene quantum dots, polymer quantum dots and other materials can be combined with biological enzymes to detect bisphenol A, polyphenols, ascorbic acid and other substances in food, which is applied to analytical detection in more food areas in the future.

3 Minutes Presentation

Aging promotes glycometabolism disorder caused by dietary advanced glycation end products

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The prevalence of type 2 diabetes has soared in modern society, especially in aged population. Modern diets are usually heat-processed and contain high levels of advanced glycation end products (AGEs). So we examined whether and how AGE consumption influences glucose metabolism in the context of aging. Both young (8-week) and middle-age mice (25-week) were fed with normal chow and heated-chow with high AGEs respectively. After 12 weeks feeding, fasting glucose, insulin, carboxyethyllysine (CML) in serum and liver were examined. In addition, representative makers of insulin signaling and inflammation were examined by q-PCR and western blot.

Heat process produced more AGEs as indicated by fluorescence AGEs (3.11-fold) and CML (4.45-fold). High AGE intake increased AGEs accumulation in serum and liver of both young and middle-age mice. However, metabolic responses to AGEs differed between young and older mice. In young mice, AGE didn't alter fasting blood glucose, while the insulin level of high AGE group was much higher. Hepatic insulin receptor substrate (IRS) level of mice fed heated-chow was significantly lower, but the phosphorylation of PI3K and AKT were not changed. In middle-age mice, fasting glucose was significantly elevated with the insulin reduction in mice fed heated-chow compared with normal diet. Correspondingly, expression of IRS, p-PI3K and p-AKT in liver were decreased, indicating insulin signaling was impaired by AGEs. No matter in young or middle-age mice, dietary AGEs caused the adipose tissue macrophages shifted to the pro-inflammatory type, which might explain the decreased insulin sensitivity. All these changes are independent of caloric intake.

High AGEs intake might cause abnormal glucose metabolism and impaired insulin sensitivity. Aged mice were more susceptible to AGEs than younger group. The results suggested that dietary AGEs, an environmental factor, might contribute to the high incidence of type 2 diabetes in aged people.



醫事技術



生物科學



生物醫學



蟲害控制

Dining Options

HKU DINING FACILITIES

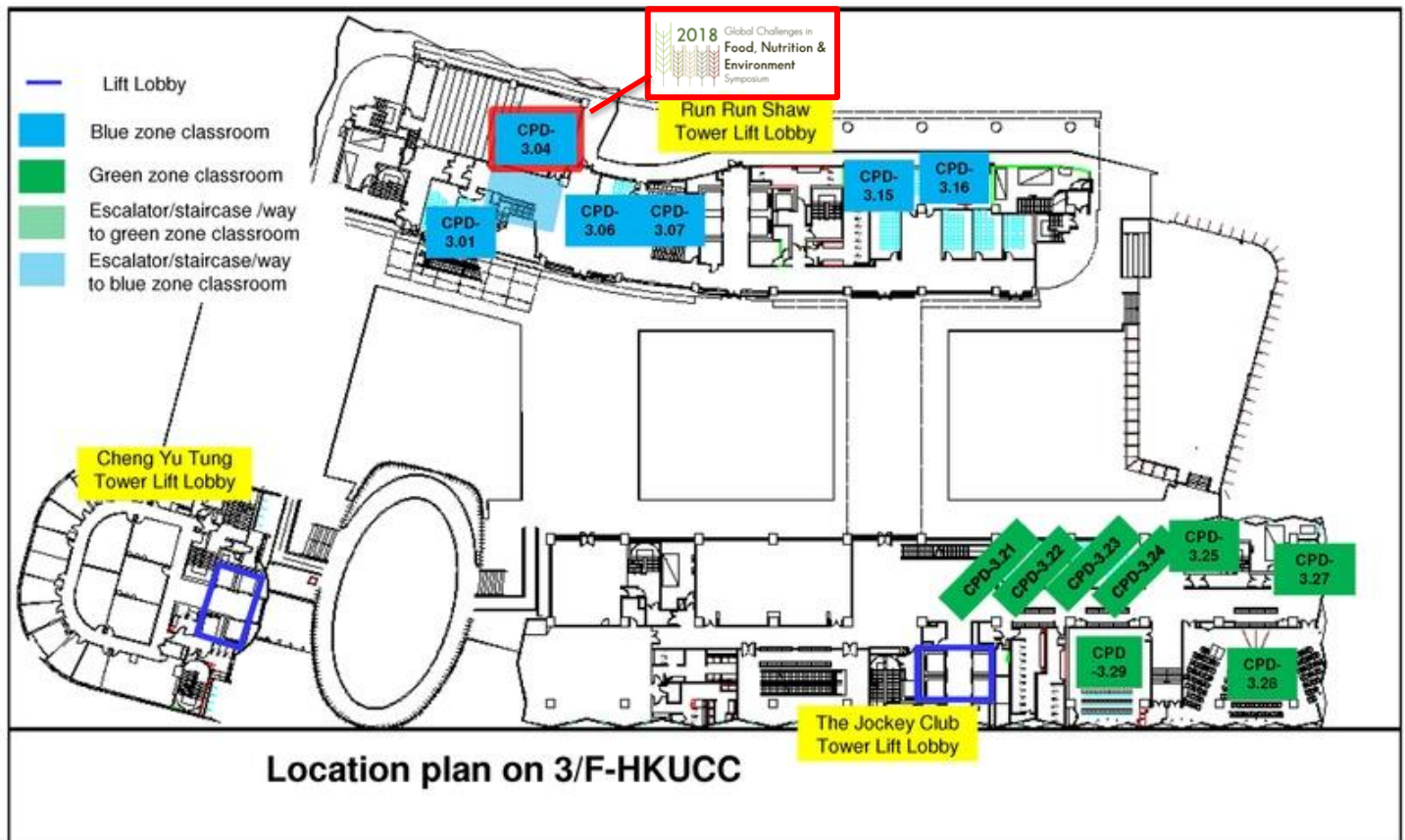


There are many restaurants located within the campus as shown on the map. Alternatively, more dining options are available around the campus from **HKU MTR Exit B1 and B2**.

Campus Map

Symposium Venue – CPD3.04 Run Run Shaw Tower

Centennial Campus of The University of Hong Kong





**The Global Challenges in Food,
Nutrition & Environment Symposium**

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