VIRTUAL

FOODIE Asia

FOOD INNOVATION AND ENGINEERING CONFERENCE

November 23-24, 2020

Organized by AIChE®

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TIPS FOR A SUCCESSFUL MEETING

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WELCOME ADDRESS

Welcome!

We would like to personally welcome you to the Virtual 2020 Food Innovation and Engineering Asia Conference (FOODIE Asia) brought to you by the American Institute of Chemical Engineers (AIChE) and chaired by Dr. Yong Sik Ok (Korea University), Dr. Cordelia Selomulya (UNSW Sydney), and Dr. Daniel Tsang (Hong Kong Polytechnic University).

The 2020 FOODIE Asia: Long Term Evolution for the Asian Food Economy will discuss strategic innovation and engineering for safe, sustainable food production and distribution that fits the consumer market and future needs. The session topics for this conference are:

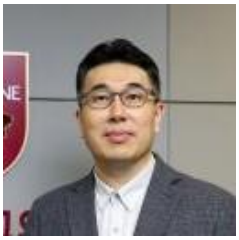
- Global Food Challenges and their Solutions
- Safe and Healthy Food
- UN Sustainable Development Goals

Recently the global population has been hit with an extraordinary set of hardships, and we would like to express our appreciation for the way this community has come together in the face of these challenges. Each day, we have been impressed and inspired by the creativity, ingenuity, and care that engineers and scientists have shown as we banded together, while being apart, to keep the essence, authenticity, and spirit of progress alive and well.

A lot of work has gone into making this conference a success. We extend our thanks to the contributions of the expert Steering Committee and to each and every one of the distinguished speakers and panelists that made this event possible.

We would also like to thank each of you for attending our conference and bringing your expertise to this gathering. Throughout this event, we ask you to stay engaged and be proactive. Our personal respects and thanks go out to all of you. We hope your experience is enjoyable, educational, and inspiring.

Sincerely,
2nd FOODIE Asia Chairs



Yong Sik Ok
Korea University

Cordelia Selomulya
UNSW Sydney, Australia

Daniel C.W. Tsang
Hong Kong Polytechnic University, Hong Kong

CONFERENCE ORGANIZERS

Conference Co-Chairs

Yong Sik Ok, *Korea University*

Cordelia Selomulya, *University of New South Wales*

Daniel Tsang, *Hong Kong Polytechnic University*

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Tanja Cirkovic Velickovic, *Ghent University Global Campus*

Lin Zhang, *City University of Hong Kong*

Ming Zhang, *China Jiliang University*

Tao Zhang, *China Agricultural University*

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TECHNICAL PROGRAM

Day 1	
23-Nov	
On demand	**Technical Session 1: Pre-recorded on demand**
	Global Food Challenges and their Solutions
	Pau-Loke Show, University of Nottingham Malaysia: Invited Talk
	Parthasarathi Subramanian, Riddet Institute, Massey University: Fabrication of a Dynamic in Vitro Small Intestinal Model
	Qiaozhi Zhang, The Hong Kong Polytechnic University: Oxidation of Biomass-Derived Glucose for Sustainable Production of Glucaric Acid and Gluconic Acid from Biomass-Derived Glucose
	Shanta Dutta, The Hong Kong Polytechnic University: Recycling Bread Waste into Levulinic Acid in Binary Monophasic and Biphasic Green Solvents
	Esteban G. Echeverria-Jaramillo, Hanyang University 한양대학교: Revalorization of the Discarded Cooking Water from Domestic Korean Pulses
	Christine Darmali, Monash University: The Role of Whey Protein and Lactic Acid on the Purity of Lactose Crystals Recovered from Acid Whey
On demand	**Technical Session 2: Pre-recorded on demand**
	Safe and Healthy Food
	Margaret Morris, UNSW Sydney: Invited Talk: Modelling the High Variety and Palatability of the Modern Food Environment
	Weibiao Zhou, National University of Singapore: Invited Talk: Assuring Food Sustainability: How Visible Light Can Help
	Won Byong Yoon, Kangwon National University: Invited Talk
	Seong Woon Roh, World Institue of Kimchi: Invited Talk
	Jelena Mutic, University of Belgrade-Faculty of Chemistry: Determination of Element Contents in Bivalves: Health Benefits and Risks
	Nan Fu, Soochow University: Interactions between Bacterial Cells and Protectant during the Production of Active Lactic-Acid-Bacteria Powder Via Spray Drying
	Kumuduni Niroshika Palansooriya, Korea University: Water Quality Improvement By Novel Chitosan-Biochar Composite Fibers: Removal of Phosphorus from Water
4:00 - 4:05 AM	**Opening and Welcome**
4:05 - 4:30 AM	**Plenary 1 and Q&A**
	Session Chair: Yong Sik Ok, Korea University
	Michael Bank, Institute of Marine Research
4:30 - 5:30 AM	**Keynote 1, 2, 3 & Q&A**
	Session Chair: Cordelia Selomulya, University of New South Wales
	Carol Lin, City University of Hong Kong and Huaimin Wang, The Hong Kong Polytechnic University
	Chunfei Wu, Queen's University Belfast
	Dan Tsang, The Hong Kong Polytechnic University
5:30 - 5:35 AM	**Break**
5:35 - 5:55 AM	**Q&A for Keynote 1, 2, 3**
	Session Chair: Cordelia Selomulya, University of New South Wales
5:55 - 6:15 AM	**Networking Break - Meet and Greet**
	Session Chair: Kumuduni Palansooriya, Korea University

TECHNICAL PROGRAM

6:15 - 6:40 AM	**Technical Session 1 Live Q&A**
	Session Chair: Pavani Dulanja Dissanayake, Korea University
6:40 - 6:45 AM	**Break**
6:45 - 7:10 AM	**Technical Session 2 Live Q&A**
	Session Chair: Fangjie Qi, University of Newcastle
7:10 - 7:55 AM	**Short Talk and Poster Session 1**
	Ye-rim Nam, Hanyang University 한양대학교: Aquafaba (chickpea cooking water) Can be Replaced As a Good Emulsifier and Foaming Stabilizer with Blackbean Cooking Water (Aquablackbean)
	Yi-fan Zheng, Hanyang University 한양대학교: Aquafaba (chickpea cooking water) Can be Replaced As a Good Emulsifier and Foaming Stabilizer with Small Blackbean(Seomoktae, 鼠目太, Rhynchosia volubilis Lou) Cooking Water
	Yoon-ha Kim, Hanyang University 한양대학교: Aquafaba (chickpea cooking water) Can be Replaced with Soybean (Glycine max) Cooking Water As a Good Emulsifier and Foaming Stabilizer
	Carla Ivonne La Fuente Arias, USP: Nanocellulose to Reinforce Ozonated Cassava Starch Films
	Adesina Adeyemo, Guangdong University of Petrochemical Technology, China: Securing the Future of Consumers through Feasible Foods Security Approaches
Day 2	
24-Nov	
On demand	**Technical Session 3: Pre-recorded on demand**
	UN Sustainable Development Goals
	Tao Zhang, China Agricultural University: Invited Talk: Biomass Waste Valorization to Generate Modified Biochar to Recover Phosphorus from Animal Manure Wastewater
	Janet Alejandra Gutiérrez Uribe, Tecnológico de Monterrey: Invited Talk
	Xinni Xiong, The Hong Kong Polytechnic University: Catalysis of Humins-Derived Biochar from Rice Waste Valorization for Glucose Isomerization
	Amin Nikkhah, Ghent University Global Campus, Incheon, South Korea: Does Selection of Variety Affect the Exergy Flow of Agricultural Production? Rice Production System in Italy
	Pavani D. Dissanayake, Korea University: A Critical Review on Microplastics As an Emerging Contaminant in Terrestrial Environment
4:00 - 4:50 AM	**Plenary 2&3 and Q&A**
	Session Chair: Dan Tsang, The Hong Kong Polytechnic University
	Jorg Rinklebe, University of Wuppertal
	Namsoo Peter Kim, University of Texas at El Paso
4:50 - 5:35 AM	**Keynote 4, 5, 6 & Q&A**
	Session Chair: Carol Sze Ki Lin, City University of Hong Kong
	Sindhu Raveendran, (CSIR-NIIST) -National Institute for Interdisciplinary Science and Technology
	Hongshun Yang, National University of Singapore
	Yong Sik Ok, Korea University
5:35 - 5:50 AM	**Q&A for Keynote 4, 5, 6**
	Session Chair: Carol Sze Ki Lin, City University of Hong Kong

5:50 - 5:55 AM	**Break**
5:55 - 6:20 AM	**Technical Session 3 Live Q&A**
	Session Chair: Chunfei Wu, Queen's University Belfast
6:20 - 6:25 AM	**Break**
6:25 - 7:25 AM	**Industry Panel**
	Panel Moderator: Xiangzhou Yuan, Korea University
	William Grieco, RAPID
	Andrea Bibiana Valbuena Valbuena, Korea University
	Dan Tsang, The Hong Kong Polytechnic University
	Kumuduni Palansooriya, Korea University
	Michael Bank, Institute of Marine Research
	Namsoo Peter Kim, University of Texas at El Paso
	Pau-Loke Show, University of Nottingham Malaysia
	Yong Sik Ok, Korea University
	Hongshun Yang, National University of Singapore
7:25 - 7:40 AM	**Closing Remarks: Conference Chairs**

Plenary Speaker Biographies

Michael S. Bank
Institute of Marine Research

Dr. Michael S. Bank works as a Senior Scientist in the Department of Contaminants and Biohazards at the Institute of Marine Research in Bergen, Norway. Michael also serves as an Adjunct Associate Professor of Contaminants and Complex Systems at University of Massachusetts, Amherst in the USA and is also an Associate Editor at the journal Chemosphere. His research is highly interdisciplinary and has its theoretical basis in Bayesian mathematical modeling, contaminant biology, environmental toxicology, and environmental governance. Specifically, his interests are focused on three principle themes (a) How do contaminants affect organisms, including humans, (b) How can contaminants in ecosystem compartments be modeled using isotopic niches, Bayesian statistics and information theory, and (c) How can this information be used in a scientific translation and environmental governance context. Dr. Bank's work primarily deals with real data sets that tend to be large in nature and that consider broad spatial and temporal scales. Michael serves on several expert committees and does advising on contaminants for several international environmental agencies.

Namsoo Peter Kim
University of Texas at El Paso

Dr. Namsoo Kim is an Associate Professor in the Department of Metallurgical and Materials Engineering at the University of Texas at El Paso (UTEP) and President of Korea Printed Electronics Research Association (KoPERA) in Korea. He received his Engineering Ph.D. from South Dakota School of Mines and Technology, Rapid City, South Dakota, USA. He was formerly Director of the KEN Research Center and WCU (World Class University) Program and Assistant Professor at SeoKyeong University (SKU) in Seoul, Korea. Dr. Kim is the Director of Printing Nano Engineering (SKU-UTEP Dual Program which is supported 2.1 Million USD) at UTEP and specializes in the field of printable materials, printing technologies, printed electronics and standardization of printed devices. PNE program was also supported by NSF grant entitled, "NUE-PINE-TREE: Nanotechnology Undergraduate Education Printing Innovative Nano-Engineering Technology Research and Elite Education" until 2016. He is one of the leading research experts in the role of creating strategy plans on education. His expertise includes research on printed electronics with printing origami and material convergence concept. During his service at UTEP he has brought external funds exceeding $3 million as primary investigator. In the past five years, more than 60 undergraduate and graduate students have benefited from his leadership. He has published more than 100 journal papers and peer reviewed conference papers and has more than 20 issued and pending patents nationally and internationally. He serves on various grant and journal review committees nationally and internationally.

Jörg Rinklebe
Journal of Hazardous Materials

- Vice-President of the International Society of Trace Element Biogeochemistry (ISTEB)
- Adjunct Professor at the University of Southern Queensland, Australia
- Visiting Professor at the Sejong University, Seoul, South Korea
- Guest Professor at the China Jiliang University, Hangzhou, Zhejiang, China
- Honorable Ambassador for Gangwon Province, Korea

Chief Editor for Special Issues and Associate Editor of the Journal of Hazardous Materials
https://ees.elsevier.com/hazmat/default.asp
Chief Editor for Special Issues and Associate Editor, Environmental Pollution
Editor of Critical Reviews in Environmental Science and Technology (CREST)
https://www.tandfonline.com/toc/best20/current

Keynote Speaker Biographies

Carol Sze Ki Lin
City University of Hong Kong

Dr. Lin is current an Associate Professor at School of Energy and Environment in City University of Hong Kong. Her academic background covers waste management, with special focus on development of integrated biorefineries utilising renewable resources including food and beverage wastes and by-product streams (e.g. waste streams from bakeries and mixed food waste from restaurant, textile waste). Dr. Lin also has experience in biochemical engineering, industrial (white) biotechnology, bioprocess design and techno-economic evaluation. Together with graduate students and colleagues, Dr. Lin has published over 123 research papers and 16 book chapters. She maintains a worldwide professional network through her service as an Associate Editor of the Biochemical Engineering Journal; Special Guest Editor for Green Chemistry, Topics in Current Chemistry, Process Safety and Environmental Protection, Current Opinion in Green and Sustainable Chemistry, Bioresource Technology, Journal of Hazardous Materials. Dr. Carol Lin has served as an Invited Professor in Division of Environmental Science and Biotechnology, College of Life Sciences and Biotechnology, Korea University. She has served as steering committee members of numerous major conferences such as Engineering Sustainable Development 2019 & 2020, organized by the APRU and the Institute for Sustainability of the American Institute of Chemical Engineers (AIChE).

Yong Sik Ok
Korea University

Dr. Ok is a full professor at and global research director of Korea University in Seoul, Korea. His academic background covers waste management, the bioavailability of emerging contaminants, and bioenergy and value-added products (such as biochar). Professor Ok also has experience in fundamental soil science and the remediation of various contaminants in soils and sediments. Together with graduate students and colleagues, Professor Ok has published over 600 research papers, 60 of which have been ranked as Web of Science ESI top papers (56 nominated as "highly cited papers" [HCPs] and 4 nominated as "hot papers") since 2009. He has been a Web of Science Highly Cited Researcher (HCR) since 2018. In 2019, he became the first Korean to be selected as an HCR in the field of Environment and Ecology. He maintains a worldwide professional network through his service as an Editor (former Co-Editor in Chief) of the Journal of Hazardous Materials, Co-Editor for Critical Reviews in Environmental Science and Technology, Associate Editor for Environmental Pollution and Bioresource Technology, and as a member of the editorial boards of Renewable and Sustainable Energy Reviews, Chemical Engineering Journal, Chemosphere, and Journal of Analytical and Applied Pyrolysis, along with several other top journals. Professor Ok has served in a number of positions worldwide including as honorary professor at the University of Queensland (Australia), visiting professor at Tsinghua University (China), adjunct professor at the University of Wuppertal (Germany), and guest professor at Ghent University (Belgium). He currently serves as Director of the Sustainable Waste Management Program for the Association of Pacific Rim Universities (APRU). He has served as chairman of numerous major conferences such as Engineering Sustainable Development 2019, organized by the APRU and the Institute for Sustainability of the American Institute of Chemical Engineers (AIChE).

KEYNOTE SPEAKER BIOGRAPHIES

Sindhu Raveendran
(CSIR-NIIST) -National Institute for Interdisciplinary Science and Technology

Dr. R. Sindhu is currently working as DST WOS-B Scientist at MPTD, CSIR-NIIST, Trivandrum, India. She obtained Ph D in Biotechnology from School of Biosciences, Mahatma Gandhi University Kottayam, India. She had then worked as Post Doctoral Fellow at RGCB, Trivandrum, India from 2006 – 2008 in the area of Metagenomics. She later joined CBF as a Project Scientist and has contributed to the Centre's activities in biomass conversion to biofuels and products, especially on pre-treatment and allied technologies. Her current research focus is on biofuels, biopolymers and microbial enzymes. She has about 159 publications/communications with an h- index of 28 (Google Scholar Citations). She is a recipient of several awards and fellowships including Elsevier BIORESTEC 2018 Impactful Research Award, Women Scientist Award for the year 2016 from BRSI, Top Reviewer Award 2017 (Bioresource Technology), Visiting fellowship from EPFL, Lausanne, Switzerland – 2014, 2016, 2017; Marie Curie Fellow – University of Naples, Italy (2016) and University of Jaen, Spain (2016); International Training Fellowship from Department of International Programmes of National Science Council (NSC), Taiwan (2012); DBT Bio-CARe Fellowship, DST WOS-B Fellowship, Best oral Presentation Award (SEEC 2018), BIORESTEC 2018 Best Paper Award, Elsevier Best Paper Award (NHBT 2015), Best Paper Award – Renewable Energy (Elsevier) – 2014, Best Paper Award (ICETB, 2009), and Fellow of the Society for Applied Biotechnology (FSAB). She is an editorial board member of three Journals – Annals of Agricultural and Crop Sciences, Journal of Environmental Sciences and Renewable Resources and EC Microbiology. She is a reviewer of 82 SCI Journals in the field of bioprocesses and products. She is a recipient of Outstanding Reviewer Certificate from leading publishers like ACS, RCS, Wiley, Springer and Elsevier. She is a National Honorary Advisory Board Member of Centre for Energy and Environmental Sustainability (CEES, India).

Daniel C.W. Tsang
Hong Kong Polytechnic University, Hong Kong

Dr. Daniel CW Tsang is currently an Associate Professor in the Department of Civil and Environmental Engineering at the Hong Kong Polytechnic University and Honorary Associate Professor at the University of Queensland. He was an IMETE Visiting Scholar at Ghent University in Belgium, Visiting Scholar at Stanford University in the US, Senior Lecturer and Lecturer at the University of Canterbury in New Zealand, and Post-doctoral Fellow at Imperial College London in the UK and the Hong Kong University of Science and Technology. Dan's research group strives to develop low-impact solutions to ensure sustainable development and foster new ways in which we utilize biomass waste, contaminated land, and urban water. Dan has published over 350 SCI journal papers with h-index of 47 (Scopus), and currently serves as Associate Editor of Journal of Hazardous Materials, Science of the Total Environment, Critical Reviews in Environmental Science and Technology, as well as Editorial Board Member of Environmental Pollution, Bioresource Technology, Chemosphere, and Advanced Sustainable Systems. Dan has received the Excellence in Review Award at Environmental Science and Technology, Resources, Conservation & Recycling, and Chemosphere. Dan is the Chair and Organizer of multiple international conferences including 5th Asia Pacific Biochar Conference (APBC2020).

KEYNOTE SPEAKER BIOGRAPHIES

Chunfei Wu
Queen's University Belfast

Dr. Chunfei Wu is a Reader at the School of Chemistry and Chemical Engineering at Queen's University Belfast. He obtained his MSc degree in School of Environmental Science and Engineering at Nankai University in China in 2007, and PhD degree in Chemical and Energy Engineering at the University of Leeds in 2010 under the supervision of Professor Paul T. Williams. He had around four-year Research Fellow experience at the University of Leeds before starting his Lectureship position at the University of Hull in 2014. He joined Queen's University Belfast in 2018 as a Senior Lecturer. He has been involved as PIs and Co-Is of several projects funded by EU, EPSRC and Royal Society etc. He has published over 130 peer reviewed journal papers with an 'h factor' of 41 (Google Scholar) and over 4800 citations in the areas of catalytic thermo-chemical conversion of wastes. He is a Charted Scientist and a Member of Royal Society of Chemistry.

Hongshun Yang
National University of Singapore (NUS)

Dr. Hongshun YANG is an Associate Professor in the Department of Food Science and Technology at the National University of Singapore (NUS). He obtained his Ph.D. in Refrigeration and Cryogenics Engineering from Shanghai Jiao Tong University in 2005 and worked as a Research Fellow at Auburn University from 2006 to 2008. He obtained his second Ph.D. in Food Science from the University of Minnesota in 2012 and was a faculty research assistant at the University of Maryland before joining NUS in 2013. Dr. Yang's research interests include food processing, safety engineering and foodomics, especially in seafood, fruit and vegetables, and cereal products. He is an Editor of LWT-Food Science and Technology, Section Editor for International Journal of Agricultural and Biological Engineering and an editorial board member for Journal of Food Science. He is the Chair Designate of Institute of Food Technologists (IFT) Aquatic Food Products Division.

Invited Speaker Biographies

Margaret Morris
The University of New South Wales, Sydney

Margaret Morris, Professor and Head of Pharmacology at UNSW (The University of New South Wales) Sydney, has a PhD in Medicine (Monash) and postdoctoral training in neuroscience. Morris leads the Environmental determinants of obesity research group within the School of Medical Sciences, where she investigates the impact of adverse early life events and lifestyle factors on chronic disease risk.
Her research focuses on the intergenerational transmission of obesity through both maternal and paternal lines and the psychology of eating, e.g. how does provision of a varied, energy rich diet override the regulatory control mechanisms that should maintain body weight? Her lab investigates the impact of a palatable, western diet, and the contributions of sugar and fat, to cognitive decline and the relationship with changes in composition of the gut microbiota. The ultimate goal is to harness better understanding of the gut-brain axis to develop new approaches to CNS disorders.

William Grieco
RAPID Manufacturing Institute

Bill Grieco is CEO of The RAPID Institute, a public-private partnership between the U.S. Department of Energy's Advanced Manufacturing Office and the American Institute of Chemical Engineers (AIChE) created to promote process intensification and modular process technologies. Prior to joining RAPID in July 2018, he was Vice President of Energy and Environment at Southern Research, a nonprofit research institute based in Alabama, where he transformed the business from one serving only the fossil energy sector to a boutique innovation testing, development, and consulting organization focused on reducing the environmental footprint of energy generation and chemicals production. Before joining Southern Research, Grieco built and led a Front End of Innovation team and led R&D for the $3 billion Building Materials Group at Owens Corning. Earlier in his career, he served as Managing Director and CTO of Gardenia Ventures, an innovation commercialization and consulting firm that he co-founded. His other executive level innovation roles focused on process development across multiple industries. These include the biofuels startup PetroAlgae, where he and his team built the first-of-a-kind intensive biomass production process to grow and convert aquatic plants to purified proteins and energy feedstocks. For the biopharmaceutical firm Alkermes, he spearheaded development and commercialization of the VIVITROL® and RISPERDAL® CONSTA product lines. Grieco began his career in process technology research and development at Rohm and Haas Company, now part of Dow and DuPont.
Grieco serves on the external advisory board for Florida Solar Energy Center. He earned a PhD and Master's degree from the Massachusetts Institute of Technology (MIT), and a Bachelor's degree from Georgia Institute of Technology — all in chemical engineering.

Seong Woon Roh
World Institute of Kimchi

INVITED SPEAKER BIOGRAPHIES

Pau-Loke Show
University of Nottingham Malaysia

Ir. Ts. Dr. Pau Loke SHOW is the Director of Research in Department of Chemical and Environmental Engineering. He is also the Director of Sustainable Food Processing Research Center and Co-director of Future Food Malaysia Beacon of Excellent, University of Nottingham Malaysia. Currently, he is associate professor at Department of Chemical and Environmental Engineering, Faculty of Science and Engineering, University of Nottingham Malaysia. He successful obtained his PhD in two years' time after he graduated his bachelor's degree from Universiti Putra Malaysia. He currently is a Professional Engineer registered with the Board of Engineer Malaysia (BEM), Chartered Engineer of the Engineering Council UK and Professional Technologist practised in Malaysia Board of Technologist. He is also a member of Institution of Chemical Engineers (MIChemE) UK and currently serves as invited member in IChemE Biochemical Engineering Special Interest Group. Ir. Ts. Dr. Show obtained the Post Graduate Certificate of Higher Education (PGCHE) in 2014, and now a fellow of the Higher Education Academy UK (FHEA). Since he started his career in September 2012, he has received numerous prestigious domestic and international academic awards, including recent seven Global Top Reviewers Awards from Web of Science and Publon. He is also the winner of ASEAN-India Research and Training Fellowship 2019 and Malaysia Young Scientist Award 2019, The DaSilva Award 2018, JSPS Fellowship 2018 award, Top 100 Asian Scientists 2017, Asia's Rising Scientists Award 2017 and Winner of Young Researcher in IChemE Malaysia Award 2016. He has successfully supervised 8 PhD students & 2 MSc students as primary supervisor. Currently, he is main supervising 11 PhD students and 4 MSc students. He has published more than 205 journal papers in less than 7 years of his career. He is now serving as an editor in Scientific Report (Nature), Journal of Biocatalysis and Agricultural Biotechnology (Elsevier), Current Biochemical Engineering (Bantam Science) Current Nutrition & Food Science (Bantam Science) and, Advanced Biotechnology and Experimental Therapeutics, editorial board member in Biochemical Engineering Journal, Bioengineered, BMC Energy, International Journal of Bioprocess and Biotechnological Advances and Current Nutrition & Food Science, He is also lead guest editor for SCI-indexed journals, which is Clean Technologies & Environmental Policy, BMC Energy, Processes, and Current Nutrition & Food Science, Bioengineered, and Journal of Chemistry.

Janet Alejandra Gutiérrez Uribe
Tecnológico de Monterrey

Dr. Janet Gutiérrez is an associate professor in the NutriOmics research group at the School of Engineering and Sciences from Tecnológico de Monterrey, and Director of the Department of Bioengineering and Science from the South Region of Tecnológico de Monterrey. She is a food engineer with graduate studies on biotechnology. For over 15 years, she has been working on the phytochemistry and nutritional biochemistry of phenolic compounds and other nutraceuticals. Particularly, her research is focused on Mexican foods such as black bean, cacti, agave and maize. She has published more than 90 papers in different prestigious journals and is the inventor of more than 10 patents and applications in Mexico and abroad. She has graduated more than 25 graduate students and her teaching skills go beyond lectures. Working with industry and social services are her main drivers in the development of challenges related to biochemistry, molecular biology, cell culture and nutraceutical discovery and characterization. In 2017, the State of Nuevo Leon awarded her with the medal for the Civic Merit due to her research career.

She is a member of the National Researchers Council, currently as Level 2 (3 of 4). Member of the technical committee of the National Network for Research on functional foods and nutraceuticals (AlfaNutra) and participant in CYTED Network for Foods with Probiotic functionality for malnourished childen (PROINFANT). Additionally, since 2018, she is a part of the Young Scientists selected by the World Economic Forum. Dr. Gutiérrez has collaboration with different universities and research centers in Mexico and abroad. Nanyang Technological University, Universidad Autónoma de Madrid, CSIC, Unversidad Politécnica de Valencia, Johns Hopkins University, Purdue University are some examples of the institutions where she has collaborations. Additionally, she has worked in research projects with PEPSICO, Kellogs, Griffith Foods, Agmel, Fundación FEMSA, Fondo ZH and CONACyT.

Zhou Weibiao
National University of Singapore

Dr Weibiao Zhou is a full professor and Head of the Department of Food Science and Technology, National University of Singapore (NUS). He is an elected Fellow of the International Academy of Food Science and Technology (IAFoST), and also an elected Fellow of the Australian Institute of Food Science and Technology (AIFST), the Royal Society of Chemistry (RSC), UK, and the Singapore Institute of Food Science and Technology (SIFST). He is a member of the Singapore Food Standards Committee, and an editorial board member of 8 SCI-indexed journals.
Currently he serves as an editor for Trends in Food Science & Technology and Food Control (both are published by Elsevier) and npj Science of Food (published by Nature).
He also serves as a Trustee for the International Food Information Service (IFIS Publishing) Ltd., UK, which publishes the Food Science and Technology Abstracts (FSTA). He was a Board Member of the previous Agri-food and Veterinary Authority (AVA) of Singapore from 2008 to 2015, and is currently Chair of the Advisory Committee on Evaluation of Health Claims, Singapore Food Agency (SFA). He has acted as a consultant or an expert panel member for a number of Singapore government organisatons.
Educated in China and Australia, he has held various professional positions in a number of organisations in Australia, Canada, China, France, Spain and USA. With over 35 years of research experience and more than 300 scientific publications, his research interests and expertise are in food engineering and food processing, particularly baking processes, dairy processes, drying, functional foods, innovative processing technologies, nano food packaging, and process modelling, optimisation and control.
https://www.fst.nus.edu.sg/our_people/faculty-members/zhou-weibiao/

Won Byong Yoon
Kangwon National University

Dr. Yoon, Won-Byong is a Professor in Kangwon National University, Korea from Department of Food Science and Biotechnology (Food Process Engineering).

Xiangzhou Yuan
Korea University

Dr. Xiangzhou Yuan is a research professor of Korea University in Seoul, South Korea. His academic background covers clean energy technology, sustainable waste management, and valorization of solid waste into value-added products (i.e., biochar, porous carbon). Dr. Yuan also has an area of expertise in climate change mitigation and wastewater purification. He has registered 4 Korea domestic patents and published about 30 research papers in reputed SCI journals, such Green Chem, Chem Eng J, J Hazard. Mater, Appl Energ. He is also active in servicing as the Outside Director of Sun Brand Industrial Inc. from 2020 and the Key Academic Committee of International Cooperation Research Centre of Carbon Capture in Ultra-low Energy-consumption, Tianjin, China from 2018. He was nominated as the Local organizing committee of 20th International Conference on Heavy Metals in the Environment (ICHMET).

Tao Zhang
China Agricultural University, China

Tao Zhang is an associate professor at the College of Resources and Environment, China Agricultural University, China. He received his Ph.D from Nanjing University, China in 2011. His academic background covers wastewater treatment, waste management, nutrients recovery and recycling, utilization of agricultural waste.

He is a member of the Expert Function Research Office of Modern Agricultural Industrial Technology System, Ministry of Agriculture, and a director of the Agricultural Environmental Damage Identification and Assessment Branch of the Chinese Society of Agriculture. In addition, he is also a member of the Water Treatment and Reuse Committee of the Chinese Society of Environmental Sciences and a member of the Circular Economy Committee of the Chinese Society of Environmental Sciences. Tao Zhang has won a number of International Invention Exhibition Awards, academic and teaching awards at both provincial and university levels.

PLENARY TALK 1

Contaminants in Seafood: Implications for Global Food Security in the Anthropocene.

Michael Bank
Contaminants and Biohazards, Institute of Marine Research, Bergen, Norway

Seafood is an important source of both nutrients and contaminants to human consumers and is a critical resource with respect to global food security. Additionally, both farmed and wild seafood, and aquatic foods in general, are becoming increasingly important as a source of protein, especially considering that the world's human population is projected to reach >9 billion people over the next 30 years. Harvesting seafood that is nutritious and low in contaminants and safe for human consumption, especially in developing countries with a strong reliance on marine-based foods, has garnered significant interest from scientists and policy makers. Here I present seafood safety data from throughout the globe to identify the most important drivers and factors governing the major bioaccumulation regimes of methylmercury, microplastics, trace metals and contaminants of emerging concern. I also evaluate and synthesize the state of poly-parameter modelling approaches within the seafood safety and food security spheres, across a wide array of spatiotemporal scales and in the context of environmental and human health, existing environmental conventions, and the relevant United Nations Sustainable Development Goals.

KEYNOTE TALKS

Sophorolipid Production from Food Waste.

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Sophorolipids (SLs) are among the most extensively studied microbial biosurfactants. *Starmerella bombicola* is the most productive strain known for SL production, with a volumetric productivity of up to 3.7 g/L.h (Wang et al., 2019). Recent sustainable development goals of food security, environmental protection, material and energy efficiency are the key drivers for the valorization of food waste. In the present work, the production of biosurfactant SLs from several (food) waste streams was investigated. Food waste obtained from a local restaurant was subjected to enzymatic hydrolysis for 16 h, yielding a hydrolysate containing about 100 g/L glucose and 2.4 g/L free amino nitrogen. The hydrolysate was subsequently used for SLs fed-batch fermentation and reached titer of 115.2 g/L in 92 h with an overall volumetric productivity of 1.25 g/L.h (Kaur et al., 2019). Further improvement of fermentation system and strategy has been developed using a semi-continuous integrated production-separation system. An average volumetric productivity of 2.43 g/L.h and an overall SLs yield of 0.73 g/g was achieved within 240 h. Moreover, the potential of sustaining high production efficiency during long-term fermentation times (480 h) was investigated and an overall productivity and SLs yield of 2.39 g/L.h and 0.73 g/g were obtained, respectively (Wang et al., 2020a). This laboratory experiment was further evaluated with TEA simulation. It was found that the most profitable option led to high NPV (US$183,598,000), IRR (36.17%), ROI (43.87%) and payback years (2.28 years) (Wang et al., 2020b). It should be stressed that SLs price need to lower to allow SLs to penetrate the market.

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Sustainable Management of Solid Wastes.

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Waste plastics recycling remains a challenging issue worldwide. A direct disposal of plastics also wastes a large amount of energy stored inside the wastes. Thermo-chemical conversion is a promising technology for the recycle of waste plastics. Hydrogen-enriched syngas production from waste plastics has been researched for many years. However the process has challenges of low economic profits. Producing high-value products such as carbon nanotubes (CNTs) will solve this problem. In this presentation, an extensive work related to the co-production of CNTs and hydrogen will be presented including the development of catalysts, influence of plastic feedstock and optimization of process conditions. For example, the adding of Mn with varied contents (0 wt.%, 1 wt.%, 5 wt.%, and 10 wt.%) to Fe-based catalyst can improve the production of CNTs. And the application of the produced CNTs as polymer filler is also presented.

Food Safety for Vegetables from Fast-Growing Economies.

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Excessive amounts of potentially toxic elements (PTEs) in farmland soils may threaten food security and induce extreme risks to human health. Identification of key contamination sources is prerequisite for remediation technologies. We examined the contamination level, health risks and source apportionment of different PTEs in common vegetables from typical farmlands in different zones (upstream, midstream, and downstream) distributed over a densely populated residential area in a pyrite mine city, which has been exploiting pyrite minerals over 50 years. The results show that most of the agricultural soils exhibit contaminated levels of different PTEs exceeding the maximum permissible levels for agricultural land use. Some metals such as Cu and Cd were mostly distributed in the labile fractions. Almost all PTEs in edible parts of the vegetables exceeded their corresponding MPL for consumption. There may be alarming health risks associated with vegetable consumption. Source apportionment of PTEs contamination in soils and vegetables was evaluated by using isotope fingerprinting technique. A significant contribution could be ascribed to the anthropogenic activities involving pyrite deposit exploitation. Further calculation by binary mixing model suggested that pyrite mining and smelting activities contributed 54–88% to PTEs contamination in vegetables. The results highlighted that isotope tracing is a suitable technique for source apportionment in vegetable contamination and it is critical to establish effective measures for waste management and enforceable regulations in PTEs-polluted area for safeguarding food safety.

Bioconversion of Food and Kitchen Waste to Value Added Products -Initiatives of Csir-Niist.

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Industrialization as well as improper waste management leads to generation and accumulation of large amount of food and kitchen wastes. It serves as an excellent source for the production of different value added products including biopolymers, biofuels, enzymes and chemicals. The objective of the present study was to utilize food and kitchen waste as sole carbon source for the production of different value-added products. Utilizing food and kitchen waste pure cultures produced 1.25% of bioethanol, 2.47µM/ml/min of pectinase and 3 g/L of 2, 3 Butanediol. The consortium produced 1.48 g/L of biopolymer, poly-3-hydroxybutyrate. This is without any optimization of various process parameters affecting production. Media engineering as well as fine tuning can improve the product yield. The present study addresses two societal issues – waste management and production of different value added products by adopting a waste to wealth strategy.

The MPTD of CSIR-NIIST has initiated several strategies for the cost effective production of biopolymer, PHB, biofuels, green chemicals and enzymes by bioconversion of food and kitchen waste. This includes utilization of used cooking oil as well as food and kitchen waste as sole carbon source for the production of PHB, 1, 3 BDO and pectinases. Fine tuning of each unit operations is going on to reduce the cost significantly. These biopolymers find applications in diverse fields as a biosensor, pH indicator films, and targeted drug delivery as well as for preparation of nano-matrix for cell culture applications.

Metal Contamination and Bioremediation of Agricultural Soils for Food Safety and Sustainability.

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Agricultural soil is a non-renewable natural resource that requires careful stewardship in order to achieve the United Nations' Sustainable Development Goals. However, industrial and agricultural activity is often detrimental to soil health and can distribute heavy metal(loid)s into the soil environment, with harmful effects on human and ecosystem health. In this review we examine processes that can lead to the contamination of agricultural land with heavy metal(loid)s, which range from mine tailings runoff entering local irrigation channels to the atmospheric deposition of incinerator and coal-fired power-plant emissions. We discuss the relationship between heavy metal(loid) biogeochemical transformations in the soil and their bioavailability. We then review two biological solutions for remediation of contaminated agricultural land, plant-based remediation, and microbial bioremediation, which offer cost-effective and sustainable alternatives to traditional physical or chemical remediation technologies. Finally, we discuss how integrating these innovative technologies with profitable and sustainable land use could lead to green and sustainable remediation strategies, and

conclude by identifying research challenges and future directions for the biological remediation of agricultural soils.

Key words: Agricultural soil, soil pollution, bioremediation, food safety

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TECHNICAL SESSION 1: GLOBAL FOOD CHALLENGES AND THEIR SOLUTIONS

Fabrication of a Dynamic *in Vitro* Small Intestinal Model.

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Developing dynamic *in vitro* models with physiologically relevant characteristics is receiving increased attention to understand the food digestion behavior and to design functional foods. The purpose of this study was to fabricate and demonstrate the potential of a dynamic *in vitro* model of the small intestine. The model consisted of a tubular semipermeable membrane mounted in a compression chamber comprising of silicone cuffs. A set of cuffs are arranged sequentially to provide intestinal motility, and the cuffs are programmed to operate in cycles of 4 sec on and 4 sec off. The cuffs have a toroidal structure, and a unique design ensures uniform pressurized air distribution inside the cuff, which results in partial occlusion of the tubular membrane. The developed system was studied for the effect of intestinal motility (with and without segmentation) on glucose transfer. A 2-fold increase in the glucose transfer rate was observed for the experiment with segmentation ($5.25 \pm 0.89 \times 10^{-6}$ mM/s) in comparison for that without segmentation ($2.51 \pm 0.51 \times 10^{-6}$ mM/s). Presumably the “glucose transfer” is through the membrane. The developed *in vitro* model was able to simulate small intestinal conditions and the intestinal motility highlighted in this work is a crucial factor to consider in *in vitro* digestion models.

Sustainable Production of Glucaric Acid and Gluconic Acid from Biomass-Derived Glucose.

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Glucose-derived organic acids, especially gluconic acid (GOA) and glucaric acid (GAA), are valuable platform chemicals in a wide range of applications. Conventional technologies (*i.e.*, biochemical oxidation and nitric acid oxidation) for GOA and GAA production suffer from their low efficiency, cost-intensive feature, and potential environmental concern. By contrast, heterogeneous catalysts have exhibited promising potential to readily oxidize glucose with great effectiveness and recyclability. Herein, base-free glucose oxidation based on heterogeneous structure-optimized catalysts is primarily highlighted to unveil their promising potential in sustainable biorefinery. Direct conversion methods of di-, oligo- and poly-saccharides using bifunctional catalyst are summarised to unravel the feasibility of raw biomass material utilization. Emerging technologies including microwave assisted oxidation and photocatalytic oxidation are emphasized owing to their sustainable preponderances with a low requirement of reaction condition. Therefore, the eco-friendly conversion of GOA and GAA can be achieved *via* biomass-derived glucose oxidation under the catalysis of various heterogenous catalysts,

offering a sustainable route to transform biomass waste into value-added products in sustainable biorefinery.

Keywords: Glucose oxidation; gluconic acid; glucaric acid; heterogeneous catalyst; biorefinery; biomass utilization.

Recycling Bread Waste into Levulinic Acid in Binary Monophasic and Biphasic Green Solvents.

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Bread waste is a common stream of food waste generated worldwide. Bread waste represents starch-rich food wastes that can serve as a potential feedstock for biorefinery applications. Catalytic production of sugars and platform chemicals could be an effective technic for recycling a considerable amount of starch-rich food waste generated across the world. This study aims to investigate the catalytic conversion of bread waste into levulinic acid (LA) in binary monophasic and biphasic green solvents. Gamma-valerolactone (GVL), isopropanol (IPA), and propylene carbonate (PC) were evaluated as green co-solvents in the organic solvent-water system. The biphasic solvent system facilitates easy recovery of LA through the extraction of the target product in the organic phase. The biphasic reaction medium is prepared using two miscible solvents, e.g., gamma-valerolactone (GVL) and water modified by sodium chloride (NaCl). Results indicates that binary monophasic (GVL/H_2O (1:1)) and biphasic medium (GVL/H_2O+NaCl (1:1)) generated a similar yield of products (sugars and derivatives), whereas, LA yield is comparatively higher in the biphasic medium. The partition coefficient for LA (LA-organic/LA aqueous) achieved (>4) in the GVL/H_2O+NaCl biphasic medium indicates that LA is effectively extracted in the organic phase. In PC/H_2O (1:1) monophasic solvent, ~72% of total soluble product yield (mostly sugars) could be achieved rapidly (1 min duration) in mild reaction condition (130°C, 0.5 M H_2SO_4), whereas, ~15-20 mol% of LA could be achieved when the reaction is elongated for 10-20 min (130°C). Considering green features and notable performance, GVL, IPA, and PC have a good potential for substituting conventional organic solvents such as dimethylsulfoxide (DMSO) and tetrahydrofuran (THF) that are often considered hazardous in terms of health, safety, and environmental implications. (The authors appreciate the financial support from the Hong Kong International Airport Environmental Fund Phase 2)

Keywords: Biorefinery, food waste, waste valorisation, bio-based chemical, catalysis.

Revalorization of the Discarded Cooking Water from Domestic Korean Pulses.

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Humanity is constantly challenged to become more sustainable by reducing the impact infringed on the environment. Finding value on what was considered waste is thus becoming a priority, especially for the food industry. With this in mind, this study focused on revalorizing the cooking water, or Aquasoya (AS), that is discarded from the cooking of domestic Korean pulses, specifically: Jwinunikong (*Rhynchosia nulubilis*), Soybean Dedu (*Glycine max (L.) Merr.*) and Black Soybean Seoritae (*Glycine max (L.) Merr.*). To begin with, AS was characterized for its composition in polyphenols (in Gallic Acid Equivalents), proteins (along with molecular mass determination) and total sugar. Its functional properties like foaming ability, emulsion stability were also investigated. The results helped in establishing optimal cooking conditions

of pressure, temperature and time (50 kPa; 112°C, 15 min) for maximum output of the aforementioned parameters. These were, per 100 g of AS, : Jwinunikong (0.20 g GAE; 2.44 g protein; 30 kDa; 2.03 g sugar), Dedu (0.04 GAE; 0.54 g protein; 30 kDa; 1.27 g sugars) and Seoritae (0.10 GAE; 1.55 g protein; 30 kDa; 1.02 g sugar). Subsequently, AS was dehydrated to obtain a powder that will constitute the main material for the development of everyday products such as a spread, egg replacement for bakery and a protein supplement. The products will have the characteristics of being an antioxidant, due to the presence of natural occurring polyphenols extracted from the pulses, additionally to being completely plant based, thus vegan. This research hence paves the path for exploring further feasible solutions for the reduction of food waste as well as consumption of animal based products.

The Role of Whey Protein and Lactic Acid on the Purity of Lactose Crystals Recovered from Acid Whey.

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Lactose crystallization in the presence of impurities is not well understood in acid whey processing particularly in the quantitative study on the purity of the final products which is a significant indicator in determining the application of lactose and improving the selling price. In this study, a traditionally stirred batch cooling crystallizer is implemented to study the effect of major impurities (protein and lactic acid) on the process yield, crystal size distribution, and crystals' quality, purity and shape. An additional study is conducted to observe the effect of a different chemical structure compound at the same acidity (effect of pH) environment by adding acetic acid to replace lactic acid. It is determined that protein might act as a heterogeneous seed which triggers faster nucleation and co-precipitation with lactose to form two individual particles. It is also investigated that there is a combination effect from protein and lactic acid which further reduce the purity of the final products compared to an individual addition of impurity. Moreover, a dominant impurity mechanism for lactose crystallization is due to the presence of similar structural impurities to lactose which is lactic acid in this case. This showed an understanding on the effect of each and/or combination of impurities, in which this studies can be translated for a general application in industries to tackle the problem with lactose composition variation from batch-to-batch production.

TECHNICAL SESSION 2: SAFE AND HEALTHY FOOD

Modelling the High Variety and Palatability of the Modern Food Environment.

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The prevalence of obesity and overweight is a growing global concern. Studies in humans consistently report increased intake of 'discretionary' food items which are commonly high in fat and sugar, energy dense, and highly processed. As such, these foods are thought to increase the risk of obesity and overweight. Experimental work in rodents and emerging work in humans indicates that such diets are associated both with increased metabolic dysfunction and adiposity, and mild cognitive impairment.

Most animal studies modelling dietary effects on cognition use high fat, high sugar pelleted diets versus low fat control diets, in group-housed animals. Our laboratory uses a cafeteria-style, high choice diet, rich in saturated fat and sugars (Caf), incorporating a range of palatable supermarket foods in addition

to regular chow, which increases voluntary energy intake three-fold. We routinely find deficits in hippocampal dependent forms of memory, which are also affected in people consuming high fat, high sugar diets.

Here we report an approach to test the impact of food 'variety' on energy and macronutrient intake, and behaviour. Adult male rats were singly housed to permit individual food intake monitoring. After 3 weeks of Caf diet, short-term place but not object recognition memory was impaired compared to rats consuming chow, and deficits were significantly negatively correlated with fat and carbohydrate intake, plasma insulin, and percent fat mass (Echo MRI). Current work is examining relationships between individual macronutrients and behavioural, metabolic and gut microbiome changes. Another approach we are trialling is exposing rats to high choice 'healthy' diet including fruit, vegetables, rice and oats, or regular diet.

Improving the external validity of preclinical models is critical to understanding the effects of these foods on the body, allowing us to better predict the effects of diet on metabolic and brain health and alleviate adverse health effects.

Assuring Food Sustainability: How Visible Light Can Help.

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The world is facing an unprecedented challenge to provide enough safe and nutritious food to a rapidly growing population under a deteriorating natural environment. Producing foods with longer shelf-life and minimising the loss of foods during transportation and storage are among the major strategies to tackle this daunting challenge to mankind. Microbial growth is a major problem causing the waste of foods as well as food poisoning by consumption of tainted foods. Not surprisingly, significant research efforts have continuously been spent on developing more innovative processing and packaging technologies that not only render food products safe to consume but also help reduce the food loss due to spoilage. This presentation shall provide an overview on the latest development of an innovative processing technology based on visible light-emitting diode (LED).

Important Parameters of Thermal Processing for Packaged Rice Cake and the Quantitative Microbiological Exposure Assessment Model for *Bacillus Cereus* .

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The objective of this study was to determine the thermal processing conditions for packaged rice cakes and to develop quantitative microbial exposure assessment models for *Bacillus cereus* in packaged rice cakes (PRC). Heat penetration curves at cold point for retort process and pasteurization were successfully predicted using heat transfer simulation model (RMSE < 0.77 ºC). The retort process showed a better sterilization effect than the pasteurization process, but degraded the quality of rice cakes such as color, shape, and texture. Probability distribution for growth of *B. cereus* in PRC was estimated and effects of thermal processing and acidification on extending the shelf-life of PRC were quantitatively assessed. The final contamination level in PRC of slab shape package (> 6.63 log CFU/g at 95% level) was lower than that in randomly packed sample (> 7.77 log CFU/g at 95% level) because the cold point in the

slab shape package was closer to the surface. Acidification significantly inhibited the growth of *B. cereus* and also affected the inactivation of *B. cereus*. A combination of acidification and low temperature pasteurization extended the shelf-life of PRC, while minimizing quality degradation of products (< 0.43 log CFU/g at 95% level).

Exploring Extremely Halophilic Archaea: From Food to Human Gut.

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On the basis of culture-dependent studies, archaea had been mainly thought to be extremophiles thriving under extreme conditions, such as hot springs, salt lakes, acid mine drainages, submarine volcanic habitats and deep oil reservoirs; however, it has been revealed that the archaea are common in various environments and are involved significantly in the process of methanogenesis and in global biogeochemical cycles of carbon and nitrogen. The extreme halophiles are well adapted to hypersaline environments, even though high salinity is toxic to most cells. These extremely halophilic archaea, also called haloarchaea or halobacteria, are known to have red-pigmented colonies and generally require more than 1.5 M NaCl for growth. All haloarchaea are clustered tightly within the class Halobacteria in the phylum Euryarchaeota; this class comprises currently six families in three orders with 62 genera and 258 species. Ecological studies of the haloarchaea in extreme environments have been performed using culture-dependent and next-generation sequencing approaches. It was found that the haloarchaea in food and human gut were more physiologically versatile than was previously suspected and that diverse extremophilic haloarchaea having unknown ecological potentials could be cultivable with intensive cultivation efforts.

Determination of Element Contents in Bivalves: Health Benefits and Risks.

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The content of 16 micro- and macro-elements (As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Se, Zn, Fe, Ca, Mg, K, Na) were determined from samples of three bivalve (Mollusca) species of clams (*Venerupis philippinarum*, *Tegillarca granosa*, and *Anadara broughtonii*) and two of scallops (*Mizuhopecten yessoensis* and *Argopecten irradians*), purchased from two fish markets in Incheon, Korea. The element content in combination with chemometrics provided sufficient information to develop classification rules for five species of bivalves according to their species. However, the As content was higher than the maximum tolerable limit specified by European Food Safety Authority (EFSA) in all species, and the Mn content of *A. irradians* were a few times higher than that in other species. Based on a data collection on food consumption of South Korean population of clams and scallops, a chronic probabilistic exposure was calculated for the toxic elements to compare with toxicological reference values, in order to have insight in potential human health impacts. It could be concluded that cadmium exposure was exceeding the toxicological limit for 5.3% of the population making it a potential health issue. Arsenic exposure was found to be of concern while its maximum levels in shellfish are not (yet) regulated. Multivariate analyses were used to analyze the differences among samples and to identify elements that can be used in species classification. Principal component and hierarchical cluster analyses showed the samples' tendency of forming clusters according to species. Furthermore, Partial Least Square Discriminant

Analysis identified As, Cd, Co, Ni, and Se as being useful for the differentiation among these bivalve species.

Interactions between Bacterial Cells and Protectant during the Production of Active Lactic-Acid-Bacteria Powder Via Spray Drying.

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Lactic acid bacteria (LAB) subjected to microencapsulation may activate cellular response towards environmental stresses and protectants, impacting on their viability and activity in the microcapsule form. This characteristic as living microorganisms is different from other sensitive bioactive substances such as fatty acids and vitamins. In this study, LAB were microencapsulated by spray drying, and the interactions between bacterial cells and protectant materials were studied. *Lactobacillus rhamnosus* GG was suspended in whey protein isolate (WPI) solution to induce cell-protein interaction, and then the WPI-treated cells were resuspended in trehalose solution or reconstituted skim milk for spray drying. The WPI-treated cells demonstrated enhanced thermotolerance during heat treatment, but their survival after spray drying was significantly reduced. The interactions between cells and proteins were experimentally studied to explore the underlying mechanism. By contrast, the addition of $CaCl_2$ either in protectant or in growth medium improved the survival of LAB cells in spray dried powder. By culturing in growth medium supplemented with 10 mM $CaCl_2$, the thermotolerance of *Lactococcus lactis* ssp. *cremoris* was improved, associated with an increase of intracellular Ca^{2+} level. These findings highlight the importance of understanding the cell-protectant interactions for developing a rational and viable scheme to produce active LAB powders.

Water Quality Improvement By Novel Chitosan-Biochar Composite Fibers: Removal of Phosphorus from Water.

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Excess phosphorous (P) in aquatic systems causes adverse environmental impacts including eutrophication which often have negative impacts on food security. This study fabricated novel chitosan-biochar composite fibers (FBC-N and FBC-C) from biochars of paper mill sludge (PMS) prepared under N_2 and CO_2 conditions at 600 °C for adsorptive removal of P from water. Investigations using SEM/EDX, XPS, Raman spectroscopy, and specific surface area measurement revealed the morphological and physico-chemical characteristics of the adsorbents. The Freundlich isotherm model described the P adsorption on BC-N, while the Redlich–Peterson model best fitted to data of three other adsorbents. The maximum P adsorption capacities were 9.63, 8.56, 16.43, and 19.24 mg g^{-1} for BC-N, BC-C, FBC-N, and FBC-C, respectively, indicating better adsorption by FBCs than biochars. The pseudo-first-order kinetic model suitably explained the P adsorption on BC-C and BC-N, while data of FBC-N and FBC-C followed the pseudo-second-order and Elovich models, respectively. Molecular level observations of the P K-edge XANES spectra confirmed that P associated with iron (Fe) minerals (Fe-P) were the primary

species in all the adsorbents. The results thus imply that FBCs hold high potential as an inexpensive and green adsorbent for remediating P in contaminated water and encourage resource recovery via bio-based management of hazardous waste.

Keywords: Eutrophication, phosphorus removal, food security, water quality, chitosan, XANES

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TECHNICAL SESSION 3: UN SUSTAINABLE DEVELOPMENT GOALS

Biomass Waste Valorization to Generate Modified Biochar to Recover Phosphorus from Animal Manure Wastewater.

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One of the reality before us today is the increasingly exhausted of phosphorus (P) resource. Animal manure, produced from livestock and poultry production, contains large amount of P. The treatment of P recovery from animal manure is regarding as a promising technical for food security. Recently, numbers methods to treat waste agricultural biomass have been considered. Amongst, pyrolysis to generate biochar has attracted attention. Biochar, has a rich surface chemistry, interesting nanostructures, abundant oxygen-containing functional groups, and a large porous structure, regarded as a potential sorbent. Due to the limitation of P-solubilization and selectivity recovery processes caused by the existing of organic phosphorus, sparingly soluble P, and many other kinds of substances, we have conducted a series of explorations on phosphorus solubilization and selectivity adsorption. For P solubilization, organic phosphorus and sparingly soluble P can be decomposed, dissolved, and released under thermal conversion (ultrasound, hydrothermal process, microwaves digestion). Coupling degradation and oxidation process, such as microwaves digestion and NaOH (or H_2O_2-HCl), ultrasound/H_2O_2, and hydrothermal assisted process have been developed. For P fixation, cation loaded biochar, such as magnesium modified corn biochar, ferric oxide hydrate modified biochar, calcium modified biochar, can be synthesized to enhance P adsorption selectivity. The adsorption isotherm, adsorption kinetics, thermodynamics have been investigated. The P saturated adsorbed modified biochar could continually release P in soil environment and its fertilizer property has been analysis.

Catalysis of Humins-Derived Biochar from Rice Waste Valorization for Glucose Isomerization.

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To develop integrated prototype for the innovative food waste valorisation technology, utilization of the unavoidable secondary products from biomass conversion to synthesize functional materials was investigated in this study. Under the microwaving heating at 160 ^oC in $AlCl_3$ aqueous solution, the starch in rice waste was effectively converted into value-added chemicals (especially 5-hydroxymethylfurfural) via hydrolysis, isomerization, and dehydration, simultaneously forming recalcitrant and insoluble humins as byproduct via condensation of intermediates during the hydrothermal processes. Thermochemical catalytic systems varying substrate concentrations (0.1, 0.15, 0.2 g/mL) and $AlCl_3$ catalyst loading (10 wt% or 20 wt%) in different duration time (0-40 min) were tested and compared to determine desired

conditions. Subsequently, batch production of humins were conducted in the selected conditions, and the solid residues were collected for Al impregnation followed by carbonization at 500 °C to produce humins-derived biochars. The derived solid materials were characterized regarding surface morphology and structures to indicate the successful synthesis of metal-impregnated carbon materials. They are also evaluated as heterogeneous catalysts for glucose isomerization under various microwaving heating, yielding up to 14 Cmol% fructose at 160 °C in water as green medium. This research proposed a novel practice for recycling by-product from waste valorization to synthesize renewable and sustainable solid catalyst. Knowledge on the controlling parameters to tailor the properties and catalytic activities of synthesized catalysts were discussed. The promising approach of catalyst synthesis from waste recycling shown in this work provides scientific insights to achieve green chemistry, builds integrated biorefinery, and boosts the circular economy.(The authors appreciate the financial support from the Hong Kong International Airport Environmental Fund Phase 2)

Key words: biomass valorisation, humins, biorefinery, glucose isomerisation, waste recycling

Does Selection of Variety Affect the Exergy Flow of Agricultural Production? Rice Production System in Italy.

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Exergy analysis is receiving considerable attention as an approach to be applied for making decision toward moving to a sustainable and energy-efficient food supply chain. This study focuses on how selection of variety affects the exergy flow of a crop production system (rice production). In this regard, 9 varieties of rice were investigated in Italy, the largest rice producer in Europe. Sensitivity analysis of inputs consumption and the exergy management scenarios of the most sensitive inputs are also provided in this study. The results indicated that the cumulative exergy consumption value of the investigated rice varieties ranges from 11,682 $MJha^{-1}$ to 15,541 $MJha^{-1}$. Chemical fertilizers and diesel fuel consumption were the biggest contributors to the total energy consumption in all investigated varieties. Luna variety, with the cumulative degree of perfection value of 3.87 and renewability indicator of 0.74, was identified as the most exergy efficient variety of rice in Italy.

A Critical Review on Microplastics As an Emerging Contaminant in Terrestrial Environment.

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At present, there is a growing concern regarding the impact of microplastics on aquatic and terrestrial environments. This review provides a comprehensive overview of the current knowledge and findings related to the sources, occurrence, fate, and risk associated with microplastic contamination in terrestrial environments. Microplastics can enter terrestrial environments through various pathways as primary microplastics, which include synthetic microplastics, and secondary microplastics, which are derived from the breakdown of larger plastic particles. Microplastic contamination of soils can result in both beneficial and detrimental effects on soil properties. Additionally, microplastics can interact with several contaminant types, such as pesticides, persistent organic pollutants, heavy metals, and antibiotics and they may act as a vector for the transfer of these contaminants in terrestrial environments. Moreover, they can be transferred through food webs and can accumulate in various trophic levels, resulting in detrimental health effects for humans and other organisms. Although several studies have focused on the occurrence and impact of microplastics contamination in marine environments, their sources, fate, transport, and effects in terrestrial environments have not been evaluated thoroughly. This review suggests that future research should focus on understanding the various interactions of microplastics with soil and other contaminants and the effect of microplastics on crop productivity and the health of living organisms. This work was carried out with the support of "Cooperative Research Program for Agriculture Science and Technology Development", Rural Development Administration, Republic of Korea.

Keywords: contaminants, toxicity, soil properties, trophic transfer

SHORT TALK AND POSTER SESSION

Aquafaba (chickpea cooking water) Can be Replaced As a Good Emulsifier and Foaming Stabilizer with Blackbean Cooking Water (Aquablackbean).

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Aquafaba (AF) is the water remaining after boiling beans and is usually discarded, nevertheless, It contains valuable water-soluble substances that have functional characteristics such as: emulsifier, thickener and foaming agent. Nutritional components and functional behavior of the AF from Soybean Seoritae (*Glycine max (L.) were compared with chickpea which is currently the pulse most used as a source of AF. Subsequently, five cooking conditions were tested by dividing into times of 30, 60, 120 and 180 min at a pressure of 40-49.6 kPa.* Considering protein and total polyphenol content (expressed in gallic acid equivalent GAE), it was established that the best cooking time is 120 min at the previously mentioned pressure. The cooking water from chickpea and soybean *in this protocol was analyzed for nutritional composition and yielded the following results: for* seoritae *polyphenol (0.14 g GAE /100g AF), protein (2.4 g /100g AF) and total sugar (5.48 g /100 g AF) and for chickpea polyphenol (0.03 g GAE / 100 g AF), protein (0.39 g/100 g AQ) and total sugar (3.28 g /100 g AQ). Furthermore, foaming properties were studied by an homogenization foam test. There was no significant difference in foam stability, however, the foam capacity in chickpea was higher than that of* soybean seoritae. Additionally, e*mulsions of AF and canola oil were prepared to assess* emulsifying stability (ES) and *emulsifying activity index (EAI)*. ES showed that more stable emulsions were produced by soybean seoritae compared to chickpea*. Conversely, EAI was higher for chickpea than for Soybean Seoritae*. *These findings will be the basis for product development using AF in powder form in the following steps of this research.*

Aquafaba (chickpea cooking water) Can be Replaced As a Good Emulsifier and Foaming Stabilizer with Small Blackbean(Seomoktae, 鼠目太, *Rhynchosia volubilis* Lou) Cooking Water.

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Aquafaba (AF) refers to the leftover water from cooking pulses that is often discarded. It can be used as an egg white replacer because of its excellent foaming and emulsifying properties, being chickpea the most commonly used bean to produce it. Seomoktae is a kind of domestic Korean pulse that contains plenty of nutrients. The aim of this study was to compare some physicochemical properties (polyphenol, protein and total carbohydrate), foam ability (FA) and stability (FS), emulsifying activity (EA) and stability (ES) between the cooking water of Seomoktae (AFJ) and chickpea (AFC). All of the samples were cooked under a pressure of 40-49.6 kPa for 2 h with a ratio of beans to water of 1:4 (w/w). The results showed a significant difference ($p \leq 0.05$) between Seomoktae and chickpea in all their physicochemical properties that were higher for Seomoktae (polyphenol: 1.6mg GAE/g, protein: 3.19g/100g, total carbohydrate: 5.97g/100g) than those from chickpea (polyphenol: 0.3mg GAE/g , protein: 0.39g/100g, total carbohydrate: 3.28g/100g). With respect to the foaming properties, FC and FS of Seomoktae (55.56%, 54.96%) were both higher than those of chickpea (50.00%, 51.65%). In regards to the emulsifying properties, though the EA of Seomoktae ($0.56 m^2/g$) was lower than that of chickpea ($1.61 m^2/g$), its emulsion was much more stable than that of chickpea with ES values of 61.92% and 54.94%, respectively. Following these analyses, we intend to extend the shelf life of AS by turning it into powder through the use of spray and freeze-drying methods in future stages of this study. The characterization

of AS constitutes the basis for the development of novel products such as baked goods, sauces, chips, among others, targeted to egg allergy sufferers and vegans.

Aquafaba (chickpea cooking water) Can be Replaced with Soybean (Glycine max) Cooking Water As a Good Emulsifier and Foaming Stabilizer.

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Aquafaba (AF) refers to the cooking water of chickpeas used as a substitute for certain animal proteins. Replacement of animal proteins is attractive to the food industry because it allows long-term cost savings. However, using cheaper and more productive soybeans, instead of chickpeas, can increase their commercialization while reducing manufacturing costs. Therefore, the purpose of this study is to compare the functional characteristics of soybeans and chickpeas to demonstrate the validity and effectiveness of such substitution. Additionally, we intend to use this AF to develop a variety of novel foods, which can also be consumed by vegans and consumers allergic to animal proteins. Firstly, the optimal cooking conditions that boiling the beans with water at a 1:4 ratio (w/v) for 120 min at low pressure (40-49.6kPa) were established to maximize the functionality of AF. These parameters were built on the basis of the total polyphenol, protein and carbohydrate composition of the soybean cooking water (SCW) and chickpea cooking water (CCW). Moreover, the emulsifying activity index (EAI), emulsifying stability (ES), foaming capacity (FC) and foaming stability (FS) were measured. In all the experiments performed, except for FS, soybeans had similar or better functionality than chickpeas ($p \leq 0.05$). As a result, replacing chickpeas with soybeans is much more efficient in terms of nutrition and commerce. Developing and commercializing AF products like sauces and desserts based on its emulsifying and foaming properties will further contribute to the growth of the vegan market around the world. It is also expected that the manufacturing size of the vegan foods can be huge over time by enabling sustainable and low-cost production. This study can make a positive effect in terms of meeting consumers' growing demand for vegetable proteins and preventing environmental pollution by using a by-product that is often discarded.

Nanocellulose to Reinforce Ozonated Cassava Starch Films.

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The use of biopolymers like starch in the packaging industry can contribute to solve environmental issues. The basic properties of starch can be selectively altered seeking specific applications. Indeed, films based on ozonated starches present higher mechanical resistance, but lower barrier properties. On the other hand, when biopolymers are combined with nanofillers, the films properties are enhanced, in special mechanical properties.

Therefore, the aim of this study was to evaluate the nanocellulose fibres (NCF) addition in films obtained from ozonated starches.

The films were produced by *casting* technique and cassava was selected as starch source. Solution up to 5 g of NCF/100 g of starch (w.b) were prepared in 100 mL of distilled water. This dispersion was mixed with a solution containing 5 g/100 g of ozonated cassava starch at different conditions, glycerol as the plasticizer (25 g/100 g of starch), and water as the solvent. This filmogenic solution was dried at 35 °C

and 45 % UR. Films were characterized in term of their mechanical (ASTM D882-09), opacity, sealing ability and, morphology.

Ozonation changed the starch molecular structure and chemical affinity, resulting in different behaviours in relation to native starches. Although NCF was dispersed in the polymeric matrix, the formation of agglomerates was visible by SEM images at higher concentration (2% and 5%).

The addition of nanocellulose fibres, in certain conditions, improved the film mechanical properties. In specific, the addition of 1 % of NCF to the 60 min ozonated starch film increased its Young Modulus in 32%, when compared with the non-reinforced formulation. Moreover, NCF provided resistance to higher temperatures, thus, improving the sealing capability. Finally, it was observed that NCF dispersion banned the passage of light, increasing the film opacity. However, it did not affect the visibility of the films, when photographed over a full coloured image.

Securing the Future of Consumers through Feasible Foods Security Approaches.

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Over the years, there has been outrageously increasing numbers of deaths globally recorded as a result of food poisoning. Despite the fact that the food processing industries are being secured by various agencies of government, to ensure thorough screening of raw materials used in foods industries. There are still daily increasing deaths originating from sources like: foods and commodities markets, green farms outlets and the likes.

This paper is aimed at bringing out easy-to-apply recommendations targeted at controlling the production, spreading and distribution of poisonous foods, fruits and vegetables by evaluating the effects of induced ripening using chemical substances, which has been established as the most common source of food poisoning across the world. Having understood the global threats which poor food hygienic culture contributes additionally to the effects of covid19 pandemic. We recommend feasible approaches such as: legal control of agro-chemicals for exporting, setting up food screening centers in remote areas, educating foods and commodities producers on the need to abstain from inducing their products with toxic substances, setting up of task forces to wage war against unscreened foods and other consumables from agricultural sectors, and creating awareness among communities on the dangers of artificial food ripening and chemical inducements to boost productivity.

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