

BESS Symposium on Fermentation - Fermented Food Technology and Innovation

1.30 -6.00 pm 2 Jul 2021



While innovation on traditional fermented food is ongoing, fermentation is drawing more attention recently due to its important roles in alternative protein revolution. In 2020, fermentation became the third technological pillar in alternative protein industries following plant-based and cultivated proteins. Fermentation is a powerful technological platform to take alternative protein products to the next level. It presents an opportunity to fundamentally change the way we eat and improve our health and economy. As such, BioEnergy Society of Singapore, BESS, is organizing a half-day symposium on fermentation. The symposium focuses on innovation on both traditional and novel fermentation-related food products.

Symposium program

Introduction

1.40 pm: Fermentation revival from traditional fermented food to alternative proteins, Dr. Geng Anli, President, BioEnergy Society of Singapore.

Topical talks

Session I:

2:00-4:00 pm: R&D in food related fermentation technology

*Session Chair: Dr. ANG Ee Lui, Group Leader, Singapore Institute of Food and Biotechnology Innovation (SIFBI), Agency for Science, Technology and Research (A*star), Singapore*

2:00-2:40 pm: Translational fermented food research, Prof. LIU Shaoquan, Department of Food Science & Technology, National University of Singapore.

2:40-3:20 pm: What can red oleaginous yeast offer to combat food insecurity? Dr. Ji Lianghui, Program Director and Senior Principal Investigator, Temasek Life Sciences Laboratories, Singapore.

3:20-4:00 pm: Applying synthetic biology in food and cosmetic industries, Dr. Simon Congqiang ZHANG, Research Scientist, Singapore Institute of Food and Biotechnology Innovation (SIFBI), Agency for Science, Technology and Research (A*star), Singapore

Translational fermented food research

Shaoquan LIU

Associate Professor

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Abstract

Fermentation plays an important role in production/development of both single molecules and whole foods/beverages. The focus of this presentation is on the whole foods/beverages by giving an overview of application of fermentation in the development of concept foods/beverages from alcoholic beverages to probiotic-fermented products using raw materials ranging from tropical fruits to food processing side-streams..

Speaker's biography



Associate Professor LIU Shao Quan is a faculty member of the Department of Food Science and Technology, National University of Singapore (NUS). He obtained his Ph.D degree from Massey University, New Zealand. He joined NUS in 2008. He previously worked in the New Zealand dairy industry for over 10 years. At NUS, he teaches food fermentation and flavour science. His research interest includes alcoholic and non-alcoholic beverages, food waste biovalorization, probiotics application.

What can red oleaginous yeast offer to combat food insecurity?

Lianghui JI

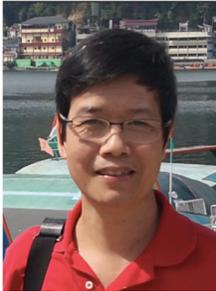
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Abstract

Red yeast, *Rhodotorula (Rhodosporidium) toruloides*, has been well-known for its high productivity for triacylglycerol (oil/lipid) and carotenoid under ultra-high cell density of up to 200 g/L. It can efficiently utilize a range of carbon sources, such as glucose, mannose, xylose, glycerol, many short-chain organic acids and alcohols. By controlling the levels of nitrogen and phosphate in the fermentation medium, it was possible to reduce lipid content to about 10% w/w. The fast growth rate and flexible carbon source make it a promising candidate for Single Cell Protein (SCP) production, which may be used directly as food staple or as animal/fish feed. We will discuss the pros and cons of red yeast SCP and the likely land requirement to fully support an urban city. We present our progress in turning red yeast into a robust producer of food ingredients and additives.

Speaker's biography



Lianghui Ji obtained his Ph.D in plant molecular biology from the University of Adelaide, Australia. He did his postdoctoral training on plant molecular virology and fungal genetics. He established his independent research group at the Temasek Life Sciences Laboratory (TLL) in 2003, an affiliate of National University of Singapore and Nanyang Technological University. He has been a Research Director and Senior Principal Investigator since 2013. His group has broad interests on translational research, trying to harness the metabolic power of elite strains of fungi, bacteria and algae. He has 4 patents licensed to 3 MMCs or start-ups. He has 10 more PCR patents available for licensing.

Applying synthetic biology in food and cosmetic industries

Simon Congqiang ZHANG

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Abstract

Food additives, nutraceuticals and cosmetic ingredients have high values and command large markets. Currently, fermentation processes, chemical synthesis or the combination of the two approaches (or semi-synthesis) supply the bulk of these ingredients. Compared to total chemical synthesis, microbial fermentation has several benefits: efficient production of enantiopure compounds, and the use of sustainable biomaterials that are environmentally friendly, avoiding the use of toxic solvents and catalysts. However, microbial fermentation has limitations and the major one is the relatively low titers and yields in production. The challenges of biomanufacturing of natural products lie partially in the complexity of biological systems, such as intricate cellular metabolism and multilayer regulation networks at the transcriptional, translational and post-translational levels. To overcome it, we have developed some innovative methods and toolboxes (A “plug-n-play” modular biosystem, and Multidimensional Heuristic Process), that significantly increased the production yields and greatly reduced the production costs. Such approaches is gradually competing with chemical synthesis approach and outperforming traditional extraction method in both sustainability, quality and costs. Looking forward, biotechnology-inspired microbial synthesis will be a significant contributor to food, nutraceutical and cosmetic industry.

Speaker's biography



Dr Congqiang ZHANG received PhD in a joint program Singapore-MIT Alliance between National University of Singapore and Massachusetts Institute of Technology. He is now leading a team in SIFBI working on multiple academic and industrial projects and initiating several international collaborations. His expertise is metabolic engineering, synthetic biology, enzyme engineering, and industrial microbiology. He has published in top journals (Nat. Commun., and Metab. Eng. etc) as the leading author and filed several patents on carotenoid and terpenoid biosynthesis. He serves as the secretary of BioEnergy Society of Singapore and an active reviewer of many prestigious journals in biotechnology. He has received competitive AME Young Investigator Research Grant from A*STAR 2019. He has been invited as a speaker in many international impactful conferences in Asia, EU and US. He is assisting Fermatics, a spinoff company, for the commercial development of bioingredients translated from his two patents.

Session II:

4:00 – 6:00 pm: Innovative food development

Session Chair: Prof. LI Zhi, Department of Chemical and Biomolecular Engineering, National University of Singapore

4:00-4:40 pm: Future Food: Innovation by Design, by Dr. WANG Wen, Biotransformation Specialist, Nestlé

4:40-5:20 pm: Scaling up mycoprotein production, by Mr. Craig JOHNSTON, Chief Technology Officer, ENOUGH

5:20-6:00 pm: Powering the plant-based food revolution with optimum nutrition, by Mr. Jason FONG, Founder and Chief Executive Officer, OsomeFood.

Future Food: Innovation by Design

Wen WANG

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Abstract

What will we be eating in 20 years' time? How will material science and biotechnology impact our dining table? In this seminar, Dr. Wang hope to share a bioengineer's perspective on future food design, in terms of shape, nutrition, texture, and interactivity. Specifically, three projects will be presented – 'bioLogic', 'Transformative Appetite' and 'Morphing pasta', where food materials are innovatively re-fabricated into novel forms to enhance human well-being. In bioLogic, we used *Bacillus subtilis* – the bacteria traditionally for producing fermented natto soybeans in Japan – to synthesize multifunctional bio-hybrid films that response to humidity changes. In this project, bio-design was enabled through the bioengineering approach, which motivated our team to rethink food from a new angle. In Transformative Appetite, we proposed an innovative strategy to avoid shipping air in food packaging. By utilizing anisotropic hydration, we produced foods that can be shipped in 2D format for compactness and autonomously folded into pre-customized 3D shapes upon cooking. This work enriched the dining experience and enabled food customization. In Morphing pasta, further enabled food design by creating authentic Italian pasta that could change shape during cooking. Last but not the least, Dr. Wang will share Nestle's effort in future food development, especially focusing on biotransformation.

Speaker's biography



Dr. Wang Wen is a bioengineer, entrepreneur, and designer. Her research focuses on biointerface, involving interdisciplinary studies that combine the knowledge of biotechnology, food science, advanced materials, and design. As a Young Global Leader (2018) awarded by World Economic Forum, Her vision is to fill the gap between research and the real-world applications, by enabling technology easy to access, and products more affordable. She has been working on numerous research and commercial projects, for instance, produce therapeutic proteins and small molecule drugs with novel processes, make sustainable biofuel from waste, remove sulfur from diesel, and fabricate innovative healthcare/household products using biological living materials. Her recent research focuses on innovative materials for enhancing well-being, such as functional and shape-shifting food. Her works have been well recognized by the media (The Washington Post, CNN, Discovery etc.), academia (Science Advances, JACS, ACM-CHI), and the public (through exhibitions at Center Pompidou, Ars Electronica).

She is currently working at Nestlé R&D Centre Singapore as team lead in creative prototyping under Science and Technology. Before coming to Singapore, she worked as a research scientist at Massachusetts Institute of Technology (MIT) Media Lab, as well as Department of Chemical Engineering. She was also a research affiliate of Carnegie Mellon University.

Scaling up mycoprotein production

Craig Johnston

ENOUGH

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Abstract

Producing vast quantities of delicious, nutritious and sustainable protein is one of the most urgent global priorities. In nature, the smaller the organism, the more rapid and more efficient the protein development. ENOUGH grows ABUNDA mycoprotein, an existing advantaged ingredient with an established market role, more sustainably and at a lower cost than other protein options. Using fermentation to meet future food protein needs is widely recognised as the most effective solution to feed a growing planet.

The presentation will cover the journey from lab to production scale for plant #1 in Europe. It will focus on range of scale -up aspects. It will also look forward in terms of developing global scale through collaboration.

Speaker's biography



Craig is co-founder and CTO of food tech ENOUGH. They are helping to tackle the combined issues of feeding a growing global population and the unsustainable impact of traditional protein farming. His 30 year career spans manufacturing, new product introduction and technology development across a range of industries. In 2011 he helped establish a global industry / academic collaboration looking at new ways to develop and manufacture medicines. He is a Fellow of the IChemE and holds an MBA.

Powering the plant-based food revolution with optimum nutrition

Jason FONG

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Abstract

In the current food manufacturer market where farming has changed vastly over the years, one must be mindful that the food they eat today will not be the same as compared to 10 years ago. With many health issues rooting from the food we consumed, this was the reason why a plant-based movement was created as it has a direct impact on both the planet and all of us. Production of plant-based food are on the rise to meet market demands but might not be the solution for the deteriorating market's health as the nutritional quality of these products has been compromised due to heavy food processing. How beneficial are these current plant-based products in the market in terms of nutrition? This talk comprises of the dangers in today's food produced in the current market and how our company, OsomeFood, is on a mission to create plant-based functional food that will be beneficial to the planet, to our health & also sustainable in the years to come.

Speaker's biography



Jason is an entrepreneur and a visionary leader with 25 years of business management. He is an accomplished all-round individual with vast experiences in the F&B, Investment, Health & Wellness space and the list goes on. His passion for Wellness drove him to invest in this industry. It was the wellness industry that he found inner peace which helped improve his mind, body, soul as well as diet. With this burning passion for health and wellness, he established Keen Lifestyle 10 years ago and innovated a holistic lifestyle concept focusing on preventive, maintenance and recovery aspects of the wellness industry. In today's context where one must be mindful about the food they eat as it directly impacts their health, Jason is determined to create plant-based functional food that is ethical to both the planet and our health yet sustainable and affordable for everyone.