Science Symposium on
Human Variability &
Personalized Nutrition
Opportunities for Research, Public Health
Benefits and Food Innovation

May 17, 2019
Block MD11, Clinical Research Centre (CRC) Auditorium,
National University of Singapore
In recent years, scientific studies on Human Variability have advanced tremendously, with the “Omics” technologies (metabolomics, genomics, proteomics, etc.) at the forefront. This has led to the development of “personalized or precision medicine” targeted at individuals. There is science now showing a potential extension to Personalized Nutrition. These sciences will have a significant impact on the food supply and suppliers, as well as implications for public health.

On May 17, 2019, ILSI SEA Region hosted a Science Symposium on Human Variability & Personalized Nutrition in National University of Singapore (NUS) with Clinical Nutrition Research Centre (CNRC), A*STAR, Singapore in collaboration with Commonwealth Scientific and Industrial Research Organisation (CSIRO). The theme of the symposium was “Opportunities for Research, Public Health Benefits and Food Innovation”. Over 100 local and overseas participants from the academia, industry and government congregated at the event to learn from international experts on the latest science and research on human variability and the opportunities in personalized nutrition for research, development and innovation to achieve individual and public health benefits.

The symposium commenced with a warm welcome address from Mr. Geoffry Smith, President of ILSI SEA Region, Singapore and Prof. Christiani Jeyakumar Henry, Director of Clinical Nutrition Research Centre (CNRC), A*STAR, Singapore.
“ILSI provides a neutral platform for discussing scientific issues and gathering points of view from the industry, academia and government. We believe that a tripartite collaboration model is an important aspect of scientific dialogue.

Our goal is to tackle issues that have important public health relevance and bring the science that is relevant to those topics and try to give a good background for making public health policy decisions. ILSI advocates the use of good science in finding solutions for public health challenges.

Developments in new sciences such as genomics and proteomics are generating masses of data about individual health and population. In Southeast Asia, there are still data gaps but there is also a lot of ongoing work in new food development such as new forms of protein and foods that might be suitable for some people who have an identifiable genetic profile.

Against this backdrop, this symposium aims to share the latest science and research on human variability, health and nutrition requirements, discuss issues relating to the regulatory framework and consumer communications on personalized nutrition and explore opportunities and directions for research, industry and public health.”

Mr. Geoffry Smith
President
ILSI SEA Region
Singapore
“Today, A*STAR has more than 20 different research institutes that range from high-speed computing to molecular biology under which CNRC fall within this paradigm.

The CNRC is a joint initiative between A*STAR, National University Health System (NUHS) and NUS. Our vision is to develop an integrated program that understands how food may be used to minimize the development of obesity, diabetes, and promote healthy aging. We have been very keen on international and national collaborations in which CSIRO is also one of our collaborators.

From 2016 to 2020, Singapore has committed to invest near $20 billion in research, innovation and enterprise.

Recently, we have been funded by A*STAR for an exciting area of research which is Food Structure Engineering for Nutrition and Health (FSENH) focusing on the use of processing, novel ingredients and physiochemical manipulation to enhance the sensory and health attributes of foods. Moving forward, an understanding in our food structure will enable us to develop foods to prevent chronic diseases and improve health and wellbeing.”

Prof. Christiani Jeyakumar Henry
Director
CNRC, A*STAR
Singapore
“CSIRO Future Science Platforms have been committed to investing frontier science, to help reinvent and create new industries, and build capacity and capability in areas of identified future importance for Australia.

Today, health system is moving from treating patient illnesses to managing consumer health and wellbeing, from accepting one-size-fits-all to precision health solutions, and from reactive system to a holistic and predictive approach.

To address this paradigm shift, precision health aspires to build a multicomponent platform that will proactively predict, prevent, detect, treat & manage an individual person’s lifetime health through decision support tools, highly tailored food & nutrition plans and lifestyle interventions.

We also need to have conversations on trust and security for the data that we are capturing such as who owns it, where it sits and how it can be accessed. Creating trust around this framework will be particularly important in this context.”

Dr. Nathan O’Callaghan
Director
Precision Health Future Science Platform
CSIRO
Australia
Chairpersons & Speakers

Mr. Geoffry Smith  
President  
ILSI SEA Region  
Singapore

Dr. Irma Silva Zolezzi  
Head  
Nestlé Research  
Singapore Hub

Prof. John Mathers  
Professor  
Newcastle University  
UK

Dr. Nathan O’Callaghan  
Director  
Precision Health Future Science Platform  
CSIRO  
Australia

Prof. Jun Kuniswa  
Director  
Center for Vaccine and Adjuvant Research  
NIBIOHN  
Japan

Dr. Neerja Karnani  
Lead  
Systems Biology and Biomarker Discovery  
SICS, A*STAR  
Singapore

Dr. David Zeevi  
James S. McDonnell Foundation Researcher  
The Rockefeller University  
USA

Dr. Femke Hannes  
Regional Lead  
Nutrition, Science and Advocacy  
JSM Nutritional Products Asia Pacific  
Singapore
Chairperson Biographies

Mr. Geoffry Smith is President of ILSI Southeast Asia Region based in Singapore, and a Member of the Executive Committee of the global ILSI Board. In addition, he is the Chairman of the Essential Micronutrients Foundation, a non-profit organization which addresses micronutrient deficiencies globally as a public health issue. He is also Director of Nutrition Strategies International which deals with food and nutrition issues in developing countries. In addition, he serves as a Member of the editorial board of the journal, Food and Nutrition Bulletin. Prior to his current positions, Mr. Smith was the Global Director, Health Chelates for Akzo Nobel Functional Chemicals, and directed the global business for these compounds in food and nutrition as well as pharmaceutical applications. He was responsible for the global project within Akzo Nobel addressing iron deficiency anemia. In addition, Mr. Smith directed the Asia Pacific activities for Akzo Nobel's Innovation Unit. He is a thirty-year veteran of the chemical industry in the Asia Pacific and has resided in Singapore for more than 20 years. He is a Member of the Nutrition Society of the UK, the American Society of Nutrition and the American Chemical Society.

Dr. Irma Silva Zolezzi is Head of Nestlé Research Singapore Hub in Singapore since February 2018 where her work is focused on nutrition and health research throughout the life course. She is also the Scientific Lead of the Nestec-EpiGen Consortium research programme, a public-private partnership with a focus on studying the role of maternal nutrition and epigenetic mechanisms underlying offspring’s later in life risk to developing obesity and metabolic disease. In July 2010, she joined the Nestlé Research Center in Lausanne, Switzerland where she held responsibilities as Group Leader of Functional Genomics, Nutrient Biosciences and Metabolic Programming. Since 2013, she has led the Maternal Nutrition Research Program. From 2005 to 2010, she was Senior Scientist and Head of the Genomics Core Unit at the National Institute of Genomic Medicine (INMEGEN), where she dedicated to the study of the genetics of complex diseases and the genomic diversity of the Mexican population. In addition, she lectured in undergraduate and graduate courses in genetics and genomic medicine and has been a member of the Mexican National Researchers System since 2010. Dr. Silva Zolezzi is a Chemical Pharmaceutical Biologist from the School of Chemistry of the National Autonomous University of Mexico (UNAM), with a M.Sc. and Ph.D. in Molecular Biomedicine, from CINVESTAV, IPN, Mexico, including a three-year placement at the Institute of Genetic Medicine McKusick-Nathans of Johns Hopkins University in Baltimore, USA.
Speaker Biographies

**Prof. John Mathers** is Professor of Human Nutrition and Director of the Human Nutrition Research Centre in the Institute of Cellular Medicine at Newcastle University, United Kingdom. He was also a founding member, and Chair of the European Nutrigenomics Organisation (NuGO). His research includes the use of genomic and epigenomics tools to understand the mechanisms through which nutrition influences cell function and, ultimately, health. In addition, in collaboration with colleagues in the University of Aberystwyth and Imperial College London, he has developed novel metabolomics-based methods for assessing dietary intake. Prior to his current position, Prof. Mathers was previously the President of the Nutrition Society and former Scientific Director of the Institute for Ageing and Health, Newcastle University. He was a Postdoc in Cambridge University and a Research Fellow in Edinburgh University before being appointed to Newcastle University. His major research interests are in understanding how eating patterns influence risks of common age-related diseases such as heart disease, diabetes, dementia and bowel cancer. He completed his undergraduate studies in Newcastle University and received his Ph.D. in Nutrition at Cambridge University.

**Dr. Nathan O’Callaghan** is Director of Precision Health Future Science Platform at Commonwealth Scientific and Research Industrial Organisation (CSIRO), Australia. Since 2012, he has held various senior R&D Management roles within CSIRO and accumulated a broad portfolio experience including oversight of the Nutrition and Health Research Clinic located at South Australian Health and Medical Research Institute (SAHMRI) which undertakes industry-funded clinical substantiation trials to demonstrate the health effects of foods, diets and lifestyle programs. He has also developed a broad experience in nutrition and health science, with a focus on developing (bio)markers to improve health through nutrition. A keen focus throughout his career has been developing cutting edge and robust molecular-based assays for assessing (metabolic) health and dietary exposure to better target and personalize the delivery of health advice.

**Prof. Jun Kunisawa** is Director of Center for Vaccine and Adjuvant Research (CVAR), National Institutes of Biomedical Innovation, Health and Nutrition (NIBIOHN), Japan. He also serves as Adjunct Professor at Osaka University, Kobe University and The University of Tokyo. After receiving his postdoctoral training at University of California, Berkeley, he was recruited by The University of Tokyo in 2004. He spent 9 years in Tokyo as Assistant and Associate Professor before moving to NIBIOHN to establish a new laboratory in 2013. In 2019, he was promoted to his current position in 2019. Prof. Kunisawa’s research focuses on the immune regulation by the gut environment (e.g., diets and commensal/pathogenic bacteria) and translational research for the development of vaccines, medicines, and functional foods. He was awarded a Ph.D. from the Department of Pharmaceutical Sciences at Osaka University, Japan in 2001.
**Dr. Neerja Karnani** is Senior Principal Investigator and Systems Biology and Biomarker Discovery Lead at Singapore Institute for Clinical Sciences (SICS), A*STAR, Singapore. After her postdoctoral work at University of Virginia, USA, in association with the ENCODE consortium (NHGRI) involving the understanding of the epigenetic landscape and instability in the human genome, she moved SICS, A*STAR in 2013 to start her own lab, where she focused on identifying diagnostic markers and interventions related to women and child health adversities. She is using multi-omics approaches (genetics, epigenetics, transcriptomics, metagenomics and lipidomics) and integrating big data to develop better molecular insights into metabolic diseases, micronutrient deficiencies, and mental health adversities. Aside from her current position, Dr. Karnani is an Executive Committee Member for two Singaporean cohorts, GUSTO (pregnancy and child development) and S-PRESTO (pre-conception). She is also a part of the science management group for EpiGen consortium, a collaboration between 3 countries (Singapore, New Zealand and United Kingdom) to study developmental origins of health and disease. Her group’s research findings have attracted major nutrition, pharma and diagnostic industries and fostered translational programs. Dr. Karnani is also a key Member and Contributor of Singapore’s National Precision Medicine program that aims at studying human genetic variation for population stratified risk prediction of health adversities.

**Dr. David Zeevi** is a James S. McDonnell Foundation Researcher at The Rockefeller University, United States. He develops computational methods for studying the gut microbiome and its contribution to health and disease. His research focuses on designing tools for the analysis of the gut microbiome and applying these tools for the understanding of the relationship between nutrition, health, and gut microbes in human individuals, with the aim of achieving personalized nutrition as personalized preventive medicine. In recent work, Dr. Zeevi, along with his researchers have shown that small differences in the genome of gut microbes are associated with significant differences in the metabolism and weight of the human host. He also co-authored several key publications in the field of microbiome research including linking the microbiome to the effects of artificial sweeteners and host circadian rhythm, modeling bacterial growth dynamics and taking the first step towards personalized nutrition by predicting the glycemic responses of individuals to complex meals.
Dr. Femke Hannes is Regional Lead for Nutrition, Science and Advocacy at DSM Nutritional Products for the Asia Pacific Region. Clinical research and diagnostics have been an area of focus for her for many years. Currently, she is responsible for communicating scientific evidence of different health benefits and building a strong network of key influencers in the scientific, medical and clinical research communities. Through collaboration with different partners, Dr. Hannes seeks to drive science and innovation in the Asia Pacific region. She has been invited to present at several international symposiums and has co-authored several scientific publications. Dr. Hannes holds a Ph.D. in Biomedical Sciences focusing on Human Health.
Human Variability & Personalized Nutrition - State of the Science

Prof. John Mathers, Newcastle University, UK

Prof. John Mathers, Newcastle University, UK presented scientific evidence of inter-individual variation in response to fish oil supplementation and diet that corroborated the interaction of genetic variation with dietary lifestyle, stressing its importance in understanding disease development and more importantly, its prevention.

Delving into the principles of personalized nutrition, the effectiveness of personalized approaches as compared to conventional “one size fits all” approaches in changing dietary behaviors was exemplified using the pan-European web-based Food4Me randomized controlled trial. While results concluded that participants assigned to a personalized nutrition intervention had bigger, sustained changes in eating behavior after 6 months, more complex phenotypic and genotypic information in developing personalized nutrition advice did not contribute to added benefits.

He suggested adopting a systematic approach to achieve more effective personalized nutrition through a collection of individual characteristics, barriers and facilitators, and working with their aspirations. He concluded by highlighting that behavioral genetics (attention, memory, reward and motivation) will play a crucial role in personalized nutrition and achieving targeted health outcomes.

Personalized Nutrition - New Research Perspectives

Dr. Nathan O’Callaghan, CSIRO, Australia

Dr. Nathan O’Callaghan, CSIRO, Australia shared his recent study on the influence of amylase copy number (AMY1 CN) on weight trajectories and glycemic control in obese individuals. The outcomes displayed a modest association between AMY1 CN and BMI but no association with baseline glycemic parameters as well as anthropometric or glycemic outcomes following either a low-calorie diet or weight management diet. This suggested that AMY1 CN is not a significant biomarker for weight loss and maintenance in overweight or obese subjects.

Dr. O’Callaghan also highlighted how precision health will proactively transform the management of health in individuals through decision support tools, highly tailored food and nutrition plans, and lifestyle interventions. Although precision health offers potential benefits to future health, conversation on building trust between consumers and service providers on data security and privacy needs to be fostered. A greater understanding of consumer attitudes and support mechanisms would also be important in this context. He shared that CSIRO is working on two projects in partnership with Nanyang Technological University and a joint initiative with A*STAR with a focus on precision health.
Presentations

System Nutrition and Big Data - Impact of Nutrients on Gut Microbiome
Prof. Jun Kuniswa, NIBIOHN, Japan

Prof. Kunisawa elucidated the complex network and mechanisms of the interaction among diet, gut commensal bacteria as well as health and disease. From his research studies, he expounded the immunologic influence of fatty acid composition in dietary oils on the regulation of host immune responses showing that fatty acid compositions especially omega-3 fatty acid, ALA in dietary oils and eicosapentaenoic acid (EPA)-derived metabolite, 17,18-EpETE could potentially control the development of allergic and inflammatory diseases. The involvement of commensal bacteria in the generation of lipid metabolites from dietary oils in the intestinal lumen was also demonstrated. He noted that not all biological pathways are commensal bacteria-dependent as some pathways could be host-dependent.

Using natto as an example, he highlighted the potential of bacteria-mediated production of functional lipid metabolite in the development of anti-allergic and anti-inflammatory functional foods and drugs. The immunologic functions of vitamin B1 and B9 in regulating the host immunity and their contribution towards moderating the fine balance between physiologic and pathologic conditions of the intestine were also discussed.

Human Variation: Findings from the Singapore GUSTO Study on Prenatal & Infant Population
Dr. Neerja Karnani, SICS, A*STAR, Singapore

Drawing attention to the findings from the tri-ethnic mother-offspring cohort study, Dr. Neerja Karnani, SICS, A*STAR, Singapore noted ethnicity differences in the infant, paternal and maternal genotypes. This influence was also consistently found in plasma arachidonic acid (AA) levels. Data also revealed that Indians tend to have higher levels of AA compared to Chinese and Malay due to the association with ‘G’ allele of FADS1 genetic variant. She pointed out that even suboptimal omega-6 polyunsaturated fatty acids in the utero environment could affect birthweight and neonatal epigenome, suggesting that genetics, epigenetics and prenatal environmental factors could dictate a child’s birth outcomes.

In addition to these key factors, she explained that microbiota composition in the first two years of life should also be taken into consideration attributing to its association with subsequent adiposity which is strongly influenced by the mode of delivery, breastfeeding and ethnicity. In the face of a highly complex and evolving human variome, Dr. Karnani concluded by encouraging greater research efforts towards integrated omics to build strength in association studies for the development of precision healthcare for future generations.
Personalized Nutrition by Prediction of Glycemic Responses
**Dr. David Zeevi, The Rockefeller University, USA**

Dr. David Zeevi, The Rockefeller University, USA provided an overview of his research study on Personalized Nutrition by Prediction of Glycemic Responses. Individual variability in response to food is governed by three factors, namely genetics, lifestyle and microbiome. His research outcome showed high interpersonal variability in post-meal glucose response to identical meals. Using a machine-learning algorithm that integrates blood parameters, dietary habits, anthropometrics, physical activity and gut microbiota in an 800-person cohort study, it was able to accurately predict post-meal blood glucose responses to real-life meals, paving the possibility of designing personalized diets to successfully lower post-meal blood glucose and its metabolic consequences.

Dr. Zeevi shared another recent study which uncovered several possible mechanistic links between the microbiome and its host through an examination of microbiome variable regions. He illustrated an example of people who have the 33-kb region in *Anaerostipes hadrus*, responsible for encoding a composite inositol catabolism-butyrate biosynthesis pathway, were associated with lower metabolic disease risk, shedding light on the association of microbiome variability with microbial adaptation and host health.

Industry Perspectives on Personalized Nutrition - Challenges & Opportunities from Research to Application
**Dr. Femke Hannes, DSM Nutritional Products Asia Pacific, Singapore**

Dr. Femke Hannes, DSM Nutritional Products Asia Pacific, Singapore shared the Industry Perspectives on Personalized Nutrition - Challenges & Opportunities from Research to Application. She spoke that the rising demand for customized experiences, healthier eating, personalized medicine and quantification of personal characteristics to track and improve health are driving towards personalization. Trend data indicated that health and wellness is one of the fastest growing markets globally and the global demand for consumer genetic testing will also continue to grow rapidly.

While consumer attitudes towards personalized nutrition were positive, she encouraged greater efforts towards translation of personalized nutrition from research to consumers and building consumer trust in brands which would be pivotal to market success.

She also underlined the need to design a framework for privacy, transparency and consent, adopt a risk-based approach towards data privacy and security and create a truthful and science-based value proposition where communication of benefits is substantiated with science-based evidence. Scalable access to expert advice, understanding of consumer appeal, and employment of gamification and incentivization will also be vital to achieving consumer retention and a sustainable business model in the ecosystem of personalized nutrition.
Prof. Christiani Jeyakumar Henry is currently Director, Clinical Nutrition Research Centre (CNRC), A*STAR in Singapore and Professor, Department of Biochemistry, National University of Singapore. He was the founding director of the Functional Food Centre in Oxford. He initially trained as a food scientist and obtained his M.Sc. and Ph.D. in Nutrition from the London School of Hygiene and Tropical Medicine (LSHTM), UK. His interests have been on understanding glycemic control, the role of glycaemia in body weight regulation, food-nutrient interactions and functional foods. He was a Board member of UK Food Standards Agency and member of the general Advisory Committee on Science of the Food Standard Agency (UK). His work on energy metabolism culminated in the development of the “Henry equations” to predict basal metabolic rate. After his training at the LSHTM, he spent over 35 years in the UK and has worked both in Europe and Asia for academic, industrial, governmental and UN agency sectors. He has provided expertise in global nutrition, product development and food policy all around the world. Prof. Henry is on the Board of Directors of International Life Sciences Institute Southeast Asia Region (ILSI SEA Region). He has published over 300 papers and presented over 390 lectures around the world. In 2010 he was awarded the British Nutrition Foundation prize for his outstanding contribution to Nutrition. He was made a Fellow of the International Academy of Food Scientists and Technologists (2012). He was the recipient of the Most Inspiring Mentor Award, from A*STAR, Singapore in 2017, and the Niigata International Grand Prix food award, Japan in 2018. He has recently been the scientific commentator on the highly successful TV program “Food Detective” that has been aired worldwide.
Prof. Michael Fenech is the Founder and Director of Genome Health Foundation in Australia. He is also a Professor at the University of South Australia who is internationally recognized for his breakthrough research in nutritional genomics and genetic toxicology. Some of his key achievements included the invention and development of DNA damage diagnostics which are used globally as the gold standards in the fields of environmental and nutritional genomics, and his concept of the Genome Health Clinic and its translation into practice which is now being accepted and recognized worldwide. His research also focuses on (i) the impact of nutrition and psychological stress on chromosomal and telomere integrity and (ii) personalized nutrition for dementia prevention and cancer growth control. He co-founded the HUMN project on micronuclei in human populations in 1997 and the Asia Pacific Nutrigenomics Nutrigenetics Organisation in 2014. In 2018, he established the Genome Health Foundation to promote education, research and translation of knowledge relating to environmental and lifestyle factors that cause or prevent DNA damage. Since 2010, he has been an invited speaker at 57 international conferences (10 plenary lectures). His H-index is 84 based on 32,100 total career citations according to Google Scholar.

Prof. John Mathers is Professor of Human Nutrition and Director of the Human Nutrition Research Centre in the Institute of Cellular Medicine at Newcastle University, United Kingdom. He was also a founding member, and Chair of the European Nutrigenomics Organisation (NuGO). His research includes the use of genomic and epigenomics tools to understand the mechanisms through which nutrition influences cell function and, ultimately, health. In addition, in collaboration with colleagues at the University of Aberystwyth and Imperial College London, he has developed novel metabolomics-based methods for assessing dietary intake. Prior to his current position, Prof. Mathers was previously the President of the Nutrition Society and former Scientific Director of the Institute for Ageing and Health, Newcastle University. He was a Postdoc in Cambridge University and a Research Fellow at Edinburgh University before being appointed to Newcastle University. His major research interests are in understanding how eating patterns influence risks of common age-related diseases such as heart disease, diabetes, dementia and bowel cancer. He completed his undergraduate studies at Newcastle University and received his Ph.D. in Nutrition at Cambridge University.
Panelist Biographies

Dr. Nathan O’Callaghan is Director of Precision Health Future Science Platform at Commonwealth Scientific and Research Industrial Organisation (CSIRO), Australia. Since 2012, he has held various senior R&D Management roles within CSIRO and accumulated a broad portfolio experience including oversight of the Nutrition and Health Research Clinic located at South Australian Health and Medical Research Institute (SAHMRI) which undertakes industry-funded clinical substantiation trials to demonstrate the health effects of foods, diets and lifestyle programs. He has also developed a broad experience in nutrition and health science, with a focus on developing (bio)markers to improve health through nutrition. A keen focus throughout his career has been developing cutting edge and robust molecular-based assays for assessing (metabolic) health and dietary exposure to better target and personalize the delivery of health advice.

Prof. Yuan Kun Lee is an Associate Professor of Department of Microbiology & Immunology and Department of Surgery, Yong Loo Lin School of Medicine, National University of Singapore. He is also the immediate past-President for International Union of Microbiological Societies (IUMS) and President of the Singapore Society of Microbiology and Biotechnology. His research interests include the effect of diet on the cross-talk between the gastrointestinal microbiota and the host, and microbial fermentation processes in the production of food and pharmaceuticals and in the treatment of waste. Prof. Lee has published over 150 papers in international peer-reviewed scientific journals, contributed 30 chapters in books, and authored 5 monographs. In addition, he has 3 patents to his name. Prof. Lee received his Ph.D. from the University of London, United Kingdom.

Dr. Femke Hannes is Regional Lead for Nutrition, Science and Advocacy at DSM Nutritional Products for the Asia Pacific Region. Clinical research and diagnostics have been an area of focus for her for many years. Currently, she is responsible for communicating scientific evidence of different health benefits and building a strong network of key influencers in the scientific, medical and clinical research communities. Through collaboration with different partners, Dr. Hannes seeks to drive science and innovation in the Asia Pacific region. She has been invited to present at several international symposiums and has co-authored several scientific publications. Dr. Hannes holds a Ph.D. in Biomedical Sciences focusing on Human Health.
Ms. Rachel Teo is Head of Consumer Business at Singapore Economic Development Board in Singapore. Her current role in the Consumer team involves working closely with global B2C companies to develop and execute their global and regional strategies from Singapore. She is a firm believer in developing strong client partnerships. Her experience also includes R&D deal-structuring and creating multi-stakeholder platforms in Singapore. As part of the EDB since 2009, Ms. Teo has been a key account manager, strategy developer and team lead in the Pharmaceuticals, India (based in Mumbai) before her present position. She has nine years of industry development experience, with a strong interest in healthcare and nutrition. Prior to her working experience at EDB, Ms. Teo also worked at Pricewaterhouse Coopers Zürich while on sabbatical in 2016 where she led a sales culture change program alongside strategy development for the pharmaceuticals & life sciences team. She received her B.Sc. in Biochemistry from the University of Wisconsin-Madison, USA and M.Sc. in Management from the Grand École at HEC-Paris, France.
Chairperson and panelists during panel discussion

Chaired by Prof. Christiani Jeyakumar Henry from Clinical Nutrition Research Centre (CNRC), A*STAR, Singapore, the panel discussed the future directions of personalized nutrition in an evolving global landscape, the role of Southeast Asia and the research gaps needed to move forward in this nascent, emerging field. It was agreed that as the paradigm of science and nutrition becomes increasingly complex, there is a need to broaden the concept of personalized nutrition and efficiently translate new knowledge from research to application to meet the nexus of supply and demand.

At present, personalized nutrition is still at its infancy with multiple hurdles to be overcome. Lack of public communication and engagement between academia and industry as well as concerns of consumer confusion and ethical issues of data handling were identified as key challenges that need to be addressed. A partnership between the academia and industry supported by a strong regulatory framework could help bridge the gap between science, consumer insights and tools to effectively deliver personalized nutrition solutions that could be trusted by consumers. While there is still a long way towards a better understanding of personalized nutrition and gaining acceptance by the market, the panelists remained optimistic about its future and encouraged continuous efforts in building data and scientific evidence to close the research gaps and pursue rigorous scientific research to keep the momentum going.

As the world welcomes a new revolution of personalized nutrition, the cross-fertilization of nutrition with other disciplines such as psychology, sociology and biology, building capabilities, collective ownership of personalized nutrition, consumer education while managing their expectations will be vital to creating an ecosystem for success.
Panel Highlights

**Prof. Michael Fenech**
Founder & Director
Genome Health Foundation
Australia

“We need educated consumers in order to appreciate personalized nutrition and they need to have a good income to spend. Although there remains a lot of uncertainties in the field of nutrigenomics such as the role of gut microbiome, interactions and mechanisms and we are at the stage of infancy, it is still a promising area especially in Southeast Asia where there is a huge thirst for knowledge in genetic diversity.

We need to continuously share about the small successes in scientific research and avoid confusing the public with exaggeration. In order to convince the masses, we need to walk the talk and show that nutrigenomics and nutrigenetics work for us.”

**Prof. John Mathers**
Professor
Newcastle University
UK

“Going back to 1970s, there had been huge investments in cancer biology research. Although cancer has yet to be resolved today, we are now able to deliver and invest on the fundamentals of cells combined with new genetic information which have led to fantastic treatments. The key lesson is to keep plugging the way of fundamental understanding and work in science and nutrition because that is going to deliver.

We need scientists themselves to keep asking big questions to demonstrate that there are important areas to discover. Molecular nutrition and nutrigenomics have achieved to an extent in asking big new questions. It is a tough road, but I am optimistic.”
“Overpromising and rising expectations from consumers believing that we are going to solve the health problems have eroded trust and the ability of professionals to deliver this information. This disconnected trust and data handling issues have led to risk-averse consumers in the nutrigenetics pathway.

CSIRO has been driving towards better understanding of our consumers, and using science and expertise to provide advice to support the individuals. Sometimes, consumers do not know their needs or wants. Thus, it is important for us to support them and build an ecosystem around these needs.”

“Commercial sectors and industry have been leading science and selling their products in the market before they fully understand the mechanisms. Consumers are craving for them and we are building scientific evidence to support it. For once, science is leading the commerce.

There has also been a great reliance on the internet to gain knowledge. Perhaps, it is for us, scientists to commit to public communication and share the responsibility of educating the public.”
“As we undergo a paradigm shift, the industry needs to provide nutritional solutions that cater to the aspirations of individuals. This process is however challenging as different levels of data and insights further adds to the complexity. We need to think in a very disruptive way to resolve this problem. A proactive consumer-centric health system supported with digitalization, tools, wearables could be the key to our future business model.”

Dr. Femke Hannes
Regional Lead
Nutrition, Science and Advocacy
DSM Nutritional Products
Asia Pacific
Singapore

“...As we undergo a paradigm shift, the industry needs to provide nutritional solutions that cater to the aspirations of individuals. This process is however challenging as different levels of data and insights further adds to the complexity. We need to think in a very disruptive way to resolve this problem. A proactive consumer-centric health system supported with digitalization, tools, wearables could be the key to our future business model.”

Ms. Rachel Teo
Head
Consumer Business
Singapore Economic Development Board

“What we are going to observe increasingly in the future is the uncommon partnership between the academia and technological companies e.g. Facebook, WeChat which know their consumers well and have earn their loyalty. We also need to consider who is going to pay for it. There needs to be incentives to drive consumer spending. We need to think how these players are going to be involved to develop effective personalized nutrition solutions.

Striking a fine balance between realism, current scientific evidence and education is also vital in this process. If there is no optimism in personalized nutrition, there would not be investments.”

Panel Highlights