Macronutrient Requirements, Intake and Health Impact in Southeast Asia
From gaining better understanding of macronutrients needs and their intake levels, to assessing the scientific processes and regulatory development on the use of food additives, and exploring the role of new agriculture technologies in ensuring a sustainable food supply, this issue of Science InSight highlights programs undertaken by ILSI SEA Region over the past 6 months.

In a seminar focusing on maternal diet and nutrition status in Southeast Asia, experts raised the challenges and limitations due to limited availability of good quality data, especially data related to women of reproductive age. There is recognition and concern that maternal mortality rates remain high in Southeast Asia, coupled with increases in teenage pregnancies across many countries. Achieving optimal maternal nutrition through national policies and appropriate programs is thus imperative for improving maternal health and birth outcomes.

In conjunction with the 2017 ILSI SEA Region Annual Meeting held in Jakarta, Indonesia, a Scientific Forum on Nutrition and Food Safety - Perspectives and Challenges for ASEAN was organized. In his presentation, Dr. Fedinal Fernando, Head of Health Division, ASEAN Secretariat, shared the health priorities and programs in ASEAN. Highlighting that multi-sectoral endorsement and collaboration with external partners will be needed to accomplish these goals, Dr. Fernando sought ILSI’s collaboration as a knowledge partner in some of the program to be undertaken.

I would like to highlight a newly established memorial award for Dr. Dave Roberts, longtime friend and a past Board member of ILSI SEA Region, which was jointly inaugurated by the University of Newcastle Australia and ILSI SEAR Australasia. The inaugural award was given to Dr. Tracy Schumacher for her research on the role of nutrition in the prevention of cardiovascular diseases among vulnerable indigenous women in rural Australia.

I hope you enjoy reading this issue of Science InSight, and I look forward to your active participation in our upcoming activities and events!

Boon Yee Yeong
Executive Director, ILSI SEA Region
The components of a diversified, balanced and healthy diet vary depending on individual needs, locally available foods, as well as cultural and dietary customs. In recent years, new developments and research in the field of nutrition and health and chronic diseases, have had an impact on recommendations for dietary intake of macronutrients.

ILSI SEA Region organized a 1½ day seminar on "Re-assessing Macronutrient Needs – Requirement, Quality and Health Impact" from May 3 to 4, 2017 in Bangkok, Thailand, to provide an overview of the most recent scientific knowledge and research findings on current and optimal macronutrient intakes, and to discuss the dietary macronutrients recommendations in the ASEAN region.

Macronutrient Requirements – Global and Regional Overview
The opening presentation of the seminar was given by Prof. Janet King, Children’s Hospital Oakland Research Institute, USA, who present on the Global Recommendations for Macronutrients Requirement and Acceptable Macronutrient Distribution Ranges. She gave an overview of the macronutrient recommendations by the World Health Organisation (WHO), the European Food Safety Authority (EFSA), as well as Dietary Reference Intakes (DRIs) from USA and Canada. Prof. King shared her opinion that the general structure for establishing nutrient recommendations needs to be reconsidered and that the current macronutrient recommendations should aim to meet nutrient requirements as well as reduce the risk of chronic disease.

However, she highlighted that there are challenges in setting recommendations for reducing chronic disease risk, as more than one nutrient may be involved. The relationship between the disease and the nutrients can be diverse, and a single food substance may influence more than one chronic disease. The risk also varies with disease, nutrient and population. Nonetheless, these are necessary steps to move forward with macronutrient recommendations, as the prevalence of chronic diseases are increasing globally. Prof. King concluded that enhanced understanding of the link between food intakes and chronic disease risk will lead to new ways to reduce the disease burden.

In the next presentation, Emeritus Prof. Geok Lin Khor, Universiti Putra Malaysia, Malaysia, then gave an overview of the Macronutrient Requirements in Southeast Asia. In particular, she focused on protein requirements of infants and young children among selected countries in Southeast Asia. Updates on protein requirement of Indonesia (2014), Philippines (2015), Vietnam (2016) and Malaysia (2017), with emphasis on age 0-18 months was shared. She also shared the Acceptable Macronutrient Distribution Ranges (AMDR) references for protein, total fat and carbohydrates in Philippines.

Emeritus Prof. Khor highlighted the health implications from insufficient protein intake, namely stunting among young children in Southeast Asia, which has been the main form of malnutrition in children.
below five. Some challenges in addressing the high prevalence of stunting in children include information gaps on dietary intake of children meeting the recommended quantity and quality of protein, as well as the application of Acceptable Macronutrient Distribution Ranges (AMDR) of other macronutrients in improving nutritional status of young children. Furthermore, recommendations of nutrient requirements are not available in some countries, indicating that a harmonization effort might be required for macronutrient requirements in Southeast Asia.

**Macronutrient Intakes in Southeast Asia**

Following the Opening Session, the 1st Plenary Session saw presentations by official representatives from six Southeast Asian countries, and South Korea.

**Indonesia**

Dr. Astuti Lamid from the Ministry of Health, Indonesia, presented and reported that protein intake increased with the increase in age and subsequently decreased among the elderly in Indonesia. Fat intake was the highest among school children and adolescents, and the intake decreased in adulthood and among the elderly. Carbohydrate intake was approximately the same among all age groups. Dr. Lamid also shared that the main sources of fat were from meat, oil or fat, eggs and milk, while the main sources of carbohydrates were from cereals and tubers.

**Singapore**

Ms. Melissa Koh from the Health Promotion Board, Singapore explained that between 1998 and 2010, the average caloric intake of Singaporeans increased by more than 20%, with meals eaten outside the home responsible for 75% of the increase. However, dietary quality has deteriorated. Adults in Singapore consumed proportionately more dietary energy in the form of carbohydrate (52.1%) than fat and protein (31.4% and 15.3% respectively). Most of the carbohydrates consumed are refined carbohydrates, mainly from refined starchy staples such as white rice. Saturated fat is increasingly replacing unsaturated fat as the main source of fat intake, and a clear trend was observed that intake of protein decreases with increase in age.

intake of Malaysian adolescents was 1508 kcal per day and the estimated energy contribution by macronutrients among Malaysian adolescents was 51% from carbohydrate, 16% from protein and 33% from fat. For adults, MANS 2014 reported that Malaysian adults consumed an average of 1466 kcal per day, while the percentage of total energy contributed by macronutrients was 55% from carbohydrate, 16% from protein and 29% from fat. He concluded that the findings showed deviation of intake from the Malaysia Recommended Nutrient Intake (RNI 2005) of 55-70% carbohydrate, 20-30% fat and 10-15% protein.

**Philippines**

Dr. Cecilia Cristina Santos-Acuin from Food and Nutrition Research Institute (FNRI), Philippines, reported that carbohydrates, particularly cereals, were the dominant contributors to energy intake in all age groups in Philippines. Fat intake was mostly from milk among the young children, and meat and meat products among older children and adults. The highest contributor to protein intake in all age groups was cereal and cereal products, indicative of staple-dependence. Fish was the second most common source of protein among older children and adults, while milk and milk products were second for young children. Dr. Acuin also shared the Philippine Dietary Reference Intakes (PDRI, 2015), which had some differences with the WHO/FAO dietary macronutrient recommendations. Energy distribution ranges are lower for protein and fat to allow for higher carbohydrate intakes that are expected in high rice-consuming populations. She emphasized a need to harmonize dietary recommendations, at least at the regional level, to provide coherence and minimize confusion in interpreting dietary adequacy.

**Thailand**

Prof. Warapone Satheannoppakao, Faculty of Public Health, Mahidol University, Thailand shared that an increase in the amount of carbohydrate consumed was observed among the population in Thailand, along with increasing age. However,
carbohydrate consumption decreases after the age of 70 years. Excessive protein intake was observed in younger age groups (1-3 & 4-5 years old). The intake of protein was observed to decrease with advancing ages. A tendency of rising fat intake was noted among females aged up to 12 years old, and males aged up to 18 years old. A continuous decrease in fat intake followed after these age groups. Prof. Satheannoppakao concluded that though energy distribution from macronutrients differed across age groups, the intake remained in the recommended range. There was also variation in the main food sources of macronutrients across gender and age groups.

**Vietnam**

Prof. Le Bach Mai from National Institute of Nutrition (NIN), Vietnam, reported that according to the General Nutrition Survey and the National Nutrition Survey in 2010, there was a reduction in intake of some food groups such as rice, potato and tubers, as well as sauces. On the other hand, there was an increased intake of other food groups, namely animal-based foods, fats and oil, as well as beans. The mean energy intake of Vietnamese people reached 1,925kcal per capital per day in 2010. Animal protein intake accounted for 38.5% of the energy intake. Energy derived from dietary lipid has increased from 6.0% to 17.6%. Overall food intake is more balanced in terms of quality and there were little changes in the intake of some food groups including fish, aqua-products, peanut, sesame, and vegetables. Prof. Mai added that due to the double burden of malnutrition prevalent in Vietnam, it is important to develop and disseminate the appropriate food-based dietary guidelines, as well as develop an appropriate policy to increase the consumption of some food groups, such as fish, soya-bean and vegetables.

**South Korea**

The final speaker for the session was Prof. Oran Kwon from Ewha Womans University, South Korea. She shared on the Development of Macronutrient Requirements: Evidence-based Approach, Korean Experience. Prof. Kwon explained that the 2015 DRI report was released by the Korean Nutrition Society with new recommendations for healthy individuals on macronutrients and micronutrients. This report included the standards for energy, fats, fatty acids and cholesterol, carbohydrates, total and added sugars, and fiber, protein and amino acids, as well as water. For each nutrient, a corresponding DRI framework was developed to ensure transparency of the decision-making process and to make appropriate scientific judgments in the face of limited data. The results from several different types of studies, including experimental, epidemiologic, and clinical, were used to determine DRIs for individual nutrients. An equation was used to derive Estimated Energy Requirement (EER) based on individual characteristics including levels of physical activity. The DRIs for the macronutrients are presented as Recommended Dietary Allowances (RDAs) for protein and amino acids, Adequate Intakes (AIs) for fibre and water, as well as Acceptable Macronutrient Distribution Ranges (AMDRs) for carbohydrates and fats. Recommendations were made after considering both nutrient inadequacies and excesses, with a focus on the risk reduction of chronic diseases.

**Protein Requirements and Health**

Dr. Christopher McGlory, McMaster University, Canada, spoke on the Optimal Protein Quality and Consumption for Healthy Living: Beyond the RDA. He explained that while current RDA for protein intake in healthy adults is 0.80 g per kg per day, there are situations in which higher protein intakes may be necessary to fulfil optimal adaptive responses, specifically in skeletal muscle. Age and acute exercises alter the protein requirements for a maximal muscle protein synthesis response, and hence older adults would require more protein. Dr. McGlory recommended the protein level of 1.0-1.2 g per kg per day for healthy individuals above 65 years and 1.2-1.5 g per kg per day for individuals with acute or chronic diseases. He also shared that whey protein is superior for stimulating muscle protein synthesis as compared to casein and soy. Dr. McGlory then highlighted that there are no data that causatively link higher protein diets to renal malfunction and disease in healthy adults, on the contrary to many beliefs.

The next presentation on Higher Protein Diets for Metabolic Health was presented by Prof. Manny Noakes, CSIRO Food and Nutrition Flagship, Australia. Research have shown that chronic consumption of nutritionally-balanced higher protein diets are more favourable for change in body fat composition, mitigation in lean mass loss and greater satiety, lower food cravings as well as longer term weight loss maintenance. Prof. Noakes shared CSIRO’s Higher Protein Diet, which consisted of 3 servings of dairy products, up to 100g of chicken, fish or eggs for lunch, and 200g of meat, chicken or fish for dinner. She added that while there are evident benefits of higher protein dietary patterns, unanswered questions remain which
include the lack of data for protein requirements in non-Caucasian populations, challenges to achieve higher protein intake in vegan and vegetarian populations, as well as whether it is net protein or protein to carbohydrate ratio that is important to achieve metabolic outcomes.

Dr. Shuichi Machida, Juntendo University, Japan focused on protein intake for sarcopenia in his presentation, The Role of Dietary Protein in the Sarcopenia of Aging.

He shared that while the causes of sarcopenia are multifactorial, a sedentary lifestyle and inadequate protein intake are two major contributing factors. Skeletal muscle protein synthesis is highly responsive to anabolic stimuli, such as protein ingestion, in healthy young adults, but decreases as one ages, leading to age-related muscle mass loss. Protein ingestion in the form of free amino acids or milk, soy, or meat proteins strongly stimulates skeletal muscle protein synthesis. Whey protein generally contains a higher concentration of essential amino acids than other protein sources and is more rapidly absorbed. Dr. Machida also emphasized that resistance-type exercise training is the most effective non-pharmacological intervention for preventing sarcopenia. Protein ingestion before or after exercise is required to augment post-exercise muscle protein synthesis rates and inhibit protein breakdown, resulting in a positive protein balance and net muscle protein accretion.

Shifting the focus to children, Prof. Um postpon Suthutvoravut, Mahidol University presented on Amino Acids and Protein Quality for Growth. She explained that insufficient protein intake early in life can lead to protein-energy malnutrition, poor growth, and impaired brain development. On the contrary, excessive protein intake also has adverse effects such as metabolic acidosis and bone demineralization, as well as increasing the risk of obesity later in life. Poor dietary protein quality is associated with stunting, particularly when energy intakes are marginal. In children with severe acute malnutrition, protein quality correlated with the rate of weight gain during recovery. Prof. Suthutvoravut shared that intervention studies showed that lysine-fortified wheat flour improved children's nutritional status. Dispensable amino acids such as arginine also promote growth by stimulation of insulin secretion. She concluded that improving dietary protein quality at population level can have a marked positive impact on health and the human capital.

Impact of Fat on Health Across the Lifespan
The first presentation of Plenary Session 3 was given by Prof. Barbara Meyer, University of Wollongong, Australia, on the Role of DHA in Early Life Nutrition in the First 1000 Days. She explained that during very early pregnancy, docosahexaenoic acid (DHA) is required for neural tube closure, while in later pregnancy, the demand for DHA is high for foetal neurological development. Studies have shown that supplementation with DHA is much better than supplementation with essential fatty acid alpha-linolenic acid (ALA) in order to increase both maternal and neonatal DHA levels. DHA supplementation in infants from 0 to 24 months resulted in increased cognitive function at 18 months of age. Prof. Meyer recommended that pregnant and lactating women should consume at least 200 mg of DHA per day, and highlighted that actual intakes of DHA are much lower than the recommended intakes.

Prof. Ratna Djuwati, University of Indonesia, Indonesia, presented her study on the Intake of Essential Fatty Acids among Indonesian Children. Her study generated data on the fatty acid composition of Indonesian foods and investigated dietary intake and sources of essential fatty acids in Indonesian children. Foods such as sardines and tofu have the highest omega 3 fatty acids content while peanuts and palm oil were richest in omega-6 fatty acids. However, the study found that total fat intake was below WHO recommendations in almost half of the children population, and the total polyunsaturated fatty acid (PUFA) intake was lower than WHO recommendations as well. This calls for public health initiatives to provide practical guidelines promoting consumption of PUFA, and especially for omega-3 and omega-6 rich foods.

The Emerging Science on Omega-3 was shared by Prof. Peter J Meikle, Baker Heart and Diabetes Institute, Australia. Omega-3 fatty acids may exert health benefits as the metabolites demonstrated anti-inflammatory effects, and may protect other lipids from oxidative stress. Prof. Meikle presented a targeted lipidomics platform that was developed using liquid chromatography electrospray ionization-tandem mass spectrometry to profile up to 600 individual lipid species from 10 µL plasma. This technology was then applied to multiple clinical and population-based cohorts to define the
plasma lipid profiles associated with type 2 diabetes and cardiovascular diseases. The plasma lipidomic profile will provide a detailed view of lipid metabolism and can be used to assess the effect of dietary intervention studies on metabolic health. He added that such studies may help to guide the development of dietary recommendations in the future.

Dr. Femke Hannes, DSM Nutritional Products Asia Pacific, Singapore, presented on Omega-3 Index and Health. She explained that omega-3 index is a measure of the amount of eicosapentaenoic acid and docosahexaenoic acid (EPA+DHA) in red blood cell membrane phospholipids expressed as the percent of total fatty acids. Studies have shown that the omega-3 index is a valid marker of intake and is inversely correlated with risk of primary cardiac arrest. Findings with respect to non-fatal events, however, was less clear, and a present case-control study aims to test the hypothesis that lower levels of EPA+DHA in blood cell membranes increases the risk for acute coronary syndromes. Dr. Hannes shared that on average, about 1500 mg/d of EPA+DHA is needed to raise the Omega-3 Index by 4 units in 5 months. She noted that with westernization of traditional diets there has been a sharp decline in fish intake, and hence a lower intake of EPA+DHA, which increases the risk for developing coronary heart diseases.

**Updates on Carbohydrates**

Prof. Yuan Kun Lee, National University of Singapore, Singapore spoke about Carbohydrate Intake and the Influence on Gut Microbiota. He presented the Asian Microbiome Project (AMP) which was initiated in 2009. AMP aims to build a basal microbiome database of Asians covering the entire region and age groups and gain insight into the link between dietary habit, life style, health and gut microbiota. They have identified two enterotype-like variations, each characterized by high abundance of Prevotella (P-type) and Bacteroides/Bifidobacterium (BB-type), and proposed links between type and quantity of carbohydrate and fat consumption in determining the enterotype, and possible roles of the commensal microbiota in health and diseases. Prof. Lee also shared the working hypothesis that consumption of less resistant starch will lead to an increase in bile acid in the colon, hence killing P-type microbiota and other bile sensitive species, reducing the diversity of inhabiting species. This hypothesis hence suggests the importance of consuming high resistant starch.

The final presentation, Consumption Levels and Sources of Added Sugar in Thailand: A Review of the Best Available Evidence was given by Prof. Wantanee Kriengsinyos, Institute of Nutrition, Mahidol University, Thailand. She reported that studies on children in Thailand suggested that the intake levels of sugar were between 25 to 50 g per day, while intake levels reported by studies on adults were inconsistent, though it has been shown that sugar consumption among the Thai people increases overtime. Frequently consumed sources of sugar include table sugar, sweetened beverages, as well as sweetened snacks such as traditional desserts, baked products and crispy snacks. Prof. Kriengsinyos highlighted that a frequently updated nationally representative survey using proper methodologies would be needed to monitor the levels and sources of sugar intake among the Thai population, and a multi-sectoral approach to raise awareness and consumer education should be the main strategy to reduce sugar intake.

**KEY CONCLUSIONS**

- A Panel Discussion focused on whether current macronutrient distribution and recommendations need to be reviewed and revised, given that Caucasians and Asians have very different body compositions, and the fact that requirements are different for individuals of different age groups.
- It was agreed that current research gaps should be addressed before going forward to revise the recommendations.
- Biochemical markers and other emerging technologies may help to address data gaps on the intake and dietary sources of macronutrients in the Southeast Asian region.
- It was suggested that the revision of recommendations should start with the most critical nutrients, targeting epidemiological health outcomes such as the obesity epidemic.
Nutrition and Food Safety in ASEAN

In recent years, there have been many emerging issues surrounding agriculture, nutrition and food safety. These issues concern not only the government sector and industry, but also the general public. In conjunction with its Annual Meeting 2017, ILSI SEA Region organized a Scientific Forum on Nutrition and Food Safety – Perspectives & Challenges for ASEAN, held on April 11, 2017 in Jakarta, Indonesia.

Health Development Agenda for ASEAN

Dr. Ferdinal Fernando, Assistant Director & Head of Health Division, ASEAN Socio-Cultural Community Department, ASEAN Secretariat, Indonesia, gave an Overview of ASEAN Post-2015 Health Development Agenda. He shared the ASEAN Socio-Cultural Community (ASCC) 2025 blueprint, which comprises of 5 characteristics and 18 key result areas, and highlighted that 42 out of 109 corresponding strategic measures were health-related. He also revealed the 4 key clusters under the ASEAN Post-2015 Health Development Agenda (APHDA) for 2016 to 2020 with a total of 7 goals and 20 health priorities such as prevention and control of non-communicable diseases (NCDs); promotion of good nutrition and healthy diet; and promotion of healthy and active ageing.

Activities that are being planned for under ASEAN Health Cluster 1 on promoting healthy lifestyle are important in establishing ASEAN nutrition surveillance system and to ensure policy and program coherence among relevant ASEAN sectors to promote good nutrition. For ASEAN Health Cluster 4 on enhancing food safety, Dr. Fernando commented on the need for multi-sectoral endorsement and collaboration by health, agriculture and trade sectors to work on the ASEAN food safety policy, ASEAN food safety regulatory framework and to operate the ASEAN Risk Assessment Centre (ARAC) for Food Safety.

Nutrient Density and Health Impact

A presentation on The Importance of Nutrient Density and Its Impact on Health was presented by Prof. Jeyakumar Henry, Director, Clinical Nutrition Research Center, Singapore. The global concern that people are consuming “energy-rich” but “nutrient-poor” foods has been implicated in the rising ethology of obesity, diabetes and chronic diseases. Helping consumers make informed choices in the selection of healthy foods has become an increasingly important public health strategy worldwide. Prof. Henry highlighted the potential ONE ILSI project on “Nutrient Density” which will be led by ILSI Europe. The project will focus on better understanding on how to use nutrient profiling approach for whole diets in order to ensure sufficient nutrient density.

Nutrient profiling is the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health. It requires information including nutrient composition of different foods, a set of dietary reference values, an algorithm to calculate “positive and negative nutrients”, and consensus on the best method in using it. Prof. Henry shared an algorithm developed by Dr. Adam Drewnowski, which comprises 9 types of nutrients to encourage in diets and 3 types of nutrients to limit, and noted several unique challenges when using the nutrient density concept in Asia. This includes the relevancy of the 9 nutrients to Asia, a diverse nutrient requirement profile, lack of detailed food composition data and precise data on food consumption patterns in Asia.

Prof. Henry concluded the presentation with a positive outlook noting that the collective expertise and experience of experts in this region can enhance the use of this concept to improve the health and well-being of the consumer.

Total Diet Studies in Indonesia

Next, Dr. Siswanto, Director of the National Institute of Health Research and Development (NIHRD), Ministry of Health, Indonesia, presented the results of the Total Diet Studies 2016 Indonesia. This national scale research conducted by NIHRD measured the nutrient intake and adequacy using Individual Food Consumption Survey (IFCS), and estimated the risk of contaminant exposure of its population using a Risk Assessment of Chemical Exposure (RACE). Results showed that Indonesians had a lower intake of fruits and vegetables, milk and water while having a higher intake of salt, sugar and fats. There was also inadequate protein intake across all age groups.

Dr. Siswanto reported that results from RACE showed that pesticide residues, commonly found in vegetables, were within safe limits though there is potential risk in exceeding the limits. In addition, exposure of heavy metals such as lead, cadmium, arsenic and mercury in food, and food additives such as saccharin, cyclamate, benzoate...
and tartrazine, were also investigated through RACE and were found to be within safe limits. Dr. Siswanto also emphasized on the need to reduce aflatoxin contamination in food products such as corn and peanuts by improving post-harvest processes.

**Detection of Contaminants in Food**

Dr. Daniel Hammer, Head of Nestle Quality Assurance Center, Singapore, gave a presentation on **Analytical Methods – Recent Advances in Detection of Contaminants in Food**. He shared that contaminants risk management involves having targeted surveillance plans, quality check activities at the right location and using adequate methods to ensure proper execution. Two examples of recent developments were given: elemental analysis and mycotoxins. He cited the current use of Inductively Coupled Plasma/Mass Spectrometry (ICP-MS) in AOAC 2011.19 as the gold standard for detecting trace elements. For mycotoxins, the current High-Performance Liquid Chromatography-Mass Spectrometry-Mass Spectrometry (HPLC-MS-MS) uses more robust stable isotopes QuEChERS and IAC methods which are in line with legislation criteria. While these methods are constantly being improved, it takes a long time to standardize them.

Dr. Hammer stressed that more effort is needed on methods alignment within the analytical community of industry, academia, 3rd party labs and authorities. He suggested that alignments at a global level can happen through initiatives such as SPIFAN driven through AOAC, and at regional level, more should be done to align on critical methods, promote state-of-the-art equipment and challenge method performance.

**New Food Technologies**

In her presentation on **Public Perceptions and Communication Strategies on New Food Technologies**, Dr. Shirley S. Ho, Associate Professor & Assistant Chair (Faculty), Wee Kim Wee School of Communication and Information, Nanyang Technological University, Singapore, noted that the development and use of nanotechnology in the food industry (nano-food) has grown steadily. While visions for nano-food suggest that the applications will improve quality and safety, there are also potential health risks coupled with difficulty in assessing low-dosage nanoparticle risks. To evaluate how people make decisions about nano-food based on their attitudes toward nano-food applications and their intention to purchase nano-food, Dr. Ho's team had conducted a survey in Singapore using a sample size of 1000 adults. This survey was also used to evaluate the roles of two major concepts, threat and coping appraisal, based on protection motivation theory (PMT). PMT was used to explain and predict the effects of potential threats on health attitudes and behaviors.

Results showed that PMT concepts are the most influential factors in shaping purchase intentions of nano-food, and that attitudes toward nano-food are best predicted by value predispositions about science and technology. In addition, value predispositions of science and technology coupled with threat- and coping- appraisal are the best indicators for evaluating how the public make sense of emerging technological products that are uncertain in their risk-profile.

Based on the results, Dr. Ho suggested that communication practitioners could enhance public acceptance of nanotechnology-enabled food products through more effective information dissemination strategies. She also urged scientists to play a more active role in communicating their research findings on nano-enabled food products to the public and educating them in the area.

**Innovations in Agriculture**

Dr. Andrew Roberts, Deputy Executive Director of ILSI Research Foundation, USA, presented on **Risk, Reward and Regulation: Understanding the Future of Agricultural Innovation through the Lens of the Past**. Dr. Roberts noted the controversial issues present around the genetically-engineered (GE) plant technology, such as the potential impacts of the technology on human health and the environment.

He illustrated the current agricultural challenges which included climate change, decline of crop yields, pest and disease threats, food prices volatility etc, and presented a list of modern agricultural innovations to solve these challenges. However, he noted that GE and genetically modified (GM) plants are subject to much more regulation than conventionally bred plants. Dr. Roberts highlighted the importance of risk communication and understanding the role of science in informing public policy. He remarked that scientists should not mix up research interest with regulations, as having interesting projects and generating more data may not be the solution to every problem. Instead, he encouraged the development of more innovative solutions without prejudice to the development process.

With these presentations, a snapshot of some current issues and challenges facing the ASEAN region were shared and discussed. In concluding the scientific forum, Mr. Geoffrey Smith, President of ILSI SEA Region, thanked the distinguished speakers for their interesting presentations as well as the audience for attending the event.
Maternal Diet and Nutritional Status in Southeast Asia

In 2014, the World Health Organization (WHO) published a report on Trends in Maternal Mortality: 1990 to 2013, reporting that the maternal mortality ratio in Southeast Asian countries was 140 per 100,000 live births, and that the number of maternal deaths in 2013 alone was 16,000. The rates are alarmingly high in Southeast Asia for women of reproductive age from 15 to 49 years old. In countries where teenage pregnancy is on the rise, the mortality rates of pregnant adolescents are also increasing.

Maternal malnutrition may lead to high mortality rate among mothers, and impact on birth outcomes. It is thus important to achieve optimal maternal nutrition for the survival of both the mother and child.

Focusing on the issue of maternal nutrition, ILSI SEA Region organized a 1-day ‘Seminar on Maternal, Infant and Young Child Nutrition’ on July 24, 2017 in Bangkok, Thailand. The seminar aimed to provide updates on dietary intake and nutritional status of women of reproductive age (15-49 years) in Southeast Asia; identify intake deficiencies, excesses and nutritional status (eg. anemia) during pregnancy and lactation in the region; and share updates on dietary interventions to improve maternal intake and nutritional status in relation to birth outcomes as well as infant and young child nutritional status.

Maternal Diet and Related Outcomes

Dr. Parul Christian, Bill and Melinda Gates Foundation, USA, gave the opening address on Maternal Nutrition – Dietary Intakes and Related Outcomes. She emphasized that maternal undernutrition and micronutrient deficiencies have been a significant problem in public health that has led to adverse consequences for both maternal and new-born health outcomes in low and middle-income countries (LMIC). Stunting BMI, and inadequate weight gain during pregnancy continue to be major factors leading to Low Birth Weight (LBW) and Small for Gestational Age (SGA). In addition, dietary quality and diversity are chronically poor in these countries and major data gaps on maternal diet exist.

Dr. Christian also explained that guiding principles for Behavior Change Communication (BCC) interventions to improve nutrition during pregnancy is required, to improve weight gain and intake of foods rich in micronutrient needs. Evaluation of their impact on maternal and birth outcomes is also required. She suggested that countries could come up with proper nutritional counselling strategies for pregnancy and it could be based on food intake using simple Food Frequency Questionnaires (FFQ). In addition, monitoring and advice on weight gain could be given, while promotion of antenatal care and supplement use, and reduction of strenuous work could also be considered.

Maternal Diets and Nutritional Status in SE Asia

Cambodia

Dr. Mary Chea from the Ministry of Health, Cambodia, shared that generally, the nutrition status and micronutrient deficiency of women aged 15-49 has improved in Cambodia. However, wasting, overweight, anemia, Vitamin D deficiency and Vitamin B9 deficiency are still on-going public health concerns in Cambodia. She also highlighted the lack of data on maternal micronutrients intake and emphasized that limited resources and dietary data constitutes the main challenges for the successful implementation of programs to reduce micronutrient deficiency and promote maternal and child health.

Laos

Dr. Bounthom Phengdy from the Ministry of Health, Lao PDR, shared that 20% of maternal deaths were due to malnutrition and 31% of women of reproductive age and 60% of pregnant women...
are suffering from anemia in the country. While the Maternity Mortality Ratio (MMR) decreased from 905 to 206 per 100,000 deaths from 1990 to 2015, the MMR is still relatively high, and more significant in rural areas. Dr. Phengdy then shared that the government’s priorities for 2017 include ensuring adequate and appropriate resources for the community, as well as continue to promote early and exclusive breast feeding and appropriate complementary feeding, micronutrient supplementation for women and children, and cooperate with other sectors such as education and agriculture sectors to ensure food security.

**Malaysia**

Prof. Zalilah bt Mohd Shariff from Universiti Putra Malaysia, Malaysia presented the maternal intake and nutritional status data from the Malaysian Adult Nutrition Survey (MANS 2014), Malaysian School-Based Nutrition Survey (2012), the Maternal and Child Health Survey (MCHS 2015) and other relevant smaller scale research studies. She shared that overweight and obesity are more prevalent than Chronic Energy Deficiency (CED) among non-pregnant and non-lactating women (18-49 years). Low birth weight was reported at 9.7% with a much higher prevalence in pre-term than full-term infants.

Prof. Zalilah also pointed out that there is limited data on pregnant and lactating women from 15 to 19 years of age. There may be under-reporting on the dietary intake, and the use of other diet quality analysis such as dietary diversity, dietary pattern and energy density is also limited. She also highlighted that there may be a lack of data on micronutrient deficiency as some of the medical conditions such as anemia during pregnancy is self-reported in the surveys.

**Myanmar**

Dr. Moh Moh Hlaing from Ministry of Health and Sports, Myanmar, presented on the maternal dietary intake in Myanmar and shared intake data from 2 cross-sectional community-based studies in different provinces. The mean caloric intakes of pregnant women in urban and rural area were 95.6% of RDA and 86.9% of RDA respectively. Dr. Hlaing also presented the nutritional status of pregnant and lactating mothers from the Myanmar Demographic and Health Survey, 2015-2016, where the prevalence of anemia was 57% among pregnant women and 48% among lactating women. She added that the Ministry of Health and Sports provides Vitamin A supplements to postpartum women within 42 days of their delivery, iron supplements and deworming tablets to pregnant women as well as Vitamin B1 supplementation to all pregnant women starting from last month of pregnancy till 3 months after delivery. Fortified rice was also introduced in Myanmar since April 2017.

**Philippines**

Next, Dr. Marina Vargas presented data on maternal dietary intake and nutritional status from Philippines 8th National Nutrition Survey (NNS2013). The energy intake of Filipino women of reproductive age (WRA) was inadequate, of which only 20% of the non-pregnant, non-lactating adults met the recommended kilocalories. A much lesser intake was noted for the non-pregnant, non-lactating adolescents. In terms of nutritional status, Dr. Vargas shared that thinness was more prevalent among non-pregnant, non-lactating adolescents, while overweight and obesity was high among non-pregnant, non-lactating adults. Pregnant adolescents were more nutritionally at-risk than adult pregnant women. Iron deficiency anemia, Vitamin A deficiency and Iodine deficiency were more prevalent among pregnant and lactating women as well. She concluded that there is a need to address maternal malnutrition in the Philippines to reduce maternal mortality and morbidity and in turn reduce undernutrition and mortality risk among Filipino children.

**Thailand**

Dr. Tippawan Pongcharoen, Institute of Nutrition, Mahidol University, Thailand, summarized that the 5th Thailand National Nutrition Survey (NNS) conducted in 2003 and the 4th Thailand National Health Examination Survey (NHES) conducted in 2008 to 2009 showed similar energy intake which...
ranged from 1116-1342 kcal/day. However, energy distribution for fat and protein had increased. Prevalence of anemia in Thailand increased to 30% in 2014 while obesity rates also increased significantly, comparing data in 2003 and 2014. She also noted that there were no data on dietary intake and nutritional status of pregnant and lactating women from the NHES.

Data from a few small scale studies conducted during 2006 to 2015 showed that the energy intake of pregnant women in both urban and rural areas ranged from 1469-1850 kcal/day, while energy intake of lactating women ranged from 1268-1737 kcal/day. Dr. Pongcharoen highlighted that the methods used to assess dietary intake as well as the indicators and references used to classify malnutrition in each survey or study may not be the same, and concluded that good quality and national representative data on dietary intake and nutritional status of WRA as well as pregnant and lactating women should be a concern.

Vietnam
The results of the General Nutrition Surveys (1990, 2000 and 2010) in Vietnam were shared by Prof. Le Thi Hop, Vietnam Nutrition Association, Vietnam. She shared that food intake is more balanced in terms of quality, and the mean energy intake of Vietnamese people have reached 1925 kcal/capital/day in 2010 while the animal protein intake was 38.5%. Prof. Hop also reported on smaller scale studies in different provinces of Vietnam. Almost all women were deficient of calcium, iron and vitamin D in Phu Tho province while 64.7% of urban and 71.1% of rural women in Hanoi had low calcium intake. While there were slight improvements, micronutrient deficiencies remained a public health problem in Vietnam. The General Nutrition Surveys 2010 showed that the prevalence of anemia among women of reproductive age was 28.8%, and 36.5% of pregnant women were anemic. The results from the national survey 2015 showed that anemia was prevalent among 25.5% of women of reproductive age and 32.8% for pregnant women. The national survey in 2010 and 2015 showed that prevalence of zinc deficiency among women of reproductive age were 65% in 2010 and 63.6% in 2015 as well.

Dietary Interventions and Case Studies

Multiple Micronutrient Intervention
Dr. Parul Christian highlighted that multiple micronutrient deficiencies are common in many LMICs, and yet the use of micronutrient supplements remains low. On the other hand, women in high income countries routinely used a one-a-day prenatal supplement during their pregnancies. She shared the robust evidence available that show that Multiple Micronutrient Supplementation (MMS) enhances birth outcomes over and above Iron-Folic Acid (IFA) supplementation, which has been known to improve fetal growth and reduces low birth weight. Hence, she suggested that replacing IFA with MMS should be considered in contexts where appropriate, given that the World Health Organization (WHO) currently does not recommend its use. Dr. Christian shared that some considerations include background levels of micronutrient deficiencies as well as the cost and supply chain. Countries in Southeast Asia are well poised to consider this change and integrate the multiple micronutrient intervention into other maternal nutrition and antenatal care programs, such as dietary counselling in low and middle income countries.

Maternal Dietary Intake in Malaysia
Next, Dr. Hamid Jan Bin Jan Mohamed, Universiti Sains Malaysia, Malaysia, shared selected findings on maternal nutrition and birth outcomes from the
USM pregnancy cohort study. While 94% adults in Malaysia do not achieve WHO recommendations for 5 servings intake of fruits and vegetables daily, according to Malaysia National Health and Morbidity Survey, the USM study found that higher intakes of fruit and vegetables during pregnancy exerts beneficial effects on fetal growth and subsequent health outcomes. The study also found that higher intakes of sugar and sodium exert detrimental effects on fetal growth, which may result in long term health consequences for the children.

An increase in maternal adiposity and poor lipid profile was also found to be associated with oxidative stress markers during pregnancy. Dr. Hamid shared another interesting finding, where maternal serum and breast milk vitamin D levels were studied. The study suggested that maternal vitamin D status during mid gestation is potentially affecting vitamin D level in breast milk at delivery and thereby, influencing vitamin D status of the breastfed infants in their early life. He concluded that during pregnancy and lactation, mothers should aim to achieve improved fruits and vegetable intake, limit confectionaries and condiments intake, adequate antioxidants status, and improve vitamin D status.

Conclusions
The seminar concluded with a panel discussion, chaired by Emeritus Prof. Corazon Barba from University of the Philippines Los Baños, Philippines. Prof. Barba highlighted the challenges and limitations with regards to dietary data among countries in the region, which include inaccuracy, lack of quality, and lack of recent data. While many experts or researchers may want to conduct more studies, it would be good to recognize these challenges and limitations. Prof. Zalilah agreed, and shared that there were many challenges from collecting data to analysis. Prof. Hop also shared that when conducting studies in rural areas, the subjects interviewed may be illiterate, and hence the interviewers can only get an estimated amount.

The panel agreed and recognized that there may not be a single solution for inaccurate or lack of dietary data, especially on women of reproductive age. It is important for each individual study group to identify the steps along the way where errors may occur.
Nutrient Profiling: A Tool for Healthier Food Choices

The rate of overweight, obesity and non-communicable diseases (NCDs) is increasing rapidly all over the world. In response to this problem, a growing number of industries, non-governmental organizations, and government agencies around the globe have taken the initiative of creating their own nutrient profiling model based on nutrient criteria for different food categories.

Nutrient profiling systems aim to promote healthier food choices through improved product formulation or product re-formulation. Nutrient profiling could also be useful as a basis for nutrition labeling, as in the formulation of FOPs, and as a tool in consumer education and promoting behavior change among the consuming public. Nutrient profiling could be applied in the formulation of healthy recipes, and could help in encouraging healthier diets.

While there have been some attempts to arrive at a nutrient profiling system for the Philippines, debate as to what system to use continues. In response to the need for discussion on this topic, the ILSI SEA Region Philippine Country Committee organized the symposium “Nutrient Profiling: A Tool for Healthier Food Choices” on April 20, 2017, in Novotel Hotel, Quezon City, the Philippines.

The symposium examined the science of nutrient profiling, its uses and applications; provided an avenue to share Philippine attempts and experiences in nutrient profiling; discussed regulatory issues related to nutrient profiling; and explored opportunities for the formulation of a nutrient profiling system in the country.

Dr. E-Siong Tee, member of the Board of Directors of ILSI SEA Region, gave an overview of nutrient profiling, together with its various uses and the science behind it. Dr. Tee discussed the key elements of nutrient profiling schemes and the different schemes developed in other countries. He pointed out that front-of pack (FOP) schemes may be based on a criteria following the established algorithm or they may be simply fact-based. He reported that Codex Alimentarius intends to discuss issues regarding FOP nutrition labeling. Finally, he emphasized that no one single internationally accepted scheme exists that is applicable or suitable for all countries.

Next, Dr. Celeste C. Tanchoco, Assistant Country Coordinator of ILSI SEA Region Philippine Country Committee, provided a background of the Philippine initiatives on nutrient profiling. She discussed the Wise Eat program initiated by the Nutritionist Dietitians of the Philippines and the results of the pre-testing of a proposed Wise Eat logo for a FOP label for processed foods. To date, however, debates still continue on what nutrient profiling system to adopt and on the choice of an FOP logo.

A Panel Discussion on the application of nutrient profiling followed. Dr. Ma. Leonora Francisco, University of the Philippines discussed their exploratory study to assess the effectiveness of
the different nutrition labeling formats to help consumer make healthy food choices. The formats tested included Nutrition Facts, GDA, Health logo, and Traffic Light. The test criteria included their ease of being understood, credibility, and perceived healthiness. It was found that the Health logo, with or without the GDA, was apparently the most effective.

Dr. Francisco’s presentation was followed by Ms. Jiang Yi Fan of Food Industry Asia who focused on the global and Asian landscape of the application of nutrient profiling on FOP labeling. She concluded that FOP nutrition labeling should be science- and fact-based, objective, and non-discriminatory, and should not be a barrier to trade.

Dr. Susan Kevork, Nestlé R&D Center Singapore presented the Nestle Nutritional Profiling System (NNPS) which has been applied across Nestlé’s product portfolio since 2004 to guide the reformulation of products and the development of new products. Dr. Kevork said that the NNPS is no longer just an internal system but is now publicly and scientifically endorsed. She illustrated how NNPS drives product innovation in many countries, including the United States as well as the Philippines. Dr. Leila Africa, University of the Philippines Los Baños presented a software which can be used for recipe development. Using the software, one can determine whether the recipe passes or fails on a particular nutrient criterion.

Dr. Maria Victoria D. Pinion, Center for Food Regulation and Research, Food and Drugs Administration Philippines, concluded the Panel Discussion by first reviewing the Revised Rules and Regulations governing the labeling of pre-packaged food products and the guidelines on the use of nutrition and health claims. She gave examples of misleading and prohibited claims, and concluded by presenting the regulatory issues on nutrient profiling, such as selection of nutrients to be included, the basis for the choice of thresholds, and the use of scoring algorithms. An important issue is the need for standard format and policy among ASEAN countries in the face of regionalization.

The open forum that followed centered on concerns regarding the proposed software to help in recipe development, the NRV to use, and the application of Nestle’s NNPS. Mention was made that the Philippines is one of the participants to the development of WHO Western Pacific Region on Nutrient Profiling, and there are plans to adapt the WPRO model in the Philippines as a tool for eventually marketing healthy food and beverages for children. Finally, caution was expressed on the criteria to use in nutrient profiling and the basis for algorithms. As people eat a whole diet rather than single foods, the approach should be fact-based rather than criteria-based.

In synthesizing the symposium, Ms. Angelina Miles, former chairman of the ILSI SEA Region Philippine Country Committee, summarized what was learned and discussed about nutrient profiling, its uses and applications, and industry’s nutrient profiling systems. She concluded with a challenge for government, academia and the food industry to work together in coming out with a nutrient profiling system as a tool for healthier food choices fit for the Philippine population. To conclude, Ms. Miles thanked the speakers for their excellent presentations, and the participants for their attendance and participation at the symposium.
Food Additives: Scientific Processes and Regulatory Development

The seminar series on Food Additives: Perspectives on Scientific Processes, Regulatory Development and Impact of Changes was organized by the United States (U.S) Foreign Agricultural Services (FAS), and ILSI SEA Region in Hanoi, Vietnam and Jakarta, Indonesia on July 11 and 13, 2017 respectively. The Vietnam Food Administration (VFA) was also a coorganizer for the seminar held in Vietnam. This series of seminars is a continuous initiative, building up on past programs held in Vietnam and Indonesia.

The seminars shared international and US approaches and processes on food additive (FA) safety assessment, partnership in regulatory development and harmonization, as well as risk communication. The seminars were attended by food regulatory personnel, key researchers, and industry representatives in both countries.

Establishing Intake Levels
Dr. Xudong Jia, Director of Laboratory of Toxicology, China National Center for Food Safety and Risk Assessment, shared details on the Process and Considerations in Establishing the Acceptable Daily Intake (ADI) for Food Additives from an International Perspective. He discussed the process that the Joint FAO/WHO Expert Committee on FA (JECFA) takes to establish ADI for substances that are intentionally added to food such as FA. He explained the concept of ADI, and explained the three types of ADI status that can be implied for a substance by JECFA: ADI “not specified”, Temporary ADI, and group ADI.

In Hanoi, Mrs. Nguyen Thi Phuong Lan, Vice Chief of the Standard and Testing Management Division, VFA, Ministry of Health Vietnam presented on Procedures and Requirement for the Approval of Food Additives in Vietnam. Mrs. Lan shared Vietnam’s current regulations on FA, and introduced the different circular relevant to FA management, declaration of conformity to technical and food safety regulations, inspection of imported FA, food safety conditions for production and business establishments and food additive labelling. Vietnam’s national technical regulations on FA (categorized by functional groups) are in conformance with JECFA standard and serve as the basis to establish the standard for FA.

In Jakarta, Dr. Tepy Usia, the Director of Food Product Standardization, National Agency for Drug and Food Control (BPOM) presented the topic on Procedures and Requirement for the Approval of Food Additives in Indonesia. He shared that food additives usage depends on the risk assessment performed by BPOM, which is based on Codex Alimentarius Risk Analysis framework, with reference to JECFA and other scientific experts’ reviews. Food additives regulation in other countries, exposure assessment data, and consumer perceptions are also used as references. Dr. Usia then shared the procedures and requirements for food additives approval and submission for the assessment of food additives that are not pre-approved in Indonesia.

Dr. Mitchell Cheeseman, the former FDA Office Director, Office of Food Additive Safety, Center for Food Safety and Applied Nutrition (CFSAN) presented on Procedures and Requirement for the
Approval of Food Additives in the United States. He shared the definition and approval processes for both FA and Generally Recognized as Safe (GRAS) substances. Dr. Cheeseman highlighted the importance of understanding that GRAS recognition requires the same amount of quantitative and qualitative scientific evidence as the process of food additive approval. The GRAS recognition is an industry driven process, where US FDA reviews the assessment and publically available data by the notifier but leaves the responsibility to the notifier to provide support on the safety of the substance. Upon satisfactory response from the notifier that the substance has no safety concerns, US FDA will issue a No-Question letter and a GRAS status would be granted to the substance.

Dr. Cheeseman also shared the US FDA definition on food safety standards and added that the safety evaluation review process will include all data throughout the history of use to ensure fair evaluation of data. Next, he reviewed the process for food additive approval submission, and concluded by indicating that safety decision is based on consensus and is made to protect public health within its intended use and withstand challenges from scientific, procedural and legal perspectives.

Case Examples on Exposure
Dr. Pharrunrat Tanaviyutpakdee, Assistant Professor, Institute of Nutrition, Mahidol University, Thailand reported the findings from the Study on Dietary Exposure of Sweeteners among the Thai consumers, where the Low-No Calories Sweeteners (aspartame, acesulfame potassium (Ace-K) and sucralose) were studied. Through the study, it was found that LNCS consumption by Thai consumers is mostly through soft drinks (89%) followed by coffee (6%) and energy drinks (3%). The most exposed groups for all three LNCS are aged between 3 – 39 years old. However, the exposure levels were far below the ADI. Higher risk of exposure may exist for eater only group, particularly in Ace-K for male aged 3 to 18 years old and sucralose for female aged 10 to 18 years old.

FDA Case Study on the Safety of High Intensity Sweeteners was presented by Dr. Cheeseman. He shared examples on the evaluation of Estimated Daily Intake (EDI) set by FDA for aspartame, Ace-K, sucralose and advantame. According to Dr. Cheeseman, FDA adopts the precautionary approach to determine the initial EDI and through the re-evaluation with credible supportive data, may lower the EDI (Ace-K) or maintain the initial EDI (aspartame).

Generally Recognized as Safe (GRAS)
In the absence of Dr. Manojit Basu, Dr. Maia Jack, Vice President of Science and Regulatory Affairs, American Beverage Association presented on Generally Recognized as Safe (GRAS): FDA's Final Rule and Industry GRAS. The GRAS final rule was published in 2016, and she elaborated on the submission procedure, FDA review process and possible FDA responses. Dr. Jack then presented on the topic Public Misperceptions on Preservatives: A Case Study on Benzoates. She indicated that the challenge for establishing maximum limit for benzoates is that the levels needed for benzoates to exert its functions may vary in different regions depending on the processing method and good hygiene practices. The result is that no chronic exceedance was observed at ADI level, in the worst-case scenario. The conclusion is that even at the current level of ADI (which is lower than it should have been), there is no safety concern for benzoate.

Next, Dr. Jack presented on the WHO/FAO Principles and Methods for the Risk Assessment of Chemicals in Food (EHC 240) - A Brief Overview. She explained that risk assessment procedure includes hazard identification followed by dose...
Food Safety Regulations

Dr. Jack also stood in on behalf of Dr. Basu to present on the topic of Public Private Partnership in the Development of Food Safety Regulations. She shared two case examples, one on Food Safety Modernization Act (FSMA) and another on fruit and vegetable juice colour guidance initiatives through public private partnership. FSMA is an example where the food industry, consumer advocacy groups and academia worked together with FDA by providing input, support and feedback for standard development and implementation process to FDA, and by providing educational and training tools and communications to the food industry and consumers. She elucidated that the consultative process during the public private partnership strengthened the final rules, by taking into account concerns from various stakeholders.

Dr. Dedi Fardiaz, Professor, Department of Food Science and Technology and Senior Scientist, SEAFAST Center, Bogor Agricultural University, Bogor, Indonesia presented on the topic of ASEAN - Harnessing Efforts and Lessons Learnt in Harmonization of Approaches for Risk Assessment and Approval Process of Food Additives. According to Dr. Fardiaz, food safety standard harmonization is an important step to support ASEAN growth. He added that ILSI SEA Region has been supporting the Food Safety Standards Harmonization workshop series as part of a discussion platform in the region to facilitate harmonization efforts towards Codex Alimentarius standard. Where Codex standard is not applicable or absent, the ASEAN member states (AMS) can discuss a harmonized standard, Dr. Fardiaz also introduced the ASEAN Food Safety Standard Database, where each AMS contributes towards providing information on the maximum limit for FA to be input into the database that automatically tracks the harmonization status.

Dr. Fardiaz then shared the outcome of 2 workshops on ASEAN Food Consumption Data and Exposure Assessment organized by ILSI SEA Region. During the first workshop in 2011, a framework for food safety standard had been defined by the food group and sub-food groups. During the second workshop in 2013, the finalization of common food categories for the ASEAN Food Consumption Database (FCD) was been agreed, resulting in 20 final food categories. Utilization of an ASEAN FCD can enable some countries without a national FCD to calculate exposure estimates.

Mr. Chih-Yung Wu, International Trade Specialist, USDA's Foreign Agricultural Services (USDA FAS) presented on the topic Economic and Regulatory Impact of Food Additive Changes based on case examples on artificial food colouring case examples. The concern on artificial food colouring was raised through the Southampton study on Food Colouring. Following the published study, the European Food Safety Authority (EFSA) decided to implement the requirement for warning labels on the potential adverse effect on food products containing food colouring agent. Other countries such as US, Israel, Peru, Saudi Arabia and Korea also followed suit on the food colouring regulation by either lowering of EDI level or banning the use of food colouring. The changes in the regulations have impacted the use of food colourings and left the food industry faced with either relabelling and reformulation, or not being allowed to sell their products in the market. Some countries have since re-evaluated the decision and further revised their regulations.

Risk Communication

Rounding up the seminars were panel discussions focused on the topic of Risk Communication on Food Additives in the era of Social Media. Mr. Wu shared the current trends for food companies to adapt consumer trends and demands (eg. FA, natural colouring agents and flavouring agents, clean labelling) in producing food products to meet consumers’ demand which may not be based on science. The panels of experts shared their insights on working together through public-private-partnership to address the need for science-based regulations to meet consumers’ demand and understanding on food substances.

Further, the panels suggested that communication to consumers should be factual and not provocative in nature, and should address the risk adequately through information on how the hazard affects public health and how to mitigate the hazards. Mr. Wu also shared the need for a channel for anyone to reach out to the experts from the academia, government and non-government bodies to learn about the credible scientific knowledge to address consumers’ concerns, as opposed to random website searches that may not be scientifically evidenced.
Future Prospects for an Affordable and Sustainable Food Supply

Looking to the future, the agri-supply chain faces two grand challenges: feeding a growing population, and ensuring that food is nutritious and healthy. They are grand because of their complex, multifaceted nature, involving demand and supply side drivers. On August 31, 2017, ILSI SEAR Australasia in conjunction with the American Association of Cereal Chemists International (AACCI) hosted a seminar, “Towards an Affordable and Sustainable Food Supply – Recent Advances and Future Prospects” in Sydney, Australia to discuss what these challenges mean and some of their innovative solutions.

New Agricultural Technologies and Sustainability

On the supply side, the rate of increase of crop improvement for production of food will not meet forecasted demand. Constraints on land, water and other inputs, as well evolving threats including biosecurity, climate change and social license are all production hazards. Additionally, the right type of production and processing needs to occur. While many people in the world are undernourished, there just as many who over eat. This is where supply melds into demand. Even if a sustainable, healthy and tasty product is available, consumers need to want it. Thus, solutions to these problems will need careful planning, collaboration and integration across the supply chain with health officials, government bodies, researchers, industry and consumers.

An obvious question in meeting these challenges is what do consumers want? It turns out authenticity is the latest in a growing list of consumer needs. To be authentic, a product must be what it says it is. It must be safe, of high quality and have integrity. The latter two aspects can refer to a broad range of things, including the technologies used to make a product, its origin, or its sustainability. Importantly, there must be a way to prove these qualities, for example, traceability through the supply chain or certification.

As new technologies emerge at the farm gate, how they are regulated and represented to the consumer will be critical to their profitability and success. Technologies that give yield gains may be at odds with desirable traits of authenticity. Take for instance, genetically modified (GM) crops. When these crops entered the Australian supply chain two decades ago, regulators and consumers approached this new technology with caution. Responding to this concern, legislation was passed requiring pre-market assessment and approval, as well as mandatory food labelling.

Now, even though 30 years of research has proven their safety, regulations and disapproving consumer sentiment still persist. This has generated costs up and down the supply chain; from companies developing these crops who need approvals, to the certification systems put in place by logistics companies to sell and store GM and non-GM grain.

This is why all eyes are on the regulators for the new generation of breeding techniques. Lines are being blurred between the definitions of traditional and the newer gene technology based breeding techniques. Crispr Cas-9, for example can make single base pair changes in DNA, with no foreign DNA inserted. There is no way to distinguish this manipulation from natural variation. Responding to this, Food Safety Australia New Zealand (FSANZ) and the Office of the Gene Technology Regulator (OGTR) are reviewing the regulations in regard to what techniques need pre-market approval and the definitions of gene technology as well as food produced by such technology.

It is impossible to predict how consumers will respond to new technologies. Researchers, industry and government must learn from the mistakes of the past and ensure information is communicated effectively to the public.

Regardless of how consumers and regulators respond to new gene technologies, parallel opportunities exist. Traditional plant breeding techniques are producing impressive crops. The CSIRO has recently made a gluten free, hull-less barley variety and a high amylose wheat. Advances
including high throughput screening in breeding can reduce product development time drastically for new varieties. Additionally, novel “omics” approaches and big data are helping to link genotype and phenotype to better understand plant genetics at a fundamental level.

Breeding technologies share a common goal to increase yield. However, pests, diseases and weeds reduce actual yields by 40% (this goes up to 60% when no crop protection product is used). Accordingly, achieving yields close to the potential should be a top priority. The key to this is increased research and development output and ensuring growers use best practice. One new practice to emerge from digital agriculture is crop surveillance, whereby a grower can monitor for disease symptoms so they can be controlled quickly. The success of such technologies will depend on access to information and grower support for their implementation. New practices may also provide value adding opportunity, if they can be marketed in ways that appeal to consumers (e.g. “greener” practices).

Food Processes & Improvements in Food Security

The post-harvest supply chain suffers considerable losses too. Food processing is an exciting area for new techniques to help minimise loss, whilst improving nutrition, maximising resource use and enhancing flavour. New technologies involving high pressure and microwave radiation are being used to make ready-made meals that don’t need refrigeration. Other pressure-based techniques are being used to make nutritious unpasteurised juices and potentially safe to drink raw milk. Fortification of milk with vitamin D and encapsulation of omega 3 fatty acids are two of many examples of food processing to improve nutrition. Processing can also optimise extraction and minimise waste, for example, using ultrasound technology to increase extraction of oil whilst minimising water use.

The developments extend beyond the processing level. New technologies are giving consumers more information at their fingertips than ever before. The new smart label database allows consumers to search product information for things such as country of origin, allergen information, product claims or traceability. Portable near infrared technologies allow consumers to obtain real time nutritional information about fresh produce, meat and dairy. These changes are allowing consumers to assess products for their authenticity and in turn may change consumer preferences.

Conclusions

Feeding everyone with the right foods are the two grand challenges whose solution will rest on how we handle and harness the unprecedented rate of technological change in the agri-food sector. New management strategies, breeding and processing technologies coordinated across the supply chain, enhanced by digital agriculture, will minimise input use and waste, whilst maximising efficiency. Demonstrating authenticity to consumers, who have ever increasing information about products, remains a challenge, and an opportunity for adding value. However, the degree of regulation on new technologies, especially for gene-related ones, may affect their profitability.

Demand side drivers appear to be the biggest risk. Consumer attitudes can make or break a new technology. Thus, proper consultation and research with consumers is paramount, and reinforces the need for integration across the supply chain.

Report prepared by Mr. Chris Baldock, University of Sydney, Australia.
Dr. Dave Roberts Award in Food and Nutritional Science

ILSI SEAR Australasia and Newcastle University, Australia have jointly established the "Dr. Dave Roberts Award in Food and Nutritional Science" to honor the contribution and commitment of Dr. Dave Roberts, following his untimely death in April 2016. He is greatly missed as one of ILSI's great supporters and friends.

Dr. Dave Roberts was a very active member of ILSI SEAR Australia's Board of Trustees, and ILSI SEA Region's Board of Directors. He had contributed significantly to ILSI SEAR Australasia's development and scientific programs over the past decade, and had also contributed to a number of programs and scientific meetings that were organized in Southeast Asia since the 1990's.

Passionate and committed to ILSI SEAR Australasia's activities in widening the scientific knowledge of the community, Dr. Roberts was supportive of younger academics and students in their professional development.

He also developed strong linkages with industry through his role as Scientific Director and Deputy CEO for Australian Food and Grocery Council (AFGC), and as a board member for Food Standards Australia New Zealand (FSANZ). These linkages proved invaluable in his role with ILSI when creating scientific agenda that were relevant and challenging to both academia and industry.

This award has been established in conjunction with the University of Newcastle, Dr. Robert's alma mater, and the inaugural award was made in April 2017 to Dr. Tracy Schumacher.

Dr. Tracy Schumacher is a postdoctoral research fellow with the Gomeroi gaaynggal (babies from Gomeroi lands) research program in rural New South Wales. This study works with pregnant Indigenous women to help find some of the answers to the development of chronic diseases in Indigenous populations. Her field of research focuses on the role that nutrition plays in the prevention of cardiovascular disease.

Dr. Schumacher was awarded a PhD in August 2016, with her thesis "Evidence-to-practice gap in the translation of dietary intake advice for the prevention of cardiovascular disease," which investigated the effectiveness of specific foods and dietary patterns in lowering cardiovascular risk factors throughout all stages of the lifespan.

ILSI SEA Region congratulates Dr. Schumacher on receiving the inaugural Dr. Dave Roberts Award in Food and Nutritional Science.
Upcoming Activity Highlights

Events

IUNS International Congress of Nutrition 2017
October 15-20, 2017, Buenos Aires, Argentina

The IUNS-ICN International Congress of Nutrition is a four yearly meeting that's been held since 1946. Its 21st edition will be based in Buenos Aires for the first time in its history. The scientific programme is designed according to the motto “From Sciences to Nutrition Security” with the aim of encouraging the exchange of knowledge in order to achieve the improvement of Nutrition Security.

ILSI Sponsored Sessions in ICN include:
- Aging Gracefully: Staying Healthy and Well Late into Life
- The Human Microbiome: Sharing Our Bodies
- Advancement of Global Food Composition Databases

The Program and more information can be found at http://icn2017.com/

Harnessing New Agriculture & Processing Technologies for Affordable and Sustainable Food Supply
November 15, 2017, Manilla, Philippines

ASEAN member states have laid out their common vision for sustainable agriculture and food security in the region through the ASEAN Integrated Food Security Framework and Strategic Plan of Action for Food Security for 2015-2020. This includes the promotion of sustainable food production such as by adopting new agricultural and processing technologies to improve productivity and efficiency, reduce post-harvest losses, address climate change, food safety as well as enhance nutrition. To facilitate understanding and knowledge dissemination, it is important that key stakeholders along the value chain and regulatory authorities gain insight on the advancement of current and future food agriculture technologies, their potential adoption and impact on the food production chain. This seminar, to be held in Manila, Philippines is the 5th in this topic series that has been held in Singapore and Malaysia in 2016, and in Australia and Indonesia in 2017.

Seminar on Drivers of Consumer Food Choices
1st Quarter 2018, Bangkok, Thailand (TBC)

The high prevalence of non-communicable diseases and their risk factors has been attributed to inappropriate food choices and a sedentary lifestyle. Promoting healthy diets and increasing physical activity have been recognized as key factors to preventing diet-related chronic diseases. A better understanding of the main determinants of food choices will facilitate the development policies and interventions to promote healthier eating patterns. This regional seminar to be held in Thailand will share insights on consumer food choices studies as well as discuss and review programmes and food regulations in promoting healthier food choices.

Research and Publications

ILSI Southeast Asia Region Conference Proceedings: The Gut, Its Microbes and Health - New Knowledge and Applications for Asia

Evidence has shown that the nutritional value of food is influenced in part by the structure and operations of an individual’s gut microbial community, and food in turn shapes the individual’s microbiome. A conference was held in Singapore on October 8-9, 2014 to promote understanding of the intestinal microbiome and its implications for health and disease, particularly among Asian populations. Selected papers from the conference and the results of a panel discussion are included in this report. The gut microbial inhabitants of Asian people differ from those of Europe and North America. Changes in traditional Asian diets have affected the gut microbiome, contributing to a shift in the region’s health burden from infectious diseases to non-communicable chronic diseases. Novel probiotic strains of Indonesian origin demonstrated significant enhancement of humoral immune response in human studies. Knowledge gaps and implications for research to further understand the Asian gut microbiome were also discussed.
# ILSI SEA Region Activities 2017-2018

## Meetings

### Food and Nutrients in Health and Disease Science Cluster

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<td>Regional Symposium on Diabetes – Current Science and Multi-Stakeholder Approaches to Prevention and Management</td>
<td>October 4-5, 2017</td>
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<td>3rd Quarter 2018 TBC</td>
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### Nutrition and Food Guidance for Public Health Science Cluster

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<td>Workshop on Food and Nutrition Labelling and Claims in Myanmar</td>
<td>November 9, 2017</td>
<td>Naypyidaw, Myanmar</td>
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<td>National Training Course on Food Composition Database - ASEAN 2018</td>
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<td>Seminar on Drivers of Consumer Food Choices</td>
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<td>10th Seminar and Workshop on Nutrition Labeling, Claims and Communication Strategies</td>
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### Food Safety and Risk Assessment Science Cluster

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<th>Date</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Training Workshop for the World Bank GFSP Food Chemical Risk Assessment Training Program</td>
<td>3rd Quarter, 2018 TBC</td>
<td></td>
</tr>
</tbody>
</table>

### Sustainable Food Systems Science Cluster

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Seminar on Harnessing New Agriculture &amp; Processing Technologies for Affordable and Sustainable Food Supply</td>
<td>November 20, 2017 (TBC)</td>
<td>Manila, Philippines</td>
</tr>
</tbody>
</table>

### Others

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
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<tbody>
<tr>
<td>ILSI SEA Region Partially-Sponsored Sessions at IUNS 21st International Congress of Nutrition (ICN)</td>
<td>October 15-20, 2017</td>
<td>Buenos Aires, Argentina</td>
</tr>
</tbody>
</table>
  * Aging Gracefully: Staying Healthy and Well Late into Life
  * The Human Microbiome: Sharing Our Bodies
  * Advancement of Global Food Composition Databases
### Meetings

<table>
<thead>
<tr>
<th>Event</th>
<th>Date/Location</th>
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<tbody>
<tr>
<td>ILSI Annual Meeting 2018</td>
<td>January 19-24, 2018 Southampton, Bermuda, USA</td>
</tr>
<tr>
<td>ILSI Southeast Asia Region Annual Meeting 2018 (25th Anniversary) and Scientific Seminar on Emerging Technologies</td>
<td>April 23-25, 2018 (TBC) Singapore</td>
</tr>
</tbody>
</table>

### Research, Meeting Reports, and Collaborative Projects

**Food and Nutrients in Health and Disease Science Cluster**
- **Estimation of Sodium Intake among Filipinos and their Sources in the Diet**
  - *In collaboration with the Food and Nutrition Research Institute (FNRI), Philippines*
  - On-going
- **Data Analysis: Levels and Sources of Sugar Intake in the Philippines**
  - *In collaboration with the Food and Nutrition Research Institute (FNRI), Philippines*
  - On-going
- **Measurement of Total Sugar Content of Commonly Consumed Foods in Malaysia**
  - *In collaboration with Ministry of Health, Malaysia*
  - Initiated

**Technical Committee on Maternal, Infant and Young Child Nutrition**
- **Vitamin D Status and its Correlates among Pregnant Thai Adolescents**
  - *In collaboration with Mahidol University, Thailand*
  - On-going
- **Success and Failures of Dietary Supplementation of Pregnant Women (Philippines)**
  - Initiated

**Nutrition and Food Guidance for Public Health Science Cluster**
- **Measurement of Total Sugar Content of Commonly Consumed Foods in Malaysia**
  - *In collaboration with Ministry of Health, Malaysia*
  - Initiated
- **Pilot Project on Inclusion of Private Data into National FCDBs in Malaysia, Philippines, Thailand and Singapore**
  - On-going
- **Risks and Benefits of Intense Sweeteners: A Survey for Food Experts and Opinion Leaders**
  - *In collaboration with Newcastle University, UK and Universiti Kebangsaan Malaysia*
  - Completed; Publication under preparation as part of Symposium Proceedings for Sugar and Sweeteners
- **Understanding Consumer Perception and Attitudes Towards Sweeteners**
  - Completed; Publication under preparation as part of Symposium Proceedings for Sugar and Sweeteners
## Food Safety and Risk Assessment Science Cluster

<table>
<thead>
<tr>
<th>Study on Dietary Exposure of Sweeteners in Thai Consumers</th>
<th>Completed; Publication under preparation</th>
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<tbody>
<tr>
<td><em>In collaboration with Institute of Nutrition, Mahidol University, Thailand</em></td>
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<table>
<thead>
<tr>
<th>ASEAN Food Safety Standards Database</th>
<th>On-going</th>
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<tbody>
<tr>
<td><em>In collaboration with ASEAN Consultative Committee for Standards and Quality (ACCSQ) and Prepared Foodstuff Product Working Group (PFPWG)</em></td>
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</tbody>
</table>

## Special Projects and Others

<table>
<thead>
<tr>
<th>Prevalence of Hemoglobinopathy among Anemic Individuals in Metro Manila: Data from the National Nutrition Survey</th>
<th>Phase 1 completed; Publication in press</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>In collaboration with the Food and Nutrition Research Institute (FNRI), Philippines</em></td>
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<table>
<thead>
<tr>
<th>ILSI SEA Region Contribution to the One ILSI Project on Nutrition, Health and Wellbeing: Multi-Country Survey - Profiling the Elderly and Review on Healthy Ageing</th>
<th>On-going</th>
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</thead>
<tbody>
<tr>
<td><em>Thailand: in collaboration with Mahidol University</em></td>
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<tr>
<td><em>Philippines: in collaboration with University of San Carlos</em></td>
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<tr>
<td><em>Malaysia: in collaboration with Universiti Kebangsaan Malaysia</em></td>
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## Publications

<table>
<thead>
<tr>
<th>Evidence of a High Prevalence of Thiamin Deficiency in Early Childhood Among a Nationally Representative Sample of Cambodian Women of Childbearing Age and their Young Children</th>
<th>Submitted to Nutrients – In Review</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Thalassemia and other Hemoglobinopathies among Anemic Individuals in Metro Manila, Philippines and Their Intake of Iron Supplements</th>
<th>Accepted by Asia Pac J Clin Nutr – In Press/ Available online</th>
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<th>Consumption and Sources of Added Sugar in Thailand: A Review</th>
<th>Accepted by Asia Pac J Clin Nutr – In Press/ Available online</th>
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<tr>
<th>Consumption and Sources of Added Sugar in Indonesia: A Review</th>
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</thead>
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|------------------------------------------------------------------------|-------------------------------------------------|

<p>| Report on Food Composition Tables: Review of Status in Southeast Asia Region | Published January 2017 on ILSI SEA Region’s website |</p>
<table>
<thead>
<tr>
<th>Publications</th>
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<tbody>
<tr>
<td>Compliance with WHO IYCF Indicators and Dietary Intake Adequacy in a Sample of Malaysian Subjects Aged 6-23 Months</td>
<td>Published in <em>Nutrients</em>, 2016, 8:778. doi:10.3390/nu8120778</td>
</tr>
<tr>
<td>The High Prevalence of Anemia in Cambodian Children and Women Cannot Be Satisfactorily Explained by Nutritional Deficiencies or Hemoglobin Disorders</td>
<td>Published in <em>Nutrients</em>, 2016, 8: 348. doi:10.3390/nu8060348</td>
</tr>
<tr>
<td>Low Urinary Iodine Concentration among Mothers and Children in Cambodia</td>
<td>Published in <em>Nutrients</em>, 2016, 8: 172. doi:10.3390/nu8040172</td>
</tr>
<tr>
<td>Sodium Consumption in Southeast Asia: an Updated Review of Intake Levels and Dietary Sources in Six Countries</td>
<td>Published Book Chapter in <em>Preventive Nutrition (5th Ed)</em>, 2016, 36: 765-792.</td>
</tr>
<tr>
<td>Dietary Sources of Sodium Among Filipinos Aged 19 to 50 years: Findings from the 2008 National Nutrition Survey</td>
<td>On-going – <em>undergoing data reanalysis</em></td>
</tr>
<tr>
<td>Functional Food Monograph</td>
<td>On-going</td>
</tr>
<tr>
<td>Report on Food Consumption Survey: Review of Status in Southeast Asia Region</td>
<td>On-going</td>
</tr>
<tr>
<td>Symposium Proceedings: Sugar and Sweeteners (Singapore Meeting)</td>
<td>On-going</td>
</tr>
<tr>
<td>Monograph 2 Volume 1: Safety Assessment of Low- &amp; Non-Calorie Sweeteners (LNCS)</td>
<td>On-going</td>
</tr>
<tr>
<td>Updated Report on Regulatory Status of Micronutrient Fortification in Southeast Asia</td>
<td>Proposed</td>
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</table>
Gut microbiota refers to the microbe population living in our intestine and is made up of trillions of microorganisms including at least 1000 different species of known. Other species include fungi, parasites and viruses. In a healthy body, pathogenic and symbiotic microbiota coexist without problems. However, a disturbance in this balance caused for example by infectious illnesses, certain diets, or the prolonged use of antibiotics can result in dysbiosis. This can result in greater susceptibility to health problems such as irritable bowel syndrome, inflammatory bowel disease, food allergies and food sensitivities.

The microbiota plays an important role in stimulating the immune system, provide protection from pathogenic organisms that enter the body and break down potentially toxic food compounds. It is also able to synthesise certain vitamins such as vitamin B12 and vitamin K. A healthy and balanced gut microbiota is key to ensuring proper digestive functioning. It helps the body to digest certain food components such as fibre that the stomach and small intestine are not able to digest. The species composition of the intestinal microbiota is highly personalised and largely determined by various factors include family genes, environment, medication use and the diet. Many studies have demonstrated the beneficial effects of functional components in food, eg prebiotics and probiotics on the gut microbiota. The former are certain dietary fibres that can serve as “food” for beneficial bacteria to help promote the growth and activity of some “good” bacteria, thereby improving the functioning of microbiota. Probiotic foods, present in some fermented products, contain beneficial live microbes that may help gut microbiota keep its balance, integrity and diversity.

Introduction

Seminar Goal

Provide scientific and regulatory updates on prebiotics and probiotics to enable their appropriate and safe use in the promotion and maintenance of a balanced gut microbiota and human health and promote research & development of these functional components.

Objectives

• Provide scientific updates on potential health benefits of prebiotics and probiotics in promoting balanced gut microbiota for the maintenance of human health.
• Obtain in-depth understanding of the regulatory requirements for the use prebiotics and probiotics in food in Malaysia
• Understand status of research and development on prebiotics and probiotics and identify gaps in knowledge

Who Should Attend

All individuals having an interest in understanding the gut microbiota, its role in promoting and maintaining human health and the potential role of prebiotics and probiotics. These include all health-care professionals especially nutritionists, dietitians, physicians; food scientists, regulators, researchers.

Call for Abstract

Participants who are interested to present in the oral/poster session are invited to submit an abstract (200-300 words in MS Word format) via email no later than 7 October 2017.

Registration and Payment

Please complete the ONLINE registration form (http://nutriweb.org.my/seminar-reg/registration/ILSI2017) by 11 November 2017 to reserve your seats. All registration will only be confirmed upon receiving proof of payment. Seats are on a first-come-first-served basis.

<table>
<thead>
<tr>
<th>Category</th>
<th>Registration Fee</th>
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<tbody>
<tr>
<td>Corporate companies</td>
<td>RM400</td>
</tr>
<tr>
<td>Government agencies / private and public universities</td>
<td>RM200</td>
</tr>
<tr>
<td>Students*</td>
<td>RM100</td>
</tr>
<tr>
<td>International participants**</td>
<td>USD120</td>
</tr>
</tbody>
</table>

Registration fee covers seminar material, 2 refreshments and lunch

*Only a limited number will be accepted; proof of student status has to be submitted with registration form
**Refers to participants residing outside Malaysia

Format of Seminar

Full-day – invited presentations and proffered papers (abstracts for presentations will be invited for oral or poster presentations).

Seminar Topics (Tentative)

1. Overview of the role of gut microbiota in human health and diseases
2. Updates on prebiotics and probiotics including health benefits and appropriate use in various conditions
3. Current status of prebiotics and probiotics and health claims in the Malaysian Food Regulations 1985
4. Technological considerations in the use of prebiotics and probiotics in food
6. Consumer perception on the use of prebiotics & probiotics
7. Recent research and development in prebiotics & probiotics

For enquiries, contact: Dr Tee E Siong / Ms Muhaini Hussin / Ms Yvonne Chwee (03-5637 3526)
Email: estee@nutrihealth.com.my/nsm.scientificupdates@gmail.com/muhaini@versa-group.com/yvonne@versa-group.com
Visit us at www.ilsisea-region.org to find out more about our upcoming activities and programs.

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