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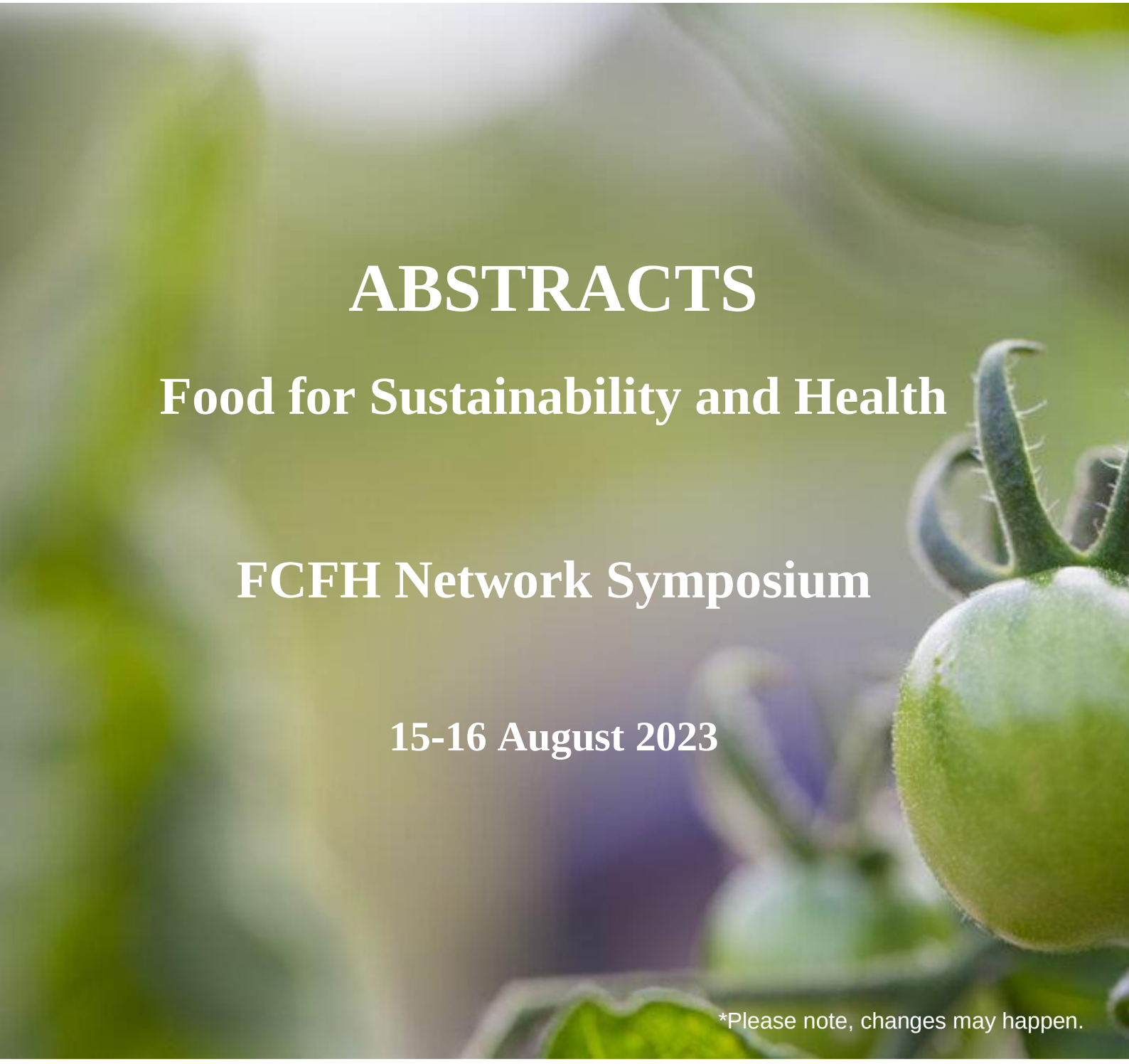

ABSTRACTS

Food for Sustainability and Health

FCFH Network Symposium

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*Please note, changes may happen.

FINLAND-CHINA
FOOD AND HEALTH NETWORK

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FINLAND-CHINA FOOD AND HEALTH NETWORK

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Zhi Chen,

Associate Professor (Tenure Track), Faculty of Biochemistry and Molecular Medicine, University of Oulu

The essential role of Th17/Treg cells in inflammation

Inflammation is worldwide most common and even life-threatening diseases. Better molecular understanding to develop new targeted therapies to treat inflammation is urgently needed. T cells orchestrate immune responses against a variety of pathogens but also contribute to pathogenesis of autoimmunity, asthma and allergic responses as well as tumor. In recent years, Th17 and Treg cells have been identified to play critical roles in inflammatory diseases.

Our research is to utilize recently established state-of-the-art systems biology approaches combined with mouse models of human diseases to characterize the molecular mechanisms regulating Th17 and Treg cell differentiation and function. We believe that our work will provide a novel mechanism on regulation of Th subsets differentiation. The final goal is to facilitate ongoing efforts in targeting these pathways to treat human diseases.

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Dr. Suchetana De Storvik,

University of Eastern Finland, Finland

Emotional eating: Relationship between implicit and explicit measurements

Overeating in response to negative emotions is termed as emotional eating (EE). EE has been positively associated with different markers of obesity and unhealthy food consumption. Explicit measurement tools such as, eating behavior questionnaires (e.g., Dutch Eating Behavior Questionnaire or DEBQ, Three Factor Questionnaire or TFEQ) and interviews are widely used to study EE. However, these can only access the information consciously available to the respondent. Behavior is also significantly influenced by unconscious/automatic processes, understanding which requires implicit measurement tools. One such tool is Implicit Association Test (IAT) that involves computerized tasks in which strength of implicit association is indicated by the speed of pairing targets of interest with specific attributes. The relationship between explicit and implicit aspects of eating behavior is still not well-established. We therefore explored the relationship of explicitly measured EE with implicit associations to sweet and savory foods. Sixty healthy (BMI: 19-29 kg/m^2; age: 20-40 years) female participants completed self-reported questionnaires DEBQ and TFEQ and undertook IAT before and after meal, with target pairs “sweet-savory foods” and attribute pairs “approach-avoid”. Preliminary findings suggest responses to the EE constructs of TFEQ and DEBQ can predict stronger implicit association to sweet in comparison to savory food before meal.

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Dr. Carlos Gomez Gallego,

University of Eastern Finland, Finland

In vitro human gut microbiota fermentation models: opportunities, challenges and examples from the University of Eastern Finland

In vitro models are laboratory-based systems that mimic the gut microbiota environment under controlled conditions. These models vary in complexity, ranging from simple batch incubations with anaerobic conditions and fecal microbiota inoculums to more intricate continuous models involving one or multiple connected, pH-controlled chemostats that are inoculated with fecal microbiota and representing different regions of the human colon. In vitro models are valuable tools for investigating the impact of food components, probiotics, and other bioactive compounds on the intestinal microbiota. However, they face several challenges depending on the model used. These challenges mostly originate from the limitations in simulating host functionality and the physicochemical conditions of the gut environment, as well as the high oxygen sensitivity of certain components of the human gut microbiota and the preservation method of the human gut microbiota inoculum.

We have developed a colon model based on a bioreactor that accurately simulates the proximal colon environment. Our experiments, which involved polyphenol-rich extracts, digested foods, and other bioactive ingredients, demonstrated the model's suitability for studying food-microbiota interactions. Furthermore, our colon model will serve as a platform for future establishment of a more intricate dynamic model with the possibility to study host-microbiota interaction in vitro.

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Dr. Per Ertbjerg,

University of Helsinki, Finland

Meat analogues and meat hybrids: Recent advances and gaps in scientific knowledge

During the last few years there has been a spark of interest in the development of meat analogues, meat hybrids, and other protein-rich alternative products. To mimic fresh meat and meat products it is advantageous to have a deep understanding of the structural differences between muscle-based food, and food based on alternative proteins. Traditionally, plant-based proteins have been utilized as ingredients in meat products. Today, an alternative market is emerging with the use of algae, insects, microbial and fungal proteins. An ongoing development has focus on plant protein isolates and concentrates, which are utilized to produce texturized vegetable protein. Extruders have the ability to transform plant proteins into structured aggregates. With the help of a single or twin rotating screws fiber-like structures are formed under conditions of controlled temperature and pressure. A long cooling die adds to the fiber formation by forming new molecular bonds. The challenges are to obtain products with appearance, texture, water-holding and flavour similar to that of meat. In hybrid meat products a portion of the meat is replaced by plant or other alternative protein to develop products such as burgers, sausages and meat balls. Such products may present familiar sensory attributes to consumers and yet have increased sustainability compared to that of pure meat products.

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Prof. Kati Hanhineva,

University of Turku, Finland

Effect of 12 weeks replacement of animal-based proteins with plant ones on serum metabolite profiles

***Introduction*:** In order to achieve the goals for sustainable nutrition for a growing population and reduced environmental impacts of food production there is a need for a shift toward more plant-based diets. The present randomized clinical trial in healthy adults aims to characterize the metabolic impact of three whole-diets with increasing proportions of dietary plant protein on serum metabolite composition.

***Material and methods*:** Healthy participants were randomized for 12 weeks to one of three study diets: 'ANIMAL'; 70 % of protein from animal sources, '50/50'; equal amount of animal and plant protein, or 'PLANT'; 70 % of protein from plant sources. Diets contained equal amount of fish and eggs. Sources for plant protein were pulses, tofu, nuts, seeds, and cereals and plant-based ready-made products and meals. Fasting serum samples were analyzed with non-targeted LC-MS/MS based system followed by peak picking and alignment with MS-Dial and data processing with R-package "notame".

***Results*:** Serum abundances of various compounds originating from plant-based foods such as lenticin (lentils) and trigonelline (xxx), increased whereas the red meat biomarker 1-methylhistidine decreased in the 'PLANT' group. Furthermore, the results indicated differential responses between groups on the lipid metabolism, since e.g., sphingomyelins SM(d32:1) and SM(d33:1), lysophosphatidylcholines 15:0 and 17:0, and long-chain palmitoylcarnitine and stearoylcarnitine decreased but medium-chain octenoyl-L-carnitine increased in the 'PLANT' group. N1-methyl-2-pyridone-5-carboxamide and 1-methylnicotinamide abundances decreased in 'PLANT' and increased in 'ANIMAL'.

***Conclusions*:** Multiple branches of metabolism were affected by the intake of plant and animal protein and their non-protein components. Changes in the acylcarnitines indicate alterations in the fatty acid composition of the diets and fatty acid oxidation. Observed changes in the serum abundance of N1-methyl-2-pyridone-5-carboxamide and 1-methylnicotinamide may associate with nicotinamide metabolism.

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Docent. Antti Knaapila,

University of Helsinki, Finland

Sensory perspective on novel alternatives to animal-based foods

Any change in the recipe or manufacturing process of a food can potentially change its sensory properties (e.g., taste and texture). Novel products in which part or all of the animal-based ingredients have been replaced with non-animal-based ones are under active research and development. Replacement of animal-based ingredients changes the sensory profile, which may change consumers' liking for the product. While it is under debate whether the sensory characteristics of novel alternatives to animal-based foods should resemble those of the products they are aimed to replace, consumers are not willing to compromise the hedonic value (pleasantness) of the alternatives. This presentation focuses on sensory challenges in novel plant-based products (especially meat and dairy analogs) where protein ingredients from pea and faba bean have been used. Meat analogs made of whey and plant proteins are introduced as an example of hybrid products. Results from the sensory studies are discussed in the context of consumers' current diets and attitudes to the alternatives.

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Prof. Marjukka Kolehmainen,

University of Eastern Finland, Finland

Food is promoting health via gut – case example: Effects of whole grain cereals and berries on inflammation, gut microbiota and gut barrier function

There is wide amount of evidence showing that whole grains are health beneficial and are associated with decrease of risk of many chronic diseases and conditions. Whole grain foods are interesting target for nutrition research due to their nutritional composition and variety of the fibers they include. In addition, the differences in the food processing and food structure cause differences in the physiological responses. In addition to high fibre content, fibre fraction contains significant amounts of protein, but we do not actually understand in detail, how proteins bound in the fibre compartment is processed and metabolized in the gastrointestinal track. Although whole-grain foods provide health benefits, their proteins are likely less bioavailable, and, thus, part of protein is travelling to the colon with the fibre fraction containing many bioactive compounds such as polyphenols. Thus, one may assume that fermentation of cereal fibers and protein by the gut microbiota may in part contribute to the health effects. Proteolytic fermentation in the distal colon yields metabolites, such as ammonia, certain phenols, branched-chain amino acids that are usually regarded as harmful for the gut barrier and may activate pro-inflammatory mechanisms in the gut, while also predisposing the individual to noncommunicable diseases through systemic effects. However, one may assume that the fermentation activity of the dietary fiber in the proximal colon alters the microbiota composition and increases its diversity and induces gut barrier function associated with beneficial health outcomes that may overcome the potential harm of proteolytic activity. In addition, cereal fiber fermentation in the gut produces short chain fatty acids and several other metabolites, including derivatives of fiber-embedded phytochemicals that have been associated with health-supporting effects. However, the evidence on the gut related activity after consumption of whole grain cereal foods are still limited.

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Prof. Kirsi Laitinen,

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Diet, microbiota and metabolic health in pregnancy and beyond

Summary: Both poor diet and obesity predispose the mother and the foetus to health complications during pregnancy and beyond. Maternal complications include gestational diabetes and risk of type 2 diabetes. Obesity is characterized by low-grade inflammation manifested by elevated circulatory pro-inflammatory cytokines. In pregnancy, the role of inflammatory responses in defining health is disputed, but nevertheless may originate from adipose tissue, gut and placenta. In this presentation the current evidence from the clinical trials regarding deviations in maternal inflammatory markers and gut microbiota due to obesity, as well as potential for their modification by dietary means will be reviewed.

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Prof. Kaisa Linderborg,

University of Turku, Finland

Stability of omega-3 docosahexaenoic acid and formation of oxidation indicators in different lipid forms

The dietary intake of marine foods is globally inadequate, and thus supplements with long-chain omega-3 fatty acids are widely used. Both source and processing choices affect the lipid class (most typically triacylglycerols (TAGs), ethyl esters (EEs)) in which docosahexaenoic acid (DHA) is present, and thus consumed. In all lipid forms, DHA is susceptible to oxidation.

This presentation describes investigations of the effect of lipid type on oxidation of DHA. Analysis of oxidation trials of pure DHA-containing TAGs and EEs, and regio- and enantiopure TAGs, are presented.

Headspace solid-phase micro-extraction with gas chromatography–mass spectrometry, liquid chromatography–mass spectrometry, and nuclear magnetic resonance spectroscopy were applied to study the oxidation product formation at 50 °C in the dark at different time points. Additionally, α-tocopherol contents were followed.

DHA in EE form was found to be more stable than DHA in TAG form in the presence of α-tocopherol. DHA was most stable in the sn-2 position with RRR-α-tocopherol. This could be attributed to the interaction of acyl chains within the same TAG molecule and possible steric hindrance for hydroperoxide formation. With RRR-α-tocopherol, significantly higher stability of DHA in sn-1 compared to sn-3 was observed. This suggests increased antioxidant response due to diastereomeric interactions between RRR-α-tocopherol and DHA in sn-1 position.

The obtained results are especially relevant for enzymatic restructuring processes of DHA-rich fish or microalgae oil concentrates aimed for food supplements or food fortification.

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Prof. Weihong Min,

Zhejiang A&F University, China

A comprehensive multi-omics study on the metabolic biosynthesis of functional components in Torreya grandis

Natural-derived peptides are effective substances that defend against oxidative stress and have a significant protective function in the pathogenesis of neurological disorders. Here, we investigated the neuroprotective effects of walnut-derived peptides against scopolamine-induced cognitive deficits in mice and explored the underlying mechanisms in various cells. The novel peptides, which are TWLPLPR, YVLLPSPK, and KVPPLLY prevented ROS production, elevated GSH-Px activity and ATP levels, and ameliorated apoptosis through regulated Akt/mTOR signaling and promoted autophagy in $A\beta_{25–35}$-induced PC12 cells. Furthermore, using the Morris water maze, we showed that YVLLPSPK relieved the cognitive deficiency by alleviating oxidative stress. Mitochondrial morphology was observed in mice hippocampal tissues using TEM. Both Western blot and immunofluorescence analysis illustrated YVLLPSPK promoted the expression of mitophagy-related proteins and activated the NRF2/KEAP1/HO-1 pathway. Subsequently, an NRF2 inhibitor (ML385) was used to verify the contribution of the YVLLPSPK-regulated NRF2/KEAP1/HO-1 pathway in PINK1-mediated mitophagy in H_2O_2-treated HT-22 cells. Additionally, the enriched KEGG pathways included oxidative phosphorylation, riboflavin metabolism, ribosome and pyrimidine metabolism, which are associated with methylation modification by oral administration of YVLLPSPK in mice with scopolamine-induced cognitive deficits through proteomics technology. Meanwhile, YVLLPSPK altered the activities of DNMTs and the level of pro-inflammatory cytokines in LPS-treated THP-1 cells. Most importantly, results indicated that YVLLPSPK potentially modulated DNA methylation in embryonic and neural precursor cells in a creating new methylation patterns manner. These data suggested that walnut-derived peptides could be useful as a therapeutic antioxidant, and as treatment for delayed neurological deficits.

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Weihong Min[1] and Fanrui Zhao[1,2]

[1] Zhejiang A&F University, China

[2] University of Camerino, Italy

Mechanism of Walnut-Derived Antioxidant Peptides in Improving Learning and Memory Dysfunction

***Abstract*:** Natural-derived peptides are effective substances that defend against oxidative stress and have a significant protective function in the pathogenesis of neurological disorders. Here, we investigated the neuroprotective effects of walnut-derived peptides against scopolamine-induced cognitive deficits in mice and explored the underlying mechanisms in various cells. The novel peptides, which are TWLPLPR, YVLLPSPK, and KVPPLLY prevented ROS production, elevated GSH-Px activity and ATP levels, and ameliorated apoptosis through regulated Akt/mTOR signaling and promoted autophagy in $A\beta_{25–35}$-induced PC12 cells. Furthermore, using the Morris water maze, we showed that YVLLPSPK relieved the cognitive deficiency by alleviating oxidative stress. Mitochondrial morphology was observed in mice hippocampal tissues using TEM. Both Western blot and immunofluorescence analysis illustrated YVLLPSPK promoted the expression of mitophagy-related proteins and activated the NRF2/KEAP1/HO-1 pathway. Subsequently, an NRF2 inhibitor (ML385) was used to verify the contribution of the YVLLPSPK-regulated NRF2/KEAP1/HO-1 pathway in PINK1-mediated mitophagy in H_2O_2-treated HT-22 cells. Additionally, the enriched KEGG pathways included oxidative phosphorylation, riboflavin metabolism, ribosome and pyrimidine metabolism, which are associated with methylation modification by oral administration of YVLLPSPK in mice with scopolamine-induced cognitive deficits through proteomics technology. Meanwhile, YVLLPSPK altered the activities of DNMTs and the level of pro-inflammatory cytokines in LPS-treated THP-1 cells. Most importantly, results indicated that YVLLPSPK potentially modulated DNA methylation in embryonic and neural precursor cells in a creating new methylation patterns manner. These data suggested that walnut-derived peptides could be useful as a therapeutic antioxidant, and as treatment for delayed neurological deficits.

Ass. Prof. Qinxue Ni,

Zhejiang Jiaozhi Technology, China

Exploration of Functional Compounds in Gardenia Fructus and Its Industrial Application- A Traditional Chinese Medicinal Food

Abstract: Zhejiang Jiaozhi Technology Company mainly works in R&D of the deep processing technology of Gardenia Fructus berry. We work with professionals from academies and universities including Zhejiang A&F University, focusing on the research and application of the functional compounds and healthy activities of Gardenia Fructus. Gardeniae Fructus (Zhizi in Chinese) as a traditional medicinal food, is rich in iridoid glycosides (e.g.,geniposide, genipin, carotenoids (e.g., crocetin, crocin I, crocin II), flavonoids (e.g.,rutin, quercetin), saponins, polysaccharides, and phenolic acids (e.g., chlorogenic acid, ursolic acid). Among them, crocins as a precious natural pigment and bioactive compounds with health-beneficial properties, is only found in Gardenia Fructus except saffron. Meanwhile, including several pharmacological actions of Gardeniae fructus, such as antioxidant, anti-inflammatory, antidiabetic, anti-cancer, treating liver disease etc., we are taking more attention on its neuroprotective effects, such as anti-dementia, anti-depression, anxiolytic, hypnotic, improving cognition, memory improvement, and other brain function disorders. Based on the researches, Zhejiang Jiaozhi Technology Ltd Co developed several products including Gardenia oil, Gardenia tea, solid seasoning, Gardenia flower essential oil and beauty products.

Dr. Yuting Su and Mingfu Wang,

Institute for Advanced Study, Shenzhen University, China

Synthesis of polyphenol loaded β-D-glucan delivery systems and their potential immunomodulation of macrophage

The polyphenol like quercetin serves as a promising anti-inflammatory and immunomodulatory agent for immune system. The poor solubility and stability, however, compromise the application of polyphenol. Adopting delivery system to load polyphenol is one of feasible approaches to increase its solubility and stability. The naturally occurring and non-digestible β-D-glucans possess immunomodulatory activities due to their specific recognition by pattern recognition receptors (PRRs) expressed on macrophages. Such merits allow β-D-glucans to function as promising carrier for targeting delivery to macrophage, ascribing to their favorable stability and biocompatibility, along with “trained immunity” on immune cells. To improve the stability and bio-accessibility of quercetin, we tried to synthesize a β-D-glucan based delivery system loaded quercetin and investigate its immunomodulatory effect on M1 and M2 phenotypic macrophage models. This project is expected to deepen the investigation of quercetin bio-accessibility with delivery system and broaden the exploration of novel dietary supplements benefiting body immune balance.

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Dr. Ye Tian,

University of Turku, Finland

Impact of enzymatic pre-treatment on composition of nutrient and phytochemical of canola (Brassica napus) oil press residues

The study aimed to develop a biorefining process to recover proteins and dietary fibres from a food industry side-stream, canola (Brassica napus) oil pressing residues. The materials were treated with commercial protease, carbohydrase, and phytase to obtain protein-rich supernatants and fibre-rich precipitates. The compositions of these fractions were analyzed using LC-MS (glucosinolates and phenolics) and GC–MS (sugars, acids, and amino acids). Compared to raw material, the supernatants were richer in proteins, sugars, acids, amino acids, phenolic acids, and flavonols; the precipitates had higher levels of minerals and dietary fibres. The enzymatic treatment decreased the contents of phytic acid, glucosinolates, and phenolic alkaloids in all fractions. The applied enzymes effectively enhanced solubility of proteins, despite the lower yield of crude proteins compared to the alkaline extraction (40–82 vs 91 g/100 g dry matters). The impact of enzymes on other chemical components was also revealed by using principal component analysis.

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Prof. Tao Wu,

Peking University, China

Family-based study to understand the gene-environment interaction influencing cardiovascular risk

The Hakka Earth building Pedigree-based Cohort (HEPC) was initiated in Nanjing County, Fujian Province, China in 2015. HEPC recruited probands with the same surnames and then enroll their first-degree and more distant relatives. According to the local genealogical booklets and family registry, pedigree structure was established. The heritability of cardiovascular traits was estimated and the genotype-environment interaction was explored based on the pedigree and phenotype information. Totally 452 extended pedigrees consisting of 2818 family members were obtained in the baseline survey. The analysis showed that the most of the cardiovascular traits presented moderate level of heritability (0.263 to 0.799). Genotype-environment interaction analysis was performed to explore the potential interaction between genetic components and the nutritional exposures influencing the risk of cardiovascular traits.

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Prof. Yunfei Xie,

Jiangnan University, China

Rapid Detection Method in Food Safety and Quality Control by Spectral Technology

The food industry is an important part of China's national economy and a fundamental industry to ensure people's livelihoods. At the same time, it bears the heavy responsibility of implementing the Healthy China strategy and providing safe food. Food safety and quality is an important manifestation of gross national happiness, which is related to the health of consumers, social stability, and even national security, and has been widely concerned by people. Spectral technology provides good solutions for rapid analysis of food safety and quality with its characteristics of fast, non-destructive, efficient, and on-site detection. In recent years, we have been committed to the research of spectral technology in food safety and quality control. The databases of Raman, near-infrared, mass spectrometry and nuclear magnetic resonance were established, and the nondestructive and rapid detection technology for the freshness of eggs, pork, nuts, beef, and other foods was realized by combining chemometrics methods, also the oxidation process of nut oil and the change process of various physical and chemical properties of repeatedly frozen and thawed beef were clarified. By developing a series of Surface Enhanced Raman Spectroscopy (SERS) materials such as gold nanosols, core-shell nanosols, monolithic columns, and nanowire arrays, the sensitivity of ordinary Raman spectroscopy has been significantly improved. This method can be applied to the detection of agricultural and veterinary residues, antibiotics, pigments, illegal additives, heavy metals, foodborne pathogens, and other pollutants in food, with detection time and detection limit lower than traditional detection methods. A SERS detection method for cyano group-based pesticide was established based on the Raman silent region (1800-2800 cm^{-1}) to avoid interference from complex matrices, achieving rapid detection of trace harmful substances in complex foods. In addition, carbon quantum dots (CDs) fluorescence spectroscopy was used to quickly determine the residues of chloramphenicol and Hainan mycin in food.

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Xuebing Xu,

Wilmar, China/ Yihai Kerry Group, China

Technology and new products development related to infant formula: case studies

Infant formula is a special category of foods targeted on the infant group of population, which requires special care of food safety, food quality, and nutritional functions. Lipids are in around 30% of infant formula, which give 50% energy for infants. Breast milk is often the golden standard for infant formula mimicking in terms of dry matters, so is the lipids part. Besides energy, lipids offer wide functions for infant nutrition. With the deeper understanding of breast milk fats, those functional components have been step by step identified and recognized together with their physical structures in the breast milk giving functionalities. This makes a variety of potential possibilities to mimic the human milk closer. In this presentation, two case studies will be illustrated. One is on structured lipids to mimic the human milk fats in terms of fatty acid profiles and triacylglycerol profiles. Two types of structured triacylglycerols will be discussed in terms of UPU structured and MPU (U-unsaturated fatty acids, M-medium chain fatty acids, P-palmitic acid). Another case is the formulation of physical structure similar to milk fat globules with various phospholipids or sphingolipids. Both cases give significant performances in terms of nutritional evaluations.

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Prof. Haixia Yang,

China Agricultural University, China

COX-2/sEH inhibition prevent aflatoxin-induced hepatocellular carcinoma

Toxic environmental carcinogens promote cancer via genotoxic and nongenotoxic pathways, but nongenetic mechanisms remain poorly characterized. Carcinogen-induced apoptosis may trigger escape from dormancy of microtumors by interfering with inflammation resolution and triggering an endoplasmic reticulum (ER) stress response. While eicosanoid and cytokine storms are well characterized in infection and inflammation, they are poorly characterized in cancer. Here, we demonstrate that carcinogens, such as aflatoxin B1 (AFB1), induce apoptotic cell death and the resulting cell debris stimulates hepatocellular carcinoma (HCC) tumor growth via an “eicosanoid and cytokine storm.” AFB1-generated debris up-regulates cyclooxygenase-2 (COX-2), soluble epoxide hydrolase (sEH), ER stress response genes including BiP, CHOP, and PDI in macrophages. Thus, selective cytokine or eicosanoid blockade is unlikely to prevent carcinogen-induced cancer progression. Pharmacological abrogation of both the COX-2 and sEH pathways by PTUPB prevented the debris-stimulated eicosanoid and cytokine storm, down-regulated ER stress genes, and promoted macrophage phagocytosis of debris, resulting in suppression of HCC tumor growth. Thus, inflammation resolution via dual COX-2/sEH inhibition is an approach to prevent carcinogen-induced cancer.

Prof. Wei Yang,

Jiangnan University, China

The synthesis of fluorescent carbon dots and their sensing applications in plant oil quality and safety

Carbon dots (CDs) are a novel fluorescent nanomaterial with outstanding luminescent characteristics, high biocompatibility, low toxicity, and ease of surface functionalization. They can be prepared through simple and diverse methods, making them ideal for use in bio/chemical sensing, bioimaging, nanomedicine, and efficient catalysis. Our team investigated the use of carbon dots in monitoring the quality and safety of edible oils through fluorescence. A ratiometric fluorescent probe and a fluorescent carbon dot with intramolecular charge transfer capability were developed. The ratiometric sensing system utilized blue fluorescent CDs (b-CDs) as the response signal and yellow fluorescent CDs (y-CDs) as the internal reference. In the case of TBHQ, our ratio probe demonstrated a strong linear relationship within the 0.2-2 μM range, with a LOD of 0.052 μM. The fluorescence of the carbon dots changed noticeably during this process. Fluorescent carbon dots (t-CDs) with intramolecular charge transfer properties were also used to monitor the polarity of frying oils. The normalized emission spectra of t-CDs showed that as the solvent polarity was increased, the fluorescence wavelength of the t-CDs gradually red-shifted, and their quantum yield gradually decreased. This further indicated that such t-CDs are sensitive to subtle changes in polarity in the microenvironment.

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Yuqing Zhang,

University of Turku, Finland

Metabolic fate of DHA from regio- and stereo-specific positions of triacylglycerols in a long-term feeding trial in rats

Although the health effects of docosahexaenoic acid (DHA) are well documented, the effects of the positional distribution of DHA in triacylglycerol (TAG) on its bioavailability are not well understood. The study compared the fatty acid (FA) composition of rat plasma, liver, brain, and visceral fat after four-week feeding with DHA in regio- and enantiopure TAGs. Feeding with DHA in the structured TAGs (daily dosage of 500 mg/kg body weight of experimental fats) significantly increased the DHA content in organs except for the brain, compared to groups fed with normal feed. The DHA groups showed a significant difference in the level of DHA among plasma TAG and visceral fat, which indicates the difference in the absorption of DHA from different positions. Our findings contribute to improving the understanding of the impact of positional distribution in TAG on the bioavailability and metabolic fate of DHA.

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Prof. Jie Zheng,

Jinan University, China

Reaction between amino acids and polyphenols with reactive aldehydes in foods and the impact on health

Acrolein, 5-hydroxymethylfurfural, and di-carbonyl compounds, such as methylglyoxal, glyoxal and 3-deoxyglucosone, are harmful substances generally produced during thermal processing of foods. They exhibit substantial deleterious effects on human beings by reacting with proteins and DNA or the generation of other toxins in vivo and in food. Amino acids and polyphenols ubiquitously exist in foods, and are intensively used to control the levels of these toxins in foods. The mechanism involves the generation of aroma compounds (between di-carbonyl compounds and amino acids), as well as the formation of various adducts via Michael addition or the Maillard reaction between amino acids or polyphenols and the aldehydes. Consequently, the blank knowledge on the absorption, metabolism and the impact on health of the neo-formed adducts catches our specific concerns and interest. In recent years, we demonstrated that different adducts formed between various amino acids and polyphenols with aldehydes displayed different functional properties or toxicities in cellular and animal models, some of which might result in higher toxicity than their aldehyde precursor, while others might improve the health. The findings indicated that the consequent impact of the interaction between toxic aldehydes with amino acids and polyphenols on human health needs to be concerned and investigated in-depth.

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