



**FOODCON
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ABSTRACT BOOK



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Day-1

Keynote Talk

Emerging Contaminants and Food Safety: PFAS Pathways, Risk Assessment, and Mitigation Strategies

Gulsun Akdemir Evrendilek

University of Maine Cooperative Extension Maine USA

Abstract: Per- and polyfluoroalkyl substances (PFAS) are a diverse group of synthetic chemicals that have raised significant concerns because of their environmental persistence, potential for human exposure, and implications for food safety. Their movement through environmental compartments and food-producing systems presents challenges for contaminant monitoring, dietary exposure assessment, and the development of effective mitigation strategies.

The occurrence of PFAS in food reflects complex interactions among contamination sources, environmental transport, biological uptake, and food production practices. U.S. Food and Drug Administration monitoring data demonstrate differences in PFAS detection patterns among food categories and seafood samples, underscoring the importance of considering sampling design, compound-specific concentrations, dietary exposure, and toxicological evidence when interpreting food safety implications.

Research conducted in Harpswell Cove, Maine, following an aqueous film-forming foam (AFFF) spill in August 2024, provides insight into PFAS dynamics in a coastal food system. Analyses of sediment, blue mussels, and hard-shell clams revealed distinct contaminant profiles and spatial and temporal patterns across these matrices. The findings demonstrate the value of integrated environmental monitoring and predictive modeling for characterizing contamination dynamics and informing risk assessment, particularly when individual sampling events or environmental compartments may provide an incomplete picture.

Beyond environmental monitoring, processing-based mitigation represents an important area of investigation. Research involving high hydrostatic pressure, ozone treatment, and hot-water extraction in clam samples addresses the potential for processing interventions to change PFAS concentrations in edible tissues. Evaluating these approaches requires distinguishing reductions in measured tissue concentrations from contaminant transfer into other process streams or actual chemical transformation. Analytical validation, mass-balance considerations, product quality, and responsible management of contaminated residuals are essential to determining whether these approaches can provide practical food safety benefits.

Integrating environmental fate and transport research with food monitoring, risk assessment, and processing-based investigations provides a foundation for more informed PFAS

management in food systems. This integrated perspective highlights the importance of understanding contaminant behavior across environmental and food matrices, interpreting exposure evidence appropriately, and establishing scientifically defensible criteria for evaluating mitigation strategies.

Keywords: PFAS; Food Safety; Seafood Contamination; Risk Assessment; Mitigation Strategies

Keynote Talk

Food Safety Management from the Auditors' Perspective

Heng Hui Gan

Kairos Integrated Food Solutions Pte Ltd, Singapore

Abstract: Every year, food establishments invest significant time and resources preparing for certification and surveillance audits. Policies are written, records are maintained, and training is conducted. Yet when the auditor walks through the kitchen, gaps emerge that no amount of paperwork preparation could have prevented.

This session takes you inside the auditor's perspective.

Drawing on real surveillance and certification audit findings across Singapore's food manufacturing, catering, and central kitchen sectors, this sharing unpacks the most persistent and consequential gaps in Pre-Requisite Programme (PRP) implementation and HACCP system compliance, not as abstract clauses from a standard, but as observable, recurring failures that appear across operations of all sizes.

Invited Talk

Food safety governance in Bangladesh: Bridging policy, science, and practice for a safer future

Nazmul H. Nazir

Bangladesh Agricultural University, Bangladesh

Abstract: Food safety governance is essential for protecting public health, ensuring food quality, and promoting sustainable socioeconomic development. In Bangladesh, food safety remains a major concern due to foodborne hazards, widespread adulteration, contamination, and weaknesses in regulatory enforcement. This presentation examines the governance framework for food safety in Bangladesh, with particular emphasis on the existing legal and institutional arrangements, policy obligations, implementation gaps, and challenges in the livestock sector.

Bangladesh has established several laws, policies, and regulatory institutions to ensure food safety, including the Bangladesh Food Safety Act, 2013, and the Bangladesh Food Safety Authority (BFSA). However, the involvement of numerous government agencies, overlapping institutional responsibilities, fragmented regulatory approaches, inadequate resources, and limited coordination create challenges for effective governance. Other important constraints include weak monitoring and enforcement, insufficient laboratory capacity, inadequate penalties, limited consumer awareness, and the dominance of informal food businesses. These challenges are particularly evident in the livestock sector, where poor farm-level biosecurity, unregulated use of veterinary drugs and antibiotics, inadequate withdrawal-period monitoring, unhygienic slaughter practices, and insufficient cold-chain infrastructure increase food safety risks. Antimicrobial resistance and contamination of animal-source foods further emphasize the necessity of coordinated preventive measures across the food supply chain.

Strengthening food safety governance requires harmonization of legislation with international standards, clarification of institutional mandates, improved regulatory capacity, and the development of nationwide surveillance systems for foodborne hazards. Capacity building for food producers, vendors, farmers, veterinarians, and food safety inspectors is also essential. Furthermore, promoting beneficial agricultural, hygienic, and manufacturing practices, alongside hazard analysis and critical control point systems, can improve preventive food safety management. Public awareness, consumer participation, transparent accountability, and stronger public–private partnerships should complement regulatory reforms.

In conclusion, effective food safety governance in Bangladesh requires an integrated, risk-based, and collaborative approach involving government institutions, industry, professionals, and consumers. Strengthening coordination, accountability, and preventive controls across the food chain is critical to protecting public health and ensuring safe, nutritious food for all.

Keywords: Food safety governance; regulatory framework; institutional coordination; food safety policy; Bangladesh.

Invited Talk

Ozonated Olive Oil as a Natural Antimicrobial Strategy for Meat Preservation: Technological Performance, Oxidative Stability and Microbiological Safety

Paula Dominguez Lacueva

The Public University of Navarre (UPNA), Spain

Abstract: The development of natural preservation strategies is gaining increasing attention in the food industry as a means of improving microbiological safety and extending the shelf life of meat products. Ozonated olive oil represents a promising approach, combining the properties of olive oil with the antimicrobial potential of ozone-derived oxidation products. Building on previous findings in beef burgers, this study evaluated the effect of ozonated extra virgin olive oil on the microbiological quality of horse meat burgers produced in Navarra, Spain.

Three formulations were investigated: a control without added oil, burgers supplemented with non-ozonated extra virgin olive oil, and burgers supplemented with extra virgin olive oil ozonated for 5, 10, or 15 minutes. Color, pH, lipid oxidation, assessed through thiobarbituric acid reactive substances (TBARS), and microbiological parameters were monitored throughout 14 days of refrigerated storage. Microbiological analyses included total viable counts (TVC), Enterobacteria (EB), and lactic acid bacteria (LAB).

The results showed that ozonated olive oil reduced microbial growth compared with both the control and non-ozonated olive oil treatments. TVC remained below the acceptability threshold of $6.67 \log_{10}$ CFU/g in all ozonated treatments throughout storage. Enterobacteria counts were also lower in ozonated samples, with values reaching a minimum of $4.53 \log_{10}$ CFU/g,

compared with up to 7.26 log₁₀ CFU/g in control samples. Similarly, LAB populations were reduced in the ozonated treatments, with counts ranging from 2.76 to 4.31 log₁₀ CFU/g. Longer ozonation times did not provide substantial additional microbiological benefits, suggesting that shorter treatments may be sufficient to achieve effective microbial control.

These findings highlight the potential of ozonated extra virgin olive oil as an innovative preservation strategy for horse meat burgers, improving microbiological stability during refrigerated storage while offering opportunities to reduce processing intensity. This approach could contribute to the development of more sustainable, clean-label meat preservation technologies.

Keywords: ozonated olive oil; horse meat burgers; food preservation; microbiological quality; shelf life; antimicrobial activity

Invited Talk

From byproduct to antimicrobial improving food safety

Sander Sieuwerts

Brannatura, Denmark

Abstract: Plant seeds protect themselves against microorganisms by antimicrobial molecules. Hence, seed-based plant materials, including agrifood byproducts, are valuable sources of natural antimicrobials that inhibit pathogenic and spoilage microorganisms. Focusing on staple foods from the pulse and cereal categories, the consortium working in the Grønholdbar development project found that pea-based ingredients and the byproducts oat hull and faba bean hull have different impacts on viability and growth potentials of the foodborne pathogens *Escherichia coli*, *Salmonella enterica*, *Pseudomonas aeruginosa* and *Listeria monocytogenes*. Our data suggest that different bioactive compounds exist in the different plant materials and that they likely are different hull-resident phenolic compounds that travel with the protein fraction when producing protein concentrates and isolates.

Invited Talk

3D Printing and Emerging Technologies: Advances in the revaluation of Food By-products for Nutraceutical and Biomedical Applications

IVAN DE JESUS TOLANO VILLAYERDE,

Universidad Estatal de Sonora (UES), Mexico

Abstract: 3D printing has transcended from biomedicine to the food industry, allowing for the creation of personalized and nutraceutical foods with specific bioactivity (antioxidant, antimicrobial) and excellent organoleptic properties. This technology facilitates the design of structural matrices and scaffolds through the use of biopolymers and bioactive compounds, which can be efficiently extracted using emerging technologies such as ultrasonic pulses. To form these systems and mitigate production costs, the valorization of agro-industrial and aquaculture by-products presents an optimal sustainable solution. A prominent example is the utilization of waste derived from the processing of pineapple (*Ananas comosus* L.) and tilapia (*Oreochromis niloticus*). Globally, pineapple production is projected at around 30 million tons, while Mexico consolidates a production that exceeds 1.2 million tons annually. Its industrial processing generates enormous volumes of byproducts, particularly the peel and leaves, which constitute an abundant source of fibers and bioactive molecules. On the other hand, the aquaculture sector registers a global tilapia production close to 6.8 million tons. In the case of Mexico, aquaculture represents an increasingly larger percentage of the national production of this species. The filleting and commercial processing of this fish generate a significant amount of remnants, such as skin and bones, which are by-products that represent exceptional matrices for the extraction of high molecular weight proteins. The utilization of these biological resources, rich in high value nutrients, not only mitigates environmental pollution and the economic liabilities associated with waste management but also catalyzes innovation. Integrating pineapple and tilapia by-products into 3D printing processes opens new frontiers in food engineering creating nutraceutical, functional, or bioactive foods and drives the development of advanced biomaterials, such as bioactive dressings for wound treatment, thereby generating a comprehensive positive impact on a social, economic and environmental level.

Keynote Talk

Translation modulators to preserve neurodegenerative decline and from metal toxicity: the role of iron and dietary potential for urate

Jack Rogers

Harvard University, USA

Abstract: Manganese (Mn) toxicity has long been linked to the neurodegenerative movement disorder of occupational manganism and also has long been associated with Parkinson's disease (PD). We collaborated with Prof. Fudi Wang (Zhejiang University) to conduct a meta-analysis demonstrating that environmental excesses of Mn are statistically linked with impaired childhood neurodevelopment and cognition (Liu W, et al, Environ Health. 2020, 2;19(1):104). Here, we present support that Mn, and also Lead (Pb), exposures to brain neurons dysregulate iron transport to cause a neurodegenerative ferroptosis that might jeopardize cognitive function. We reviewed how high Mn and Pb exposures perturb iron homeostasis Rogers JT, Cahill CM. Learn Mem. 2020 09; 27(9):395-413.PMID: 32817306.

The Alzheimer's amyloid precursor protein (APP) cytoprotectively exports excess toxic Fe from neurons after binding to the central iron exporter ferroportin (FPN) (Venkataramani et al, 2018). As a part of normal cellular physiology, increases in intracellular iron concentrations induce the up-regulation of APP gene expression at the level of translation by relieving of repression by the Iron-regulatory Protein-1 (IRP1) acting at the site of an iron-responsive element RNA stem loop (IRE) in the 5'untranslated region (5'UTR) or APP mRNA. Resulting from these events, increased APP(s) levels have a protective role to promote excess iron efflux. The iron storage protein ferritin also is translationally up-regulated to confer cyto-protection via its ferroxidase activity (in the H- subunit). We discuss our model that Mn and Pb can both operate in SH-SY5Y neural cell lines and in rodents to selectively interfere with the translation of ferritin and APP by a post-transcriptional mechanism to explain environmental metallo-neurotoxicities both ex vivo and in vivo. We review our findings that overexposures to Mn and Pb cause toxicity to neurons by targeting 5'UTR specific IREs amongst the network of iron-associated transcripts encoding proteins that promotes neuronal viability; this includes APP and ferritin whose Mn/Pb-induced absence increases iron load and may generate ferroptosis and cell death.

For a new potentially nutritional therapy, urate's elevation emerged as a neuroprotective strategy to treat neurologic disorders based on convergent epidemiological and clinical

biomarker data as well as on its antioxidant and metal chelator properties. We present our findings that the use of urate (and thus inosine) , and our neuroprotective APP/ferritin 5'UTR activators, indeed mitigate Mn/Pb induced degeneration of cultured dopaminergic neurons. Activators of IRE-target sequences are to be tested for their capacity to restore translation of the mRNAs for APP (neuroprotective iron export) and ferritin (neuroprotective iron storage) after their inhibition in the presence of Mn or Pb. Among the activators, we describe clinical aspects of the purine urate's neuroprotective potential to ward off Mn and Pb dependent neuronal injury via IRE-mediated pathways.

Invited Talk

Eating to Prevent Injury: Evidence-Based Nutrition for the Female Athlete

Natalia Prato

Guatemalan Autonomous Sports Confederation (CDAG), Guatemala

Abstract: Female athletes face specific physiological and nutritional challenges that directly influence their risk of injury, yet most sports nutrition guidelines are still largely based on research conducted in male populations. Low energy availability, a central feature of Relative Energy Deficiency in Sport (REDs), can impair bone health, hormonal function, muscle recovery and neuromuscular performance, increasing the risk of bone stress injuries and soft tissue damage. Additionally, micronutrient deficiencies such as iron, calcium and vitamin D are common in this population and may further compromise tissue integrity and training adaptation.

This presentation will review current evidence on the relationship between nutrition and injury risk in female athletes, with emphasis on energy availability, macronutrient distribution, protein intake for tissue repair, and key micronutrients for bone and muscle health. It will also address practical considerations related to the menstrual cycle and training periodization. Drawing on applied experience with high-performance athletes, the session will present strategies for early screening, nutritional assessment and individualized intervention within multidisciplinary sports teams. The aim is to provide practitioners with evidence-based tools to support not only performance, but also long-term health and injury prevention in female athletes.

Invited Talk

Agro-Food Waste as an Ingredient in Functional Beverage Processing: Sources, Functionality, Market and Regulation

Arely Leon Lopez

TecNM Venustiano Carranza Campus, Mexico

Abstract: Waste generated by the agro-food industry is a serious environmental, social, and economic issue. The Food and Agriculture Organization of the United Nations defines food waste as food that loses quantity or quality to the point that food service providers and consumers throw it out. The FAO reports that 17% of worldwide food production may be wasted. Food waste may include fresh products, food close to the expiration date discarded by retailers, and food products from household kitchens and eating establishments. However, food waste offers opportunities to extract functional ingredients from sources such as dairy, cereals, fruits, vegetables, fibers, oils, dyes, and bioactive compounds. The optimization of agro-food waste as an ingredient will help in the development and innovation of food products to generate functional foods and beverages to prevent and treat several diseases in consumers

Invited Talk

Emulsification of natural antimicrobials and validation of antimicrobial activity in a plant-based beverage

Cielo Char

University of Chile, Chile

Abstract: Synthetic antimicrobials—such as potassium sorbate, benzoates, and propionates—are effective at inhibiting the growth of microorganisms in food. While these substances are considered safe at low concentrations, they are facing increasing scrutiny due to their potential adverse health effects following long-term consumption; some studies have shown that they promote inflammation and alter the gut microbiome. In recent years, there has been growing

interest in natural antimicrobials, such as essential oils, as potential alternatives to conventional synthetic antimicrobials for extending food shelf life and inactivating foodborne pathogens. The incorporation of these hydrophobic compounds into aqueous-based food products is often limited by their poor solubility. Therefore, there is a need to evaluate new delivery systems for encapsulating and releasing essential oils within food products. In this context, the objective of this study was to design micro- and nanoemulsions of the hydrophobic compounds cinnamaldehyde, vanillin, and citral, using modified starch (Capsul®) and pea protein isolate as encapsulating agents. The study aimed to assess the physical properties and stability of these micro- and nanoemulsions; evaluate their antimicrobial effect—both individually and in combination—against *Listeria innocua* and *Escherichia coli* in oat-apple beverages; and, finally, validate the effectiveness of the emulsions by determining the microbiological, physical, and chemical stability of these plant-based beverages during 21 days of storage at 4°C. It will be demonstrated that the emulsification of cinnamaldehyde—and its combination with vanillin or citral—improved the dispersion and antimicrobial activity of these hydrophobic compounds within the beverage, providing an effective strategy to enhance their functionality and microbiological stability in complex, aqueous-based food matrices.

Invited Talk

Modeling Stage-Specific Predictors of Food Safety Engagement Along the Willing–Ready–Able (WRA) Continuum Among FSMA-Exempt Produce Growers in West Virginia, USA

Jesica Temple

West Virginia University, USA

Abstract: A statewide psychometric validation study established the Willing–Ready–Able (WRA) framework as a reliable diagnostic of food safety engagement among Food Safety Modernization Act (FSMA)-exempt produce growers in West Virginia. However, while the framework demonstrated stage differentiation, factors associated with progression between stages remained unclear. The present companion analysis modeled stage-specific predictors of advancement along the validated WRA continuum (Willing < Ready < Able). Using cross-sectional survey data ($n = 125$) and multivariate modeling, WRA stage progression (Willing = 0, Ready = 1, Able = 2) was treated as an ordinal outcome. Buyer Pressure, Barriers, Years Farming, Mixed Market participation, Education, and Farm Scale (acres) were entered as predictors. Ordinal model-fit statistics supported treating WRA as an ordered continuum (AICc = 247.7 vs. 254.5; BIC = 269.1 vs. 290.3). Stage-restricted logistic regressions indicated that Buyer Pressure increased the odds of Ready versus Willing classification (OR = 2.57, $p = 0.02$; AUC = 0.76), whereas Years Farming increased the odds of Able versus Ready classification (OR = 1.63, $p = 0.04$; AUC = 0.66). Barriers, Mixed Market participation, Education, and Farm

Scale were not significant predictors in either transition ($p > 0.05$). Secondary neural network analyses confirmed the same core predictor structure, reinforcing robustness. Predictors of food safety engagement differed by stage, indicating that early-stage advancement was associated with market pressure whereas later-stage advancement aligned with production experience. These findings extend WRA from a validated classification framework to a stage-sensitive predictive model capable of informing targeted outreach among FSMA-exempt growers.

Invited Talk

Trimester-adapted nutritional support as a cofactor of functional loading in pregnancy

Anastasiia Shapovalova

National Academy of Sports Medicine (NASM), USA

Abstract: Personalized nutrition for physically active populations stops short of pregnancy. Prenatal guidance runs in two streams that never meet: exercise recommendations on how to move, dietary recommendations on what to eat. Neither couples the symptom a woman reports in the morning to a probable nutritional gap and to the loading format for that day. Gestation reshapes the substrate any training load acts on. Plasma volume climbs 40 to 50 percent above pre-pregnancy levels; oxygen uptake peaks 20 to 30 percent above baseline near term. The protocol presented here treats nutrients as biochemical cofactors of muscular work and recovery, not as a parallel set of dietary rules. It comes down to one decision, made before each session: which loading format a given nutritional state can carry that day. Its core is a three-step daily correction scheme. The specialist identifies the dominant morning symptom, names the probable deficient link, and only then selects the loading format. The scheme runs in three branches. Pronounced weakness with shortness of breath directs assessment to iron status and vitamin C intake and narrows the session to breathing work and walking. Cramps direct assessment to hydration and to magnesium, a cofactor in more than 300 enzymatic reactions, and lengthen rest intervals. Nausea with an energy drop moves the session into a window of stable glycemia that follows a slow-carbohydrate meal. Trimester forms the second axis: the first prioritizes glycemic stability, folates, and iron paired with vitamin C against a background of nausea; the second brings protein forward alongside calcium and magnesium in synergy, plus omega-3; the third adds fiber and fluid intake against slowed peristalsis, iron in view of blood loss at delivery, and stable glycemia. In prenatal exercise research, exercise-derived cytokines are described as partial mediators of placental oxidative metabolism, with the

placenta secreting cytokines in return. That evidence is limited and mostly from rodent models, so adequate nutritional provision enters the protocol as a premise, not a demonstrated outcome. The scheme addresses obstetrician-gynecologists, perinatal physiotherapists, prenatal trainers, nutrition specialists, and adapted physical activity practitioners. It was developed for uncomplicated pregnancy; where contraindications exist, any physical intervention requires clearance from the supervising obstetrician. Clinical effectiveness is not claimed, and the model has not been tested against a control. In the reviewed literature no comparable day-level coupling of symptom, nutritional link, and loading format was identified.

Invited Talk

Continuous biocatalytic production of GAMG from glycyrrhizin in a fluidized-bed reactor

Ilaria Benucci

University of Tuscia, Italy

Abstract: The increasing demand for natural and high-intensity sweeteners has stimulated the development of sustainable biotechnological approaches for the production of sugar alternatives. Among these compounds, 18 β -glycyrrhetic acid 3-O-monoglucuronide (GAMG), obtained from glycyrrhizin (GL), is particularly attractive due to its intense sweetness and improved safety profile compared with the parent compound. However, the development of efficient and stable processes for its selective production remains a relevant challenge.

In this work, a continuous biocatalytic process for the conversion of GL into GAMG was investigated using immobilized β -glucuronidase (β -GUS) in a fluidized-bed reactor (FBR). The process was systematically evaluated by investigating the main operational parameters affecting enzyme performance and reactor efficiency. The effects of pH and temperature on enzymatic activity were first assessed, followed by optimization of the fluid-dynamic conditions through variation of the volumetric flow rate and immobilized biocatalyst loading. The operational stability of the system was subsequently evaluated over 15 consecutive reaction cycles and compared with a conventional batch configuration.

The fluidized-bed configuration provided enhanced biocatalyst stability, with the immobilized β -GUS retaining more than 80% of its initial activity after eight cycles and approximately 30% after 15 cycles. Under the optimized operating conditions, employing 5 g of immobilized biocatalyst and a flow rate of 560 mL/min, GL conversion reached 75%. These conditions promoted substantial GAMG formation, with a maximum concentration of 275 ppm, while

limiting the accumulation of glycyrrhetic acid (GA), indicating a high degree of selectivity towards the desired intermediate.

Overall, the results demonstrate the feasibility of combining enzyme immobilization and fluidized-bed technology for the continuous and selective production of GAMG. The improved operational stability and favorable conversion profile obtained with the FBR support its potential as a scalable biocatalytic platform for the sustainable production of natural high-intensity sweeteners.

Invited Talk

Algal Bioactive Extracts as Natural Preservatives for IV-Range Seafood: Initial Results from the CONMAR Project

Fini Sánchez García

University of Cádiz, Spain

Abstract: The CONMAR project focuses on the bioactivity of algal extracts as natural alternatives to synthetic additives in minimally processed (IV-range) seafood. The study evaluates the antioxidant capacity of two macroalgae (*Ulva Lactuca* and *Gracilaria cornea*) and two microalgae (*Nannochloropsis gaditana* and *Rhodorus marinus*), assessing *R. marinus* for this application for the first time. All strains were sourced from the Spanish Bank of Algae (SEA) and cultivated under controlled conditions to ensure batch reproducibility.

Under a green chemistry framework, ultrasound-assisted extraction (UAE; 130 W, 50 kHz) was performed using food-grade solvents, ethanol and ethyl acetate. Enzymatic hydrolysis using the MIURA cocktail was introduced prior to extraction to facilitate cell wall disruption and target recovery. Antioxidant activity was quantified using DPPH and ABTS radical scavenging assays.

Enzymatic pre-treatment proved essential for *R. marinus*, yielding nearly a threefold increase in both bioactive recovery and antioxidant capacity compared to non-hydrolyzed controls. These preliminary findings support the implementation of targeted enzymatic disruption paired with green solvents to obtain stable marine antioxidants for seafood preservation.

Day - 2

Keynote Talk

Engineering Circular Bio-Based Materials for Active Food Packaging: From Resource Valorization to Real-Food Applications

Gulden Goksen

Tarsus University, Turkey

Abstract: Growing concerns about plastic pollution, food loss, and the environmental burden of conventional packaging have accelerated the search for circular materials capable of combining packaging performance with active food protection. Agricultural, agro-industrial, and marine by-products provide renewable sources of biopolymers and bioactive compounds that can be transformed into functional packaging components rather than treated as waste. This keynote presentation provides an integrated perspective on the engineering of bio-based films, coatings, electrospun mats, and absorbent pads for active food packaging. Particular attention will be given to the recovery and utilization of cellulose and nanocellulose from agricultural and marine residues; the extraction of chitosan, gelatin, starch, and plant and marine-derived bioactives; and their incorporation into biodegradable polymer matrices. The presentation will examine how material composition, processing conditions, and structural architecture influence mechanical, thermal, barrier, absorption, antioxidant, antimicrobial, and release properties. Solution casting, electrospinning, homogenization, ultrasonication, and freeze-drying will be discussed as complementary processing strategies for tailoring material functionality. Selected case studies from ongoing European projects will illustrate the progression from resource valorization and physicochemical characterization to real-food validation. These examples include active films and nanofibrous materials, active aerogel pads, and biodegradable packaging concepts integrating recovered biopolymers and natural active compounds. Emphasis will be placed on material-design principles, structure-function relationships, and food-specific preservation requirements. Moving from promising laboratory materials to practical packaging also requires attention to raw-material variability, scalability, safety and migration, regulatory compliance, consumer acceptance, biodegradability, recyclability, and end-of-life management. Furthermore, the packaging performance should be evaluated in real food systems through microbial safety, physicochemical quality, sensory

acceptance, and shelf-life indicators rather than inferred solely from material characterization. Connecting circular resource utilization, materials engineering, and food-level validation can support multifunctional packaging systems that reduce dependence on conventional plastics, add value to underutilized biomass, minimize food losses, and contribute to safer and more sustainable food systems.

Invited Talk

3D-Printed Bioactive Edible Films for Sustainable Food Packaging

Sibel Uzun

Izmir Institute of Technology, Turkey

Abstract: Food packaging plays a critical role in maintaining the safety, quality, and freshness of food products throughout storage and distribution. Although conventional petroleum-based plastics are inexpensive, lightweight, and effective, their extensive use has raised serious environmental and potential health concerns because of their limited biodegradability and persistent accumulation in ecosystems. These challenges have increased the demand for sustainable, biodegradable, and functional packaging alternatives. In this context, active bio-based films represent a promising packaging approach, as they can incorporate functional compounds that improve product stability, extend shelf life, and preserve nutritional quality. This study aimed to optimize the three-dimensional (3D) printing process and fabricate edible films based on soy protein isolate (SPI) and green microalgae (MA), as well as to characterize their rheological, mechanical, barrier, structural.

The effects of MA concentration, nozzle diameter (0.52–0.81 mm), and printing speed (10–20 mm/s) on the printability of SPI–MA formulations were investigated. Following extrusion-based 3D printing, the films were dried and evaluated in terms of color characteristics, tensile strength, elongation at break, puncture strength, water vapor permeability, microstructure. Based on printability and dimensional stability, the optimum processing conditions were determined as 3% MA concentration, a nozzle diameter of 0.72 mm, and a printing speed of 20 mm/s. Compared with the control SPI films, the optimized MA-containing films exhibited a decrease of more than 16% in elongation at break. In contrast, puncture strength and tensile strength increased by more than 12% and 40%, respectively, indicating improved mechanical resistance. The incorporation of MA also reduced water vapor permeability by more than 40%, demonstrating an improvement in the moisture-barrier performance of the films. Therefore, 3D-printed SPI–microalga edible films have considerable potential as eco-friendly, nutritious,

and antioxidant-active alternatives to conventional petroleum-based packaging materials and may contribute to the development of sustainable active food packaging systems.

Invited Talk

Cross-Perspectives on Bread Waste in Greater Tunis: Consumer Behavior vs. University Catering

Hajer Debbabi - Hamza

National Agronomic Institute of Tunisia (INAT), Tunisia

Abstract: Bread is a cornerstone of the Tunisian diet, with annual national consumption reaching 74 kg per capita. Supported by a heavy state compensation system where the government covers 50% to 65% of actual production costs (real cost estimated between ~0.14–\$0.18 USD), bread is sold at a regulated price of 0.190 TND (~0.06 USD). However, this low retail price creates an illusion of zero financial value, making bread the most wasted food commodity in Tunisia across both domestic and institutional settings. This waste is particularly critical given the country's high reliance on imported soft wheat, which reaches 90% to 100% in dry years, impairs food security, and exposes the economy to severe macroeconomic, environmental, and geopolitical vulnerabilities. This study synthesizes our empirical findings on bread waste in Metropolitan region of Tunis (capital of Tunisia), combining household survey data with direct quantitative measurements in university canteens.

At the household level, findings from our survey of 320 residents in Greater Tunis demonstrate that over-purchasing driven by low prices (61.5%) and rapid staling during room-temperature storage (72.4%) represent the primary drivers of domestic disposal (17%). Although national estimates indicate that 113,000 tonnes of bread are discarded annually, households actively implement traditional "3R" strategies (Reduce, Reuse, Recycle), including reheating, culinary repurposing in local recipes (63%), animal feeding, and charitable donation (46%).

At the institutional level, our direct tray-weighing across five university restaurants in Greater Tunis (11,007 individual trays; 569 students surveyed) revealed an overall bread loss rate of 38.1%, including 23.2% discarded on trays and 16.2% unserved kitchen surplus. Despite high environmental awareness (76%) and favorable perceptions of bread quality (93%), a marked Attitude-Behavior Gap persists among students, largely disinhibited by the heavily subsidized meal ticket (0.200 TND / ~0.065 USD).

To address this gap, we deployed a participatory pilot intervention incorporating behavioral nudging and Responsible Research and Innovation (RRI) principles across four university restaurants. Post-intervention evaluation revealed that 34.1% of students claimed to achieve

zero bread waste compared to 11.9% at baseline, while over 43% actively adopted waste-reduction strategies by opting out or taking smaller portions.

Overall, mitigating bread waste in Tunisia necessitates a multi-dimensional strategy combining targeted public awareness, subsidy targeting reforms, improved bakery quality standards, and behavioral nudges at the point of distribution

Keynote talk

From Waste to Wealth: Unlocking the Industrial Potential of Tropical and Subtropical Fruit By-Products

Maria Gloria Lobo Rodrigo

Canarian Institute of Agricultural Research (ICIA), Spain

Abstract: The global production of tropical and subtropical fruits continues to expand in response to increasing consumer demand for fresh produce and processed foods. However, between 25% and 60% of the harvested biomass is lost as peels, seeds, pomace, crowns, cores, and other by-products generated throughout cultivation, postharvest handling, industrial processing, retail, and consumption. Traditionally regarded as waste, these materials are now recognized as valuable renewable feedstocks rich in dietary fibers, polyphenols, carotenoids, pectin, essential oils, enzymes, proteins, and structural biopolymers. Their inadequate disposal contributes to greenhouse gas emissions, environmental pollution, and resource depletion, whereas their valorization represents a key opportunity to advance the circular bioeconomy.

An overview of waste generation in major tropical and subtropical fruits, including bananas, mangoes, pineapples, and papayas, is presented together with the biological, technological, and market factors responsible for these losses. Recent advances in sustainable valorization technologies—including green extraction methods, microbial fermentation, enzymatic bioconversion, integrated biorefineries, and thermochemical conversion—are discussed as effective strategies for recovering high-value compounds while improving resource efficiency and reducing environmental impacts.

Particular emphasis is placed on the expanding industrial applications of fruit-derived compounds and biomaterials beyond the food sector. Bioactive extracts are increasingly incorporated into functional foods, nutraceuticals, cosmetics, and pharmaceutical formulations owing to their antioxidant, antimicrobial, and health-promoting properties. At the same time, structural polysaccharides and natural fibers are being transformed into biodegradable

packaging, edible coatings, textiles, biocomposites, and other sustainable materials, while sugar-rich residues provide renewable feedstocks for the production of bioethanol, biogas, biohydrogen, organic acids, enzymes, and other bio-based chemicals. These multidisciplinary applications illustrate how a single agricultural by-product can generate multiple value streams within integrated biorefinery systems.

Current challenges related to food safety, toxicological risks, process scalability, economic feasibility, and regulatory frameworks are also addressed, together with emerging strategies based on life cycle assessment, industrial symbiosis, and cross-sector collaboration. The transition from waste management to comprehensive biomass utilization highlights the potential of tropical and subtropical fruit by-products as strategic raw materials for food, health, cosmetic, textile, energy, and other bio-based industries, supporting more sustainable production systems and accelerating the development of a circular global bioeconomy.

Invited Talk

Enhancement of Cassava RS5 Using Stearic Acid and Comparison of Its Structural, Functional, and Digestibility Properties with RS4 and Native Cassava Starch

P. S. Adhiyamaan

Fitura Pvt. Ltd, India

Abstract:

Background & Objective: This study investigates the development and characterization of cassava-derived Resistant Starch Type 5 (RS5) using stearic acid and compares its properties with Resistant Starch Type 4 (RS4), produced via citric acid esterification, and native cassava starch.

Methods: RS5 was synthesized by forming amylose-lipid complexes with varying stearic acid concentrations (1%, 1.5%, and 2%). RS4 was synthesized via citric acid esterification. Physical, structural, pasting, and in vitro digestibility properties were evaluated using X-ray diffraction (XRD), Fourier Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscopy (SEM), Rapid Visco Analyzer (RVA), and standard enzymatic digestibility assays.

Results: The RS5 sample treated with 2% stearic acid exhibited superior functionality, achieving a highest complexing index (65%), swelling power of 12.5 g/g, and enhanced water retention. Structural analyses confirmed unique modifications in RS5, including a V-type crystalline structure revealed through XRD and amylose-lipid complexation identified via FT-IR (1740 cm⁻¹ peak). SEM demonstrated surface exfoliation and granule disruption. RS4

retained an A-type crystalline structure with increased thermal stability. Functionally, RS5 exhibited exceptional thickening capabilities with a final viscosity of 2179 mPa·s and strong gel-forming potential. RS4 displayed superior thermal stability (hot paste viscosity 1330 mPa·s) and reduced retrogradation. Digestibility analysis highlighted significantly higher resistant starch content in RS5 (25.67%) and RS4 (29.59%) compared to native cassava starch (10.74%).

Conclusion: This study demonstrates the potential of cassava starch modifications to create versatile, functional ingredients tailored for industrial and health-focused applications. RS5 is well-suited for dairy and gel formulations requiring firm texture and thickening, while RS4 provides enhanced stability for high-temperature and frozen food applications.

Keywords: *Resistant Starch (RS5, RS4); Cassava Starch; Amylose-Lipid Complex; Functional Properties; In Vitro Digestibility*

Invited Talk

Unlocking the Protein Potential of Fruit and Vegetable Seeds: Extraction Technologies, Functional Properties, and Applications in Sustainable Foods

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Abstract: The transition towards sustainable food systems requires the efficient utilisation of nutrient-rich agro-food by-products that are presently underexploited or discarded during processing. Fruit and vegetable seeds constitute a substantial fraction of processing residues and contain significant levels of proteins along with lipids, dietary fibre, minerals, phenolic compounds, and other bioactives. Although these matrices vary markedly in composition and contain compounds that may restrict protein accessibility or functionality, they offer considerable potential as alternative sources of food grade protein ingredients. Their valorisation may contribute to waste reduction, improved resource circularity, and diversification of plant-protein supply chains.

This review critically examines fruit and vegetable seeds as emerging protein resources, focusing on the relationships among seed composition, extraction conditions, protein structure, functional performance, and their food application. Conventional alkaline solubilisation-isoelectric precipitation remains widely used for preparing protein concentrates and isolates, however, its effectiveness is strongly influenced by seed type, particle size, solvent-to-solid ratio, pH, temperature, extraction time, and the isoelectric characteristics of the constituent

proteins. Emerging and assisted processes-including enzyme-assisted extraction, ultrasound-assisted extraction, microwave-assisted extraction, pulsed electric field treatment, and other green technologies-are assessed for their capacity to enhance mass transfer, disrupt cellular structures, improve protein release, and potentially reduce chemical and energy inputs. The review also considers possible processing induced changes, including protein denaturation, aggregation, hydrolysis, oxidation, and modification of intermolecular interactions, which can affect both nutritional quality and techno-functionality.

Particular emphasis is placed on key quality attributes governing food use, including protein yield and purity, amino acid profile, in vitro digestibility, antinutritional factors, molecular size distribution, solubility, water and oil holding capacities, emulsifying activity and stability, foaming behaviour, gelation, and thermal properties. These characteristics determine the suitability of seed-derived proteins for applications in beverages, bakery systems, extruded snacks, emulsified foods, protein fortified products, and plant-based meat alternatives. The review further identifies challenges related to compositional variability, co-extraction of phenolics and lipids, flavour and colour limitations, low protein solubility near the isoelectric region, processing scalability, regulatory compliance, and consumer acceptance.

Future research should combine raw-material standardisation, process optimisation, green extraction, multi-scale structural characterisation, nutritional evaluation, life cycle assessment, and product-specific validation. Such an integrated approach is essential to convert fruit and vegetable seed residues into safe, functional, economically feasible, and sustainable protein ingredients for modern food formulations.

Keywords: Fruit and vegetable seed proteins; Agro-food by-products; Protein recovery; Green extraction; Techno-functional properties; Protein digestibility; Sustainable food systems; Circular bioeconomy.

Invited Talk

From Agri-Food By-products to Functional Foods: A Sustainable Valorisation Approach

Rocío Jiménez de la Peña Armada

Complutense University of Madrid, Spain

Abstract: The valorisation of agri-food by-products represents an important approach for promoting sustainability and innovation within the food industry. Food by-products are rich in bioactive compounds such as polyphenols, dietary fiber, and triterpenes, among others. Their effective valorisation can optimize resource utilization, reduce food waste, and support the development of functional food products. Achieving these goals requires an integrated strategy involving the identification of suitable by-products, the selection of appropriate processing and

extraction techniques, the characterization of their chemical composition and functional properties, the assessment of their quality and safety, and the evaluation of their potential biological activities.

By-products from fruit and vegetable industries are particularly promising because of their high content of bioactive compounds. After selection, different treatments can be applied to improve the recovery and enhance the bioavailability of these valuable components. Conventional solvent extraction remains widely used, but green approaches, including high hydrostatic pressure (HHP) processing or enzymatic hydrolysis, are efficient and sustainable alternatives. The evaluation stage is essential to monitor the effect of the applied treatment, with particular emphasis on chemical characterization and metabolomic profiling. In addition, quality assessment of treated by-products provides important information regarding the technological functionality, safety, nutritional value, and sensory acceptability for potential food applications. Finally, *in vitro*, cell-culture, and *in vivo* studies can provide evidence of health-related activities, including antioxidant, antimicrobial, and anti-inflammatory effects.

This strategy is effectively demonstrated through the valorisation of apple and potato by-products. Apple pomace, generated in large amounts during juice and cider production, is rich in phenolics and dietary fiber; The combination of HHP and food-grade enzymes has enabled the production of a dietary-fiber- and antioxidant-rich ingredient. Potato peel, a major by-product of potato processing, is a source of phenolic compounds. Optimized extractions of potato peels produced antioxidant-rich extracts that, when incorporated into yogurt, improved its phenolic content and antioxidant capacity.

Through an integrated valorisation approach, agri-food by-products can be transformed into valuable ingredients, contributing to a more sustainable food industry. Further research will optimise these processes and expand their applications in the development of functional foods.

Invited Talk

Appl[e]ause: a multidimensional consumer-centric approach to evaluate acceptance of apple pomace-based bakery products

Nazarena Cela

University of Basilicata, Italy

Abstract: Consumers' acceptance is critical to the successful development of upcycled foods. However, research in this field has mainly focused on sensory characterization and hedonic evaluation, while less attention has been devoted to beyond-liking measures. This study investigated the multidimensional acceptance of six apple pomace-based bakery prototypes, divided in sweet (Sweet bread, Biscuit, Shortbread) and savoury (Breadstick, Cracker, Nachos) formulations, integrating hedonic evaluation with consumption contexts and food and

beverages pairings. For each product, consumers (n = 110, F = 65%, mean age = 27.6) rated their overall liking (OL) and selected the most appropriate sensory attributes, consumption contexts and gastronomic pairings using the Check-All-That-Apply method. Versatility Index (VI), Food Pairing Index (FPI) and Beverage Pairing Index (BPI) were calculated and integrated with OL into a Multidimensional Acceptance Index (MAI). Significant differences among products emerged across all acceptance dimensions. Breadstick showed the highest OL, VI and MAI, whereas Nachos showed the lowest values. Pairing profiles provided additional differentiation: Sweet bread achieved the highest FPI despite neutral liking, while Biscuit showed the highest BPI. Correlations among OL, VI, FPI and BPI were positive but varied in magnitude, supporting their complementary contribution to product characterization. Consumer segmentation identified two clusters with significantly different multidimensional acceptance profiles, particularly in contextual versatility and pairing potential. Overall, the proposed approach suggested to shift the upcycled foods evaluation from simply asking whether consumers like them to understanding when and how they fit into consumers' eating practices, offering a more comprehensive perspective for developing upcycled products with a meaningful role in everyday consumption.

Invited Talk

Application of pulsed electric field technology to food and dairy materials

Owen M. McDougal

Boise State University, USA

Abstract: Pulsed electric field (PEF) technology is a non-thermal food processing and preservation method. The Food and Dairy Innovation Center at Boise State University has explored the use of PEF to treat a range of materials including potatoes, crushed grapes, barley, beans, plant-based fiber, and a wide range of dairy solutions. The traditional applications of PEF technology have relied on short, high-voltage bursts of electricity to induce electroporation of cell membranes for mass transfer or induced cell death. The potato processing industry leverages the benefits of PEF at industrial scale, driving commercial PEF systems capable of 50 to 90 tons/hr. Emerging applications of PEF involve treatment of liquid solutions beyond juice pasteurization. This presentation will detail traditional material treatment by PEF and transition to future applications where the technology provides benefits through mechanisms that remain largely underexplored.

Invited Talk

Food Upcycling: Transforming Agro-Industrial By-Products into Value-Added Food Ingredients

Silvia Matiacevich

University of Santiago de Chile, Chile

Abstract: Food upcycling offers new opportunities to transform agro-industrial by-products into valuable ingredients while addressing food losses and promoting more sustainable production systems. There are substantial amounts of agricultural and food-processing residues, many of which contain bioactive compounds with potential applications in food formulation and preservation. This presentation discusses the opportunities and challenges associated with recovering these compounds and developing functional ingredients through sustainable technologies.

Particular attention is given to green extraction processes, including ultrasound-assisted extraction, environmentally friendly solvents, and supercritical fluids, as well as encapsulation technologies aimed at improving the stability of recovered compounds. Research conducted at the Universidad de Santiago de Chile provides an example through the valorization of walnut green husk (*Juglans regia* L.), a by-product rich in antioxidant polyphenols. Ultrasound-assisted extraction, combined with spray drying using chickpea protein as an encapsulating material, has enabled the development of plant-based antioxidant powders with potential applications in food systems.

Despite these advances, industrial implementation remains challenging. Variability in raw materials, processing costs, ingredient stability, food safety, regulatory requirements, and consumer acceptance must be considered when moving from laboratory research to commercial production.

Food upcycling should therefore extend beyond recovering bioactive compounds to demonstrating their technological functionality, safety, and effectiveness in real food matrices. Integrating food science, process engineering, and industry collaboration will be essential to translate agro-industrial residues into sustainable ingredients and strengthen circular economy strategies within the food sector.

Oral Talk

Effect of acetic acid pretreatment concentration on UVC- assisted drying of banana: kinetics and mathematical modeling

Patricia Moreira Azoubel

Federal University of Pernambuco (UFPE), Brazil

Abstract: Drying is widely used for fruit preservation, contributing to increased shelf life and added value. However, the process can face limitations due to high internal resistance to water removal, which can result in long drying times. The food industry is increasingly interested in innovative drying technologies that can shorten dehydration time while minimizing energy use, reducing environmental impact, and preserving the overall quality of the product. This study investigated UVC-assisted convective drying of banana with and without acetic acid (AA) pretreatment. Bananas of ‘Prata’ variety were purchased in a local market. The fruits were sanitized, the peels were manually removed, and the pulp was cut into 0.5 cm thick slices. For the pretreatment step, the samples were immersed in 10% and 50% (w/w) AA solutions for 15 minutes. Drying was performed in a UVC-assisted dryer at 50 °C. The apparatus assembled in this study included, in addition to the dryer, a thermal blower, a set of UVC lamps, a semi-analytical scale, and a computer, which collected the weighing information in real time. From the drying data, it was possible to study the kinetics, using the dimensionless moisture data as a function of the process time. Among the five models (Henderson and Pabis, Logarithm, Exponential Two Terms, Wang and Singh, and Simple Exponential) used to fit the experimental fruit drying kinetics data, the Exponential Two Terms model presented the best prediction for all conditions studied. It was found that higher rates and shorter drying times were observed when banana samples were pretreated with AA, compared to the control sample (without pretreatment), mainly when the lower solution concentration was used. This behavior may be attributed to the stiffening and structural collapse induced by the acidic environment. High concentrations of organic acids can reduce the pH of plant tissue, intensifying the formation of cross-links between pectins and promoting cell wall shrinkage. These changes reduce porosity and increase internal resistance to water diffusion, hindering moisture flow to the surface. Thus, even during heating, water mobility remains limited, resulting in slower drying compared to samples subjected to 10% AA solution pretreatment.

Invited Talk

Germination as a Natural Strategy for Nutritional Enrichment of Cereal- and Legume-Based Foods: Evidence from Multigrain Pita Bread and Lentil Creams

Marcela Jarpa Parra

Universidad Adventista de Chile, Chile

Abstract: Germination is a natural, low-cost bioprocess that activates endogenous enzymes, reduces antinutritional factors and can improve the nutrient density and bioactive profile of cereals and legumes without chemical additives or fortification. This presentation reviews the nutritional and sensory outcomes of germination in two food systems developed by our group. In the first, multigrain pita bread (wheat, rye, millet, broad bean and lentil) made with germinated or non-germinated flours was compared with a commercial bread. Germination maintained protein, fiber and ash content, lowered energy content relative to the commercial bread (249 vs. 261 kcal), and yielded breads with higher DPPH antioxidant capacity and phenolic compounds (p-tyrosol, vanillic acid) absent from the commercial product, without affecting dough density or water-holding capacity. In a consumer test (n = 97, 9-point hedonic scale), the germinated bread was as acceptable as the commercial one and scored significantly higher in flavor than the non-germinated bread; it also obtained the highest aroma score. Just-about-right analysis identified crumb porosity and acid flavor as the attributes to optimize in the germinated bread. In the second system, lentil creams processed by germination, fermentation or both were compared with the lentil cream of Chile's Complementary Feeding Program for Older Adults (PACAM). The germinated cream showed the highest protein content (29.3 vs. 16.4 g/100 g), lower fat, higher iron and zinc (6.6 vs. 4.2 and 4.8 vs. 3.0 mg/100 g) and markedly lower sodium (15.6 vs. 157 mg/100 g) than the fortified reference, together with increased vanillin and gallic acid. It also achieved the highest sensory acceptability among 39 older adults ($p < 0.001$), whereas fermentation-driven acidification reduced acceptance. These results show that germination can improve the nutritional quality and bioactive composition of staple foods while supporting consumer acceptance, and that its effects depend on the food matrix. Germination is therefore a practical, scalable strategy for nutrient-dense foods, including those targeting vulnerable groups such as older adults.

Keywords: germination; nutritional enrichment; pulses and cereals; bioactive compounds; minerals; functional foods

Invited Talk

Peruvian Andean Germplasm to Global Functional Foods: Unveiling the Nutritional and Bioactive Potential of Amaranthaceae Seeds Through a Comparative Analytical Approach

Christian R. Encina-Zelada

National Agrarian University La Molina (UNALM), Peru

Abstract: Amaranthaceae seeds, including quinoa (*Chenopodium quinoa* Willd.) and other Andean grains, have gained global recognition for their high nutritional value and bioactive potential. This study presents a comparative characterization of Amaranthaceae seeds from three different geographical regions: Peru, Slovakia, and Poland. The nutritional composition (proximate analysis, fatty acids, minerals) and bioactive properties (total phenolic content, antioxidant capacity, and phenolic profile) were evaluated using advanced analytical approaches, including spectrophotometric and chromatographic techniques. The results revealed significant differences among the samples, attributed to genetic, environmental, and agronomic factors. Peruvian samples exhibited distinct bioactive profiles, highlighting the importance of Andean germplasm as a source of functional ingredients. The comparative approach provides valuable insights for the valorization of Amaranthaceae seeds and their potential application in the development of functional foods. This research also underscores the importance of international collaboration in promoting sustainable food systems and biodiversity conservation.

Invited Talk

Identification of Metabolic Biomarkers of Resistant Starch Intake and Its Effects on Women's Metabolic Health

Jiyoung Lee

George Washington University, USA

Abstract: Despite the known health-promoting properties of resistant starch (RS), consumption remains low relative to recommended intake levels. RS intake influences gut microbiota composition and metabolic markers, potentially through short-chain fatty acid (SCFA)-mediated energy harvesting and hepatic lipogenesis. However, prospective evidence is limited. To address this gap, we conducted a double-blind, randomized dietary intervention comparing high versus low RS consumption in adult women with risk factors for metabolic syndrome. After 8 weeks, high RS intake produced mixed metabolic responses: blood pressure decreased modestly, whereas body weight, body fat, and triglyceride levels increased, along with distinct changes in gut microbiota composition. Because the triglyceride elevation reached a clinically meaningful magnitude, high RS interventions should include regular lipid monitoring to ensure cardiometabolic safety. These findings highlight the complex interplay between SCFA-producing gut microbiota and host energy metabolism and suggest that individualized dietary strategies may be needed to optimize metabolic outcomes.



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