

# 5<sup>th</sup> Edition of Innovations in FOOD SCIENCE AND HUMAN NUTRITION

SEP 20 - 21, 2022 at  
BARCELONA, SPAIN

## Venue:

Hotel FrontAir Congress Barcelona  
Carrer de les Alberedes  
16, 08830 Sant Boi de Llobregat,  
Barcelona, Spain



Login:

Meeting ID: 868 3534 1315

Pass code: 147751





# Scientific Program

Day  
**1**

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

# Tuesday

**SEP 20, 2022**

Meeting Room - Castelldefels

08:00-08:40 \_\_\_\_\_ Registrations

08:40-09:00 \_\_\_\_\_ Opening Ceremony

Moderator: **Duconseille Anne**, Institut National de Recherche pour l'Agriculture, INRAE, France

## KEYNOTE TALKS

09:00-09:30 \_\_\_\_\_ **Protective effects of extra virgin olive oil and exercise training on rat skeletal muscle against high-fat diet feeding**

*Li Li Ji , Director, The Laboratory of Physiological Hygiene and Exercise Science University of Minnesota, USA*

09:30-10:00 \_\_\_\_\_ **Superhydrophobic Sand for Enhanced Food Production in Hot and Dry Regions**

*Himanshu H Mishra, King Abdullah University of Science and Technology (KAUST), Saudi Arabia*

10:00-10:30 \_\_\_\_\_ **Glutathione supplement of parenteral nutrition: interactions with nutrients**

*Jean-Claude Lavoie, Université de Montréal. Research Centre, CHU Sainte-Justine, Canada*

**GROUP PHOTO**

**Refreshment Break 10:30- 10:50 @ Foyer**

**Technical Session-I  
Functional Foods, Nutrition, Nutraceuticals & Bioactives**

**Session Chairs:**

*Li Li Ji, University of Minnesota, USA*

*Noushine Shahidzadeh, University of Amsterdam, The Netherlands*

10.50-11.10 \_\_\_\_\_ **Influence of *Lactobacillus brevis* DSM 32386 added to model cheese on generation of GABA**

*Elena Franciosi, Fondazione Edmund Mach (FEM), Italy*

Day

1

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

**Tuesday**

**SEP 20, 2022**

- 11:10-11:30** ————— **Anti-obesity potential of *Moringa olifera* seed extract and lycopene on high fat diet induced obesity in male Sprague Dawley rats**  
*Tahany Saleh Aldayel, Princess Nourah Bint Abdulrahman University, Saudi Arabia*
- 11:30-11:50** ————— **Isolation and identification of new diterpene derivatives from sweet pepper pericarp**  
*Barbara Chilczuk, University of Life Sciences, Lublin, Poland*
- 11:50-12:10** ————— **Iron incorporation in edible salt to combat iron deficiency**  
*Noushine Shahidzadeh, University of Amsterdam, The Netherlands*
- 12:10-12:30** ————— **Assessment of the stability of plant extracts during freeze-drying process and storage**  
*Marzena Pabich, University of Life Sciences, Lublin, Poland*
- 12:30-12:50** ————— **Anti-obesity effect of fresh and browned *Magnolia denudata* flowers in 3T3-L1 preadipocyte and a high fat diet murine model**  
*Yong Hoon Joo, College of Life Sciences and Biotechnology, Korea University, South Korea*
- 12:50-13:10** ————— **Identification of volatiles formed in fruits during storage using multinomial logistic regression**  
*Jiri Létal, Independent Statistical Consultant, Czech Republic*

**Lunch Break 13:10 -14:00 @ Restaurant**

Day  
**1**

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

**Tuesday**

**SEP 20, 2022**

**Technical Session-II  
Global Food Security and policies  
Food Safety & Risk Management  
Sustainable Food Production**

**Session Chairs:**

*Himanshu H Mishra, KAUST, Saudi Arabia*

*Robert A. Coleman, The University of Findlay, USA*

**14:00-14:20** ————— **The relationship between one's socioeconomic status and personal responsibility beliefs towards food access**

*Robert A. Coleman, The University of Findlay, USA*

**14:20-14:40** ————— **Application of digital twins in the food industry**

*Elia Henrichs, University of Hohenheim, Germany*

**14:40-15:00** ————— **Content of toxic elements in naturally gluten-free grains available on the Polish market: health risk assessment**

*Joanna Bielecka, Department of Bromatology, Medical University of Białystok, Poland*

**15:00-15:20** ————— **Optimisation of cultivated meat production through high-resolution transcriptomic analysis of satellite cell differentiation**

*Tobias Messmer, Mosa Meat B.V., The Netherlands*

**15:20-15:40** ————— **Precision fermentation strategies for novel food proteins**

*Christoph Herwig, Institute of Chemical Environmental and Bioscience Engineering, TU WIEN, Austria*

**15:40-16:00** ————— **The Value of Co-Creation in Designing Computational Intelligence Tools to Reduce Waste in Agrifood Supply Chains**

*Juan S. Angarita-Zapata, University of Deusto, Spain*

**Refreshment Break 16:00- 16:20 @ Foyer**

Day  
1

5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA

Tuesday

SEP 20, 2022

Technical Session-III

Chemistry and Bio Chemistry of Foods  
Clinical Nutrition and Therapeutic Dietetics  
Food and Chemical Toxicology  
Meat, Poultry and Sea food

Session Chairs:

*Efrat Monsonogo Ornan, Food and Environment The Hebrew University of Jerusalem, Israel*

- 16:20-16:40 ————— **Organic aquaculture in Italy: current situation**  
*Benedetto Sicuro, University of Turin, Italy*
- 16:40-17:00 ————— **Transformation of highly marbled beef under various cooking processes**  
*Duconseille Anne, Institut National de Recherche pour l'Agriculture, INRAE, France*
- 17:00-17:20 ————— **Transformation products of azoxystrobin formed after the ozonation process - presence in fruit samples and toxicity assessment**  
*Monika Sachadyn-Król, University of Life Science in Lublin, Poland*
- 17:20-17:40 ————— **Ultra-processed food effects on bone development and quality**  
*Efrat Monsonogo Ornan, The Robert H. Smith Faculty of Agriculture, Food and Environment The Hebrew University of Jerusalem, Israel*
- 17:40-18:00 ————— **DETECTION and Hazard Assessment of the transformation products of boscalid During ozonation process By LC-MS and in-silico toxicity assessment**  
*Iwona Budziak-Wieczorek, University of Life Science in Lublin, Poland*

Panel Discussions

Day

2

5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA

Wednesday

SEP 21, 2022

Meeting Room - Castelldefels

Technical Session-IV

Food and Nutritional Science

Food Production and Quality Assurance

Session Chairs:

*Barbara Giussani, Universita degli Studi dell Insubria, Italy*

*Ali Rhouma , PRIMA Foundation, Spain*

- 09:10-09:30 ———— **Characteristics and quality of Chilean abalone undergoing different drying emerging technologies**  
*Mario Perez-Won, Universidad del Bío Bío, Chile*
- 09:30-09:50 ———— **Predicting thickness perception of liquid food products from their non-Newtonian rheology**  
*Daniel Bonn, University of Amsterdam, The Netherlands*
- 09:50-10:10 ———— **Performance PRIMA Programme after 4 years of its implementation in the Mediterranean region**  
*Ali Rhouma , PRIMA Foundation, Spain*
- 10:10-10:30 ———— **Study of the activation energy and the mechanical compression to characterize the transition between uncooked and cooked state of the cowpea seeds**  
*Ekoué TEKOU, (LaSBASE), ESTBA/Université de Lomé, France*
- 10:30-10:50 ———— **Evaluating the Shelf-life of Pasteurized Milk in Oman**  
*Intisar Al-Gharibi, Food Safety & Quality Center, Ministry of Regional Municipalities, Oman*
- 10:50-11:10 ———— **Micronutrients and the Immune System: their role in COVID-19**  
*Ascensión Marcos, Institute of Science, Technology of Food and Nutrition (ICTAN), Spanish National Research Council (CSIC)., Spain*

**Refreshment Break 11:10- 11:30 @ Foyer**



Day  
**2**

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

**Wednesday**

**SEP 21, 2022**

- 11:30-11:50 ————— **Analytical strategies for food analysis using miniaturized NIR spectroscopy**  
*Barbara Giussani, Università degli Studi dell'Insubria, Italy*
- 11:50-12:10 ————— **Impact of vanilla origins on sensory characteristics of chocolate**  
*Renata Januszewska, Barry Callebaut Belgium NV, Belgium*
- 12:10-12:30 ————— **Use of seaweed and yeast extract as biostimulants to enhance the phytochemical profile and nutraceutical properties of Prunus Persica fruits**  
*Giuseppe Mannino, University of Turin, Italy*
- 12:30-12:50 ————— **Cocoa beans and liquor fingerprinting: a real case involving SSR profiling of CCN51 and "Nacional" varieties**  
*Matteo Busconi, Università Cattolica Del Sacro Cuore, Italy*
- 12:50-13:10 ————— **Decaffeinated green tea processing using pilot scale SFE Technique**  
*Saziye Ilgaz, European Speciality Tea Association, Turkey*

**Lunch Break 13:10-14:00 @ Restaurant**

**Poster Session 14.00-15.30**

**Awards and Closing Ceremony**

Day  
**2**

**5<sup>th</sup> Edition of Innovations in**  
**FOOD SCIENCE AND HUMAN NUTRITION**  
**SEP 20 - 21, 2022 AT BARCELONA**  
**Wednesday** **SEP 21, 2022**

**Poster Session 14.00-15.30**

- Poster-1** ————— **Antibiotic resistance and virulence factors in Lactobacilli**  
*Andrea Colautti, University of Udine, Italy*
- Poster-2** ————— **Effects of PEF pre-treatment on vacuum microwave drying, freeze-drying, and hot air drying of Chilean abalone (*Concholepas concholepas*).**  
*Luis González-Cavieres, Universidad del Bío Bío, Chile*
- Poster-3** ————— **Effect of pulsed electric fields (PEF) on digestibility and protein quality of freeze-dried Chilean abalone**  
*Anais Palma-Acevedo, Universidad del Bío Bío, Chile*
- Poster-4** ————— **Innovative nonwovens with addition of feathers for agricultural applications**  
*Krystyna Wrze niewska-Tosik, ŁUKASIEWICZ Research Network-Institute of Biopolymers and Chemical Fibres, Lodz, Poland*
- Poster-5** ————— **LC-QTOF-MS comparison of phenolic compound profiles in plant extracts during storage**  
*Małgorzata Materska, University of Life Sciences, Lublin, Poland*
- Poster-6** —————  **$\beta$ -Caryophyllene reverts free fatty acids-induced steatosis in HepG2 hepatocytes through CB2 and PPAR- $\alpha$  receptors**  
*Rosaria Scandiffio, University of Turin, Italy*
- Poster-7** ————— **Beneficial Effects of Intermittent Fasting And High Intensity Interval Training In Obese Mice With Nonalcoholic Fatty Liver Disease**  
*Patricia de Castro de Paiva, State University of Rio de Janeiro, Brazil*
- Poster-8** ————— **Agri-food byproducts as a natural source of food-grade Pickering stabilizers: chemical and emulsifying properties**  
*César Burgos-Díaz, Agriaquaculture Nutritional Genomic Center, CGNA, Temuco, Chile.*

Day  
**2**

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

**Wednesday**

**SEP 21, 2022**

- Poster-9** ————— **Pork liver recovery by obtaining a soluble protein extract with techno-functional properties: characterisation of the spray-dried extract and of the residual insoluble fraction**  
*Narcís Feliu-Alsina, Universitat de Girona (UdG), Spain*
- Poster-10** ————— **Production of L-carnitine-enriched edible filamentous fungal biomass through submerged cultivation**  
*Neda Roustá, University of Borås, Sweden*
- Poster-11** ————— **Vacuum drying's effect on nutritional composition and functional properties of Broccoli (*Brassica oleracea var. italica*)**  
*Antonio Vega-Gálvez, Universidad de La Serena, Chile*
- Poster-12** ————— **Biofortification of *Solanum tuberosum* L. tubers through foliar CaCl<sub>2</sub> and Ca(NO<sub>3</sub>)<sub>2</sub> pulverization**  
*Fernando José Cebola Lidon, Universidade NOVA de Lisboa, Campus da Caparica, Portugal*
- Poster-13** ————— **Evaluation of the mineral composition of food supplements – a preliminary assessment**  
*Fernando Henrique Da Silva Reboredo, Universidade NOVA de Lisboa, Campus da Caparica, Portugal*
- Poster-14** ————— **Synthetic Food Colour Additives: A General Perspective on Chemical Properties, Applications in Food Products, and Health Side Effects**  
*Maria Manuela Abreu Da Silva, ESEAG/Grupo Universidade Lusófona, Portugal*
- Poster-15** ————— **Modern glycemic monitoring systems and prevalence of metabolic syndrome among adolescents with type 1 diabetes mellitus**  
*Monika Grabia, Medical University of Białystok, Poland*
- Poster-16** ————— **Subcritical Water Extraction of Pectin from Passion Fruit (*Passiflora edulis* sp.) Rinds**  
*Debora Tamires Vitor Pereira, University of Campinas, Brazil*

Day  
**2**

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

**Wednesday**

**SEP 21, 2022**

**Technical Session  
(Virtual Through ZOOM)  
Barcelona Time - CEST  
Barcelona Time (13.00 onwards)**

- |                    |  |
|--------------------|--|
| <b>13:00-13:20</b> | <b>Gelation mechanisms and network structures in polysaccharide gels from viewpoints of macro- and microscopic aspect</b><br><i>Shingo Matsukawa, Tokyo University of Marine Science and Technology, Japan</i>               |
| <b>13:20-13:40</b> | <b>Mediterranean Diet Combined With a Low-Carbohydrate Dietary Pattern in the Treatment of Overweight Polycystic Ovary Syndrome Patients</b><br><i>Ding Jie, Changhai Hospital of PLA Military Medical University, China</i> |
| <b>13:40-14:00</b> | <b>Network Structure of Agarose During Gelation Studied by Multiple Particle Tracking and NMR Measurements</b><br><i>Hwabin Jung, Tokyo University of Marine Science and Technology, Japan</i>                               |
| <b>14:00-14:20</b> | <b>Physical Properties of Stingless Bee Honey from Community Enterprise in Songkhla Province, Thailand</b><br><i>Vatcharee Seechamnaturakit, Faculty of Agro-Industry, Prince of Songkla, University, Thailand</i>           |
| <b>14:20-14:40</b> | <b>Where to grow the Giant Kelp? “Nutritional composition of wild harvested giant kelp compared”</b><br><i>Diane Purcell-Meyerink, Teagasc Food Research Centre, Ireland</i>   |
| <b>15:40-15:00</b> | <b>Assessing well-being among young adult men based on Sen’s Capability Approach</b><br><i>Susanne Ferschl, Technical University of Munich, Germany</i>  |

Day  
**2**

**5<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION  
SEP 20 - 21, 2022 AT BARCELONA**

**Wednesday**

**SEP 21, 2022**

- 
- 15:00-15:20** ————— ***Streptococcus thermophilus*: anti-inflammatory potential of surface protein derived-peptides**  
*Rania Allouche, Lorraine University , France*
- 15:20-15:40** ————— **Determination of glyphosate, Gluphosinate, N-acetyl Gluphosinate residue in sesame seeds by LC/MS/MS**  
*Angela Santilio, Istituto Superiore di Sanità, Rome, Italy*
- 15:40-16:00** ————— **Analysis of the effect of genetically modified *Trichoderma atroviride* strains in SWO1, a protein with amorphogenetic activity, in chili plants**  
*Jorge Luis Folch-Mallol, Universidad Autónoma del Estado de Morelos - UAEM, Mexico*
- 16:00-16:20** ————— **Phytochemicals and Botanicals as Nootropics – Old Neuroactive Players with New Science**  
*Deshanie Rai, OmniActive Health Technologies, Morristown NJ, USA*



---

# Keynote Talks DAY-1

---



## Protective effects of extra virgin olive oil and exercise training on rat skeletal muscle against high-fat diet feeding

**Li Li Ji, Ph.D.**

*Professor and Director, Laboratory of Physiological Hygiene, School of Kinesiology, University of Minnesota Twin Cities, USA*

A diet high in saturated fat leads to skeletal muscle deteriorations including insulin resistance, mitochondrial dysfunction and muscle fiber atrophy. Consumption of long-chain polyunsaturated fatty acids and regular exercise have shown promises in alleviating high-fat diet (HFD)-induced adverse effects. This research aimed to investigate whether 12 weeks of extra virgin olive oil (EVOO) feeding in conjunction with endurance training (T) could reduce metabolic, antioxidant and mitochondrial dysfunctions in rat muscle chronically exposed to HFD. The results revealed that HFD-induced decline of mitochondrial oxidative enzymes was restored with EVOO and EVOO+T, along with an upregulation of PGC-1 $\alpha$  level and mitochondrial biogenic markers. HFD-inflicted elevation of muscle proteolytic indicators were severely suppressed by EVOO+T. Mitochondrial dynamics of fusion and fission was greatly disturbed by HFD, but restored with EVOO+T. EVOO+T ameliorated muscle autophagy/mitophagy markers and suppressed mitochondrial ubiquitination levels, along with decreased FoxO3 activity. Antioxidant enzyme levels were upregulated by EVOO+T, resulting in a reduction of HFD-induced oxidative damage. HFD decreased muscle NAD<sup>+</sup> content due to elevated expression of PARP-1 and CD38 levels, whereas EVOO+T promoted NAD<sup>+</sup> salvage, restored NAD<sup>+</sup> content and increased expression of sirtuins. In conclusion, HFD impaired muscle functional integrity shown by protein ubiquitination, loss of mitochondrial quality control and reduction of oxidative capacity. Replacement of HFD with EVOO in conjunction with training corrected the observed adverse effects and ameliorated muscle function.

### Biography:

Li Li Ji is Professor and Director of the Laboratory of Physiological Hygiene and Exercise at the University of Minnesota Twin Cities since 2011. Dr. Ji's research expertise is cellular and molecular exercise physiology, with emphasis on free radicals and redox biology. He studies muscle metabolic and antioxidants adaptations in response to exercise, aging, nutrition and certain pathogenesis, and seeks prevention and treatments using experimental interventions. Dr. Ji has published over 200 articles and book chapters, and given over 170 invited lectures. His work has been cited for over 20,000 times in scientific literature and current has an H-index of 74.





## Superhydrophobic Sand for Enhanced Food Production in Hot and Dry Regions

**Himanshu Mishra\*, Adair Gallo Jr., and Kennedy Odokonyero**

*King Abdullah University of Science and Technology (KAUST), Water Desalination and Reuse Center, Division of Biological and Environmental Sciences and Engineering, Saudi Arabia*

Food–water security is our non-negotiable necessity. In this context, the importance of irrigated agriculture cannot be overstated – while only 20% of cultivated land is irrigated, it contributes ~40% of the total world food production. However, irrigated agriculture claims over 70% of global freshwater withdrawals annually. In many arid and semi-arid regions, e.g., the Middle East, excessive volumes of ground and river waters are exploited to offset evapotranspiration losses due to intense solar radiation and dry air. Decades of freshwater withdrawals have critically depleted water supplies in these regions (and beyond), resulting in food and water security concerns to become issues of international importance. In response, plastic mulches have been utilized to reduce water evaporation, but their eventual land-filling and cost render them unsustainable<sup>5</sup>. My group has pioneered Superhydrophobic Sand (SHS) by combining sand grains with nanoscale layer of paraffin wax. SHS is extremely water repellent, and when a ~5 mm-thick SHS layer is applied onto wet soil in a hot and dry environment (irrigated via sub-surface setup) it dramatically reduces the evaporative water loss. With higher soil moisture content in the root region, plants develop and grow better. For the past five years, we have been conducting field trials of SHS in western Saudi Arabia with a number of crops, including tomato (*Solanum lycopersicum* – variety A, cv. Bushra; variety B, cv. Nunhem's Tristar F1), barley (*Hordeum vulgare*, cv. Morex) and wheat (*Triticum aestivum*, cv. Balady). Under normal irrigation, we observed 17-72% enhancements in the fruit and grain yields compared to unmulched controls; this performance was at par with plastic mulches. Unlike plastic sheets that require landfilling, SandX mulches lose their water repellence after 7-9 months and get integrated into the sandy soil on plowing. Notably, there were no statistically significant differences in the soil microbiome in the mulched and unmulched cases. Over 35,000 kg of SandX have been field tested so far in collaboration with farmers, universities, and industrial partners.

### Biography:

Himanshu Mishra is an Associate Professor of Environmental Science and Engineering at KAUST. His group develops and applies experimental methods to interrogate physical and chemical phenomena at interfaces of water such as surface forces, electrification, wetting, and catalysis. Fundamental insights are then translated into sustainable technologies such as for achieving water– food–climate security in arid lands via soil amendment and carbon sequestration and beyond. He has authored ~40 peer-reviewed articles in top journals, including *Nature Communications*, *Science Advances*, *PNAS*, *JCIS*, and flagship journals of the American Chemical Society and the Royal Society of Chemistry; he is a co-inventor on nine granted/pending patents.



## Glutathione supplement of parenteral nutrition: interactions with nutrients

**Jean-Claude Lavoie, Ph.D., Nadine El Raichani, Clémence Guiraut, Guillaume Morin and Ibrahim Mohamed**

*Full Professor, Department of Nutrition, Faculty of Medicine, Université de Montréal. Research Centre, Canada*

**Background:** Oxidative stress is a central factor in many pathological complications observed in very premature infants (< 32 weeks of gestation). These include retinopathy of prematurity (ROP), necrotizing enterocolitis (NEC), and bronchopulmonary dysplasia (BPD). The high oxidative stress observed in this population is mainly caused by their exposure to strong oxidizing molecules such as peroxides which inherently contaminate their parenteral nutrition (PN), and their oxygen supplementation. Their deficiency in glutathione, a key endogenous antioxidant, prevents the resolution of this stress. In newborn animals, glutathione supplementation of PN prevented oxidative stress and alveolar loss (the main characteristic of BPD). Of its two forms - disulfide (GSSG) and free thiol (GSH) - GSSG has been used because it has better stability in PN. However, a 30% loss of GSSG in PN is observed. The potentially high therapeutic benefits of GSSG supplementation on the health of very preterm babies makes studying its stability very important.

**Materials and Methods:** GSSG was incubated in combination with the following components of PN: dextrose, multivitamins, Primene, Travasol, as well as with cysteine, cystine and peroxides for 24h. Total glutathione in these solutions was measured 0-24h after the addition of GSSG.

**Results:** The combination of cysteine and multivitamins caused the maximum loss of glutathione. The stability of GSSG was not affected by multivitamins. The cysteine was responsible for about 20% of the loss of GSSG, in presence of multivitamins the loss reached more than 70%. Removing the cysteine prevented the degradation of glutathione.

**Conclusion:** GSSG reacts with cysteine to form cysteine-glutathione disulfide, another suitable glutathione substrate for preterm neonates. The study confirms that GSSG added to PN can potentially provide a precursor to *de novo* synthesis of glutathione *in vivo*.

## Biography:

Since obtaining my Ph.D. from Université de Montréal (1998), I am working in the field of oxidative stress in newborns, especially those born prematurely requiring parenteral nutrition, in relation with lung disease such as BPD (> 60 articles on this specific subject). Over the past 10 years (from 2012), my team has produced 28 articles, of which 20 in the field of neonatal oxidative stress: 13 animal studies (metabolic pathways), 5 clinical studies with premature infants (specific markers of these pathways) and 2 reviews (*Sex-specificity of oxidative stress in newborn ...; Parenteral nutrition and oxidant stress in the newborn ...*)

---

**Scientific Session**

**DAY-1**

---

## Influence of *Lactobacillus brevis* DSM 32386 added to model cheese on generation of GABA

**Elena Franciosi<sup>1\*</sup>, Andrea Mancini<sup>1</sup>, Tiziana Nardin<sup>1</sup>, Nicola Cologna<sup>2</sup>, Andrea Goss<sup>2</sup>, Andrea Merz<sup>2</sup>, Roberto Larcher<sup>1</sup>**

<sup>1</sup>Fondazione Edmund Mach (FEM). Via E. Mach 1, 38010 San Michele all'Adige, Italy,

<sup>2</sup>Trentingrana Consorzio dei Caseifici Sociali Trentini s.c.a., Via Bregenz 18, Trento, Italy.

Gamma-aminobutyric acid (GABA) plays a fundamental role in brain function through the gut:brain axis system. In this study we used the GABA-producing strain *Lactobacillus brevis* DSM 32386 as adjunct culture during model-cheeses production and investigated its ability to produce GABA in situ during cheese ripening. Our objective was to evaluate the viability of the microorganisms added to the model-cheese and the release of GABA. Model-cheeses were prepared in triplicate during three consecutive weeks for a total of 60 samples, incorporating the commercial mix Lyofast MOT 086 CE and 1) *L. brevis* DSM 32386 2) *L. brevis* DSM 32386 with extra glutamate acid 3) *L. brevis* DSM 32386 with a proteolytic commercial strain of *Lactobacillus helveticus* 4) *L. brevis* DSM 32386 with a proteolytic commercial strain of *Lactobacillus delbrueckii* at different concentrations. Samples of bulk milk and cheese after four weeks ripening were processed for microbiological counts. Cheese samples were further analyzed in order to quantify the concentration of GABA and microbial populations. The amino acid composition of all cheese samples was quantified by ultra high performance liquid chromatography- orbitrap Q-exactive mass spectrometry (UHPLC-HQOMS). The lactic acid bacteria population remained higher than  $10^6$  cfu g<sup>-1</sup> after 28 days of storage, without any significant difference amongst the groups in terms of microbiological evolution and composition. We detected very interesting variations of GABA concentrations between the different groups during cheese ripening: without addition of a proteolytic strain of *L. delbrueckii*, GABA was detected at very low concentration. At the end of ripening, the cheeses produced with *L. delbrueckii* or glutamate acid in addition to *L. brevis* DSM 32386, showed the highest level of GABA (172 mg/Kg). In conclusion, this study demonstrated that the tested strains *L. brevis* DSM 32386 is a promising candidate for the production of GABA-enriched cheese with the help of a proteolytic strain of *L. delbrueckii*.

### Biography:

I work in Edmund Mach Foundation since 2002 as researcher and I have a 20 years' experience in research on food microbial biodiversity and the enhancement of their potential. The final objective is the improvement of food quality and sustainability from traditional to new functional food production, with a particular interest to the dairy field. My main skills are classic phenotypic and genotypic microbiology, dairy technology and fermentations and NGS (Next Gene sequencing) data elaboration.

## **Anti-obesity potential of *Moringa olifera* seed extract and lycopene on high fat diet induced obesity in male Sprague Dawely rats**

**Omnia E.Kilany<sup>a</sup>, Heba M.A.Abdelrazek<sup>b</sup>, Tahany Saleh Aldayel<sup>c\*</sup>, ShimaaAbdo<sup>d</sup>, Manal M.A.Mahmoud<sup>e</sup>**

<sup>a</sup> *Department of Clinical Pathology, Faculty of Veterinary Medicine, Suez Canal University, Ismailia, Egypt*

<sup>b</sup> *Department of Physiology, Faculty of Veterinary Medicine, Suez Canal University, Ismailia, Egypt*

<sup>c\*</sup> *Nutrition and Food Science, Department of Physical Sport Sciences, Princess Nourah Bint Abdulrahman University, Riyadh, Saudi Arabia.*

<sup>d</sup> *Suez Canal Authority Hospital, Ismailia, Egypt*

<sup>e</sup> *Nutrition and Clinical Nutrition Department, Faculty of Veterinary Medicine, Suez Canal University, Ismailia, Egypt*

Present research explored the anti-obesity effect of *Moringa olifera* seed oil extract and lycopene (LYC). Forty eight male Sprague Dawely rats were divided equally into 6 groups. Group I (C) served as control, group II (MC) was given *Moringa olifera* seed oil extract (800 mg/kg b.wt) for 8 weeks, group III (LC) was given (20 mg/kg b.wt) LYC for 8 weeks, group IV (O) received high fat diet (HFD) for 20 weeks, group V (MO), was given HFD for 20 weeks and received (800 mg/kg b.wt) *Moringa olifera* seed oil extract for last 8 weeks and group VI (LO), received HFD for 20 weeks and was given (20 mg/kg b.wt) LYC for last 8 weeks. Hematology, lipid peroxidation and antioxidants, non-esterified fatty acids (NEFA), glucose, lipid profile, serum liver and kidney biomarkers, inflammatory markers, leptin, resistin and heart fatty acid binding protein (HFABP) were determined. Also histopathology for liver, kidney and aorta were performed besides immunohistochemistry (IHC) for aortic inducible nitric oxide synthase (iNOS). Administration of *Moringa olifera* seed oil extract and LYC significantly ameliorated the HFD induced hematological and metabolic perturbations as well as reduced leptin and resistin. Both treatments exerted these effects through promotion of antioxidant enzymes and reducing lipid peroxidation as well as inflammatory cytokines along with reduced iNOS protein expression. Administration of *Moringa olifera* seed oil extract and LYC have anti-obesity potential in HFD induced obesity in male Sprague Dawely rats.

### **Biography:**

Tahany Saleh Aldayel has obtained her PhD from University of Surrey, United Kingdom. She is a Professor Assosited at Princess Nourah Bint Abdurhman University, Riyadh, Saudi Arabia. She used to be a Director of Scitfic Journals at Princess Nourah Bint Abdurhman University. Currently she is the Director of Research Center, Applied College, Princess Nourah Bint Abdurhman University. The Scripps Research Institute. She has published over 50 papers in reputed and high impact factor journals and has been serving as reviewer in peer review journals.

## Isolation and identification of new diterpene derivatives from sweet pepper pericarp

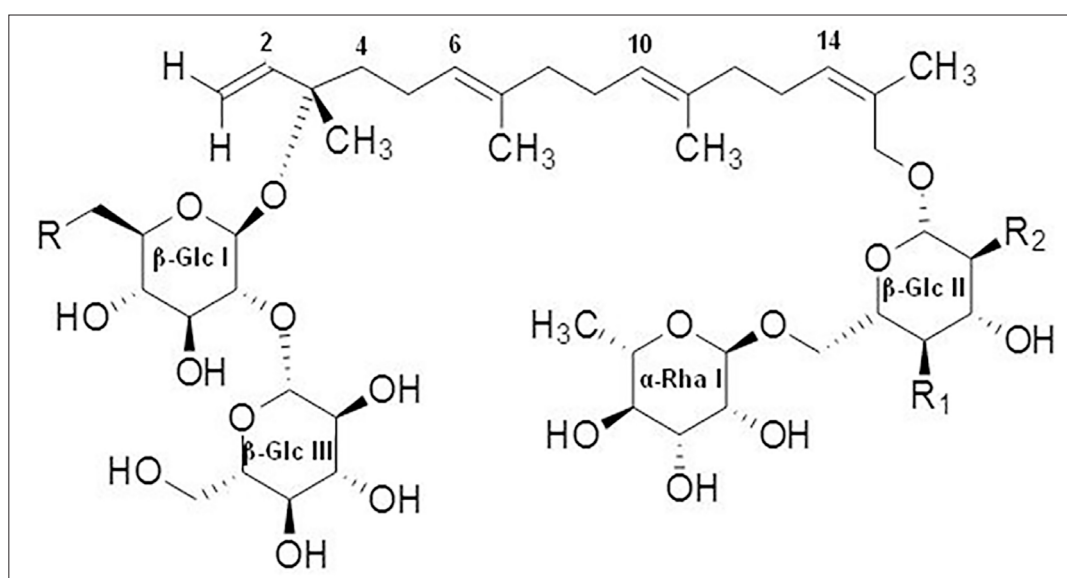
**Barbara Chilczuk, Małgorzata Materska, Marzena Pabich**

*University of Life Sciences, Department of Chemistry Research Group of Phytochemistry, Akademicka 15 Street, 20-950 Lublin, Poland*

The subject of the research was the fruit of red sweet pepper, extremely popular and widely available all over the world [1]. Pepper can be a rich source of compounds with pro-health properties, which are characterized by a milder, but more complex effect on the body compared to their synthetic counterparts [2]. Sweet peppers contain also capsinoids that can be an alternative to capsaicinoids in clinical use, such as cancer prevention, weight loss, and diabetes treatment [3].

The sweet pepper fruit cv. Ajfos was analyzed. Peppers were harvested at full maturity, washed, dried, cut, frozen (−18 °C) and then lyophilized. The ground lyophilisate was extracted with 80% ethanol. The concentrated extract was divided into 3 fractions with variable hydrophilicity by solid-phase extraction (SPE). The division was carried out on SPE-C18 columns.

The isolation process lipophilic compounds was performed through medium pressure chromatography. The purity of the isolated compounds was validated by ultra-high performance liquid chromatography (UP-LC-MS). Identification analysis was performed based on nuclear magnetic resonance (NMR).



Compound	R	R1	R2
2	OH	$\alpha$ -Rha II (2→1) $\beta$ -Glc IV	OH
3	O-malonyl	OH	$\beta$ -Glc IV
4	O-malonyl	$\alpha$ -Rha II	OH

Fig. 1. Structural representation of the newly identified compounds.

**Compound 2** is 3-O- $\beta$ -D-glucopyranosyl- (1 $\rightarrow$ 2)- $\beta$ -D-glucopyranosyl- 17-hydroxy- 6E, 10E, 14Z- (3S)-geranylinalool- 17-O- [ { $\beta$ -D-glucopyranosyl -(1 $\rightarrow$ 2)}  $\alpha$ -L-rhamnopyranosyl- (1 $\rightarrow$ 4)-{ $\alpha$ -L-rhamnopyranosyl- (1 $\rightarrow$ 6)}]-  $\beta$ -D-glucopyranoside. **Compound 3** is 3-O- $\beta$ -D-glucopyranosyl-(1 $\rightarrow$ 2)- $\beta$ -D-glucopyranosyl-6-malonyl-17-hydroxy-6E,10E,14Z-(3S)-geranylinalool-17-O-[ $\beta$ -D-glucopyranosyl -(1 $\rightarrow$ 2)-{ $\alpha$ -L-rhamnopyranosyl-(1 $\rightarrow$ 6)}]- $\beta$ -D-glucopyranoside. **Compound 4** is 3-O- $\beta$ -D-glucopyranosyl-(1 $\rightarrow$ 2)- $\beta$ -D-glucopyranosyl-6-malonyl-17-hydroxy-6E,10E,14Z-(3S) geranylinalool-17-O- [ $\alpha$ -L-rhamnopyranosyl -(1 $\rightarrow$ 4)-{ $\alpha$ -L-rhamnopyranosyl-(1 $\rightarrow$ 6)}]- $\beta$ -D-glucopyranoside.

Due to combined spectral analytical methods, 8 compounds were isolated and identified, including 3 new ones. The isolated compounds belonged to the group of diterpenic glycosides derivatives and the differences between the structure of the identified compounds were seen in their oligosaccharide chains (Figure 1).

#### References

- [1]. Guevara, L.; Domínguez-Anaya, M.A.; Ortigosa, A.; González-Gordo, S.; Díaz, C.; Vicente, F.; Corpas, F.; Palacio, J.; Palma, J.M. Identification of Compounds with Potential Therapeutic Uses from Sweet Pepper (*Capsicum annum* L.) Fruits and Their Modulation by Nitric Oxide (NO). *Int. J. Mol. Sci.* 2021, 22, 4476.
- [2]. Szajdek, A.; Borowska, J. Właściwości utleniające żywności pochodzenia roślinnego. *Żywność Nauka i Technologia Jakość* 2004, 4, 5–28.
- [3]. Kwon, D.Y.; Kim, Y.S.; Ryn, S.Y.; Ryu, S.Y.; Cha, M.R.; Yon, G.H.; Kim, M.J.; Kang, S.; Park, S. Capsiate improves glucose metabolism by improving insulin sensitivity better than capsaicin in diabetic rats. *J. Nutr. Biochem.* 2013, 24, 1078–1085.

This work was supported by Ministry of Science and Higher Education in Poland, project no 029/RID/2018/2019

#### Biography:

Barbara Chilczuk graduated in chemical studies in 2007. She work at the University of Life Science in Lublin (Poland). She is interested in phytochemistry. The purpose of her research is to isolate and identify compounds with potential health promoting properties. The subject of detailed research is pepper, which is rich in biologically active compounds. The research is focused around chromatographic methods.

## Iron incorporation in edible salt to combat iron deficiency

**Simon E. G. Lepinay<sup>1</sup>, Raymond B.T. Nijveld<sup>2</sup>, Krassimir P. Velikov<sup>1,3</sup>,  
Noushine Shahidzadeh<sup>1, \*</sup>**

<sup>1</sup> *Institute of Physics, University of Amsterdam, Science Park 904, 1098 XH, Amsterdam, Netherlands.*

<sup>2</sup> *Nouryon Specialty Chemicals B.V., Zutphenseweg 10, 7418 AJ Deventer*

<sup>3</sup> *Unilever Innovation Centre Wageningen, Bronland 14, 6708 WH Wageningen, The Netherlands.*

Iron is a micronutrient that is essential for insuring a healthy immune system and sufficient energy levels. Its deficiency in our body can lead to anemia, known as one of the most severe and important nutritional deficiencies in the world today. To combat this deficiency, the fortification of foods with iron is a natural way to increase the global iron uptake. However, currently solutions for iron fortification are limited by the bioavailability of iron from iron salts, and adverse reactions iron can cause in food systems which compromise product quality. Here, we present our strategy as novel encapsulating technology for integrating bio-available iron in stable edible salt carriers. We report on iron-fortified NaCl crystalline materials with a good compromise between bioavailability and product shelf life. Inspired by the multimineral Himalaya salt that naturally incorporates low levels of iron impurities, we have developed high iron content table salt by using a liquid inclusion strategy. We discuss the impact of the relative humidity on the dynamics of NaCl crystal growth and iron inclusion distribution. The size of the inclusions and the amount of incorporated iron in the crystals were investigated using different analytical techniques such as Raman confocal microscopy and inductively coupled plasma-optical emission spectrometry (ICP-OES). Finally, using a core-shell strategy, we show how the shelf life of the final new composite crystalline material can in addition be improved.

### Biography:

Noushine Shahidzadeh is full professor and group leader at the University of Amsterdam; she is currently member of the board of directors of the Interpore foundation and the scientific board of the Netherlands Institute for Conservation, Art and Science (NICAS). The aim of Shahidzadeh's research is to support interdisciplinary projects with interesting questions in physics and physical chemistry applied to areas such as food processing-sector and cultural heritage preservation. During her career, she has coordinated many national and European research projects with industries, government institutions. Her expertise covers (i) salt crystallization in bulk and confinement (ii) behavior of surfactant and emulsion systems, and (iii) wetting of surfaces.



## Assessment of the stability of plant extracts during freeze-drying process and storage

**Marzena Pabich, Małgorzata Materska, Barbara Chilczuk**

*University of Life Sciences, Department of Chemistry, Research Group of Phytochemistry, Lublin, Poland*

In recent years, there has been growing interest among consumers in naturally produced food products with beneficial effects on the body [1, 2]. Therefore, alternative and acceptable natural sources of food additives high in bioactive compounds are sought after. As a result, plant extracts previously considered therapeutic or sensory unattractive may be a component of functional foods. Natural plant extracts can be also a safer alternative to chemical food preservatives, helping to reduce the use of synthetic antioxidants in food production.

In presented work investigations were done on the basis of water extracts of elderberry and viburnum flower, cistus, fireweed and blackberries leaves. After extract preparation, some part of them was freeze-dried and stored for 6 months. Antioxidant activity (AA) (with DPPH method) of the fresh and stored extracts was measured as a reflection of the content of active compounds and extract stability during storage.

It was noticed that freeze-drying caused a decrease in antioxidant activity in the range of 1.3-22.9% for viburnum flower and cistus extract, respectively. Elderberry and viburnum flower extracts proved to be the most stable during the 6-month storage time. The observed decrease in AA was the lowest among all extract and it was 7.1 and 9.0 %, respectively. The highest decrease in antioxidant activity was found for the cistus extract (50.5%). The use of low temperatures during the freeze-drying process, a product of good quality and durability is obtained [3]. In addition, it is recognized that the freeze-drying process causes the lowest losses of bioactive compounds and their antioxidant properties, which was confirmed by the results of this studies.

The proposed plant concentrates can be used as an additive to food of animal origin, e.g. meat products, in order to prevent oxidation processes and extend its shelf life.

### References

- [1] Vella N.M., Stratton L.M., Sheeshka J., Duncan A.M. Functional food awareness and perceptions in relation to information sources in older adults. *Nutrition Journal* **2014**, 13, 1-24.
- [2] Basha M.B., Mason C., Shamsudin M.F., Hussain H.I., Salem M.A. Consumers attitude towards organic food. *Procedia Economics and Finance* **2015**, 31, 444-452. [https://doi.org/10.1016/S2212-5671\(15\)01219-8](https://doi.org/10.1016/S2212-5671(15)01219-8)
- [3] Sadowska A., Dybkowska E., Rakowska R., Hallmann E., Świdorski F. Ocena zawartości składników bioaktywnych i właściwości przeciwutleniających proszków wyprodukowanych metodą liofilizacji z wybranych surowców roślinnych. *ŻYWNOSĆ. Nauka. Technologia. Jakość*, **2017**, 24, 4 (113), 59 – 75. DOI: 10.15193/zntj/2017/113/211

This work was supported by Ministry of Science and Higher Education in Poland, project no 029/RID/2018/2019.

## Biography:

Marzena Pabich was graduated from Maria Curie-Skłodowska University (UMCS) in Lublin (Poland) in chemical studies in 2011. She received his Ph.D. on Food Technology and Nutrition from the University of Life Sciences in Lublin in 2020. She is interested in phytochemistry, natural products with potential health-promoting properties and dietetics. The subject of detailed research are dry plant extracts, especially from plant leaves, which are rich in biologically active compounds. The research are also focused around chromatographic methods.

## **Anti-obesity effect of fresh and browned *Magnolia denudata* flowers in 3T3-L1 preadipocyte and a high fat diet murine model**

**Yong Hoon Joo, Deok Jae Lee, Namhyun Chung, Yong Kwon Lee**

*Department of Biosystems Engineering College of Life Sciences and Biotechnology, Korea University, South Korea.*

The anti-obesity effect of fresh and browned *Magnolia denudata* flowers was investigated in 3T3-L1 and obese mice. The 3T3-L1 adipogenesis was inhibited by FMFE and BMFE. MFEs down-regulated expression of the adipogenic-specific genes and their downstream target genes, such as peroxisome proliferator activated receptor gamma (PPAR $\gamma$ ), CCAAT/enhancer binding protein alpha (C/EBP $\alpha$ ), sterol regulatory element binding protein 1-c (SREBP-1c), fatty acid synthase (FAS), fatty acid-binding protein 4 (FABP4), hormone-sensitive lipase (HSL), perilipin. The expression extent of transcription factors (PPAR $\gamma$  and C/EBP $\alpha$ ), lipids storage, and mobilization protein (perilipin) in 3T3-L1 were significantly decreased with treatment of MFEs. C57BL/6J male mice were subjected to either a normal diet (ND) or a high fat diet (HFD) for 6 weeks and then fed with fresh magnolia flower extracts (FMFE) and browned magnolia flower extracts (BMFE) for 4 weeks. The extent of adipocyte/body weight, histological adipocyte size, total cholesterol, low density lipoprotein cholesterol, leptin, aspartate aminotransferase, and alanine transaminase were reduced with FMFE and BMFE consumption. Furthermore, we also have found that both magnolia flower extracts (MFEs) induce enhanced phosphorylation of adenosine monophosphate-activated protein kinase (pAMPK) in liver tissue. Both MFEs inhibited the activity of metabolic enzymes such as acetyl-CoA carboxylase (ACC) and 3-hydroxy-3-methylglutaryl-coenzyme A reductase (HMGCR), and significantly decreased the expression of PPAR $\gamma$ , C/EBP $\alpha$ , and perilipin in adipose tissue. All these results suggested that both MFEs have antiobesity activity.

### **Biography**

Dr. Yong Hoon Joo was born in Seoul, Korea in 1986. He graduated the Department of chemical engineering & biotechnology at the Korea polytechnic university in February 2013. In March 2013, he entered the Department of biosystems and biotechnology at Korea University Graduate School. His advisor is Professor Namhyun Chung, and the laboratory name is a biochemistry lab. Dr. Joo received a master's degree in August 2015 and a doctorate in February 2021. He studies natural product analysis and their physiological activity. Dr. Joo is working on a post-doctoral course in the professor Chung's laboratory

## Identification of volatiles formed in fruits during storage using multinomial logistic regression

**Jiří Létal<sup>a</sup>, Jan Goliáš<sup>b</sup>, Josef Balík<sup>b</sup>**

<sup>a</sup>*Independent Statistical Consultant,*

<sup>b</sup>*Department of Post-Harvest Technology of Horticultural Products, Faculty of Horticulture, Mendel University in Brno, Czech Republic*

Volatiles are among the many compounds contributing to the quality of fruit, which are influenced by many factors. Using five Asian pear cultivars, the aromatic profile of fruits was carried out through the analysis of volatile compounds detected by SPME/GC/MS. A total of 117 volatile compounds were detected, including 25 alcohols, 16 aldehydes, 40 esters, 4 lactones, 17 terpenoids, 10 ketones, 2 organic acids and 3 hydrocarbons.

All these compounds were identified in five fruits of each cultivar at the time of harvest (the first maturity stage) and after the controlled post-harvest ripening period of 27 days at 20°C (the second maturity stage). To get an overall aromatic profile of each cultivar at different stages of maturity as a balance of all emitted compounds, means and standard errors were calculated for determined compounds.

A stepwise multinomial logistic regression model was applied to explore the effect of all volatiles as explanatory variables resulting in a binary response (the first maturity stage / the second maturity stage) – value of 0 corresponded to the first maturity stage and the value 1 coded the second maturity stage of fruits after 27 days of storage at 20°C. The substances affecting significantly ( $p$ -value < 0.01) the variability between cultivars under different storage conditions were selected. In such a way, only several main distinctive compounds may be identified. To show which linear combination of selected compounds explain the proportion of variance the most and differentiate cultivars at each of two stages of maturity, a principal component analysis was used in the next step. All statistical analyses were performed using SAS 9.4.

The method was also successfully used to identify main components of volatiles in other cultivars of pears and fruits (apricots, plums, cherries, and grapes) during ripening and under different storage conditions.

### Biography:

Jiří Létal, having mathematical education at Masaryk University in Brno, I was engaged for more than 15 years in agricultural research, focusing on data analysis of extensive plant breeding programs. I worked also as a lecturer of biometric courses, including statistical analysis of field trials. I have completed doctoral studies at Mendel University in Brno. In the last 15 years, I have got experience in statistical analysis of clinical trials as a principal biostatistician in pharmaceutical and biotech industry. I am a member of the International Society for Clinical Biostatistics (ISCB).

## The relationship between one's socioeconomic status and personal responsibility beliefs towards food access.

**Robert A. Coleman Ph.D. & Mark D. Fulford, Ph.D.**

*The University of Findlay , USA*

This presentation will be focused on the background, research approach, results, and follow- up efforts surrounding the article “Socioeconomic Status and Individual Personal Responsibility Beliefs Towards Food Access”<sup>1</sup>. Despite worldwide attention given to food access, very little progress has been made under the current model and hunger and malnutrition still exist in both developed and developing countries. Recognizing that individual engagement is likely based on personal experiences and perceptions, this research study investigated whether or not a correlation exists between one's socioeconomic status (SES) and perceived personal responsibility for food access. Findings indicate that one's SES level (using income as proxy) is correlated to the amount of responsibility they feel they have toward food access. The results and implications provide fresh insight into the ongoing global debate surrounding food access and can be important considerations for global leadership and policy. Outcomes also provide insight into individual levels of engagement surrounding food access, willing and able participants, and point to least-cost solutions which may be better suited to implement and initiate change. Results indicate that the issue of food access is more complex than simply lobbying for better decision-making among individuals and populations or presenting large-scale solutions that require and individual's engagement (setting aside immediate life-threatening situations), highlighting the importance of unit of analysis considerations. In a follow-up to this research study, a current qualitative effort is underway which looks to address the question of “why”, thus adding more context and understanding to the quantitative outcome presented.

### **Reference:**

<sup>1</sup>Coleman, R.A., Fulford, M.D. Socioeconomic Status and Individual Personal Responsibility Beliefs Towards Food Access. Food ethics 7, 1 (2022). <https://doi.org/10.1007/s41055-021-00096-7>

### **Biography:**

With over 20 years' experience as a business practitioner, Robert holds an engineering degree as well as a Ph.D. in Management; currently he runs a consulting firm and is an Assistant Professor in the College of Business at the University of Findlay. He possesses a high aptitude for critical thinking and analyzing complex settings surrounding areas such as the current food model, leadership; policy; strategy; goal setting; culture; processes; management, communication; and organizational development. He brings the ability and passion to collaborate with others surrounding local and global issues to enhance and support targeted decision-making and achievable strategic solutions.

## Application of digital twins in the food industry

**Elia Henrichs\* and Christian Krupitzer**

*Department of Food Informatics and Computational Science Lab, University of Hohenheim, Stuttgart, Germany.*

The food industry faces many challenges, including feeding a growing population, food loss and waste, and inefficient production systems. To cope with those challenges, digital twins that create a digital representation of physical entities by integrating real-time and real-world data seem to be a promising approach. In our literature review, we investigated the application of digital twins in the food industry represented by the food supply chain. The survey revealed that the application of digital twins mainly targets the production (agriculture) or the food processing stage. Nearly all applications focus on monitoring and many on prediction. However, only a small amount focuses on integrating systems for autonomous control or providing recommendations to humans. The major proportion of applications replicates machines or production/processing machines. Only a few digital twins, found in transportation and retail stages, are concerned with food products to determine the food's quality. The main challenges of implementing digital food twins are combining multidisciplinary knowledge and providing enough data. Nevertheless, digital twins offer huge potential, e.g., in determining food quality, speeding up product development, increasing traceability, or designing personalized food.

### Biography:

Elia Henrichs is a research assistant and PhD student at the Department of Food Informatics at the University of Hohenheim in Stuttgart, Germany. His research interests focus the real-time analysis of food quality in the food supply chain using smart sensors. He received his Bachelor's and Master's degrees in Brewing and Beverage Technology from the Technical University of Munich, Germany, in 2018 and 2020, respectively.

## Content of toxic elements in naturally gluten-free grains available on the Polish market: health risk assessment

Joanna Bielecka, Renata Markiewicz-Żukowska, Jolanta Soroczyńska, Katarzyna Socha

*Department of Bromatology, Medical University of Białystok, Poland.*

**Background:** Healthy eating patterns and adequate physical activity levels play a crucial role in maintaining human health. Food provides many important nutrients to the diet, however, could also be one of the main routes of exposure to the toxic elements. This study aimed to determine the content of As, Cd, Pb, and Hg in naturally gluten-free grains and pseudo-grains available on the Polish market such as millet, maize, rice, quinoa, and oat. The second objective was to assess the safety of consumption of the tested products.

**Material and methods:** The study material consisted of 341 different products without replications. The content of Hg was determined using the atomic absorption spectrometry method (AAS) with the amalgamation technique. To measure As, Cd, and Pb levels inductively coupled plasma mass spectrometry (ICP-MS) was applied. The health risk was assessed by calculating three indicators- target hazard quotient (THQ), cancer risk (CR), and hazard index (HI).

**Results:** The highest average As, Cd, Pb, and Hg contents were observed for the following subgroups: red rice (252.2 µg/kg), roasted buckwheat groats (65.4 µg/kg), popcorn (99.8 µg/kg), and parboiled rice (4.0 µg/kg), respectively. The exceedance of the established limits was found in one sample for As, three samples for Cd, three samples for Pb, and two samples for Hg. The values of the health risk indicators did not show an increased risk for the adult Polish population.

**Conclusion:** Naturally gluten-free grains and pseudo-grains could be regarded as safe for consumption by the Polish population, given their As, Cd, Pb, and Hg content.

### Biography:

In 2019, she completed her master's degree in dietetics at the Medical University of Białystok. In the same year, she started PhD studies at the Department of Bromatology, Medical University of Białystok. Her PhD thesis concerns the nutritional as well as toxicological aspects of naturally gluten-free grains. Her scientific interests involve food safety evaluation, especially as regards the content of the toxic elements. In 2021, she finished postgraduate studies at the University of Warmia and Mazury at the department of Life Sciences with a specialization in management in food security systems. Currently, her impact factor is 87.738.

## Optimisation of cultivated meat production through high-resolution transcriptomic analysis of satellite cell differentiation

**Tobias Messmer<sup>\* 1,2</sup>, Richard Dohmen<sup>1,2</sup>, Lea Melzener<sup>1,2</sup>, Lieke Schaecken<sup>1</sup> Rui Hueber<sup>1</sup>, Iva Klevernic<sup>1</sup>, Carolina Furquim<sup>1</sup>, Ekaterina Ovchinnikova<sup>1</sup>, Arin Dogan<sup>1</sup> Benjamin Bouchet<sup>1</sup>, Mark J Post<sup>1,2</sup>, Joshua E Flack<sup>1</sup>**

<sup>1</sup> *Mosa Meat B.V., Maastricht, The Netherlands*

<sup>2</sup> *Department of Physiology, Maastricht University, Maastricht, The Netherlands*

The emerging field of cultivated meat aims to recreate skeletal muscle through the proliferation and differentiation of animal-derived stem cells *ex vivo*, to produce edible tissue for human consumption. While presenting a potential solution to ecological and ethical issues of meat consumption, this technology must overcome a multitude of scientific challenges, including reliance on animal-derived components, limited tissue maturation, and large bioprocess variability. RNA-sequencing, a technique allowing quantification of gene expression of single cells or cell populations, can afford in-depth insight into the biological processes and cellular states of muscle stem cells. Utilising various transcriptomic datasets of satellite cells during differentiation, we deepened our understanding of the involved signalling pathways, differentially expressed surface receptors, and cellular heterogeneity during myogenesis *in vitro*. On this basis, we developed a serum-free differentiation media, as well as a single-cell model of myogenic differentiation *in vitro*, and assessed the role of donor variation in the extent of differentiation achieved. These advances represent an essential stepping stone on the road to a robust, fully animal component-free process for cultured meat production.

### Biography:

Tobias Messmer is a Jr. Scientist in the Stemness & Isolation team at Mosa Meat and a PhD student at Maastricht University. After completing his B.Sc. and M.Sc. in Molecular Biotechnology at Heidelberg University, and laboratory internships at Cambridge University and Harvard University in cancer and stem cell biology and bioinformatics, Tobias' research focusses on the bioinformatic and molecular characterisation of muscle progenitor cells during the proliferation and differentiation phases of Cultivated Meat production. Tobias is a co-founder of the online platform 'Cellular Agriculture Online Symposium' (CAOS) as well as he non-profit organization 'Cellular Agriculture Germany'.



## Precision fermentation strategies for novel food proteins

**Anna Khorosheva<sup>1, 2</sup>, Michael Egermeier<sup>3</sup>, Eva Sommer<sup>2</sup>, Christoph Herwig<sup>1</sup>**

<sup>1</sup> *Biochemical Engineering, Institute of Chemical Environmental and Bioscience Engineering, TU WIEN, Austria*

<sup>2</sup> *Fermify GmbH, Vienna, Austria*

<sup>3</sup> *KWood Competence Centre, Austria*

Novel food solutions must rely on a robust, scalable, predictive, ecologic and economic production process of the key ingredients. In our studies, we are producing recombinant proteins, which can be subsequently be formulated to novel food products.

This contribution presents a physiology based approach to precision fermentation. We are using well controlled physiological conditions, such as constant substrate uptake rates, which can be modulated according the metabolic load of the cell as well as by its production / energy supply relationship. In addition, we use digital twin based experimental design to efficiently explore process variable to process parameter relationships.

This approach directly links sound science process understanding on metabolism with a scalable and predictive processing strategy and the process can be optimized significantly. As a result, this platform process can be quickly adapted to new proteins and target products, so that time to market can be significantly reduced.

### Biography:

Christoph Herwig, bioprocess engineer from RWTH Aachen, worked in industry in the design and commissioning of large chemical facilities prior to enter his interdisciplinary PhD studies at EPFL, Switzerland in bioprocess identification. Subsequently he positioned himself at the interface between bioprocess development and facility design in biopharmaceutical industry. Since 2008, he is full professor for biochemical engineering at the Vienna University of Technology. The research area focuses on the development of data science methods for integrated and efficient bioprocess development along PAT and QbD principles for biopharmaceuticals.

## The Value of Co-Creation in Designing Computational Intelligence Tools to Reduce Waste in Agrifood Supply Chains

**Juan S. Angarita-Zapata\***, Manuel Amador Cervera, Jon Legarda, Ainhoa Alonso-Vicario

*Deusto Institute of Technology (DeustoTech), Faculty of Engineering, University of Deusto, Bilbao, Spain*

Digital technologies generate massive amounts of data with enormous potential to manage Food Supply Chains (FSCs) more efficiently and sustainably. Nevertheless, the intricate patterns and complexity embedded in large volumes of data present a challenge for systematic human expert analysis. In such a data-driven context, Computational Intelligence (CI) has achieved significant momentum to analyze and extract the underlying data information, or solve complex optimization problems, thus, striking a balance between productive efficiency and sustainability of FSCs. However, although some recent studies have sorted the CI literature in FSCs, they are mainly oriented towards a scientific perspective that highlights elements, such as how CI methods work, their performance, and the data they used. As such, there is limited knowledge on how to design and incorporate CI tools in FSCs, considering the needs and requirements of actors and stakeholders involved in different chain stages. Therefore, this paper presents a co-creation methodology for designing and implementing CI tools in three FSCs focused on vegetables, bread, and meat and fish. This co-creation approach involves actors and stakeholders of the three FSCs, who actively participate in designing the most suitable CI tools that can support them in reaching more sustainable supply chains in terms of food waste mitigation. The results show that a co-creation approach has managed to design the archetypes of four CI tools, which can be adapted to the needs and requirements of the three FSCs used as case studies. These CI tools are focused on production and demand forecasting, shelf-life prediction, and stock management. In conclusion, the co-creation methodology proposed allowed effective coordination of heterogeneous actors and stakeholders to get the best of CI in dealing with food waste in three different FSCs.

### Biography:

Dr. Juan S. Angarita Zapata, received his B.S. and M.S. degrees in Systems Engineering and Computer Science at Universidad Industrial de Santander (Colombia) in 2014 and 2016, respectively. In 2017, he received a Marie Skłodowska-Curie Fellowship at the University of Deusto - UD (Spain), where he obtained his PhD in Computer Science. He is currently a research associate at UD where is participating in multiple European research projects, working on the development of Computational Intelligence solutions for food supply chains and intelligent transportation systems. His research interests lie at the intersection of machine learning, optimization, food industry, and Transportation.

## Organic aquaculture in Italy: current situation

**Benedetto Sicuro\***

*Department of Veterinary Medicine, l.go Braccini 2 10095 Grugliasco (TORINO) - Italy*

Aquaculture in Italy is based on five main species: rainbow trout (*Oncorhynchus mykiss*), European sea bass (*Dicentrarchus labrax*), gilthead sea bream (*Sparus aurata*), Mediterranean mussels (*Mytilus galloprovincialis*) and Manila clams (*Venerupis philippinarum*). In the past, the situation of organic aquaculture in Italy has been comparable to other European countries, with the exception of Ireland, that is first European country for organic aquaculture production. The number of farms has recently increased as effect of traditional farms transformation. The greater number of organic fish farms is localized along Adriatic coast and in North East Italy, (Veneto region) and rainbow trout is one of the first organically farmed species. Despite the efforts of the Italian Ministry of Agriculture and Forestry, only a small percentage of the Italian fish farmers demonstrated an interest organic production. Until 2014, in Italy there were 41 organic aquaculture farms in 2014. The production of organic aquaculture in Italy has successively increased of 82% of production until 2018. The demand for organic aquaculture products in Italy is increasing, particularly among people that are regular organic food consumers, however there are some aspects that should be addressed: the difficulty to introduce organic aquaculture products in the large-scale retail trade, the high prices of specific fish feed ingredients and the application of long terms marketing strategies.

### Biography:

Benedetto Sicuro, Associate professor in Department of Veterinary Sciences, Turin, Italy. He teaches aquaculture since 2000 in the university of Torino. In the past has taught applied statistics and ecology. Currently is working in integrated aquaculture, in fish nutrition and applied ecology. He has been involved in several national and international projects in aquaculture. Currently he is the coordinator of aquaculture project in aquaponics. He has published 95 articles, mainly in aquaculture. He is guest editor of a special issue in aquaculture for the journal "Animals". The most relevant articles have been recently published in Reviews in Aquaculture.

## Transformation of highly marbled beef under various cooking processes

**Duconseille Anne<sup>ab</sup>, Astruc Thierry<sup>b</sup>, Sasaki Keisuke<sup>a</sup>, Motoyama Michiyo<sup>a</sup>**

<sup>a</sup> *Institute of Livestock and Grassland Science, National Agriculture and Food Research Organization (NARO), Ikenodai 2, Tsukuba, Ibaraki 305-0901, Japan*

<sup>b</sup> *Institut National de Recherche pour l'Agriculture, l'alimentation et l'Environnement (INRAE), QuaPA, F-63122 Saint-Genès-Champanelle, France.*

Cooking meat induces modifications in its structure and composition, affecting its sensory and nutritional properties. The extend of these modifications varies according to the cooking method and meat characteristics. Thus, it is difficult to draw any general mechanism regarding the impact of cooking on meat. There is little information on the impact of cooking on highly marbled beef, which are considered in Asia as high-quality products. To better understand the general impact of cooking on the structure of fatty meat, highly marbled beef were cooked under three different methods—grilling, boiling, and sous-vide cooking—with two endpoint temperatures, 55 °C (rare) and 77 °C (well-done). Light microscopy was performed to visualize muscle, connective, and adipose tissues. After cooking, muscle fibers were more compact, which can be attributed to perimysium shrinkage and water transfer, for all cooking processes except grilling at 55 °C. In addition to water, proteins were transferred from the intracellular compartment to the extracellular compartment during cooking, with, seemingly, a higher amount at 77°C than at 55°C. The cross-sectional area of muscle fibers was not impacted by cooking, regardless of the temperature or cooking method. Connective tissue between adipocytes was affected by cooking at 77 °C, showing undulations, but not at 55 °C. Generally, the adipocytes were badly damaged (adipocytes broken, and fat melted) after cooking, whatever the method used, and whatever the endpoint temperature. Despite the cooking method used, cooking to well-done clearly affected the structure of the perimysium of beef, possibly because of collagen denaturation.

### Biography:

During my thesis at INRAE (Theix, France), I characterized the molecular and structural composition of pigskin gelatin related to its dissolution quality. After my PhD, I joined Clermont-Auvergne University (Clermont-Ferrand, France) to work on meat chewing to help in the development of meat products for the elderly. Then, I worked for two years at NARO (Tsukuba, Japan) to help understand the impact of cooking on the structure of highly marbled beef. Now, I continue to work at INRAE on the impact of processes on animal products in order to develop new technologies and sustainable products for a better future.

## Transformation products of azoxystrobin formed after the ozonation process - presence in fruit samples and toxicity assessment

**Monika Sachadyn-Król**

*University of Life Sciences in Lublin, Faculty of Food Science and Biotechnology, Department of Chemistry, Poland.*

Azoxystrobin is a systemic, broad-spectrum fungicide widely used in the protection of agricultural crops. Besides active substance, there is also a vast number of potential transformation products (TPs), whose occurrence in food products and effects on human health are largely unknown. The ozonation process used to protect against microbial contamination and to reduce mycotoxins and pesticides from food products can also cause a number of undesirable reactions, including pesticide oxidation to derivatives. This transformation products may have negative health consequences.

Therefore, the aim of the work was to investigate what TPs are formed in the ozonation process of samples containing azoxystrobin, evaluation of their presence in berry fruit samples and hazard assessment using an in-silico toxicity tests.

LC-ESI-QTOF was used for the identification of possible TPs, for toxicity assessments the decision tree based Toxtree and the quantitative structure activity relationship (QSAR) based Toxicity Estimation Software Tool (TEST) were used.

The results suggest that the transformation of azoxystrobin can proceeds via different reaction pathways including oxidation of vinyl methyl ether portion of the  $\beta$ -methoxyacrylate moiety, hydrolysis of the methyl ester and the nitrile group, cleavage of the acrylate double bond, hydrolytic ether cleavage between the aromatic ring giving phenol, and oxidative cleavage of the acrylate double bond.

The toxicity assessments showed that the possible products have the same category (high – III) in Cramer rules, do not show toxicity in the Ames test, are not carcinogenic. All show a similar mutagenity score with median-lethal concentrations (LC50) in rats ranging between 358 and 537 mg/kg and similar value of environmental toxicity (0,96-1,08). They can interfere the primary, secondary and tertiary sites of metabolism of the important enzyme class cytochrome P450 monooxygenases.

### Biography:

Dr. Monika Sachadyn-Król in 2011 graduated from the Faculty of Chemistry at the Maria Curie-Skłodowska University in Lublin. After defending her doctoral dissertation in 2016 she started working as an assistant professor at the Department of Chemistry of the University of Life Sciences in Lublin. She is an author of 24 publications, monograph chapters and conference reports, recently focusing on the topic of food ozonation. Specialty: food and nutrition technology, environmental protection.

*NOTE: Project financed under the program of the Minister of Science and Higher Education under the name "Regional Initiative of Excellence" in 2019 - 2023 project number 029/RID/2018/19 funding amount 11 927 330.00 PLN*

## Ultra-processed food effects on bone development and quality

### Efrat Monsonego Ornan

*Institute of Biochemistry and Nutrition The Robert H. Smith Faculty of Agriculture, Food and Environment The Hebrew University of Jerusalem, Israel*

**OBJECTIVES:** Ultra-processed foods have known negative implications for health; however, their effect on skeletal development has never been explored.

**METHODS:** We established a UPF model in which, young rats fed UPF diet, rich in fat and sugar, and studied their metabolic state, bone structure, chondrocytes transcriptome and nutritional approaches to repair this skeletal impairment.

**RESULTS:** Here, we show that young rats fed ultra-processed food rich in fat and sugar suffer from growth retardation due to lesions in their tibial growth plates. The bone mineral density decreases significantly, and the structural parameters of the bone deteriorate, presenting a sieve-like appearance in the cortices and poor trabecular parameters in long bones and vertebrae. This results in inferior mechanical performance of the entire bone with a high fracture risk. RNA sequence analysis of the growth plates demonstrated an imbalance in extracellular matrix formation and degradation and impairment of proliferation, differentiation and mineralization processes. Our findings highlight, for the first time, the severe impact of consuming ultra-processed foods on the growing skeleton.

**CONCLUSIONS:** This pathology extends far beyond that explained by the known metabolic effects, highlighting bone as a new target for studies of modern diets.

**DISCLOSURES/CONFLICTS:** Funding: This work was supported by the Israel Science Foundation (Grant No. 1050/13).

**Institutional Review Board Statement:** All procedures were approved by the Hebrew University Animal Care Committee #AG-13-13952-2, AG-18-15441-2.

**Conflicts of Interest:** The authors have declared that no conflict of interest exists.

### Biography:

In 2006, I joined the Institute of Biochemistry and Nutrition. This was a significant step for me, allowing me to fulfill my goal of conducting a research on the interrelation of genetic and environmental factors (such as nutrition) in bone development. I have always felt that the fast-developing and emerging field of nutrition is a fascinating discipline in terms of both research and public health. Furthermore, in joining the School of Nutrition I have in essence come full circle, since my first degree and in fact, first interest was nutrition. I therefore consider my current appointment both a mission and a privilege: I am able to study nutrition at the highest scientific level, in my research. And in teaching future nutritionists, I have the opportunity to highlight and enhance the scientific side of this crucial occupation.

## Detection and hazard assessment of the transformation products of boscalid during ozonation process by lc-ms and *in-silico* toxicity assessment

**Iwona Budziak-Wieczorek**

*Department of Chemistry, Faculty of Food Science and Biotechnology, University of Life Science in Lublin, 20-950 Lublin, Poland.*

Pesticides are agrochemicals used in agriculture or in public health programs, and urban green areas in order to protect plants and humans from various diseases. However, due to their known ability to cause a large number of negative health and environmental effects, their side effects can be an important environmental health risk factor. Pesticide residues have always posed a major safety hazard to human health. With the development of agricultural production and improvements in science and technology, additional methods for degradation of pesticide residues have emerged. Amongst them, ozone-based treatment recently have demonstrated to be effective in removing pollutants, transformation products which may also be toxic and can be formed during ozonation.

The purpose of this research was to examine the potential hazard posed by transformation products generating by exposing boscalid to an ozonation process. Boscalid (2-chloro-N-(4'-chloro-[1,1'-biphenyl]-2-yl)-3-pyridinecarboxamide) is agricultural fungicide mainly used for vineyard protection as well as a wide range of crops including fruit, vegetables and ornamentals. The structural elucidation of pesticide residues arising from the ozone degradation of boscalid has been investigated by liquid chromatography combined with mass spectrometry (LC-ESI-QTOF/MS). The potential toxicities of transformation products were estimated by *in silico* toxicity assessment using two publicly available programs: Toxtree and the United States Environmental Protection Agency's (USEPA) Toxicity Estimation Software Tool (TEST). These programs using structural alerts and quantitative structure-activity relationship (QSARs). All experiments in this work were performed by mixing aqueous ozone stock solutions with aqueous stock solutions of boscalid. The result suggest that the some transformation of boscalid can be potentially more toxic than the parent compounds when considering oral rat median-length concentrations LD<sub>50</sub>.

**Acknowledgements:** This work was financially supported by the Ministry of Science and Higher Education, project No 029/RID/2019/2022

### Biography:

Mrs Iwona Budziak-Wieczorek graduated from the Faculty of Chemistry of the Jagiellonian University in Krakow in 2016. She works as a research assistant in the Department of Chemistry in the Faculty of Food Science and Biotechnology at the University of Life Sciences in Lublin. She is interested in cocrystallization methods of natural flavonoids like xanthohumol or cardamonin as well as solubility and permeability study. The purpose of her research is to synthesise new cocrystals of poorly water-soluble natural chalcones with beneficial biological activity. She believes that the cocrystallization process can be used as an effective approach to modulate the physicochemical properties and improve the bioavailability of nutraceuticals. The research is focused around crystallographic, spectroscopic and statistical methods.





---

**Scientific Session**

**DAY-2**

---

## Characteristics and quality of Chilean abalone undergoing different drying emerging technologies

**Mario Pérez-Wona<sup>\*</sup>, Anais Palma-Acevedo<sup>a</sup>, Luis González-Cavieres<sup>a</sup>, Roberto Lemus-Mondaca<sup>b</sup>, Gipsy Tabilo-Munizagaa**

<sup>a</sup> Food Engineering Department, Universidad del Bío Bío, Av. Andrés Bello 720, Chillán, Chile.

<sup>b</sup> Department of Food Sciences and Technology, Universidad de Chile, Av. Dr. Carlos Lorca 964, Santiago, Chile.

The Chilean abalone (*Concholepas Concholepas*) is a gastropod mollusk; it has a high commercial value due to the qualities of its meat, especially hardness, as a critical acceptance parameter. However, its main problem is its short shelf-life which is usually extended using traditional technologies with high energy consumption. Therefore, it is necessary to apply different technologies for both the pre-treatment and drying process. In this research, pulsed electric field (PEF) was used as a pre-treatment for vacuum microwave drying (VMD), freeze-drying (FD), and hot-air drying (HAD). Drying conditions and characteristics were set according to previous experiments. After the application of experiments, drying samples were analyzed in terms of physical quality (color, texture, microstructure, and rehydration capacity), protein quality (degree of hydrolysis and computer protein efficiency ratio), and energy parameters. Regarding quality, the treatment that obtained lower hardness was PEF+FD ( $195 \text{ N} \pm 10$ ), the lowest change of color was for treatment PEF+VMD ( $\Delta E: 17 \pm 1.5$ ), and the best rehydration capacity was for treatment PEF+VMD (1.2 h for equilibrium). For protein quality, the highest Computer-Protein Efficiency Ratio was the sample 2.0 kV/cm of PEF (index of  $4.18 \pm 0.26$  at the end of the digestion). And about energetic consumption, results show that VMD decreases the drying process in 97% whether PEF was used or not. Consequently, it is possible to conclude that using PEF as a pretreatment for VMD and FD treatments has advantages that must be used in accordance with the consumer's needs or preferences.

**Keywords:** *Chilean abalone, pulsed electric fields, freeze-drying, proteins, energy sustainability.*

**Acknowledgments:** Project FONDECYT REGULAR 1201075.

### Biography:

Mario Osvaldo Perez Won is an academic from the University of Bío-Bío, Chillán, Chile. He is a Food Engineer with a master's degree in Fishery Sciences from the University of Kagoshima, Japan, and a Ph.D. in Agriculture from the same university. Dr. Perez-Won works in the food area with emerging technologies such as pulsed electric fields and high-pressure processing; additionally, in seafood process engineering, food rheology, food process engineering development, biotechnology, and functional properties of proteins. Dr. Pérez-Won has been awarded nearly 15 research projects and is currently director of a FONDECYT REGULAR project, among various participations in other research. All this is not close to summarizing a career with a hundred scientific publications, one of the last published in Trends in Food Science & Technology Journal.

## Predicting thickness perception of liquid food products from their non-Newtonian rheology

**Antoine Deblais, Elyn den Hollander, Claire Boucon, Annelies E Blok, Bastiaan Veltkamp, Panayiotis Voudouris, Peter Versluis, Hyun-Jung Kim, Michel Mellema, Markus Stieger, Krassimir P Velikov, Daniel Bonn\***

*\*Institute of Physics, University of Amsterdam, Amsterdam, The Netherlands., Wageningen University of Research, Wageningen, The Netherlands., Unilever Innovation Centre Wageningen, Wageningen, The Netherlands*

The “mouthfeel” of food products is a key factor in our perception of food quality and in our appreciation of food products. Extensive research has been performed on what determines mouthfeel, and how it can be linked to laboratory measurements and eventually predicted. This was mainly done on the basis of simple models that do not accurately take the rheology of the food products into account. Here, we show that the subjectively perceived “thickness” of liquid foods, or the force needed to make the sample flow or deform in the mouth, can be directly related to their non-Newtonian rheology. Measuring the shear-thinning rheology and modeling the squeeze flow between the tongue and the palate in the oral cavity allows to predict how a panel perceives soup “thickness”. This is done for various liquid bouillons with viscosities ranging from that of water to low-viscous soups and for high-viscous xanthan gum solutions. Our findings show that our tongues, just like our eyes and ears, are logarithmic measuring instruments in agreement with the Weber-Fechner law that predicts a logarithmic relation between stimulus amplitude and perceived strength. Our results pave the way for more accurate prediction of mouthfeel characteristics of liquid food products.

### Reference:

Predicting thickness perception of liquid food products from their non-Newtonian rheology, A Deblais, et al., Nature communications 2021, 12 (1), 1-7

### Biography:

Bonn is professor of Physics at the University of Amsterdam and CNRS Research director. He is serving as the head of the van der Waals-Zeeman Institute and leader of the Soft Matter Group. The overall aim of Bonn’s research is to understand the flow behavior of fluids and soft matter systems, including wetting, free surface flows, singularities and instabilities. This is of fundamental interest with more than 350 papers published, but also highly relevant for many applications; he has a lot of industrial collaborations and a successful startup company.

## Performance PRIMA Programme after 4 years of its implementation in the Mediterranean region

**Ali Rhouma, Antonella Autino, Octavi Quintana, Mohamed Al Shennawi and Angelo Ricabonbi**

*PRIMA Foundation, Carrer del Gran Capitá, 2-4 , 08034 Barcelona Nexus.*

During the first four years of Implementation, PRIMA has shown to be an effective instrument for R&I collaboration between the EU and Mediterranean countries. Currently, 168 projects with an overall budget of 225 million EUR involving 1571 teams mainly from the PRIMA Participating States located on both shores of the Mediterranean basin, selected out of 2018-2021.

Fifteen Key performance indicators have been assessed in this article in order to evaluate the performance of the programme based on the Value flow analysis methodology.

The input KPIs measuring the resources involved in achieving the objectives of the programme demonstrate the ability of PRIMA to attract additional financing from participating states and to increase Horizon 2020 budget resources. The budget allocated to non-European countries from Section1 exceeds the initial goal of 25% foreseen in the PRIMA Decision .

The process KPIs show the high efficiency of PRIMA programme regarding the 4 KPI during the first four years and demonstrate its performance against the targets set up by H2020 .

The Outputs and outcomes Key Performance indicators show a continuous increase of participation of entities from non-European countries. However, due to their relatively low capacities to lead projects' consortia they hardly appear as project coordinators. Section1 (fully funded by PRIMA) of the programme has attracted SMEs participation which represent 20% of the total number of beneficiaries.

The projects produced 131 publications Its highest number was produced between 2020 and 2021.

The networking analysis based on the common projects between participating states identified 3 main clusters and demonstrated that PRIMA was able to create new networks in the Mediterranean region and strengthen existing networks.

### Biography:

Prof. Ali Rhouma is a senior project officer at PRIMA foundation responsible for Nexus Water-Energy-Food- Ecosystems and Farming systems. He holds an agricultural engineering degree (INAT-Tunisia), European Master in environment at Swiss Federal Institute of Technology and a PhD in plant production and protection (UCBL-France, INAT-Tunisia.). He has more than 20 years of experience in agricultural research in Tunisia and in the Mediterranean region and led several research and innovation projects and is a co-author and author of 75 publications and 4 National patents. He participated to several European projects (FP6, FP7, H2020) aiming to reinforce S&T policy dialogue in the Euro-Mediterranean region. He previously worked at IRESA-Ministry of Agriculture - Tunisia as the director of Research Department.

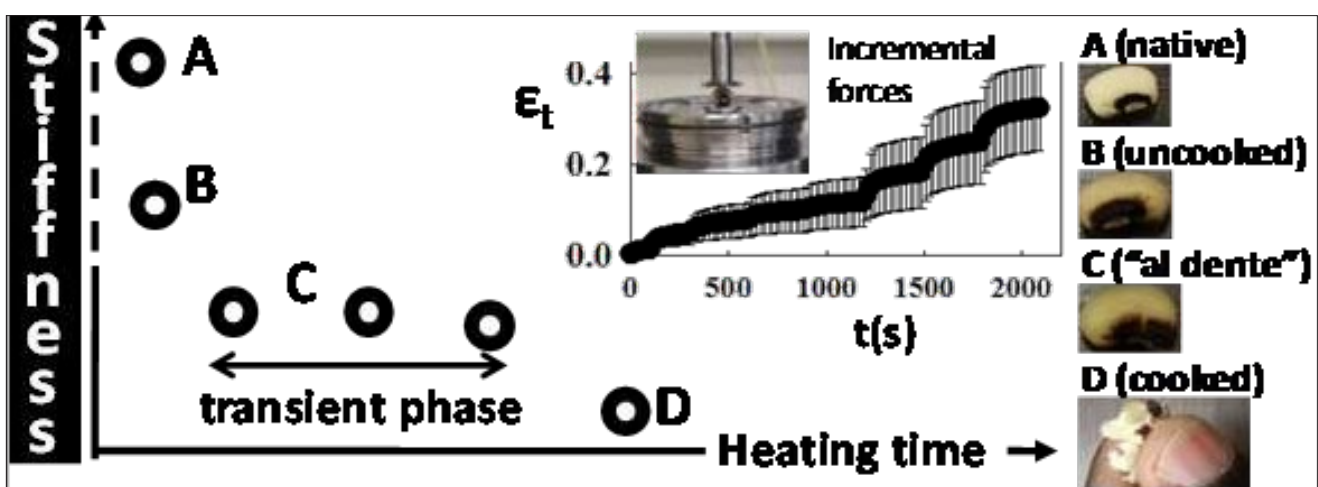
## Study of the activation energy and the mechanical compression to characterize the transition between uncooked and cooked state of the cowpea seeds

Ekoué TEKOU<sup>a</sup>, Komla AKOU<sup>b</sup>, Elolo OSSEYI<sup>a</sup>

<sup>a</sup>Laboratoire des Sciences Biomédicales, Alimentaires et Santé Environnementale (LaSBASE), ESTBA/ Université de Lomé, BP : 1515, Lomé, Togo, France.

<sup>b</sup>Univ. Grenoble Alpes, CNRS, Grenoble INP, LRP, 38000 Grenoble, France.

Cooking of foods requires technical knowledge and skills to control the food quality especially its texture and flavor until it is considered as ready for consumption. Therefore, the food goes through different states of hardening, softening or pasting, which are characteristic of the cooking process. The study which is reported here aims (1) to know the cooking temperature, time and activation energy of the cowpea seeds, (2) to imitate the finger tests by using the mechanical compression tests and to achieve the texture of the cooked cowpea seeds with a better mouth feel 1,2. Cowpea seeds were cooked in water at a temperature above  $60\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  with an activation energy equal to  $28.35\text{ kJ/mol}$ . The time dependence of the deformation at a constant force made it possible to deduce the viscoelasticity indices for the different heating times at  $97\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  (Fig. 1). The two viscoelasticity indices have shown a transient heating time domain from 30 to 75 min  $\pm 3$  min, elastic indices remained almost constant ( $\sim 14\text{ N}$ ) while viscosity indices increased (from  $0.11 \times 10^6$  to  $0.24 \times 10^6\text{ N.s}$ ). The transition from the uncooked to the cooked cowpea seeds was directly correlated with the water absorption kinetics 2. The transition was explained by the physicochemical reactions 3 underlying the cooking process.



**Figure 1:** a) Time-dependence of cowpea seeds stiffness showing the transition between uncooked (A and B) and cooked (D) seed (transient phase (C)). The insert shows the time dependence of the seed deformation  $\epsilon_t$  in a multistep mechanical compression test. The heating temperature was  $95\text{ }^{\circ}\text{C}$ . The error bars are the standard deviation calculated on the average of 4 seeds.

## References

Khattab, R.Y., Arntfield, S.D., (2009). Nutritional quality of legume seeds as affected by some physical treatments 2. Antinutritional factors. *Food Science and Technology*, 42,

1113-1118.

Teko, E., Osseyi, E., Munialo, C. D., & Ako, K. (2021). The transitioning feature between uncooked and cooked cowpea seeds studied by the mechanical compression test. *Journal of Food Engineering*, 292

Coffigniez, F., Briffaz, A., Mestres, C., Akissoé, L., Bohuon, P., & El Maâtaoui, M. (2019). Impact of soaking process on the microstructure of cowpea seeds in relation to solid losses and water absorption. *Food Research International*, 119, 268-275.

## Biography:

Ekoué TEKO, PhD student at the Rheology and Processes Laboratory at the University Grenoble Alpes, France. I obtained an Engineering degree in Food Nutrition and Technology from University Ibn Khaldoun, Algeria. And member of the Laboratory of Biomedical, Food and Environmental Health Sciences, College of Biological and Food Techniques, University of Lomé, Togo. My current research goals are to develop a process for the industrial transformation of cowpea seeds into "Adowè" puree and to make cowpea proteins more assimilable. I am very involved in studies and the valorization of plant-based protein. I have published two articles: "Rheological study of cowpea puree 'adowè' and the influence of saliva on the puree viscosity". *IJFST*, 2022, 57(5):3098-3105. And "The transitioning feature between uncooked and cooked cowpea seeds studied by the mechanical compression test". *J. Food Eng.*, 2021, 292, 110368.

## Evaluating the Shelf-life of Pasteurized Milk in Oman

**M. Al-Farsi\*, I. Al-Gharibi, A. Al-Abri, A. Al-Humaimi, F. Al-Nabhani, H. Al-Hashmi, K. Al- Sarmi, and S. Al-Shibli**

*Food Safety & Quality Center, Ministry of Regional Municipalities, P O Box 292, PC 132, Muscat, Oman.*

The aims of this study were to survey the current storage condition of pasteurized milk in Oman and to evaluate its physicochemical and microbiological stability. The results of the statistical survey indicated that 50% of the total outlets surveyed were in violation in terms of providing the conditions for storing pasteurized milk, where grocery stores formed the majority of those outlets in violation. The results of physicochemical and microbiological tests of samples, which were stored at temperatures of 5 ° C and 8 ° C for a period of 12 days from the date of production, indicated that the characteristics of pasteurized milk were not affected during the storage period, and their results were consistent with the standard specifications of pasteurized milk. Therefore, extending the shelf-life of pasteurized milk stored at 5 °C for a period of 9 days from the date of production is considered safe.

**Keywords:** Milk, shelf-life, pasteurization, milk storage temperature, microbiology.

### Biography:

Intisar Al Gharibi is the director of Risk Assessment & Food Crisis Management in Food Safety & Quality Centre, Muscat, Oman. She is food safety specialist with over 19 years' experience, starting her professional life as a food microbiologist with Food & Water Laboratory, Ministry of Regional Municipalities. Intisar has built upon this solid foundation to design, develop and implement food safety compliance initiatives to promote a safer food supply for consumers, through monitoring contaminants and foodborne diseases, assessment and management of food risks and food crisis.

## Micronutrients and the Immune System: their role in COVID-19.

### **Ascensión Marcos. Prof.,**

*Dep. of Metabolism and Nutrition. Institute of Science, Technology of Food and Nutrition (ICTAN). Spanish National Research Council (CSIC), Spain.*

One outcome of the pandemic developed by SARS-CoV virus since December 2019 has been the increasing public awareness of the role of the immune system as the first line of defense against external pathogens, as well as the importance of adequate nutrition in maintaining strong immune defenses. This is the reason why nutrition should be the most important prevention factor to count on. Indeed, a high quality diet has recently been shown to reduce both the risk and severity of COVID-19, particularly in areas with higher socioeconomic deprivation. In this sense, the intake of micronutrients (especially vitamins A, D, C, E, B6, B12, folate, zinc, iron, copper, and selenium) has been shown to exert a particular role in the defense mechanisms of the organism against viruses and bacteria. Nevertheless, hectic and stressful lifestyles and impaired nutritional situations, such as obesity and metabolic disorders (diabetes, cardiovascular diseases) can create micronutrient imbalances and affecting seriously the immune system. Therefore, the addition of a micronutrient supplement to a balanced daily diet can be a safe, effective, and low-cost strategy to achieve optimal micronutrient status, support a well-functioning immune system, and enable a proper immune response to vaccination, important considerations during the COVID-19 pandemic, especially in certain groups of the population at risk. Indeed, since the beginning of the year 2020, when the pandemic appeared worldwide, this has been an area of research in constant progress. However, further research is necessary to better understand the effects of certain micronutrient supplementations on the immune response, and thus on reducing the global burden of infection, not only in developing areas, but also in industrialized regions.

### **Biography:**

Research Professor at the Spanish National Research Council (CSIC) (2006-). Head of the Immunonutrition Research Group. President of the Federation of Spanish Societies of Nutrition, Food and Dietetics (FESNAD): (2015-2020). President of the International Society for Immunonutrition (ISIN) (2014-2022). Treasurer of the Spanish Nutrition Society (SEÑ): (2010-). Vocal of Institutional Affairs of the Spanish Society of Microbiota, Probiotics and Prebiotics (SEMiPyP) (2017-). Past-President of the Federation of European Nutrition Societies (FENS). (2011-2015). She has performed as coordinator of various multicenter studies on nutrition, eating disorders and obesity. She has participated in 95 research projects, a total of 579 publications: 303 SCI original articles, 31 SCI reviews, 17 supplement SCI journal editions, 86 non-SCI original articles and 7 non-SCI reviews, 114 chapters, 8 books and 9 book editions.



## Analytical strategies for food analysis using miniaturized NIR spectroscopy

**Barbara Giussani<sup>1</sup>, Jordi Riu<sup>2</sup>, Giulia Gorla<sup>1</sup>**

<sup>1</sup>*Dipartimento di Scienza e Alta Tecnologia. Università degli Studi dell'Insubria, via Valleggio, 9, 22100 Como, Italy.*

<sup>2</sup>*Department of Analytical Chemistry and Organic Chemistry, Universitat Rovira i Virgili, carrer Marcel·lí Domingo 1, 43007 Tarragona, Spain.*

Food analysis is one of main concerns of analytical chemists, continuously working to provide precise and accurate methods to meet the needs of producers and consumers, supported by the fast technological development of analytical instrumentation. The needs of product and process control strategies stimulate scientists to face new challenges. One of these is represented by using portable instrumentation, which offers many advantages but often also leads to trade-offs.

Portable near infrared spectroscopy (NIRS) has gained a lot of popularity in recent times thanks to the commercialization of numerous sensors operating in this wavelength range. An impressive number of applications can be found in the literature, many of them in food analysis.

In this presentation, application of NIR portable spectroscopy in food analysis will be illustrated. In particular, the attention will be focused on the optimization of the spectroscopic signal collection for powder and liquid samples. Many portable spectrometers are designed for direct contact analysis of solid samples, and the analysis of powders and liquids is therefore not trivial. In some cases, it is possible to buy separate accessories for liquid or powder analysis, but this increases the cost of the instrument and sometimes decreases its portability.

If the accessory is not available, it is necessary to study ad hoc strategies, such as the design of sample holders or the intelligent use of simple laboratory glassware acting as sample holder.

Two examples of home-made sample holders will be presented for liquid and powder analysis (olive oil and flour), together with some strategies to analyze liquid samples (milk) using laboratory glassware for two different types of NIR portable sensors (NeoSpectra Micro Development Kit and NeoSpectra Scanner, Si-Ware). In the end, a methodology based on multivariate data treatment allowing to choose the best way to register the signal will be presented.

### Biography:

Barbara Giussani graduated in Chemistry at Università degli Studi dell'Insubria (Como, Italy) in 2001, and received his Ph.D. in Analytical Chemistry from the same university in 2004. She is Associate Professor at the Department of Science and High Technology of the Uninsubria, where she is teaching Analytical Chemistry and Chemometrics. Her research interests are mainly focused on the two areas of: (i) chemometrics and control process strategies, and (ii) design and development of smart analytical strategies to solve real-world problems, from sampling to data analysis. Infrared and near-infrared spectroscopies, especially using portable sensors, are the techniques that most uses, being the most suitable for the type of research she deals with.

## Impact of vanilla origins on sensory characteristics of chocolate

**Renata Januszewska<sup>\*1a</sup>, Elodie Giret<sup>2a</sup>, Fabienne Clement<sup>2b</sup>, Isabelle Van Leuven<sup>1b</sup>, Christophe Goncalves<sup>2c</sup>, Ekaterina Vladislavleva<sup>3</sup>, Priscille Pradal<sup>1c</sup>, Ranveig Nåbo<sup>1d</sup>, Alex Landuyt<sup>1e</sup>, Geert D'Heer<sup>1f</sup>, Sonja Frommenwiler<sup>1g</sup>, Hanspeter Haefliger<sup>1h</sup>**

<sup>1a</sup> – Renata Januszewska (PhD), Global R&D Sensory Manager, Barry Callebaut Belgium NV, 122 Lebbeke-Wieze, 9280 Belgium,

<sup>1b</sup> – Isabelle Van Leuven (PhD), GC-MS Specialist, Barry Callebaut Belgium NV, Belgium,

<sup>1c</sup> – Priscille Pradal, Manager, Sensory Americas, Barry Callebaut Canada Inc., Canada,

<sup>1d</sup> – Ranveig Nåbo, Specialist, ASM Foods AB, Sweden,

<sup>1e</sup> – Alex Landuyt, R&D Technical Services Lead EMEA, Barry Callebaut Belgium NV, Belgium,

<sup>1f</sup> – Geert D'heer, R&D Pilot Plant Manager, Barry Callebaut Belgium NV, Belgium,

<sup>1g</sup> – Sonja Frommenwiler, Buyer, Barry Callebaut Sourcing AG, Switzerland,

<sup>1h</sup> – Hanspeter Haefliger, Senior Group Buyer Specialty Ingredients, Barry Callebaut Sourcing AG, Westpark, Switzerland,

<sup>2a</sup> – Elodie Giret, SEBAA Group Manager, Montreuil, France,

<sup>2b</sup> – Fabienne Clement, Director R&D Flavor Creation, France,

<sup>2c</sup> – Christophe Goncalves, GC-MS Specialist, Prova, France.,

<sup>3</sup> – Ekaterina Vladislavleva (PhD), CEO & Chief Data Scientist, DataStories International Belgium

The sensory characteristics of white and milk chocolate with three origins of vanilla (Madagascar, Indonesia, and Papua New Guinea) were investigated using a multi-analytical approach. The sensory tests included profiling using Quantitative Descriptive Analysis with a trained panel; Temporal Dominance of Sensations test with untrained respondents from various countries currently residing in Belgium, and the consumers sensory preference test with consumers in Belgium, France, Sweden and Canada. The vanilla extracts were also analyzed by gas chromatography-mass spectrometry (GC-MS) in combination with olfactometry (GC- MS-O) to identify the key aroma compounds in the different vanilla origins.

This research shows that sensory profile of Papua New Guinea (PNG) samples is different from Madagascan and Indonesian extracts. The flavor signature was correlated with almondy and anisic descriptors. The perceived difference between Madagascan and Indonesian origins was reduced when assessed within complex matrices such as chocolate. In sugared water, Madagascan vanilla has balsamic, phenolic notes while Indonesian has woodier notes. In a chocolate base, the Indonesian sample lost its woody characteristic for a dairy enhanced characteristic. The botanical variety has more impact on difference in sensory profile of a chocolate than the vanilla origin itself.

The sensory data correlates with volatile components identified in this study. Guaiacol and vanillin were identified as the main key aroma compounds in all three vanilla origins using GC-MS-O. Additional key

aroma compounds were responsible for the differences in sensory characteristics between the three vanilla origins: anisaldehyde for anisic note in the PNG samples and ethyl 2-methylbutanoate and 3/2-methylbutanoic acid in the Indonesian sample. Sensory profiles of vanillas from various origins were more visible and pronounced in white chocolate compared to milk chocolate.

This study gives novel insights to the chocolate, as well as the vanilla sectors, regarding possibilities of vanilla replacement and consumer preferences across Europe and Canada.

## Biography:

Renata Januszewska currently works at the Global R&D, Barry Callebaut Belgium, where she does research in Applied Food Science, with the focus on cocoa and chocolate sensory analysis. Enjoys life while working in the European and multicultural environment with scientists, policy makers and business people related to food sector. Her recent publications are: a) the book 'Hidden Persuaders in Cocoa and Chocolate. A Flavor Lexicon for Cocoa and Chocolate Sensory Professionals', published by Elsevier in 2018; b) the article 'Impact of vanilla origins on sensory characteristics of chocolate', Food Research International, 2020; and 3) the article 'Challenges of pairing chocolates and nuts', Food Research International, 2021.

# Use of seaweed and yeast extract as biostimulants to enhance the phytochemical profile and nutraceutical properties of *Prunus Persica* fruits.

**Giuseppe Mannino**

University of Turin; Department of Life Sciences and Systems Biology; Plant Physiology Unit; Via Gioacchino Quarello 15/A; 10135, Turin, Piedmont, Italy.

Plant biostimulants are currently being investigated as innovative agricultural products to improve crop production and fruit quality without causing environmental and food contamination. Here, the effects of applying a biostimulant based on algae and yeast extracts were evaluated on productivity, fruit maturity

**Field Trial**

**Figure 1.** Caliber Class (Panel A) and Yield (Panel B and C) of fruits harvested from untreated trees (0) or treated with different biostimulant dosages (5, 4, 2.5 L/ha).

**UV/Vis Determination**

**Figure 2.** Total Content of Polyphenols (Panel A), Flavan-3-ols (Panel B), Anthocyanins (Panel C), and Carotenoids (Panel D) of fruits harvested from untreated trees (0) or treated with different biostimulant dosages (5, 4, or 2.5 L/ha).

**LC&GC Analysis**

**Figure 3.** Cellular antioxidant activity (white bars), radical scavenging and reducing activity of peel (Panel A) and pulp (Panel B) of peach fruits harvested from untreated trees (0) or treated with different biostimulant dosages (5, 4, 2.5 L/ha).

**LC&GC Analysis**

**Figure 4.** Composition of polyphenol compounds of peel (Panel A) and pulp (Panel B) of peach fruits harvested from untreated trees (0) or treated with different biostimulant dosages (5, 4, 2.5 L/ha). Data are expressed as relative content compared to untreated fruits.

**LC&GC Analysis**

**Figure 5.** Fatty Acids composition of peel (Panel A) and pulp (Panel B) of peach fruits harvested from untreated trees (0) or treated with different biostimulant dosages (5, 4, 2.5 L/ha). Data are expressed as relative content compared to untreated fruits (dotted line).

time, and fruit quality of two *Prunus persica* cultivars (var. Sugar Time and Villa Ada). After the biostimulant treatment, a two-week reduction in ripening time and a concomitant increase in the percentage of fruit production during early ripening stages were observed, both in terms of fruit yield (+110%) and size (+85%). Phytochemical and nutraceutical analysis were separately performed on both skin and pulp of the fruits in order to understand if the main waste product derived from food industrial processing could be further valorized. Regarding fruit quality, proximate analysis showed that peaches treated with the biostimulant had better nutritional composition than untreated samples, as both unsaturated fatty acid quality (C16:3 $\omega$ 3: +328%; C18:2 $\omega$ 6: -23%) and micronutrients essential for human health (Fe: +14%; Cu: +21%; Zn: +24%). From the nutraceutical point of view, although small changes in the profile of bioactive compounds were observed via HPLC-DAD/MS/MS, a strong boost in antioxidant properties was recorded in fruits harvested from plants treated with the biostimulant (ABTS: +38%; DPPH: +41%; FRAP: +38%). In conclusion, the application of biostimulants was able not only to reduce ripening time and fruit size of peaches, but also slightly increasing nutritional and nutraceutical values of both skin and pulp, leading to more marketable fruits.

## Biography:

Giuseppe Mannino graduated in Pharmaceutical Chemistry and Technology at University of Palermo in 2015. After graduation, he started a PhD course in Pharmaceutical and Biomolecular Sciences at the University of Turin. Now, he is working at the Plant Physiology Unit of the Department of Life Sciences and Systems Biology as assistant professor. His research experience mainly focused on the phytochemical characterization of plant extracts via HPLC-ESI-MS/MS, GC-FID and GC-MS instrumentation, and on the evaluation of their potential bioactivity on both animal and plant model systems.

## **Cocoa beans and liquor fingerprinting: a real case involving SSR profiling of CCN51 and “Nacional” varieties**

**Matteo Busconi<sup>1</sup>, Lorenzo Stagnati<sup>1</sup>, Giovanna Soffritti<sup>1</sup>, Michelangelo Martino<sup>1</sup>, Cristian Bortolini<sup>2</sup>, Alessandra Lanubile<sup>1</sup>, Adriano Marocco<sup>1</sup>**

*<sup>1</sup>Department of Sustainable Crop Production, Università Cattolica Del Sacro Cuore, Via Emilia Parmense 84, 29122, Piacenza, Italy*

*<sup>2</sup>Soremartec S.r.l. piazzale Pietro Ferrero 1, 12051, Alba, Cuneo, Italy.*

The worldwide demand for cocoa is rising but several cases of adulteration, usually of fine cocoa with bulk cocoa, are reported while industry requires cocoa stocks with constant aromas and quality. In cocoa chain, adulteration and lots misidentification can happen along the entire chain from the bean to the liquor. The availability of a DNA traceability system able to recognize the different cocoa varieties is something expected to have a big impact on cocoa sector. Several studies carried out at the laboratory level support the use of DNA in traceability but, clearly, the situation can change completely when moving from the lab to real cases. In the present paper, samples were recovered from big lots of beans and liquors provided by an Italian big brand. Two different cocoa types labelled as “Nacional” and “CCN51” from Ecuador have been examined; DNA was extracted from both beans and cocoa liquor and successfully amplified and examined by using cocoa reference SSR markers. Allele profiles revealed that “Nacional” is an admixture of several genotypes as confirmed also by single beans and leaves profiling. Contrary to Nacional, analyses suggest that CCN51 from

Ecuador is characterised by a single diploid genotype. The comparison of CCN51 alleles with data present in databases revealed that misidentification is present also for this modern vegetatively propagated variety and that in different countries are present different CCN51. The production of artificial mixtures demonstrates that DNA markers are able to identify even small traces of unwanted genotypes. Finally, the results suggest that, while for Nacional DNA traceability is not feasible, because of the multigenotype nature of the variety, for CCN51 traceability is possible. However, before doing this, it is necessary to precisely define the genetic identity of CCN51 by comparing accessions coming from the different countries where it is present and cultivated.

### **Biography:**

Matteo Busconi, is associate professor of Agricultural Genetics and Ph.D. in molecular biotechnology at the Faculty of Agricultural, Food and Environmental Sciences, Università Cattolica del Sacro Cuore. He is lecturer, in the same University, for the courses of: Plant Physiology and Genetics; Vegetable Production and Technology; Plant Derived Products; Plant Genomics for Sustainable Agriculture and Grape and Wine Biotechnology. His research activity is mainly based on plant biodiversity, DNA analysis and DNA based traceability along the Agro-food chain. He is the author of over 60 publications in national and international scientific journals and in proceedings of national and international conferences.

## Decaffeinated green tea processing using pilot scale SFE Technique

**Saziye Ilgaz**

*European Speciality Tea Association, Professional Member, Turkey.*

The aim of this study is to produce decaffeinated green tea that contains minimum amount of caffeine ( $\leq 0.1\%$ ) with maximum EGCG quantity. A selective and environmentally friendly extraction technique, Supercritical Fluid Extraction (SFE) was used to produce decaffeinated green tea by preserving quality and safety of the final product. Trials were studied on a pilot scale production plant and extraction parameters were selected as the pressure (375 bar), extraction temperature (62.5 °C), extraction time (180 min), CO<sub>2</sub> flow rate (2 and 3 L/min) and modifier concentration (0, 2.5 and 5 mol% EtOH). Full factorial experimental design with two replicates was employed to generate 12 different processing conditions. Caffeine contents of the samples obtained in 12 decaffeination experiments, in which pressure, temperature and time were used as constant variables, varied between 0.03% and 1.18%. It was determined that the EGCG contents of the mentioned samples were maintained between 83.8% and 96.3%. As a result, the caffeine content of two green tea samples decaffeinated using the same parameters decreased from 2.37% to 0.03%, while the EGCG content was preserved at the rate of 94.3%. Optimum extraction conditions where the most efficient results are obtained are as follows: 375 bar pressure, 62.5 °C temperature, 180 min extraction time, 3 L/min CO<sub>2</sub> flow rate and 5 mol% modifier concentration. Results showed that modifier quantity, CO<sub>2</sub> flow rate and their 2-way interaction had great impact on decaffeination yield by preserving maximum EGCG content.

**Key words:** Supercritical fluid extraction, green tea, decaffeination, caffeine, EGCG

### Biography:

Dr. Ilgaz an independent tea specialist with over 36 years of experience in the tea industry. She worked in the black and green tea factories and Tea Research Institute of Caykur between 1985- 2021. Since 2003, she has worked as project manager, senior tea specialist, consultant and researcher in 7 projects related to tea, 3 of which were financed by TUBITAK and 1 of which was financed by EU. She has some scientific articles and 2 national patents on tea. From 2005 to 2021 she served on FAO -IGG on Tea and ISO / TC 34 / SC 8 -Tea. She is the professional member of ESTA since April 2021.

---

# Posters DAY-2

---



## Antibiotic resistance and virulence factors in Lactobacilli

**Andrea Colautti<sup>1</sup>\*, Nicolò Rossi<sup>2</sup>, Carla Piazza<sup>2</sup>, Giuseppe Comi<sup>1</sup>,  
Iacumin Lucilla<sup>1</sup>**

<sup>1</sup> Department of Agricultural, Food, Environmental and Animal Science, University of Udine, Via Sondrio 2/A, 33100, Udine, Italy

<sup>2</sup> Department of Mathematics, Computer Science, and Physics, University of Udine, 33100 Udine, Italy

Lactobacilli are ubiquitous bacteria, used in the production of fermented foods and as probiotics. Their long history of safe employment has allowed them to be classified as GRAS (General Recognized As Safe) microorganisms by the US Food and Drug Administration (FDA) and QPS (Qualified Presumption of Safety) by the European Food Safety Authority <sup>1</sup>. However, an increasingly topical and discussed issue is antibiotic resistance. This bacterial defense mechanism has spread over the years not only in pathogens but also in other bacteria including Lactobacilli that can contribute to potential horizontal transfer of antibiotic resistance genes. Also, the presence of virulence genes generally associated with pathogenic microorganisms, and episodes of infection in patients with prior health problems have been reported in this bacterial genus <sup>2</sup>. Taking into account the latest EFSA directives that require the genetic characterization of the bacterial strains used as a probiotic and food starter <sup>3</sup>, a new pipeline was developed for the assembly of the bacterial genome, with the aim of obtaining a more accurate result without contaminating sequences <sup>4</sup>. Using this pipeline, representative strains of a library of about 200 strains belonging to *Lactocaseibacillus* spp. were assembled. In addition to the presence of probiotic factors, the presence of risk factors associated with antibiotic resistance and virulence were evaluated through the use of specific databases. Results demonstrated that no potential risk factors were identified on the bacterial chromosome, however, the presence of a gene whose function is not yet fully understood has been identified on a plasmid, pointing out the risk that mobile and transferable elements such as plasmids may present genetic elements whose presence requires careful monitoring.

### References:

- (1) doi:10.2903/j.efsa.2007.587
- (2) doi:10.1016/j.fm.2021.103934
- (3) doi:10.2903/j.efsa.2021.6506
- (4) doi:10.1093/bioinformatics/btab719

### Biography:

Andrea Colautti, “Food and Human Health” PhD student from 2019 at the University of Udine. Master's degree in Food Science and Technology achieved in 2019, and bachelor's degree in Food Science and Technology achieved in 2016 at the University of Udine. During the current PhD program, the main topics addressed for the development of the thesis are the study of probiotic bacteria, in particular their characterization through bioinformatics techniques.

## **Effects of PEF pre-treatment on vacuum microwave drying, freeze-drying, and hot air drying of Chilean abalone (*Concholepas concholepas*).**

**Luis González-Cavieres<sup>a</sup>, Mario Pérez-Won<sup>a</sup>, Anais Palma-Acevedo<sup>a</sup>, Erick Jara-Quijada<sup>a</sup>, Roberto Lemus-Mondaca<sup>b</sup>, Rodrigo Díaz-Álvarez<sup>a</sup>**

<sup>a</sup> *Department of Food Engineering, Universidad del Bío Bío, Av. Andrés Bello 720, Chillán, Chile,*

<sup>b</sup> *Department of Food Science and Technology, Universidad de Chile, Av. Dr. Carlos Lorca 964, Santiago, Chile.*

The loco (*Concholepas Concholepas*) is a gastropod mollusk, from the Muricidae family, and lives exclusively on the coasts of Chile and Peru, its meat is highly valued, has a high commercial price, and it is classified as a gourmet product. However, one of the main factors limiting export is its short shelf life. Currently, the drying of loco is being studied as a method of preservation for export. In the present study, the processes of vacuum microwave drying (VMD) with a rotary system with 5 rpm speed, freeze-drying (FD) with a vacuum of 0.0021kPa and -55°C, and hot air drying (HAD) at 60°C, applying pulsed electric fields (PEF) as pretreatment (2kV cm<sup>-1</sup>), were investigated and compared in terms of drying kinetics, diffusivity, rehydration ratio, energy consumption, CO<sub>2</sub> consumption, and loco microstructure. The VMD process was carried out in a laboratory-scale designed equipment, using an initial power intensity of 7.74 W g<sup>-1</sup> for 10 minutes and then 16.77 W g<sup>-1</sup> with a vacuum pressure of 40kPa. The treatment that presented the highest diffusivity was VMD (3.28×10<sup>-9</sup> m<sup>2</sup> s<sup>-1</sup>) and a processing time of 69 minutes, on the other hand, the treatment that presented the lowest diffusivity (7.30×10<sup>-10</sup> m<sup>2</sup> s<sup>-1</sup>) and the longest process time (9 h) was FD. In terms of energy consumption, there was a difference of 97% between FD and VMD; however, the FD rehydration ratio was the one with the best results. Therefore, it is possible to conclude that both treatments have advantages that should be used according to requirements.

### **Biography:**

Luis Alberto Gonzalez Cavieres, food engineer, student of the PhD program in food engineering at the University of Bio-Bio, Chillan, Chile, currently working with Dr. Mario Perez-Won (University of Bio-Bio) and Dr. Roberto Lemus (university of Chile), in research on emerging technologies, mainly in vacuum microwave drying, as well as equipment optimization. In 2021 we published a review entitled "Advances in Microwave Vacuum Drying (VMD) Systems for Food Products" in Trends in Food Science & Technology Journal.

## Effect of pulsed electric fields (PEF) on digestibility and protein quality of freeze-dried Chilean abalone

**Mario Pérez-Won<sup>a\*</sup>, Anais Palma-Acevedo<sup>a</sup>, Roberto Lemus-Mondaca<sup>b</sup>, Gipsy Tabilo-Munizaga<sup>a</sup>, Luis González-Cavieres<sup>a</sup>**

<sup>1</sup> Food Engineering Department, Universidad del Bío Bío, Av. Andrés Bello 720, Chillán, Chile.

<sup>2</sup> Department of Food Sciences and Technology, Universidad de Chile, Av. Dr. Carlos Lorca 964, Santiago, Chile.

The Chilean abalone is a gourmet product of high commercial value both in Chile and in the world, hence the use of lyophilization is presented as an interesting alternative for its commercialization. The objective of this study was to evaluate different magnitudes of pulsed electric fields (PEF) in the digestibility and in the freeze-drying process of Chilean abalone. The experiments were carried out by applying PEF (0.5, 1.0 and 2.0 kV cm<sup>-1</sup>) to sheets of Chilean abalone, and it was subsequently cooked (CO). Another group of Chilean abalone sheets was cooked and then PEF were applied. Both groups were lyophilized. As a control sample, fresh Chilean abalone sheets were freeze-dried. The kinetics and diffusivity of the lyophilization process, protein content, degree of hydrolysis (DH), Computer-Protein Efficiency Ratio (C-PER), Differential Scanning Calorimetry (DSC), and Fourier Transformed Infrared Spectroscopy (FT-IR) were evaluated. The result for diffusivity shows that a lower value of  $7.30 \times 10^{-10} \text{ m}^2\text{s}^{-1}$  was obtained for the control sample. The treatment that presented the shortest freeze-dried time and the highest C-PER was the sample 2.0 PEF. Regarding DH, there were only significant differences at minute 90 of the process. Finally, it is important to mention that the amide I region of the proteins was affected by all the treatments as well as the general structure results for DSC analysis. In conclusion, the order in which the treatments were applied affected the structure of the Chilean abalone proteins. Finally, it is possible to say that PEF could generate new perspectives on the freeze-drying process and protein digestion.

**Key words:** Chilean abalone, pulsed electric fields, freeze-drying, proteins.

**Acknowledgments:** Project FONDECYT REGULAR 1201075

### Biography:

Anais Estefanie Palma Acevedo, Food Engineer, recently graduated in a Master's degree in Food Science and Engineering from the University of Bio-Bio, Chillán, Chile, and accepted at the doctoral program in Food Engineering at the same university. Currently working as a research assistant in the FONDECYT REGULAR project 1201075, whose director is Dr. Mario Pérez-Won (Universidad del Bío- Bío) and Dr. Roberto Lemus (Universidad de Chile) and Dra. Gipsy Tabilo Munizaga (Universidad del Bío-Bío) as co-research. My main research areas are emerging technologies and proteins, and more recently dehydration and modeling by different methods.

## Innovative nonwovens with addition of feathers for agricultural applications

**Krystyna Wrześniewska-Tosik<sup>1(\*)</sup>, Tomasz Mik<sup>1</sup>, Ewa Wesołowska<sup>1</sup>,  
Tomasz Kowalewski<sup>1</sup> Michalina Pałczyńska<sup>1</sup>, Damian Walisiak<sup>1</sup>**

*1 ŁUKASIEWICZ Research Network-Institute of Biopolymers and Chemical Fibres, Lodz, Poland*

The aim of research is the manufacture innovative feather-based nonwovens characterised by added functionalities and advantages derived from the use of feather keratin such as: tailor-made biodegradation adjusted to the crops duration, input on organic nitrogen to the soil, zero waste at their end of life and cost competitive materials. The nonwovens obtained by needle punching method consists of wool and feather-based keratin fibres and can be used for agricultural applications.

There are many reasons why developed nonwovens are suited for agricultural uses:

- Friendly to the environment and human health ensuring the reduction of biomass waste in the form of feathers, deposited and polluting the environment.
- Biodegradability - the developed innovative nonwovens are made of biodegradable raw materials of natural origin
- Ability to control the time of microbial decomposition by the share of feather fractions in the nonwoven
- High efficiency with low financial outlay - market price of the developed products, due to the fact that they are made of waste materials, will be much lower than that of fossil based products
- Fertilizing properties - nonwovens made of waste natural resources can be used in 100% as soil improvement agents, because they contain significant amounts of fertilizing ingredients in their structure which are used to meet the nutritional needs of crops.

Elaborated nonwoven, due to above mentioned functionalities can improve productivity and efficiency of agricultural production, increase crop yield and reduce the need for pesticides.

### Biography:

Krystyna Wrześniewska-Tosik (female) PhD DSc, Prof. ŁUKASIEWICZ IBWCh. Head of Team of Keratin Composites. Area of expertise: processing of waste containing keratin, production of keratin from natural raw materials, modification of keratin structures, utilization of chicken feathers in the preparation of modern composite materials for a wide variety of applications, and environment –friendly technologies. She is the author and co-author of over 50 publications, 32 patents including 4 patents and 4 patent applications on the theme of composite materials with content of keratin, participation in over 60 national and international conferences, laureate of 38 team and 14 individual prizes.

### ACKNOWLEDGMENTS

The investigation presented in this paper was carried within research project EkoPióro POIR.04.01.04-00-0059/17 „Development of innovative protective nonwovens with addition of feathers”. The project is co-financed by the European Union from the European Regional Development Fund under the Intelligent Development Operational Program.

## LC-QTOF-MS comparison of phenolic compound profiles in plant extracts during storage

**Małgorzata Materska, Barbara Chilczuk, Marzena Pabich, Monika Staszowska-Karkut**

*University of Life Sciences, Department of Chemistry, Research Group of Phytochemistry, Akademicka 15 Street, 20-950 Lublin, Poland*

Plant extracts contain many active substances, which mainly include phenolic compounds and tannins, which are used as antioxidants in the food, cosmetics and medicine industries. The possibility of preparing extracts in the form of dried material facilitates their storage and dosing. This opens up many new possibilities for their use. The key limitation in the use of dried plant extracts is their durability. During storage, they undergo aging processes accompanied by the degradation of active ingredients. The rate of aging of extracts depends on the storage conditions - here the decisive role is played by light, which induces photooxidation processes. The specific chemical composition of the extracts also determines the durability of the extracts. It is determined by the species of the source plant, therefore an important issue is the proper selection of plants in order to obtain extracts with the desired properties.

The aim of the presented study was to assess the qualitative composition of fresh plant extracts and their changes occurring naturally as an effect of the aging process of the extracts. Water infusions from elderberry and viburnum flower, cistus, fireweed and blackberries leaves were prepared, filtered, cooled, frozen and lyophilized. The profiles of phenolic compounds were determined by the LC-QTOF-MS method in fresh and stored extracts. The analysis was performed using liquid chromatograph (Agilent Technologies 1290) with MS detector (Agilent 6530 Accurate-Mass Quadrupole Time-of-Flight). Data were processed with MassHunter software (Agilent Technologies, Palo Alto, Ca, USA).

It was found that during the storage of freeze-dried extracts, their chemical composition was slightly modified. The stored extracts still contained many phenolic compounds with significant chemical activity, therefore they have significant potential to be used as natural food additives.

### Biography:

Małgorzata Materska was graduated in chemistry. She works on University of Life Sciences in Lublin (Poland) and she is a head of Phytochemical Research Group. Her scientific interests are related to food chemistry and phytochemistry. She works on the isolation and identification of plant derived compounds with beneficial biological activity. She focuses on the search for active compounds of plant origin that could completely or partially replace synthetic antioxidants in food. She believes that the kingdom of plants gives practically unlimited possibilities of finding active substances that can be used both in food and medicine.

**NOTE:** This work was supported by Ministry of Science and Higher Education in Poland, project no 029/RID/2018/2019.

## $\beta$ -Caryophyllene reverts free fatty acids-induced steatosis in HepG2 hepatocytes through CB2 and PPAR- $\alpha$ receptors

Rosaria Scandiffio<sup>\*1</sup>, Erika Cottone<sup>1</sup>, Massimo Maffei<sup>1</sup>, Patrizia Bovolin<sup>1</sup>

<sup>1</sup>Dept. Life Sciences and Systems Biology, University of Turin, Italy.

Nonalcoholic fatty liver disease (NAFLD) is one of the most common cause of liver disorder, defined by excessive accumulation of triglycerides in hepatocytes.

The accumulation of lipids causes oxidative stress and inflammation, that may lead to the progression of NASH (nonalcoholic steatohepatitis). The scientific interest for natural compounds has increased exponentially in the last years, along with the number of studies on nutraceuticals, aimed to test their effects on many disorders, including obesity, NAFLD and also cancer.

The sesquiterpene (E)- $\beta$ -caryophyllene (BCP), widely distributed in the plant kingdom<sup>1</sup>, is one of the most promising natural compounds in chronic inflammation studies<sup>2</sup>, with significant effects on reduction of lipid accumulation<sup>3</sup>. In our study we demonstrate its ability to revert free fatty acid (FFA)-induced steatosis and modify the lipid profile in HepG2 hepatocytes by *in vitro* biological assays and lipidomic analysis. To simulate the condition of steatosis, HepG2 cells were treated with palmitate and oleate, and lipid content was quantified by fluorescent staining. Our results demonstrate that the treatment with a 0.5 mM mixture of palmitate and oleate causes 80% increase in intracellular triglycerides, while the 24h co-treatment with 0.5  $\mu$ M BCP determines a significant reduction in triglyceride accumulation. Moreover, we show that the BCP-induced triglyceride reduction could be mediated by the cannabinoid receptor 2 (CB2) and peroxisome proliferator-activated receptor alpha (PPAR- $\alpha$ ). It is known that trans fatty acids promote inflammation and endoplasmic reticulum stress, whereas cis-unsaturated fatty acids are protective<sup>4</sup>. To reveal the potential change in HepG2 lipid profile, induced by BCP treatment, we used a lipidomic approach based on gas chromatography-mass spectrometry (GC-MS). Our GC-MS data show that co-treatment with BCP induces a reduction of palmitic and stearic acids, oleic acid, elaidic acid and an increase in palmitoleic acid (monounsaturated fatty acid).

Taken together these results reveal interesting and novel properties of BCP, suggesting potential applications in the reduction of trans-fatty acid accumulation and cellular damages caused by the accumulation of fats, typical condition of NAFLD.

### References

- 1 Maffei, Int. J. Mol. Sci. 2020, 21, 6540.
- 2 Scandiffio et al. Nutrients, 2020, 12, 3273.
- 3 Geddo et al. Nutrients, 2019, 11, 2788.
- 4 Oteng et al. Adv. Nutr., 2020, 11(3):697-708.

### Biography:

I'm Rosaria Scandiffio, graduated in Medical Biotechnology and currently a Ph.D. student in Pharmaceutical and Biomolecular Sciences, at the University of Turin, with an upcoming thesis on "Biological effects of plant extracts on cellular models of obesity and hepatic steatosis". During these three years of Ph.D, our research group headed, by Prof Massimo Emilio Maffei and Prof Patrizia Bovolin, published several papers in international journals such as Nutrients, Chemosphere and Toxicology, and not only about the aforementioned topics but also about microplastics associated with organic pollutant in the Adriatic sea and its correlation with adipogenesis *in vitro*.

## **Beneficial effects of intermittent fasting and high intensity interval training in obese mice with nonalcoholic fatty liver disease**

**Patricia de Castro de Paiva\*, Thatiany de Souza Marinho, Carlos Alberto Mandarin de Lacerda, Marcia Barbosa Aguila**

*State of Rio de Janeiro University-Brazil, Brazil*

Intermittent fasting (IF) and high-intensity interval training (HIIT) are procedures that might mitigate the effects of nonalcoholic fatty liver disease. Two groups of 3-month-old C57BL/6 male mice were fed for 16 weeks with a control (C) or high-fat (HF) diet. In the last four weeks, IF, HIIT and IF/HIIT were implemented. Obese HF animals showed liver fat accumulation with macro-, and micro-vesicular steatosis and inflammatory infiltrate. IF and HIIT successfully reduced liver steatosis in the HF derived groups. IF, HIIT, and IF/HIIT were beneficial in improving glucose metabolism in both C-derived and HF-derived groups. High levels observed in plasmatic and liver levels of total cholesterol (TC) and triacylglycerol (TAG) in HF group compared to C group were mitigated by IF, HIIT, and IF/HIIT. IF decreased adiponectin and increased leptin and insulin in HF group. HIIT improved adiponectin and leptin. IF changes liver gene expressions: increased IL-6 in C IF group, reduced IL-6, and PAI-1 in HF group. IF/HIIT reduced IL-6, MCP-1, and PAI-1. IF and HIIT enhanced hepatic beta-oxidation. Also, lipogenesis was reduced by IF and HIIT in HF derived groups. In conclusion, IF and HIIT benefit weight loss, hormones, glucose tolerance/insulin resistance, liver steatosis/inflammation, fatty acid oxidation, and lipogenesis. Furthermore, the IF groups showed beneficial effects more often and intensely than HIIT ones. The IF/HIIT combination was slightly more efficient than IF, indicating that IF is the primary intervening factor benefiting the obese mouse liver.

### **Biography:**

Doctoral student at the Postgraduate Program in Human and Experimental Biology of the State of Rio de Janeiro University. Master in Health, Laboratory Medicine and Forensic Technology. Master in Aerospace Sciences at Brazilian Air Force University (UNIFA). Graduated in Physical Education from the State of Rio de Janeiro University. Experience in Military Physical-Professional Education and Training. Brazilian Olympic Comittee Reseacher.

## Agri-food byproducts as a natural source of food-grade Pickering stabilizers: chemical and emulsifying properties

**César Burgos-Díaz<sup>1\*</sup>, Yohana Mosi-Roa<sup>1</sup>, Mauricio Opazo-Navarrete**

*<sup>1</sup>Agriaquaculture Nutritional Genomic Center, CGNA, Temuco, Chile.*

Agri-food byproducts valorization is a challenging field of study to ensure environmental protection and thus contribute to the circular economy. These wastes/by-products are an excellent source of valuable compounds such as natural emulsifiers and bioactive compounds. In this perspective, there is a large opportunity to valorize these byproducts as a promising source of value-added substances. Therefore, a relevant aspect of this study was the utilization of agri-food byproducts as a novel source of natural stabilizers (solid amphiphilic particles) to develop food-grade Pickering emulsion. This type of system refers to emulsions that are not physically stabilized by conventional emulsifier molecules, but instead by solid colloidal particles. Based on the above considerations, the aim of this study was to develop food-grade Pickering emulsions stabilized by particles obtained from agrifood wastes/byproducts (lupin hull and camelina press cake). Thus, the Pickering stabilizers (particles) were fabricated by grinding each agrifood waste with a high-speed centrifugal rotor mill. Then, a pre-emulsion was prepared with each particle dispersion and using a high-speed homogenization. Finally, the system was homogenized at high pressure using a microfluidizer. The obtained Pickering emulsions were characterized in terms of droplets size, emulsion stability, microstructure, among others. Thus, the influence of the different Pickering stabilizers (stabilized with different agri-food by-products) on the emulsion characteristic was evaluated.

The preliminary results showed that Pickering stabilizers were effective for stabilizing oil-in-water (O/W) emulsions. In addition, the formed O/W emulsions were highly stable against creaming at high concentrations. The confocal laser scanning microscopy (CLSM) images clearly showed that the particles were anchored to the interfaces of oil droplets, which is a demonstration of the formation of a Pickering emulsion stabilized by solid particles. The findings contribute to a better understanding on the utilization of novel biocompatible and food-grade particles as efficient Pickering stabilizers for forming O/W emulsions.

### Biography:

Dr. César Burgos-Díaz is a Researcher at CGNA-CHILE. He is a specialist in food science and technology, whose main areas of expertise are encapsulation of bioactive compounds, functional properties of plant proteins and development of emulsions for application in the food industry. He has led several research projects in the mentioned topics and the results of his work have been published in several scientific publications and book chapters. He is currently leading a research project on "Microencapsulation of aroma in a food-grade Pickering emulsion system for increasing its protection and stability".

### FUNDING:

This research was supported by ANID through project FONDECYT project N° 1210136.



## **Pork liver recovery by obtaining a soluble protein extract with techno-functional properties: characterisation of the spray-dried extract and of the residual insoluble fraction**

**Narcís Feliu-Alsina\*, Elena Saguer**

*Institut de Tecnologia Agroalimentària (INTEA), Universitat de Girona (UdG), C/ Maria Aurèlia Campany i Farners 61, 17003., Spain.*

Valorisation of food co- and by-products is a strategy fully framed in the context of the circular economy that aims to improve resource efficiency, minimizing not only resource inflows but also waste generation. This is especially important in the case of products from animal origin, given the environmental cost of livestock activity. Increasing offal consumption has been suggested as a realistic strategy to reduce the contribution of meat production to environmental impacts. Despite the high nutritive value of pork liver, it is unpopular with Western consumers because of its strong flavour and less tender texture. This work focuses on its potential for valorisation through obtaining a soluble protein extract with techno-functional properties and the use of the residual insoluble fraction (pellet) as a loading protein. For this purpose, protein extracts and the corresponding pellets were obtained under different pH conditions (4.5 and 6.0) following a randomised complete block design. The obtained extracts were subsequently spray-dried and their physicochemical characteristics and techno-functional properties determined, in this last case at pH 4.5 and 6.0, regardless of extraction pH. Relative to the insoluble fractions, different layers were separated and their physicochemical characteristics determined. The results obtained indicate that spray-dried extracts recovered at pH 4.5 were lower in fat relative to those recovered at pH 6.0 and showed better surface properties, especially in the case of the foaming ones, but were unable to form heat-induced gels. Regarding the insoluble fractions, two and three layers were separated at pH 4.5 and 6.0, respectively, with one layer showing always a fleshier appearance and with relatively higher protein and collagen contents. Although differences were observed in composition among the different layers and/or depending on the extraction pH, in general, residual insoluble fractions (as a whole or separated layers) could be used as loading ingredients.

### **Biography:**

I am a Technology Ph.D. student at the Universitat de Girona, specialised in Food Science and Technology research field, particularly in co- and by-products from the meat industry. Previously, I have my Agri-food Engineering Bachelor's Degree and Food Biotechnology Master's Degree at the Universitat de Girona. My Final Bachelor's Degree Project was related to the research on obtaining polyphenols from beer and apple industry by-products at Odisee University of Gent and my Final Master's Degree Project was related to plant pathology research at the Institut de Tecnologia Agroalimentària of Girona.

## **Production of L-carnitine-enriched edible filamentous fungal biomass through submerged cultivation**

**Neda Rousta\*, Jorge A. Ferreira, Mohammad J. Taherzadeh**

*Swedish Centre for Resource Recovery, University of Borås, 50190 Borås, Sweden.*

Edible filamentous fungi are a promising future source of functional food and feed, including protein, vital amino acids, and immunostimulant chemicals. L-carnitine, an essential component of energy metabolism, is a functional compound generated in solid-state fermentation by the Zygomycetes filamentous fungus *Rhizopus oligosporus*. The current study is the first to show that submerged cultivation of numerous Ascomycetes and Zygomycetes, such as *Aspergillus oryzae*, *Neurospora intermedia*, *Rhizopus oryzae*, and *Rhizopus oligosporus*, can produce L-carnitine-enriched edible fungal biomass. With a yield of 3 mg L-carnitine per gram of fungal biomass, *A. oryzae* has a lot of potential for producing this bioactive molecule, which is significantly higher than the other fungi evaluated in this study and earlier investigations. Other parameters, such as cultivation time and the presence of yeast extract, were discovered to play a role in addition to the fungal strain. To clarify its potential for producing L-carnitine-enriched fungal biomass, more research on submerged growth optimization of *A. oryzae* in both high-quality recipes and medium based on low-value substrates is proposed.

### **Biography:**

Neda Rousta is currently pursuing her PhD in Industrial Biotechnology. her research activities aims at producing edible fungal biomass with enhanced bio-functionality. She has a background in Nutrition Sciences and Biochemistry. Previously she has worked as a quality control manager of a food company for three years and has an experience as a nutritionist for six years. She currently works as research assistant in project Ways2Taste and is responsible for fungal biomass production in pilot scale and nutritional analysis of both biomass and fermented food.

## **Biofortification of *Solanum tuberosum* L. tubers through foliar $\text{CaCl}_2$ and $\text{Ca}(\text{NO}_3)_2$ pulverization**

**Ana Rita F. Coelho<sup>1,2</sup>, Fernando C. Lidon<sup>1,2</sup>, Cláudia Campos Pessoa<sup>1,2</sup>, Ana Coelho Marques<sup>1,2</sup>, Inês Carmo Luís<sup>1,2</sup>, João Caleiro<sup>1</sup>, Manuela Simões<sup>1,2</sup>, José Kullberg<sup>1,2</sup>, Paulo Legoinha<sup>1,2</sup>, Maria Brito<sup>1,2</sup>, Mauro Guerra<sup>3</sup>, Roberta G. Leitão<sup>3</sup>, Carlos Galhano<sup>1,2</sup>, Paula Scotti-Campos<sup>2,4</sup>, José N. Semedo<sup>2,4</sup>, Maria Manuela Silva<sup>2,5</sup>, Isabel P. Pais<sup>2,4</sup>, Maria J. Silva<sup>2,6</sup>, Ana P. Rodrigues<sup>6</sup>, Maria F. Pessoa<sup>1,2</sup>, José C. Ramalho<sup>2,6</sup> and Fernando H. Reboredo<sup>1,2</sup>**

<sup>1</sup>Earth Sciences Department, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus da Caparica, 2829-516 Caparica, Portugal

<sup>2</sup>GeoBioTec, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus da Caparica, 2829-516 Caparica, Portugal

<sup>3</sup>LIBPhys-UNL, Departamento de Física, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus da Caparica, 2829-516 Caparica, Portugal

<sup>4</sup>INIAV-Instituto Nacional de Investigação Agrária e Veterinária, Avenida da República, Quinta do Marquês, 2780-157 Oeiras, Portugal

<sup>5</sup>ESEAG-COFAC, Avenida do Campo Grande 376, 1749-024 Lisboa, Portugal

<sup>6</sup>Plant Stress & Biodiversity Lab, Centro de Estudos Florestais (CEF), Instituto Superior Agronomia (ISA), Universidade de Lisboa (ULisboa), Quinta do Marquês, Av. República, 1349-017 Lisboa, Portugal

Calcium, although relatively immobile in cells and not readily remobilized from the mature to the active growing parts of plants, is an essential macronutrient for plant growth and development. In this context, the efficiency of Ca enrichment in tubers of three genotypes of *Solanum tuberosum* L. (Agría, Picasso and Rossi), through foliar spraying with  $\text{CaCl}_2$  and  $\text{Ca}(\text{NO}_3)_2$  solutions prompt this study. Potato varieties were grown in three production fields and during the life cycle, four pulverizations with calcium chloride (3 and 6 kg ha<sup>-1</sup>) or calcium nitrate (0.5, 2 and 4 kg ha<sup>-1</sup>) were applied. Considering that geomorphology of potato-growing fields strongly affects water surface drainage, orthophotomaps, were produce using a high-definition and multi-sector RGB camera and a parrot sequoia camera installed in a drone, being the drainage patterns of surface water of the fields studied with an Agisoft PhotoScan Professional. The obtained data was further relate with the levels of organic matter, electrical conductivity, pH and nutrients of the soils, as well as with quality parameters of the irrigation water (pH, electrical conductivity,  $\text{Ca}^{2+}$ ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{HCO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ ). The potential phytotoxicity, the potential synthesis of photoassimilates after the 3rd Ca application was screen, being found minimum deviations relatively to the control. At harvest, the average Ca biofortification index varied between 5–40%, 40–35% and 4.3–13% in Agría, Picasso and Rossi, respectively. Moreover, the equatorial region of the tubers in general showed that Ca accumulation prevailed in the epidermis and, in some cases, in inner areas of the potato tubers. It is concluded that Ca enrichment of potato tubers through foliar spraying complemented the xylem mass flow of Ca from roots, through phloem redistribution. Both fertilizers showed similar efficiency, but Rossi revealed a lower index of Ca accumulation.

## Biography:

Fernando José Cebola Lidon, is a Full Professor at the Nova School of Science and Technology-New University of Lisbon (FCT/UNL), and coordinating researcher of the GeoBioTec research group (Geobiosciences, Geoengineering and Geotechnologies). He has Aggregation in “Biology: Agrophysiology and Food Quality” (University of Évora) since 2013, Ph D in “Biology / Plant Biochemistry” (FCT/UNL), since 1994, Degree in “Biochemistry” (Faculty of Sciences of the University of Lisbon), since 1988, and in “Biology and Geology” (University of Évora), since 1984. His research interests are focusing Phytochemistry; Agrifood Technologies; Biofortification; Nutritional Phytotechnology.

## Evaluation of the mineral composition of food supplements – a preliminary assessment.

**B. Gominho<sup>1</sup>; M. Guerra<sup>2</sup>; F. Reboredo<sup>\*1,3</sup>; F. Lidon<sup>1,3</sup>, Maria Manuela Silva<sup>4</sup>**

<sup>1</sup>*Departamento de Ciências da Terra (GeoBioTec), Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus da Caparica, 2829-516 Caparica, Portugal.*

<sup>2</sup>*LIBPHYS, Departamento de Física, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus da Caparica, 2829-516 Caparica, Portugal.*

<sup>3</sup>*GeoBioTec, Departamento de Ciências da Terra (GeoBioTec), Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, Campus da Caparica, 2829-516 Caparica, Portugal*

<sup>4</sup>*ESEAG-COFAC, Avenida do Campo Grande 376, 1749-024 Lisboa, Portugal.*

The European dietary supplements market size was valued at USD 61.8 billion in 2021 and is expected to expand at a compound annual growth rate (CAGR) of 5.8% from 2022 to 2030 (<https://www.grandviewresearch.com/industry-analysis/europe-nutrition-supplements-market>). In EU Food supplements (FS) are intended to correct nutritional deficiencies, and are regulated as foods (<https://www.efsa.europa.eu/en/topics/topic/food-supplements>). For ingredients other than vitamins and minerals, the European Commission has established rules to protect consumers against potential health risks.

In some cases, the presence of contaminants (organic and inorganic compounds), might lead to harmful effects at long-term, counteracting and/or minimizing the possible beneficial effects [1]. The main objective of this work was to analyse 9 different FS currently sold in Portugal in order to evaluate its elemental composition but also to detect putative harmful compounds such as heavy metals, by Energy dispersive X-ray fluorescence spectrometry.

The list of FS is the following: Horsetail (Salutem); Echinacea (Form +); XCESS (Xcore Nutrition); Magnesium (Vitalis); Acai (Cem Porcento); Kyolic 1000 (Kyolic); Red Rice (NormoLip5 ESI); Red Rice (BioActivo Pharma Nord) and Muscle Repair (GoldNutrition).

If we take into account the recommended daily intake dose by the manufacturer, 3 of them must be ingested with extreme caution. In Magnesium (Vitalis) the concentration of Mg (412.6 mg) is higher than the Daily Reference Intake (DRI) for adults, plus the presence of Ti (330.7 mg) and Pb (0.09 mg). Red-Rice (NormoLip5 ESI) exhibited an average value of Cr (0.37 mg) higher than the DRI, occurring the same for the FS Muscle Repair (GoldNutrition) in what regards its Zn content (20.4 mg). These findings might pose problems to human health due to the toxicity of Pb (no known level of Pb exposure is considered safe) whereas the excess of Mg might cause nausea, diarrhoea and abdominal cramps, and Cr irregular heartbeat, headaches and allergic reactions.

### Reference

[1] Reboredo et al (2020) Exp Health 2020, 12, 917–927, doi:10.1007/s12403-020-00354-9.

## Biography:

Fernando Henrique Reboredo is Associate Professor with Aggregation at the NOVA School of Science and Technology-New University of Lisbon (FCT/UNL). He has been responsible for the launch of several new scientific domains at the New University of Lisbon such as, Agro-industrial Production and Sustainability; Climate Change and Agriculture; Agrofood Production, Medicinal Plants; Forests and Human Health. His main activities are focused on the biofortification of several edible crops in macro and micronutrients, and studies regarding the risk assessment of food supplements and natural products, especially regarding the accumulation of heavy metals.

## **Synthetic Food Colour Additives: A General Perspective on Chemical Properties, Applications in Food Products, and Health Side Effects**

**Maria Manuela Silva<sup>1</sup>, Fernando Henrique Reboredo<sup>2</sup> and Fernando Cebola Lidon<sup>2</sup>**

*<sup>1</sup>ESEAG/Grupo Universidade Lusófona, 1749-024 Lisboa, Portugal,*

*<sup>2</sup>GeoBioTec Research Center, Faculdade de Ciências e Tecnologia, Campus da Caparica, Universidade Nova de Lisboa, 2829-516 Caparica, Portugal*

Food properties, namely colours, which are a visual feature associated with the spectral distribution of light resulting from the interaction with matter, largely determine consumer's satisfaction and expectations, affecting their choice and eating desires. In this context, synthetic food colours have been increasingly used rather than natural food colours by food manufacturers, as they have several economically relevant traits, such as their low cost; resistance to light, oxygen, and pH changes; and high colour stability. In contrast to natural food colours, which are usually extract from several natural sources and purified, synthetic food colours are produced by full chemical synthesis or the modification of several precursor compounds. Nevertheless, some synthetic food colours must be used with caution since, depending on other factors, depending on the daily intake can be harmful to the health of the consumers. This study is a review on the chemical properties, application in food products and health side effects of the azo food colours Tartrazine, Sunset Yellow FCF, Azorubine, Ponceau 4R, Allura Red AC, Brilliant Black PN, Brown HT and Litholrubine BK. It is concluded that, to overcome the constraints imposed by the synthetic food colours, the use of these food colourants must be performed within the limits and to fulfill a certain function (within the legal framework), whilst facing the whole impact at short and long terms.

### **Biography:**

Maria Manuela Abreu da Silva, is a Coordinating Professor at ESEAG/COFAC, Lusófona University Group, and researcher of the GeoBioTec research group (Geobiosciences, Geoengineering and Geotechnologies) at Nova School of Science and Technology-New University of Lisbon. She has PhD in Chemistry from the University of Lisbon, since 1996, Degree in Technological Chemistry, from the Faculty of Chemistry of the same University, since 1989, and a Post-Graduated Course (2 years) "Young Technicians for Industry" in Chemistry R&D since 1996 developed at the Technological and Nuclear Institute ITN/LNETI. Since 2005, her research interests are focusing Phytochemistry; Agrifood Technologies; Biofortification; Food Additives; Nutritional Phytotechnology.

## Modern glycemetic monitoring systems and prevalence of metabolic syndrome among adolescents with type 1 diabetes mellitus

**Monika Grabia<sup>\*1</sup>, Renata Markiewicz-Żukowska<sup>1</sup>, Joanna Bielecka<sup>1</sup>, Anita Mielech<sup>1</sup>, Artur Bossowski<sup>2</sup>, Katarzyna Socha<sup>1</sup>**

<sup>1</sup> Department of Bromatology, Faculty of Pharmacy with the Division of Laboratory Medicine, Medical University of Białystok, Mickiewicza 2D St., 15-222 Białystok, Poland,

<sup>2</sup> Clinic of Paediatrics, Endocrinology, Diabetology with Subdivision of Cardiology, Children's University Clinical Hospital in Białystok, Waszyngtona St. 17, 15-274 Białystok, Poland

Intensive insulin therapy among type 1 diabetes mellitus (T1DM) patients can be provided by using an insulin pump (CSII) or multiple daily insulin pen injections (MDI)[1]. Continuous (CGM) or flash (FGM) glucose monitoring systems are gaining popularity as they facilitate daily functioning, and the number of hypo- and hyperglycemic incidents[2]. However, obesity is becoming more common, and the additional presence of metabolic syndrome (MetS) may influence the development of many cardiometabolic complications[3].

The aim of the study was to estimate the MetS prevalence in adolescents with T1DM in relation to insulin therapy and modern GM systems. The study included 120 participants aged 10-17 years. The T1DM group, as well as control group, consisted of 60 persons. Fasting glucose, glycated hemoglobin (HbA1c), triglycerides, HDL-cholesterol, and total antioxidant status (TAS) in blood were determined. The occurrence of MetS was diagnosed according to the criteria of IDF, ATP, and WHO. Body composition analysis by bioelectroimpedance was performed. A 3-day food diary was used to assess dietary nutrient intake.

It was shown that one in three young diabetics had MetS. The biggest subgroup of T1DM with MetS (MetS+) patients were those who used CSII without the support of modern GM. Their eGDR (8.7 mg/kg/min), HbA1c (8.3%), and TAS (1.099mmol/L) levels were worse than those who used CSII and CGM (6.5mg/kg/min, 7.9%, 1.259mmol/L). The diet of MetS+ was higher in saturated fatty acids (17.6 vs. 16.0g, p<0.01), and lower in foods rich in oleic acid (12.3 vs. 21.4g, p<0.001), ω-3 (0.831 vs. 1.3g, p<0.001) and ω-6 (4.9 vs. 7.6g, p<0.001).

The usage of GM systems, compared to the type of insulin therapy, played a major role in influencing the occurrence of MetS. However, abnormal MetS component values also appeared in these groups. Long-term occurrence of adverse factors may accelerate the development of cardiometabolic complications.

### References

Yeh, H.-C.; Brown, T.T.; Maruthur, N. et al. Comparative Effectiveness And Safety Of Methods Of Insulin Delivery And Glucose Monitoring For Diabetes Mellitus. *Ann Intern Med* 2012, 157, 336-347.

Freckmann, G.; Ulbrich, S. Continuous Glucose Monitoring (CGM) In Diabetes Therapy. *Med Monatsschr Pharm* 2018, 41, 455-460.



Grabia, M.; Markiewicz-Żukowska, R. Nutritional Status Of Pediatric Patients With Type 1 Diabetes Mellitus

From Northeast Poland: A Case-Control Study. *Diabetes Ther* 2021, 12, 329-343.

## **Biography:**

A PhD student at the Department of Bromatology, Medical University of Białystok. She is currently working on her PhD thesis concerning oxidative stress markers and their relation to dietary factors and nutritional status among adolescents with type 1 diabetes mellitus depending on the applied insulin therapy and modern glycemic monitoring systems. She has been associated with diabetology for many years, as a dietician and educator. She acquires her qualifications in the field of patient education and counselling by participating in scientific conferences and specialization trainings that increase her scientific and research competence.

## **Subcritical Water Extraction of Pectin from Passion Fruit (*Passiflora edulis* sp.) Rinds**

**Débora Tamires Vitor Pereira<sup>\* ac</sup>, Pablo Méndez-Albiñana<sup>b</sup>, José A. Mendiola<sup>a</sup>, Mar Villamiel Guerra<sup>b</sup>, Alejandro Cifuentes<sup>a</sup>, Julian Martínez<sup>c</sup>, Elena Ibañez<sup>a</sup>**

<sup>a</sup>*Foodomics Laboratory, Instituto de Investigación en Ciencias de la Alimentación (CIAL, CSIC-UAM), 28049, Madrid, Spain*

<sup>+</sup>*Química y Funcionalidad de Carbohidratos y Derivados, Instituto de Investigación en Ciencias de la Alimentación (CIAL, CSIC-UAM), 28049, Madrid, Spain,*

<sup>c</sup>*School of Food Engineering, University of Campinas, UNICAMP, 13083-862, Campinas, SP, Brazil*

Recent studies have shown that fruit by-products from the agroindustry are important sources of pectin, widely used in the food and pharmaceutical industries. Obtaining pectin using emerging extraction technologies is an attractive alternative because these clean methods use non-toxic solvents and produce high-quality products with short extraction times. The objective of this work was to evaluate the potential of the Subcritical Water Extraction (SWE) method to obtain pectin from passion fruit rinds, converting this by-product through an environmentally sustainable process. Thus, the extractions were performed at constant pressure (10 MPa), solvent to feed (S/F) ratio of 30 kg solvent/kg of dried rind, and mass flow rate of 3 g/min of Milli-Q quality water as solvent. Approximately 3.0 g of dried passion fruit rinds residue was used for each extraction. The influence of temperature on the pectin extraction yield was verified using different temperature levels (100, 120, 140, and 160 °C) during the extractions, which were carried out for 30 min. Subsequently, the extracts obtained were added with ethanol (96%) at 1:2 (v/v) proportion, and the mixture was kept for 16 h at 4 °C to precipitate the pectin. To collect the precipitates, the mixture was centrifuged at 1700 g for 30 min at 4 °C, and the products obtained were washed with anhydrous ethanol three times before lyophilization. Yields were calculated by dividing the weight of dried recovered pectin (g) by the initial powder (g) weight. The results showed that SWE at 120 °C provided the highest yield (16%) of pectin, indicating that this extraction condition promoted the hydrolysis of passion fruit rinds pectin. Finally, it is concluded that SWE is an efficient and promising process for recovering pectin from passion fruit rinds.

### **Biography:**

Débora T. V. Pereira currently, is a visiting PhD student in the Foodomics and Prebioin Laboratories at the Institute of Food Science Research (CIAL) in Madrid (Spain). As a PhD candidate at the School of Food Engineering at the State University of Campinas (FEA/UNICAMP), Débora conducts research on the following topics: characterization of raw materials, green technologies for the recovery of bioactive compounds, membrane separation process, and use of agro-industrial by-products. She has master's and bachelor's degrees in Food Engineering from FEA/UNICAMP and Federal University of São João del-Rei, respectively. She is a Food Engineering specialist, emphasizing Thermodynamics, Physical Separations, and Food Analysis.

---

Virtual talks

DAY-2

## **Gelation mechanisms and network structures in polysaccharide gels from viewpoints of macro- and microscopic aspect**

**Shingo Matsukawa**

*Tokyo University of Marine Science and Technology, Japan.*

Macroscopic measurements on physical properties of food gels provide information about formation of networks and network structures. On the other hand, measurements of microscopic physicochemical properties are instructive to give mobility and structures in nano-meter and molecular level. The gelation of Kappa Carrageenan and Iota Carrageenan solutions is considered to be induced by the formation of double helices and their aggregation which generate an exothermic peak in micro-DSC, where the peak temperature is mostly identical with the gelation temperature and the peak area is corresponding to the enthalpy for the formation and aggregation of helices<sup>1,2</sup>. The molecular mobility of carrageenan chains are strongly decreased by formation and aggregation of helices. NMR relaxation times reflect flexibility of the chains. The diffusion coefficients give the information about the mobility of molecules and the structure of the hydrocolloids<sup>3,4</sup>. Nano-particle tracking is a noninvasive technique performed by monitoring the Brownian motion of the probe particle which provides information on the local viscoelasticity in carrageenan gels and spatial differences in the local physical properties during the gelation of the media<sup>5,6</sup>.

### Reference

- 1) Du, L., Brenner T., Xie, J., Matsukawa, S., Food Hydrocollids, 55,81-88(2016).
- 2) Brenner, T., Tuvikene, R., Parker A., Matsukawa, S., Nishinari, K., Food Hydrocollids, 39,272- 279(2014).
- 3) Zhao, Q., Brenner, B., Matsukawa, S., Carbohydr Polym, 95(1),458-464(2013).
- 4) Hu, B., Du, L., Matsukawa, S., Carbohydrate Polym, 150,57-64(2016).
- 5) Geonzon, L.C., Bacabac, R.G., Matsukawa, S., Food Hydrocolloids, 92, 173-180(2019).
- 6) Geonzon, L. et al. Food hydrocolloids, doi.org/10.1016/j.foodhyd.2021.107095

### **Biography:**

Shingo Matsukawa got a BSc in 1984 from Department of synthetic chemical engineering in Hokkaido Univ, a MSc from Master's Program in Environmental Science in Univ of Tsukuba in 1994 by a study of bio-chemo-mechanical synthetic gel systems, and a PhD from Department of Organic and Polymeric Materials in Tokyo Institute of Technology in 1997 by a study on water and polymer diffusion in aqueous gels using NMR. He is a specialist for measurements of diffusion coefficients  $D$  in polymer solution, especially the  $D$  of polymer probe in gels by super-high magnetic field gradient to get information about network structure.

## Mediterranean Diet Combined With a Low-Carbohydrate Dietary Pattern in the Treatment of Overweight Polycystic Ovary Syndrome Patients

Shanshan Mei<sup>1,2</sup>, Jie Ding<sup>2</sup>, Kaili Wang<sup>2</sup>, Zhexin Ni<sup>2</sup> and Jin Yu<sup>2,3</sup>

<sup>1</sup>Shanghai University of Traditional Chinese Medicine, Shanghai, China,

<sup>2</sup> Department of Gynecology of Traditional Chinese Medicine, Changhai Hospital of PLA Military Medical University, Shanghai, China,

<sup>3</sup> International Peace Maternity and Child Health Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China

**Objectives:** To determine the therapeutic effect of a Mediterranean diet(MED) combined with a low-carbohydrate(LC) dietary model in overweight polycystic ovary syndrome (PCOS) patients.

**Methods:** In this 12-week randomized controlled clinical trial, 72 overweight patients with PCOS were randomly assigned to one of two energy-restricted dietary models: the MED/LC diet or the Low fat (LF) diet. After the intervention, the number of the two groups returned to normal menstruation was counted. Body weight, body mass index (BMI), waist circumference, waist-hip ratio (WHR), body fat percentage (BF%), serum fasting insulin(FINS), fasting plasma glucose(FPG), insulin resistance index (HOMA- IR), quantitative insulin sensitivity index (QUIKI), total cholesterol (TC) and high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), triglyceride (TG), total testosterone (TT), luteinizing hormone (LH), follicle-stimulating hormone (FSH), and prolactin (PRL) were compared between 2 groups before and after intervention.

**Results:** MED/LC group had more significant reduction trend in weight ( $-6.10 \pm 1.52$  kg vs  $-4.79 \pm 0.97$  kg,  $P < 0.05$ ), BMI ( $-2.12 \pm 0.57$  kg/m<sup>2</sup> vs  $-1.78 \pm 0.36$  kg/m<sup>2</sup>,  $P < 0.05$ ), WC ( $-6.12 \pm 5.95$  cm vs  $-3.90 \pm 1.58$  cm,  $P < 0.05$ ), WHR ( $-0.06 \pm 0.02$  vs  $-0.03 \pm 0.02$ ,  $P < 0.05$ ), BF% ( $-2.97\% \pm 1.78\%$  vs  $-1.19\% \pm 0.91\%$ ,  $P < 0.05$ ), TT ( $-0.20 \pm 0.24$  ng/mL vs  $0.08 \pm 0.11$  ng/mL,  $P < 0.001$ ), LH ( $-5.28 \pm 3.31$  mIU/mL vs  $-3.39 \pm 3.64$  mIU/mL,  $P < 0.05$ ), and LH/FSH ( $-1.18 \pm 0.75$  vs  $-0.66 \pm 1.05$ ,  $P < 0.05$ ) compared with the LF group. In addition, FPG ( $0.05 \pm 0.38$  mmol/mL vs  $-0.50 \pm 1.01$  mmol/mL,  $P < 0.001$ ), FINS ( $-4.88 \pm 6.11$  uU/mL vs  $-8.53 \pm 5.61$  uU/mL,  $P < 0.01$ ), HOMA-IR index ( $-1.11 \pm 1.51$  vs  $-2.23 \pm 0.25$ ,  $P < 0.05$ ), and QUIKI index ( $0.014 \pm 0.016$  vs  $0.028 \pm 0.019$ ,  $P < 0.05$ ) decreased significantly in the MED/LC group compared with the LF group. Comparing the changes in lipid parameters between the two groups (LF vs MED/LC), significant differences in TG ( $-0.33 \pm 0.32$  mmol vs  $-0.76 \pm 0.97$  mmol,  $P < 0.05$ ), TC ( $-0.40 \pm 1.00$  mmol vs  $-1.45 \pm 2.00$  mmol,  $P < 0.05$ ), and LDL-C ( $-0.41 \pm 1.05$  mmol vs  $-0.73 \pm 0.76$  mmol,  $P < 0.05$ ) were observed.

**Conclusion:** The results of this study suggest that the MED/LC diet model is a good treatment for overweight PCOS patients, significantly restoring their menstrual cycle,improving their anthropometric parameters and correcting their disturbed endocrine levels, and its overall effectiveness is significantly better than the LF diet model. Therefore, this study recommends that the MED/LC diet model can be used in the clinical treatment of patients with overweight PCOS.

### Biography:

Ding Jie, male, MEDICAL doctor, engaged in the research of polycystic ovary syndrome, endometriosis and gynecological oncology. He has participated in the publication of more than 10 SCI papers, participated in 3 projects and obtained 2 patents.

## Network Structure of Agarose During Gelation Studied by Multiple Particle Tracking and NMR Measurements

**Hwabin Jung\*, Shingo Matsukawa**

*Department of Food Science and Technology, Tokyo University of Marine Science and Technology, 4-5-7 Konan, Minato-ku, Tokyo, 108-8477, Japan*

The sol-gel transition mechanism of agarose has been a subject of interest due to the wide applications of the gel in biological and biomedical fields. In this study, the spatial heterogeneity and gelation mechanism of agarose during gelation were observed by a dynamic rheometer, pulsed-field-gradient stimulated echo (PGSTE)<sup>1</sup>H NMR, and multiple particle tracking measurements. The dynamic temperature sweep of 1% agarose solution showed a macroscopic aggregation around 40 °C ( $T_{gel}$ ) with a sharp increase of elastic modulus ( $G'$ ) upon cooling. A drastic decrease of signal intensity at  $T_{gel}$  measured by PGSTE 1H NMR indicated that the solute agarose chains formed the aggregated bundles. The particle trajectories and mean square displacement (MSD) of the probe particles reflected the steric interactions between the particles and the network. The MSD as a function of lag time ( $\tau$ ) exhibited two distinct groups of particle movements with diffusive and confined behaviors from higher temperature than  $T_{gel}$  (55 °C) to  $T_{gel}$ , indicating phase separation takes place before bundle formation. Below  $T_{gel}$ , the MSD curves for 270 nm particles exhibited clear two groups with broad distribution even. This suggests the existence of a sparse and dense structure in the gel. Meanwhile, all particles seem to be restricted around  $T_{gel}$  for 1000 nm probe particles which is consistent with  $G'$ . The probability distribution of MSD at a short lag time (1 s) quantified the change of each group of diffusive and confined particles as a function of temperature. The results demonstrate that the smaller particle (270 nm) experienced distinct microenvironments even below  $T_{gel}$  formed by the concentrated and dilute polymer phase, while 1000 nm particles were entrapped around  $T_{gel}$  due to steric hindrance by the aggregated bundles of the concentrated phase.

### Biography:

Hwabin Jung is a third-year PhD student in the Laboratory of Food Physical Chemistry at Tokyo University of Marine Science and Technology. She holds Bachelor's and Master's degrees in Food Science and Technology from Kangwon National University, South Korea. Her work focuses on studying the structural properties of biomaterials based on NMR techniques and mechanical measurements. She is currently working on elucidating the gelation mechanism of agarose using the multiple particle tracking.

## Physical Properties of Stingless Bee Honey from Community Enterprise in Songkhla Province, Thailand

**Vatcharee Seechamnaturakit\* & Chanisara Kluabpet, Kumpee Thongpoon and Siriluk Thongpoon**

*\*Excellent Center of Functional Food and Gastronomy, Faculty of Agro-Industry, Prince of Songkla, University, Had Yai District, Songkhla Province, Thailand.*

This work aim to investigate the physical properties of stingless bee honey, *Tetragonula pagdeni* (Schwarz) and *Tetragonaula fuscobalteata* (cormeron), collected from 10 community enterprises in Songkhla Province, Thailand. The experiments included the determination of %moisture, water activity( $a_w$ ), total soluble solid ( $^{\circ}$ Brix), pH, The honey had saturated with glucose, fructose and sucrose. The amino acid profile, minor elements, total phenolic acid contents and flavonoid contents were measured. The result showed that the moisture content from most of community enterprises was not exceeded 21%, excepted Bang Reight and Thepa community enterprises had %moisture of  $22.4\pm 0.93\%$  and  $23.56\pm 2.54\%$ . The  $a_w$  in honey from Bang Reight community enterprises was only worth more than 0.70 ( $0.73\pm 0.00$ ). Total soluble solid was in the range of 7.10-7.95. The taste of honey was sweet-and-sour. Then, %Glucose was between 12.00 – 16.10%. It found that %glucose of Tha Chang community enterprise was highest (16.07%), whereas one of Na Mom community enterprise was lowest (12.37%). According to the sweet taste of honey, it revealed that honey from Cha Lung community enterprise had highest ratio of fructose to glucose, which was 1.654 compared with Bang Reangh community enterprise being as 0.373. Due to the fermentation process in honey, the product of fermentation process was in the form of free acidity. The free acidity was in the range of 12.00 – 29.50 milli equivalent/Kg and pH value was between 3.2-4.0. The amino acid profile from every community enterprises included essential amino acids : Lys, Met, Phe, His, Arg, Tyr, Leu, Ile, and Val and non-essential amino acids : Gly, Ala, , Pro, Glu, Ser, Thr, and Asp. Stingless bee honey from every community enterprises have not found toxic heavy metals including As, Cd, Pb. The contained microelement in honey included Na, Ca, Mg, K, P, Cu, Fe, Mn, Zn and Se. From the above result, stingless bee honey is one type of community product with enrichment of the functional components and health benefits. We should promote and support as the value-added products, such as healthy foods and ingredients in pharma-cosmetic.

**Key words:** Stingless bee honey, physical property, fermentation process

## Where to grow the Giant Kelp? “Nutritional composition of wild harvested giant kelp compared”

**Diane Purcell-Meyerink<sup>1,2</sup>, Michael A. Packer<sup>1</sup>, Thomas T. Wheeler<sup>1</sup>  
Maria Hayes<sup>2</sup>**

<sup>1</sup>*Cawthron Institute, 98 Halifax Street, Nelson 7010, New Zealand*

<sup>2</sup>*Food BioSciences Department, Teagasc Food Research Centre, Ashtown, Dublin 15, Ireland*

The giant Kelp (*Macrocystis pyrifera*) is one of the fastest growing seaweeds globally with growth rates of up to 60 cm per day. It is a positively buoyant species enabling the creation of kelp forests - a critical ecosystem in the ocean. *Macrocystis pyrifera* communities have been lost in recent decades off the coast of Australia, and since 2012 this species is listed as a threatened ecological community. It is also a native species to New Zealand and found on the west coast of the US, South America, and South Africa.

The protein content of *Macrocystis pyrifera* ranges from 9-17% dry weight and depends on factors including, location, environmental factors and harvest season. Protein obtained from seaweed contain all the essential amino acids, and the protein profile of seaweeds is similar to egg protein. Initial nutritional analysis using AOAC standard protocols of wild harvested fronds of *Macrocystis pyrifera* from Tory Channel, South Island, New Zealand, found 12.2% dry weight (DW) crude protein. *Macrocystis pyrifera* from Tower Bay, Tasmania, Australia contained only 6.5% protein based on DW. Total fat values were similar at both sites with 1.9% DW from New Zealand, and 1.2% and 1.4% DW from Australia. *Macrocystis pyrifera* usually has <2% fat content year-round therefore these values are in the expected range. Interestingly, total polysaccharides varied between sites with the New Zealand kelp found to contain 21.6 mg / 100 g polysaccharides and the Australian samples 21.8 mg / 100 g, and 35.3 mg / 100 g, respectively. Previous studies have found higher growth rates for this species on wave-exposed sites that can impact positively nutrient uptake specifically in low nitrogen environments. This data suggests that such wave-exposed locations are worth investigating for aquaculture-based seaweed farms, to enable optimal conditions for seaweed production and quality, within a changing climate.



## Assessing well-being among young adult men based on Sen's Capability Approach

**Susanne Ferschl<sup>1</sup>, Peter Gelius<sup>2</sup>, Karim Abu-Omar<sup>2</sup>, Maike Till<sup>2</sup>, Richard Benkert<sup>3</sup>, Thomas Abel<sup>3</sup>**

*<sup>1</sup>Department of Sport and Health Sciences, Technical University of Munich, Germany;*

*<sup>2</sup>Department of Sport Science and Sport, University of Erlangen-Nuremberg, Germany.*

*<sup>3</sup>Institute of Social and Preventive Medicine, University of Bern, Switzerland.*

**Background:** Inequalities in well-being are widely documented. Sen's Capability Approach provides a helpful lens to analyze multiple domains of well-being focusing on the opportunities people have. It allows taking into account individual and structural influence factors and respects human diversity by acknowledging different ideas of a good life. This study investigated the social correlates of multidimensional well-being among the little researched population group of young adult men. Capabilities and functionings, their mutual associations as well as their respective dependence on social, economic and cultural capital were analyzed.

**Methods:** We analyzed repeated cross-sectional data from the Young Adult Survey Switzerland (N = 58,615). Descriptive statistics were applied to analyze the distribution of capabilities and functionings according to individuals' equipment with social, economic and cultural capital. Finally, multivariate regression analyses were conducted to investigate associations between the three forms of capital, overall capabilities, and functionings.

**Results:** Young men with lower capital equipment rated their capabilities and functionings lower than others. Capabilities and corresponding functionings differed in the domains of health, happiness, and intellectual stimulation. Multivariate analysis confirmed the effects of social, economic, and cultural capital on both overall capabilities and functionings.

**Conclusion:** According to individual's capital equipment, young adult men differed in their perception of well-being capabilities and functionings. Future research needs to consider aspects of choice and adaptation to restricted living conditions. Implications for the adoption of healthy eating behavior will be discussed.

### Biography:

Susanne Ferschl is a research associate at the Department of Sport and Health Sciences, Unit of Sociology of Diversity at the Technical University of Munich, Germany. She is currently finishing her Phd at the University of Erlangen-Nuremberg. Her research interests include social inequalities in health (risk) behaviors and health, transdisciplinary research and the Capability Approach.

## **Streptococcus thermophilus: anti-inflammatory potential of surface protein derived-peptides**

**Rania Allouche<sup>\*1</sup>, Zeeshan Hafeez<sup>1</sup>, Annie Dary-Mourot<sup>1</sup>, Magali Genay<sup>1</sup>  
& Laurent Miclo<sup>1</sup>**

<sup>1</sup>CALBINOTOX, Lorraine University, France.

*Streptococcus thermophilus* is a food grade bacterium that belongs to lactic acid bacteria. It is widely used as a starter culture in the dairy industry after *Lactococcus lactis*, as it is the only species of streptococcus genus considered as Generally Recognized as Safe by FDA and has obtained Qualified Presumption of Safety status from EFSA. In addition, it is largely and regularly consumed by a significant proportion of the population in fermented milk products such as yogurt and cheeses. Studies revealed that some strains of *S. thermophilus* displayed an anti-inflammatory activity *in vitro* but the mechanism is unknown (Junjua et al., 2016). Thus, it can be assumed that peptides generated in the gastro-intestinal tract from hydrolysis of *S. thermophilus* surface proteins might exhibit an anti-inflammatory activity and contribute to the overall anti-inflammatory effect of the bacterium. Therefore, surface proteins of two *S. thermophilus* strains were first obtained by shaving with different digestive enzymes. Then, the recovered polypeptides/peptides were analysed by LC-MS/MS. It was found that the majority of the identified peptides belongs to the surface-located proteins of this bacterium which were strain dependent. The anti-inflammatory activity of peptide hydrolysates was evaluated in human THP-1 macrophages. The total set of peptides from surface proteins showed an anti-inflammatory activity since secretion of IL-8 and IL-1 $\beta$  cytokines by macrophage-like THP-1 cells was reduced after LPS-induced inflammation. Furthermore, LPS-stimulated THP-1 macrophages upon treatment with peptide hydrolysates also displayed reduced expression levels of pro-IL-1 $\beta$  and COX-2. The results suggest that the peptides from surface proteins of *S. thermophilus* may contribute to the potential anti-inflammatory action of this bacterium.

### **Biography:**

RANIA ALLOUCHE, after receiving master degree in fundamental and applied microbiology, from the University of Bretagne Occidentale, France, enrolled her PhD in biotechnological and food engineering at Lorraine University. Currently, she is in a final year of her PhD and preparing thesis manuscript. During her thesis, she explored the anti-inflammatory potential of *Streptococcus thermophilus*, a yogurt bacterium. Her research interests include bioactive peptides and functional foods as well as health effects of probiotic bacteria.

## Determination of glyphosate, Gluphosinate, N-acetyl Gluphosinate residue in sesame seeds by LC/MS/MS

**Angela Santilio**

*National Institute of Health – Department of Environment and Health; Rome, Italy.*

Sesame (*Sesamum indicum L.*) is a crop known to humankind from the ancient years. Although it is not as widely spread as other oil seed crops (rapeseed, soy) but its consumption is high in Asian countries where in many dietary preparations the sesame oil is used. Sesame is mainly cultivated in Sudan, Ethiopia, India, China and Mexico. Sesame is very susceptible to pests and diseases and thus various pesticides use to ensure high yields. On the other hand, seeds may contain pesticide residues, because vegetable/oil plants are susceptible to attack by insects and pathogens as well as to threats from weeds, and thus are chemically protected against *agrophages* at different stages of cultivation. In addition, pesticides apply during storage and transport of seeds. Among the pesticides, glyphosate uses for loot against parasites, in pre-emergence and for weeding interventions.

Sesame seeds are a very used and appreciated ingredient in the world of bakeries. Sesame seeds are able to give a particular aroma to bread, to improve crunchiness and to bring health benefits even if taken in small quantities. Given this, the monitoring of pesticide residues in a commercially important crop like sesame extremely warranted. According to the European legislation Maximum residue level are set for sesame seed for glyphosate at 0.1 mg/kg (EU Regulation n. 293/2013) and for Glufosinate and N-Acetylglufosinate expressed as Gluphosinate at 0.03 mg/kg (EU Regulation n. 2016/1006).

In this work, the QuEChERS methodology was applied coupled LC/MS/MS by using a Raptor polar column (30x2.1 mm; 2.7  $\mu$ m). The method studied in term of linearity, accuracy, precision, matrix effect and LOQ. All parameters were agree with the acceptability criteria of the document SANTE/12682/2019. Good performance of the column separation obtained without need the regeneration of the stationary phase and loss of capacity.

### Biography:

Angela was born in Rome (IT) on March 17th 1964. She graduated in Chemistry at “La Sapienza University” – Rome (IT). She is researcher and works at National Institute of Health in Rome. Her activity is on research and technical advices to the Ministry of Health as regards the plant protection products and pesticide residues. She is author of several papers on national and international journals. She is reviewer for International scientific journal. She is contact point for the Italian NRL-SRM. She studies analytical methods for the determination of pesticide residue by single methods. She is CIPAC Member.

## Analysis of the effect of genetically modified *Trichoderma atroviride* strains in SWO1, a protein with amorphogenetic activity, in chili plants

Jorge Luis Folch-Mallol\*, Ricardo Sánchez-Cruz

Centro de Investigación en Biotecnología, Universidad Autónoma del Estado de Morelos. Av. Universidad 1001, 62209, Cuernavaca, Mor. México tel, Mexico.

Here, we analyzed the effects on *Capsicum annuum* plants of *Trichoderma atroviride* P. Karst strains altered in the expression of SWOLLENIN (SWO1), a protein with amorphogenetic activity on plant cell wall components. Strains of *T. atroviride* that overexpressed the *Taswo1* gene were constructed as well as deletion mutants. A novel, cheap and accurate method for assessing root colonization was developed. Colonization assays showed that the *Taswo1* overexpressing strains invaded the host root better than the WT, resulting in a stronger plant growth-promoting effect. The expression of plant defense marker genes for both the systemic acquired resistance and induced systemic resistance pathways was enhanced in plants inoculated with *Taswo1* overexpressing strains, while inoculation with deletion mutant strains resulted in a similar level of expression to that observed upon inoculation with the wild-type strain. Response to pathogen infection was also enhanced in the plants inoculated with the *Taswo1* overexpressing strains, and surprisingly, an intermediate level of protection was achieved with the mutant strains. Tolerance to abiotic stresses was also higher in plants inoculated with the *Taswo1* overexpressing strains but was similar in plants inoculated with the wild-type or the mutant strains (see Figure). Compatible osmolyte production in drought conditions was studied. This study may contribute to improving *Trichoderma* biocontrol and biofertilization abilities opening the possibility to diminish pesticides and fertilizers to achieve a sustainable agriculture.



**Figure 5.** Water stress effects on *C. annuum* plants inoculated with different *T. atroviride* strains. Plants were grown for 30 days under a normal water regime, and at this time, irrigation was suspended for thirteen days. Then, irrigation was resumed, and 3 days later, the survival rate was assessed. C+ regularly watered plants without inoculum. C- non-inoculated, non-irrigated plants. WT: wild type *T. atroviride*; pUE10 *T. atroviride* with the empty vector, *Taswo1-28*, and *Taswo1-10*: overexpressing strains; *Taswo1-6Δ* and *Taswo1-8Δ*: mutant strains for *Taswo1*. Experiments were performed in triplicate.

## Biography:

Dr. Jorge L. Folch-Mallol has dedicated the last 20 years working with fungi in many aspects such as fungal amorphogenetic proteins that disrupt the crystalline structure of cellulose (loosenins and expansins) and esterases. Also, he has works on bioremediation of xenobiotic compounds and lately he has been working with fungal-plant interactions looking forward to a sustainable agriculture. He has published more than 70 articles and has an H index of 20. He also teaches molecular biology to undergraduate studies and has directed 10 PhD thesis.

## Phytochemicals and Botanicals as Nootropics – Old Neuroactive Players with New Science

**Deshanie Rai, PhD**

*OmniActive Health Technologies, Morristown NJ, USA*

Multitasking, longer working hours, and the tendency to be “on” 24/7 are becoming the new norms of daily life among millennials and older adults, especially during this time of COVID-19. Generally, these lifestyle habits and new work-life situations are a recipe for stress, anxiety, sleeplessness, and poor cognitive performance. These collectively can take a toll on overall health. Not surprisingly, consumers are increasingly looking for solutions to help them power through their hectic lifestyles by enhancing their cognitive and emotional wellbeing and sleep support. In this regard, there is now a preference for using naturally derived, plant-based, non-pharmaceutical extracts and active compounds, such as natural caffeine from *Paullinia cupana* (guarana) and *Coffea arabica* (coffee), *Alpinia galanga* (greater galangal), *Bacopa monnieri* (bacopa), and *Withania somnifera* (ashwagandha).

Consumers are turning to caffeine-free botanicals because of their neuroactive, neuroprotective and nootropic effects – botanicals that have been an important part of traditional medicinal systems and that are also now gaining more academic interest. This presentation will focus on the science we have generated to support the effects of *Alpinia galanga* (aka Thai ginger) on mental alertness, focus and sleep. Our clinical studies support that a 300 mg dose of *Alpinia galanga* can effectively increase aspects of the attention network test, including promoting feelings of calmness. More specifically, our studies have consistently shown that in contrast to caffeine, an *Alpinia galanga* water-soluble extracts is able to increase and sustain mental alertness over a five-hour period, without the caffeine- crash phenomenon. We will also share mechanistic data including molecular docking studies to demonstrate how this *Alpinia galanga* extract works to support nootropic benefits.

### Biography:

Dr. Rai is an accomplished scientist focused on developing, translating, and communicating science related to health and wellness. She has made significant scientific contributions to self-care including the design, implementation, and publication of studies across multiple therapeutic areas: gastrointestinal health, vision and cognitive health, and the microbiome. Through this work, she has supported product launches for infants, children, and adults. Dr. Rai has led Advisory Board meetings and panel discussions on a variety of topics including sleep, mental energy, and gastrointestinal health. She is the recipient of several awards and holds leadership roles in scientific and professional organizations.

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Notes:.....

**WE WISH TO  
SEE YOU AGAIN AT**

**7<sup>th</sup> Edition of Innovations in  
FOOD SCIENCE AND HUMAN NUTRITION (IFHN-2023)  
SEP 20 - 21, 2023 AT FRANKFURT, GERMANY**

Website: <https://foodscience-nutrition.org/>

Email: [foodscience@innovinc.org](mailto:foodscience@innovinc.org)



**Innovinc International**

5201 Great America Pkwy #320, Santa Clara, CA 95054,  
United States  
Ph: +1-408-352-1010

**Innovinc International**

301, Sri Venkateswara Residency, Balaji Nagar, Nizampet,  
Hyderabad, TS, India. 500072  
Ph: +918374242127