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BOOK OF ABSTRACTS

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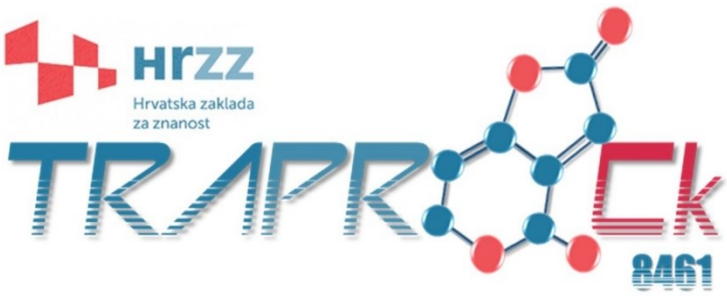

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Table of Contents

PLENARY LECTURES

BODY COMPOSITION AND METABOLIC HEALTH

Ines Bilić Ćurčić[1,2*]

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plenary lecture

Body composition – the balance between muscle mass, fat tissue, and other components – is a crucial determinant of metabolic and overall health. Unlike body weight or body mass index (BMI), it provides a clearer picture of risks associated with conditions such as diabetes, cardiovascular disease, and metabolic syndrome. A favorable metabolic profile includes lower visceral fat and adequate lean mass. Excess abdominal fat is linked to insulin resistance, hypertension, and dyslipidemia, while reduced muscle mass (sarcopenia) increases the risk of metabolic disorders, impaired mobility, and disability, particularly in the elderly. When sarcopenia coexists with obesity, the resulting sarcopenic obesity worsens health outcomes. It affects about 27% of diabetics and up to 66% of hospitalized heart failure patients.
Accurate assessment methods for evaluation of body composition include bioelectrical impedance analysis (BIA), Dual-energy X-ray Absorptiometry (DXA; the gold standard), and imaging techniques like CT and MRI, though the latter are less accessible and expensive. Functional tests, such as the SARC-F questionnaire and walking tests, also help evaluate muscle strength.
Experience from the Clinical Hospital Center Osijek shows that liraglutide therapy (3.0 mg) and bariatric surgery significantly improve body composition. Maintaining healthy composition involves strength training, balanced nutrition with sufficient protein, and, when necessary, medical interventions. Cardiorespiratory fitness also plays a protective role, independent of BMI.
In conclusion, assessing and optimizing body composition should be integral to health evaluations and chronic disease prevention strategies. A comprehensive approach – including diagnostics, lifestyle modifications, and targeted therapies – is essential for promoting metabolic health.

Keywords: body composition, metabolic health, sarcopenic obesity, visceral fat, therapy, lifestyle modifications

ANTIMICROBIAL RESISTANCE – A GLOBAL HEALTH PROBLEM OF 21ST CENTURY

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plenary lecture

The clinical use of penicillin began during the Second World War. Around 1954, some strains of *Staphylococcus aureus* became resistant to penicillin. The first epidemic of resistant *Salmonella* Typhimurium occurred in the UK in 1963. The administration of antibiotics as growth promoters to animals led to the spread of antimicrobial resistance, as did their careless use in humans. Resistant strains of bacteria have been shown to spread between humans, animals and the environment. The reduced use of antibiotics increases the percentage of susceptible bacterial strains. Additionally, cross-resistance between chemically analogue drugs (e.g. avoparcin-vancomycin) was identified. In 2006, the EU (and Croatia) banned the use of antibiotics as growth promoters. In recent decades, the pharmaceutical industry has developed fewer and fewer new antibiotics. Efforts are being made to minimise the further development of antimicrobial resistance through prudent use. In the EU, the EFSA issues recommendations for monitoring antibiotic resistance of certain bacterial species isolated from humans, animals and food: *Salmonella* spp., *Campylobacter coli/jejuni,* indicator strains of *Escherichia coli, Enterococcus* spp., and methicillin-resistant *Staphylococcus aureus*. The results indicate a high resistance of *Salmonella* spp. to ampicillin, sulphonamides, tetracyclines and ciprofloxacin and a low resistance to cefotaxime and ceftazidime. Different susceptibility patterns were observed across particular *Salmonella* serovars. *Campylobacter coli/jejuni* show a high resistance to ciprofloxacin and erythromycin. However, while most *Salmonella* strains do not produce extended-spectrum beta-lactamases (ESBL), *Escherichia coli* harboring ESBL, AmpC β-lactamases and cephalosporinases has been reported in several EU Member States.

Keywords: antimicrobial resistance, antibiotics, resistance monitoring

NUTRITIONAL PROGRAMMING IN THE FIRST 1000 DAYS - IMPLICATIONS FOR LIFELONG HEALTH

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plenary lecture

The first 1,000 days, from conception throughout child's first two years, are critical for establishing the foundations of overall health and development. Adequate nutrition during this period is essential, as it influences not only immediate growth but also long-term outcomes, including cognitive development, immune function, and the risk of non-communicable chronic diseases. This concept, known as nutritional programming, underscores the importance of maternal and child nutrition in shaping health trajectories.

Maternal nutrition during pregnancy significantly impacts fetal development. Deficiencies in essential nutrients such as folate, iron, and iodine can lead to adverse birth outcomes, including low birth weight and developmental delays. Supplementation with these nutrients has been shown to improve birth outcomes and reduce the incidence of birth defects. Postnatal, breastfeeding provides optimal nutrition, supporting immune development and reducing the risk of infections and timely introduction of appropriate complementary foods ensures adequate growth and development.

In conclusion, the first 1,000 days represent a window of opportunity to influence lifelong health outcomes. Investing in maternal and child nutrition during this period yields significant returns in terms of human capital and public health. Comprehensive strategies that integrate direct nutrition interventions with broader social support are powerful means to promote lifelong health and brain development and wellbeing.

Keywords: nutritional programming, first 1000 days, malnutrition, health development

FOOD SUPPLEMENTS – COMPOSITION, SAFETY, INTERACTIONS, GLOBAL TRENDS

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plenary lecture

Food supplements find their place in the preventive trend of self-medication, and they fall into the category of products that fall under the Food Law. Due to their effectiveness and pharmaceutical form, consumers often consider them to be medicines. Global trends show more and more innovations, new ingredients and new types of food supplements.

When placing a product on the market, it is necessary to ensure that the product is healthy. However, the quality of food supplements, their biologically active ingredients and quantity also affect the overall health safety with an appropriate label. The connection between active ingredients, their amounts and their effects on health is achieved through health claims. In this way, the consumer can choose a product that they believe has a positive impact based on their own needs.

When considering that the general population is increasingly using food supplements, as well as the increasing variety of food supplements available, it is inevitable that side effects caused by them will occur more frequently. Also, there are interactions between different active substances of two or more supplements used at the same time, as well as interactions between food and food supplements and/or drugs. Nutrivigilance is by definition a set of activities and actions related to the detection, definition and assessment of side effects that occur when consuming food and food supplements. In order to monitor side effects and categorize their threat to individual health, some EU countries have introduced a system on their own initiative. Croatia joined the countries with a Nutrivigilance National System five years ago with a public application questionnaire containing carefully selected questions for the purpose of collecting data on side effects and raising awareness and potential threats as another public health policy

Keywords: food supplements, composition, safety, interactions, nutrivigilance

NUTRITION

FROM OBESITY TO PROLACTINOMA – HYPERPROLACTINEMIA AND HYPOGONADOTROPIC HYPOGONADISM: CASE REPORT

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poster presentation

Prolactinoma is the most common hormonally active tumor of the pituitary gland that can cause secondary obesity. Hyperprolactinemia often leads to hypogonadotropic hypogonadism, which can result in weight gain and metabolic disorders. A 35-year-old man presents with progressive weight gain since childhood. Despite weight loss attempts (-20 kg in 2014; -68 kg in 2021), the patient has continuously regained the weight. Clinically, he had a persistent feeling of exhaustion, occasional headaches, impaired vision, no facial hair, and was functioning normally without night eating. Physical examination revealed a body mass of 152 kg (BMI 43.47 kg/m²). Laboratory tests revealed significant hyperprolactinemia (PRL 5573 mIU/L) and hypogonadotropic hypogonadism (testosterone 2.89 nmol /L). MRI of the pituitary showed an expansive formation of the right lobe of the adenohypophysis measuring 2.8x2.4x2.2 cm, which indicates macroprolactinoma. Other pituitary and target gland hormones were normal, as were visual field and neurological status. Vitamin D deficiency was additionally determined. Cabergoline therapy and testosterone substitution with cholecalciferol were started. After 6 months, prolactin and testosterone normalized, and a control MRI after 8 months showed a reduction in the tumor by 0.3 cm. Clinically, the patient is significantly better - he has more energy, increased libido, and in a year, he lost 68 kg (BM 90 kg, BMI 25.2 kg/m²). In obese patients, endocrine causes should be considered. Timely recognition and treatment of prolactinoma can result in significant improvement of the clinical status and loss of body weight, along with the importance of education about a healthy lifestyle.

Keywords: obesity, hyperprolactinemia, hypogonadotropic hypogonadism

NUTRITION AND BRAIN HEALTH: THE ROLE OF NUTRIENTS IN COGNITIVE FUNCTION AND MENTAL WELL-BEING

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poster presentation

In recent years, a growing body of research has highlighted the significant impact of nutrition on brain development, cognitive function, and overall mental well-being. Cognitive processes such as memory, learning, attention, and emotional regulation are influenced by both dietary patterns and specific nutrients. Omega-3 fatty acids (EPA and DHA), B vitamins (especially B6, B12, and folate), magnesium, vitamin D, and vitamin E support neurogenesis, synaptic plasticity, and reduce neuroinflammation. Vitamin D also contributes to neurotrophic factor regulation and is associated with mood and cognitive performance.

Developments in nutritional psychiatry support the view that dietary modifications can trigger beneficial epigenetic changes, influencing gene expression related to brain structure and function. Micronutrients acting as methyl donors – such as choline, folate, and vitamin B12 – are crucial in DNA methylation processes that help maintain optimal nervous system function.

Moreover, excessive intake of saturated fats, trans fats, refined sugars, and ultra-processed foods is linked to neuroinflammation, oxidative stress, impaired synaptic signaling, and increased risk of cognitive decline and mood disorders. These substances can negatively affect hippocampal integrity and learning abilities, especially in vulnerable individuals.

This abstract presents recent insights into the role of nutrition in maintaining brain health and cognitive performance, with emphasis on the importance of balanced dietary patterns, brain-supportive nutrients, and the growing potential of personalized nutrition in promoting mental well-being.

Keywords: brain health, cognition, mental health, nutrition, epigenetics, processed food

PROTEIN INTAKE IN ELDERLY WITH CHRONIC KIDNEY DISEASE

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poster presentation

Adequate protein intake is crucial for maintaining muscle mass, functional capacity, and overall health in the elderly. The nutritional requirements for protein become especially important in individuals with chronic diseases, where proper intake can influence disease progression, quality of life, and survival. The elderly often face challenges such as malnutrition and frailty, which can be mitigated through appropriate nutritional intervention.

In patients with chronic kidney disease (CKD), balancing protein intake is particularly complex. Evidence indicates that in early stages of CKD (stages 1–3), moderate increases in protein consumption (around 1.2–1.4 g/kg/day) may help reduce malnutrition and improve health outcomes without significantly accelerating disease progression. Conversely, in advanced stages (stages 4–5), protein restriction (0.6–0.8 g/kg/day) is often recommended to slow renal decline. However, recent studies suggest that individualized approaches are essential, as overly restrictive diets can contribute to malnutrition and muscle wasting, especially in the elderly.

This review underscores the importance of tailoring protein intake according to CKD stage, age, nutritional status, and comorbidities. Ensuring sufficient protein intake in early CKD can prevent deterioration, while cautious restriction in later stages can preserve residual kidney function without compromising nutritional health. Ultimately, personalized dietary strategies are vital to optimize health outcomes, prevent malnutrition, and improve quality of life among elderly CKD patients.

Keywords: protein intake, chronic kidney disease (CKD), malnutrition, elderly health, personalized nutrition

THE ASSOCIATION OF MATERNAL AND INFANT SELF-REPORTED ANEMIA DURING EARLY LIFE: AN ONLINE QUESTIONNAIRE ANALYSIS

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poster presentation

Iron deficiency anemia is one of the most prevalent nutritional deficiencies in infancy and is associated with adverse neurodevelopmental and immunological outcomes. Emerging evidence suggests that maternal iron status prior to conception may influence the risk of anemia in infants. The objective of this study was to investigate the association between maternal anemia prior to pregnancy and the occurrence of anemia in infants during the first year of life. A cross-sectional survey was conducted among 472 mothers recruited from a Facebook group focused on complementary infant feeding. The anonymous online questionnaire included questions on maternal anemia prior to pregnancy, preconception iron testing, and whether their child had been diagnosed with anemia in infancy. Descriptive statistics were calculated in Microsoft Excel, and a chi-square test (χ^2) was used to determine the significance of association ($p < 0.05$). Among participants, 14.7% reported being diagnosed with anemia before pregnancy, and 20.7% that their child experienced anemia in infancy. Furthermore, 44.3% of mothers had not undergone any preconception medical evaluation, while 48.8% had checked their iron levels, with 27.7% doing so independently. A statistically significant association was found between maternal anemia prior to pregnancy and infant anemia (χ^2, $p = < 0.05$). These findings highlight a significant relationship between maternal anemia before conception and the risk of anemia in infants. The findings underscore the importance of preconception care and early nutritional interventions for women of reproductive age to prevent iron deficiency in early childhood.

Keywords: maternal anemia, infant anemia, preconception care, iron deficiency, early childhood nutrition

WATER AS A SIGNIFICANT CONTRIBUTOR TO THE TOTAL DAILY IODINE INTAKE?

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poster presentation

Iodine is a trace element that plays a key role in the overall metabolism, growth of the body, and neurodevelopment. Both, deficiency and excess of iodine negatively affect health. In Croatia, and many more countries globally, iodized salt is the main source of iodine considering that the consumption of the marine foods like fish, shellfish or algae as best natural sources of iodine, is low. So far, in Croatia, water has not been assessed as a contributor to achieve the adequate intake of 150 µg of iodine per day.

We analysed samples of bottled (11 samples) and tap water (10 samples) from four counties. Iodine content was determined by the spectrophotometric method based on the Sandell-Kolthoff reaction.

Iodine content in bottled waters ranged from 25.60 to 33.82 µg/L and in tap waters from 36.6 to 50.41 µg/L, which was significantly higher ($p<0.0001$). Having in mind that about 20% of daily fluid intake comes from food, an adult men should consume around 3.0 L and a woman around 2.2 L of water per day. With that consumption, bottled water contribution to the daily iodine ranges between 76.80 to 101.46 µg for men and 56.32 to 74.4 µg for women while tap water contribution goes from 109.80 to 151.23 µg for men and 80.52 to 110.90 µg for women.

The number of people affected with thyroid disease is on the rise, and Croatia is no exception. Our results clearly show that some people probably have an excessive iodine consumption, pointing out the need for an in-depth analysis of relationship between iodine consumption and health.

Keywords: iodine; water; tap water; bottled water; excessive iodine consumption

THROUGH KNOWLEDGE TO HEALTH: THE EDUCATIONAL ROLE OF PHARMACISTS IN FOOD SUPPLEMENTATION

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invited lecture

With the increasing use of food supplements worldwide, pharmacists play a crucial role in supporting public health through evidence-based counselling and responsible health promotion. As the most accessible healthcare professionals with expertise in pharmacology, pharmaceutical care, and patient communication, pharmacists are uniquely positioned to guide patients in the safe and effective use of food supplements.

Modern lifestyles, often characterized by suboptimal nutrient intake and elevated stress, have contributed to growing reliance on supplementation to maintain health and prevent disease. While supplements can provide essential vitamins, minerals, and other bioactive compounds, their inappropriate use may lead to potential risks such as interactions with prescription medicines, overdosing, or unnecessary intake. Through individualized patient assessment, counselling on proper usage, and therapeutic monitoring, pharmacists mitigate these risks and optimize outcomes.

According to the FIP/WHO guidelines on Good Pharmacy Practice, pharmacists should actively promote patient self-care, including the appropriate use of supplements. This involves structured patient need assessments, motivational communication strategies, and shared decision-making models that empower patients to take an active role in their health. Additionally, pharmacists contribute to improving health literacy and addressing socio-economic factors that influence supplement use.

The publication of the first Croatian pharmacist manual on supplements developed by pharmacists, represents a significant step toward strengthening the pharmacist's role in promoting informed, responsible self-care. By combining international best practices and evidence-based guidance, the manual supports all health professionals in delivering patient-centred care and contributing to improved public health and community well-being.

Keywords: pharmacists, dietary supplements, self care, health education, practice guidelines

EXPOSURE TO CAFFEINE WITH RISK ASSESSMENT ON THE HEALTH STATUS OF THE POPULATION IN THE SARAJEVO CANTON

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oral presentation

Caffeine is the most widespread psychoactive substance in the world which is found in various foods and drinks, including coffee, tea, soft drinks, energy drinks, products containing cocoa or chocolate, as well as some medications and supplements. This paper aimed to determine the amount and frequency of consumption foods and drinks containing caffeine, and to assess the single dose and habitual caffeine intake among adult population in the Sarajevo Canton.
The assessment of caffeine intake in the studied population (n=693, man 153 and woman 540 aged from 18 to 65 years) was carried out through a semi-quantitative questionnaire conducted in the Sarajevo Canton from September to December 2020. Average daily caffeine intake (mg/day and mg/kg of body weight) was calculated based on data on consumption of certain categories of foods and drinks and mean concentrations of caffeine for individual categories. Student's t-test was used to compare the means of daily caffeine consumption of two population groups.
Total daily caffeine intake in the adults ranged from 0.08-951.4 mg/day, average 194.76 mg/day (2.75 mg/kg body weight). Dietary sources contributing to total daily caffeine intake came from coffee (52%), tea (8%), chocolate (3%), cocoa and chocolate drinks (14% mg), soft drinks (6%), and sports and energy drinks (17%). Average daily caffeine intake in the male population was 232.05 mg/day, and in the female population 179.04 mg/day. It was estimated that the average daily intake of caffeine in men is statistically significantly higher than the daily intake of caffeine in women ($t=4.03$; $p<0.0001$). A single dose of caffeine intake above 200 mg was recorded in 3.27% of male respondents and 2.59% of female respondents. Results showed that the average caffeine intake in the studied population did not exceed the recommended maximum average daily intake of 400 mg/day of caffeine and did not pose a health risk.

Keywords: caffeine, adult population, health risk, risk assessment

PROCESSED FOOD INTAKE PATTERNS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE ACROSS FOUR SEVERITY STAGES

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poster presentation

As the majority of patients with chronic obstructive pulmonary disease (COPD) have compromised nutritional status recent studies have focused on observing possible dietary patterns that may reduce the risk of disease. The aim of this study is to observe the consumption of food according to the SIGA classification in COPD patients with different stages of disease. Food consumption was observed in 71 patients (66.5 ± 8.4 years; 53.5% men) who were divided into four groups according to GOLD stages. All foods consumed were classified according to the SIGA classification from three 24-hour recalls collected during pulmonary rehabilitation (September 2023 to May 2024; Special Hospital for Pulmonary Diseases, Zagreb). The assessment of respiratory function was performed following standard protocols. The patients had a similar daily energy intake across the GOLD stage groups, with the median of total study population being 1484 (1265 – 1742) kcal. The results show that patients with GOLD I and GOLD II had a higher proportion of daily energy intake from the un/minimally processed food and culinary ingredients (56.1% *vs.* 61.8% *vs.* 47.3% *vs.* 49.5%, p=0.022) SIGA group compared to the GOLD III and GOLD IV patients. In contrast, the patients with GOLD I and GOLD II had a lower proportion of daily energy intake from the ultra-processed foods (14.5% *vs.* 11.4% *vs.* 25.8% *vs.* 18.2%, p=0.016) SIGA group. There is a positive association between the consumption of unprocessed foods and FEV_1 (r=0.271; p=0.022), nutritionally balanced processed foods and FVC (r=0.314; p=0.008), while a negative association was found between the FEV_1/FVC ratio and the consumption of ultra-processed foods (r=-0.251; p=0.031). The results highlight the need to consider the degree of food processing when assessing dietary intake in COPD patients.

Keywords: COPD, FVC, FEV_1, processed food, SIGA classification

NUTRITION AND FERTILITY PRESERVATION

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oral presentation

Nutrition plays a vital role in female fertility and reproductive health. Evidence indicates that specific nutrients significantly influence ovulation, egg quality, and hormonal regulation. For instance, daily folate intake exceeding 400 mcg can reduce anovulation risk by up to 40%, with 400–800 mcg recommended during preconception. Coenzyme Q10 (100–600 mg/day) has been shown to enhance egg quality, especially in women over 35. Adequate iron intake (~18 mg/day) from plant sources supports ovulatory function, while myo-inositol (2–4 g/day) improves insulin sensitivity and ovulation, benefiting women with polycystic ovary syndrome (PCOS). Maintaining optimal vitamin D levels (1000–2000 IU daily) is linked to regular cycles and improved implantation. Omega-3 fatty acids (500–1000 mg/day) help reduce inflammation, supporting hormonal balance and egg quality. Additionally, antioxidants such as vitamins C and E, selenium, and zinc mitigate oxidative stress, potentially enhancing ovulation and pregnancy outcomes.

Balanced dietary patterns rich in fruits, vegetables, lean proteins, and whole grains—such as Mediterranean and plant-based diets—are associated with higher fertility success. Conversely, poor dietary choices, excessive processed foods, sugar, and saturated fats can impair reproductive function and increase risks like PCOS and insulin resistance. Lifestyle factors, including physical activity and stress management, further influence fertility alongside nutrition. Personalized nutritional strategies are essential for optimizing reproductive outcomes, emphasizing the importance of targeted supplementation and healthy habits. Enhanced understanding of these nutritional factors can improve fertility rates and support healthier pregnancies worldwide.

Keywords: fertility, ovulation, nutrients, PCOS, hormonal balance

GUT MICROBIOME AND WOMEN'S HEALTH

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poster presentation

Emerging research underscores the critical role of the gut microbiome in modulating women's reproductive, metabolic, and immune health across different life stages. Specific microbial taxa and their functional metabolites, such as short-chain fatty acids (SCFAs), are integral to hormonal regulation, inflammation control, and nutrient absorption. Notably, gut dysbiosis has been linked to conditions including polycystic ovary syndrome (PCOS), adverse pregnancy outcomes, menopause-related osteoporosis, and autoimmune diseases. Interventional studies provide promising insights: micronutrient supplementation during pregnancy enhances microbial diversity, potentially supporting fetal development; fermented dairy intake (e.g., kefir) increases SCFA-producing bacteria, correlating with improved cardiorespiratory fitness in female athletes; and long-term prune consumption modulates microbiota composition, associated with reduced inflammation and preservation of bone density in postmenopausal women. Probiotic administration, particularly *Lactobacillus* strains, shows potential in alleviating pelvic pain in endometriosis and may offer mental health benefits during pregnancy, although findings remain inconsistent. Despite these advances, causality and mechanistic pathways require elucidation, and personalized microbiome-targeted therapies remain under development. Understanding the precise interactions between microbial communities, hormonal pathways, and immune responses could facilitate novel preventive and therapeutic approaches, ultimately improving women's health outcomes across reproductive and aging stages. Current evidence emphasizes the clinical relevance and future research directions needed to harness the gut microbiome's therapeutic potential in women's health.

Keywords: gut microbiome, women's health, SCFAs (short-chain fatty acids), PCOS (polycystic ovary syndrome), probiotics

HEALTH VALUE OF LIPID INDICES IN TURKEY MEAT

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poster presentation

Turkey meat is similar to broiler meat in terms of its nutritional composition and quality. It is easily digestible, high in protein and low in fat. Turkey meat is a good source of minerals and vitamins and has a desirable colour and texture that is accepted by the consumer. The aim of the work was to analyse the fatty acid profile of turkey breast meat and to calculate the health value of lipids using qualitative and nutritional indices. To analyse the fatty acids and calculate the health lipid indices, 10 fresh turkey breasts were purchased at the market. The samples for fatty acid profile analysis were prepared with a MARS 6 microwave and analysed using a SCION 436-GC gas chromatograph. The results of the fatty acid profile analysis in turkey breast meat showed that the total saturated fatty acid (SFA) content was 35.45%, monounsaturated fatty acids (MUFA) 23.94%, ∑n-6 polyunsaturated fatty acids (n-6 PUFA) 35.28% and ∑n-3 polyunsaturated fatty acids (n-3 PUFA) 5.32%. The qualitative lipid indices in the breast meat are shown in the ratio ∑PUFA/∑SFA, which is 1.14, and in the ratio ∑n-6 PUFA/n-3 PUFA, which is 6.63. The nutritional indices for turkey breast meat calculated from the fatty acid data are: NVI (nutritional value index) = 1.46; AI (atherogenicity index) = 0.58; TI (thrombogenicity index) = 0.76 and HHI (hypo-/hypercholesterol index) = 2.65. From the results it can be concluded that white turkey meat is a good source of nutritionally and healthily valuable fats and is recommended for human consumption.

Keywords: breast meat, turkey, fatty acid profile, qualitative and nutritional indices

DIET QUALITY ASSESSMENT BASED ON THE DIET QUALITY QUESTIONNAIRE – AN OBSERVATIONAL STUDY FROM HERZEGOVINA

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poster presentation

The Diet Quality Questionnaire (DQQ) is a globally recognized tool developed by Harvard University for the rapid assessment of diet quality. It has been adapted for use in over 70 countries and is based on the frequency of consumption of 29 distinct food groups. The DQQ enables the estimation of several key dietary indicators, including dietary diversity, micronutrient adequacy, and associations with non-communicable disease risk.

This cross-sectional study anonymously surveyed adults aged 18 to 70 in Herzegovina, using the DQQ alongside a short set of sociodemographic and health-related questions. A total of 277 individuals completed the questionnaire. The majority of respondents were women (73.6%) and most belonged to the 18–25 age group (51.3%). Educational attainment was high, with 27.4% holding a bachelor's degree and 39.7% a master's degree. Over half of the participants (56%) were employed, yet 69.3% rated their income as insufficient.

Despite these economic challenges, 32.1% reported their health as excellent. The most frequently consumed foods were green salad, bananas, chocolate, cheese, and chicken, while coffee emerged as the most commonly consumed beverage. Notably, 76.9% of participants reported not consuming fast food on the previous day. Most respondents (41.2%) reported eating 2–3 meals per day, and 43% considered themselves moderately physically active.

These findings offer valuable insights into dietary behaviours in Herzegovina, revealing a tendency toward healthier food choices even amidst financial limitations. Such data can inform the development of region-specific dietary guidelines aimed at improving public health outcomes.

Keywords: Diet Quality Questionnaire, Herzegovina, adults, dietary diversity, regional nutrition patterns

GUT MICROBIOME AND AGING – CAN WE RESET IT

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invited lecture

Aging is associated with profound alterations in the gut microbiome, including reduced diversity, decreased beneficial bacteria like *Bifidobacteria* and *Lactobacilli*, and increased pathogenic species. These changes contribute to systemic inflammation, immune dysregulation, and the development of age-related diseases such as cardiovascular disorders, neurodegeneration, osteoporosis, and metabolic syndromes. Emerging evidence suggests that targeted modulation of the microbiome could promote healthy aging and improve quality of life in older adults.

Interventions such as dietary modifications, prebiotics (e.g., inulin, fructo-oligosaccharides, galacto-oligosaccharides), probiotics, polyphenols, dietary fiber, omega-3 fatty acids, vitamin D, and fermented foods have demonstrated potential in restoring microbial diversity, strengthening gut barrier function, and reducing inflammation. For example, prebiotics from sources like chicory root and garlic enhance beneficial bacteria and immune responses; probiotics (*Lactobacillus*, *Bifidobacterium* strains) improve digestion and cognitive markers; polyphenol-rich foods support beneficial taxa and combat oxidative stress; high-fiber diets increase short-chain fatty acid production, promoting colonic health; omega-3 fatty acids modulate microbial composition toward anti-inflammatory profiles; and fermented foods contribute live microbes, enhancing resilience.

While these approaches show promise, challenges remain in achieving a sustained microbiome "reset," given age-related physiological changes, medication use, and lifestyle factors. Personalized strategies targeting these factors could revolutionize interventions aimed at reducing disease burden, promoting longevity, and extending healthspan. Understanding how to effectively reset the aging microbiome remains a frontier with significant therapeutic potential.

Keywords: gut microbiome, aging, prebiotics, probiotics, inflammation

SUSTAINABLE DIET OF STUDENTS

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invited lecture

A sustainable diet is one that meets an individual's nutritional needs, is environmentally friendly, and helps preserve food resources for future generations. It has a crucial role in reducing environmental impact, ensuring food security, and promoting health for current and future generations, while preserving biodiversity and ecosystems. This study aimed to assess the dietary patterns of students at the University of Rijeka and evaluate the environmental sustainability of their diets. A total of 224 students of both genders participated by completing a validated semi-quantitative food frequency questionnaire. Based on reported food intake, individual environmental impacts were calculated, including carbon footprint (g CO_2 equivalent), water footprint (liters of H_2O), and ecological footprint (square meters of land use). Findings indicate that the average student diet moderately adheres to Mediterranean dietary principles. Male students and those in younger age groups exhibited significantly higher carbon, water, and ecological footprints. A strong correlation was observed between total energy intake and environmental impact, particularly in terms of ecological footprint. Overall, the dietary habits of students can be classified as moderately sustainable. To improve sustainability, a dietary shift toward increased consumption of plant-based foods and reduced intake of animal-based products is recommended. Food choices significantly influence environmental outcomes, and adopting sustainable diets can contribute to reductions in greenhouse gas emissions, water use, and land exploitation. Higher education institutions provide a strategic setting for promoting health and sustainability initiatives. Encouraging sustainable dietary behaviors among students can support both individual health and broader environmental goals.

Keywords: climate change, impact on the environment, nutrition, sustainable diet

IODINE STATUS OF CHILDREN WITH NEURODEVELOPMENTAL CONDITIONS

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poster presentation

Current evidence suggests that the prevalence of mild-to-moderate iodine deficiency is increased in children with neurodevelopmental conditions, particularly autism spectrum disorder. Brain development is affected by iodine status during pregnancy, primarily through thyroid hormones. Also, adequate childhood iodine intake is important for continuous cognitive development. Investigations on the role of iodine intake above the required or even excessive intake on neurodevelopmental outcomes are scant. First morning urine samples were collected from 37 children with various neurodevelopmental conditions, primarily autism spectrum disorder (89%). Seven girls and 30 boys were recruited, between 2.5 and 18 years of age. None of the children used supplements containing iodine. Urinary iodine concentration (UIC) was determined by a spectrophotometric method based on the Sandell-Kolthoff reaction. Altered iodine status was found in 41% of children. A low UIC (< 100 µg/L) was only found in one child while 14 had UICs > 200 µg/L, indicating iodine intake above adequate levels. Our findings are contradictory to previously published research that reported an increased prevalence of low iodine status in children with neurodevelopmental disorders. Having in mind that high iodine intake also negatively affects health, more research is needed to determine reasons behind these findings in this vulnerable population, especially given the fact that parents often practice iodine supplementation, with no professional guidelines.

Keywords: iodine, urinary iodine concentration, children, neurodevelopmental disorders, autism spectrum disorders

FOOD AND COLORECTAL CANCER: SYSTEMATIC REVIEW OF DIETARY INFLUENCES ON RISK, PREVENTION AND OUTCOMES

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poster presentation

Colorectal cancer (CRC) remains one of the leading causes of cancer-related morbidity and mortality worldwide. Mounting evidence links dietary patterns to the risk and progression of CRC. Understanding the impact of food on CRC can inform preventive strategies and improve patient outcomes.
The aim was to explore the relationship between diet and colorectal cancer, identifying key dietary risk factors and protective foods, and discussing implications for prevention, education, and patient counseling.
A literature review was conducted using PubMed, Scopus and Web of Science, focusing on studies published between 2020 and 2025. Records identified through database searching: n = 542. Full-text articles assessed for eligibility: n = 72
Dietary patterns high in red and processed meats (25 studies), low fiber intake and excessive alcohol consumption (25 studies) were associated with increased CRC risk. Diets rich in fruits, vegetables, whole grains, and omega-3 fatty acids demonstrated protective effects (22 studies). Nutrients like calcium, vitamin D, and folate (25 studies) also play a role in reducing risk. Obesity and high glycemic diets were additional contributing factors.
Diet is a modifiable risk factor in CRC. Health professionals can play a pivotal role in patient education by promoting dietary awareness and supporting healthy lifestyle changes. Integrating nutritional counseling into health care may reduce CRC incidence and support favorable outcome/ recovery.

Keywords: colorectal cancer, diet, nutrition, prevention, food, risk

BODY COMPOSITION, MUSCLE STRENGTH, DIET QUALITY AND EATING HABITS OF STUDENT POPULATION

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poster presentation

The quality of the diet directly influences body composition, i.e., the proportion of muscle, fat, and visceral fat. Elevated levels increase the risk of chronic, non-communicable diseases such as cardiovascular disease and type 2 diabetes. The Mediterranean diet is considered a sustainable model for the prevention of chronic diseases. The aim of this study was to assess the diet quality and body composition of university students with different levels of formal nutritional knowledge and to compare two dynamometers. The study included 38 university students from different scientific disciplines - social sciences, humanities, kinesiology and nutrition (63% female), with an average age of 24.4 ± 1.4 years. The data was collected between May and September 2024. Dietary habits were assessed using a short questionnaire and three-day food records, analysed using Prehrana software and the Mediterranean Diet Quality Index. Anthropometric parameters were measured: height (Seca 217), body weight and composition (Omron BF511) and circumference (neck, waist, hip, thigh, lower leg) using a non-elastic tape. Muscle strength in the dominant hand was measured with the Camry EH101 and JAMAR Plus dynamometers. Results showed that students were generally adequately nourished, with an average BMI of 23.2 kg/m² (range 18.9–32.3). Muscle strength was moderate (Camry: 32.4 kg; JAMAR: 33.2 kg), higher in males (43.5/44.4 kg) than females (25.9/26.6 kg). Average energy intake was 1869.8 ± 559.8 kcal, with 18.8% protein, 41% fat, 40.5% carbohydrates, and 7.7 g fiber per 1000 kcal. Mediterranean diet scores ranged from 8.7 (nutrition students) to 10 (social science students). Overall, students' diets were low in fruit, vegetables, and fiber, and high in fat. Nutrition students had better diet quality. The Camry EH101 proved a cost-effective alternative to the JAMAR Plus.

Keywords: body composition, muscle strenght, eating habits, student population

NUTRITIONAL STATUS IN VULNERABLE GROUPS: PEOPLE WITH MENTAL DISORDERS

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invited lecture

Vulnerable groups, such as people with mental disorders, are at increased risk of developing chronic diseases and often experience limited access to appropriate care and support. The development of comorbidities (obesity, cardiovascular diseases, and type 2 diabetes mellitus) leads to a reduction in life expectancy in this population by 8 to 20 years, compared to the general population. Their nutritional status is affected by multiple factors, including poor dietary habits, low socioeconomic status, low physical activity, pharmacological therapy, and cognitive challenges related to mental disorders. In many cases, they depend on organized forms of care, including housing programs and daily support services.

The diet of people with mental disorders is often characterized by high intake of sugar and saturated fat, and low intake of fruit and vegetables. However, total energy intake rarely differs from that of the general population. Studies comparing nutritional status between people with mental disorders and the general population have shown differences in sociodemographic factors, body weight and body mass index. In terms of dietary intake, differences were found in fruit, saturated fat, polyunsaturated fat and sodium intake, and several other micronutrients. In addition to the effects of pharmacological therapy, cognitive impairments affecting memory and reporting accuracy, and low motivation pose challenges in dietary assessment. All these findings emphasize the importance of tailored assessment methods and nutritional counselling for this vulnerable group. Assessing and addressing their dietary needs is essential for improving their overall health and quality of life.

Keywords: vulnerable groups, nutritional status, nutritional assessment, mental health disorders

SOURCES OF NUTRITION INFORMATION AMONG PROFESSIONAL AND SEMI-PROFESSIONAL ATHLETES: A CROSS-SECTIONAL STUDY

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poster presentation

A balanced diet tailored to an athlete's individual needs is essential for optimizing performance, supporting recovery, and maintaining both short- and long-term health. Previous studies have shown that athletes often receive nutrition-related information from informal and frequently non-credible sources, while relatively few seek advice from qualified professionals such as sports nutritionists. The aim of the present study was to examine the sources from which professional and semi-professional athletes obtain information about proper nutrition. This cross-sectional study was conducted in April and May 2024. The sample consisted of 119 professional and semi-professional athletes, aged 18 years or older and residing in Croatia. Data were gathered through a comprehensive online questionnaire designed to assess athletes' general knowledge, attitudes, and behaviors related to nutrition. Of the total sample, 49.2% were professional athletes, while 50.8% were semi-professionals. The survey allowed respondents to select multiple sources of nutrition information. The findings revealed that 84% of participants reported the internet as a source of nutrition-related information, whereas only 26.1% reported receiving information from a sports nutritionist. These results highlight the predominance of informal sources, particularly the internet, in shaping athletes' nutritional knowledge. Given the relatively low reliance on qualified professionals such as sports nutritionists, there is a clear need to promote evidence-based guidance and improve athletes' access to credible nutrition information.

Keywords: athletes, diet, health, nutrition knowledge, sports nutritionist

VEGETABLE CHIPS WITH SAUCE – AN INNOVATIVE NUTRITIONALLY RICH SNACK

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poster presentation

Vegetable chips with sauce is a functional and innovative snack developed by the student team *InovEativci* as a nutritionally rich alternative to conventional snacks often high in salt, fat, and additives. Intended primarily for children, but also suitable for adults seeking a balanced diet. Product consists of chips made from dehydrated sweet potato, carrot, parsley, beetroot, and kohlrabi, paired with a cashew-based dip enriched with nutritional yeast, honey, and turmeric. The dehydration process preserves nutritional value and ensures high raw-material utilization.

The product follows a zero-waste concept, using dehydrated vegetable peels as seasoning. It contains only one allergen and is packed in recyclable and reusable packaging, contributing to its sustainability profile.

A sensory analysis conducted with primary school children showed high acceptance in terms of aroma, appearance, and texture. Sweet potato and carrot chips were the most preferred, while beetroot and kohlrabi were less favored. Children expressed interest in consumption, with minor suggestions for stronger seasoning. Sixty percent of parents stated they would purchase the product for their child, though only 16.7 % believe their children would choose healthy snacks on their own.

Survey data revealed that 80 % of adults and 90 % of children regularly consume snacks, while 55 % prefer large packages (150 – 200 g). Additionally, 60 % of respondents favor reusable packaging, and 36.5 % of parents believe their children would consume healthier snack options. This product presents a concrete response to growing market demands for sustainable, appealing, and nutritionally dense snack products, especially among younger populations.

Keywords: healthy snacks, dehydrated vegetables, sensory analysis, zero-waste

PSORIASIS AND NUTRITION – ALLIES OR ENEMIES

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oral presentation

Psoriasis is a chronic inflammatory skin disease. The course of the disease is often associated with the development of various comorbidities such as psoriatic arthritis, metabolic syndrome, cardiovascular disease, inflammatory bowel disease and psychological comorbidities. People with psoriasis are often obese. Evidence suggests that obesity is a risk factor for the development of psoriasis, worsens existing psoriasis and that weight loss can improve the severity of psoriasis in overweight people. Similarly, excess body weight can interfere with the treatment of psoriasis and increase the cardiovascular risk profile in these patients. People with psoriasis often follow unbalanced dietary habits such as higher fat intake and lower intake of fish or dietary fiber. It has been shown that certain diets can favor the development and progression of psoriasis and its comorbidities. Saturated fatty acids, simple sugars, red meat, or alcohol worsen psoriasis, while unsaturated fatty acids, vitamin D, vitamin B12, selenium, dietary fiber, or probiotics contribute to psoriasis improvement. All of the above emphasizes that effective weight control regimens are important for psoriasis patients who are obese, and that nutritional strategies are important for all psoriasis patients due to the possible mitigation of worsening, or the severity of the clinical picture of the disease itself.

Keywords: psoriasis, obesity, nutrition, comorbidity, plan

INTRODUCTION OF COMPLEMENTARY NUTRITION

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oral presentation

Complementary feeding is the addition of nutrients to breast milk. The primary purpose of introducing complementary feeding is to increase the caloric density and diversity of nutrients, which is conducive to the addition of high biological value proteins and essential fatty acids, as well as micronutrients considered essential for the rapidly growing body during infancy.
The research method used was the analysis of literature sources from medical databases (Hrčak, Science Direct) and the digital archive PubMed. The search included articles published in English and Croatian, and references to selected research and review articles related to the topic of the paper were also searched to find additional studies.
About 20% of mothers in the US start complementary foods before 4 months of age. European, Indonesian and Chinese infants are introduced to complementary foods before 6 months of age. Adequate macronutrient intake in healthy term infants aged 6 to 12 months, expressed as a percentage of the recommended daily allowance (RDA), protein 14%, carbohydrates 45 - 55%, fat 40% and fibre 680 - 940 kcal/day.
Complementary feeding should be introduced between the 17th and 26th weeks of the child's life. During this period, numerous changes occur in the infant's body, such as assuming a sitting position, controlling head movements, showing the first attempts to actively grasp nearby objects, interest in the food eaten by family members. The digestive system matures, the amount of digestive enzymes increases, and the first teeth appear.

Keywords: complementary feeding, infants, physiological and neurological maturation

DIETETICS AND DIET THERAPY

THE IMPORTANCE OF PROPER NUTRITION IN TERMS OF CARDIOVASCULAR REHABILITATION OUTCOMES

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oral presentation

Cardiovascular diseases (CVDs) represent one of the leading public health problems globally, with a significant burden of morbidity, mortality and reduced life's quality. Cardiac rehabilitation (CR) is a key strategy in the secondary prevention of CVDs and includes a multidisciplinary approach that includes physical activity, pharmacological therapy, psychosocial support and less, but not least, nutritional interventions. Proper nutrition plays a crucial role in improving the outcome of CR as it enables the optimization of cardiometabolic parameters such as blood pressure, lipid profile, glycemic regulation and body weight. A review of the literature suggests that dietary patterns such as the Mediterranean diet, the DASH diet and the Whole Food Plant-Based diet are associated with lower rates of cardiovascular interventions, reduced inflammatory responses and improved endothelial function. Particularly relevant is the intake of essential fatty acids, fiber, antioxidants and reduced consumption of saturated fats, trans fats, refined carbohydrates and ultraprocessed foods. In addition to analyzing the impact of diet on rehabilitation outcomes, this review also considers key challenges in implementing nutritional interventions, including adherence to dietary guidelines, the role of educating patients and integration of personalized nutritional counselling into clinical practice. To sum up, the available scientific evidence strongly supports the importance of proper nutrition as an integral part of CR. The implementation of structured nutritional strategies in rehabilitation programs can significantly improve long-term cardiovascular interventions, which highlights the need for greater involvement of health proffesionals in this particular area.

Keywords: cardiovascular rehabilitation, DASH diet, Mediterranean diet, nutritional intervention, proper nutrition

LOW-GLYCEMIC LOAD DIET AS A COMPLEMENTARY STRATEGY IN BREAST CANCER MANAGEMENT – A REVIEW

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poster presentation

A low-glycemic load diet (LGLD), based on carbohydrates with low glycemic index and minimal insulin response, is gaining attention in breast cancer research due to its metabolic and endocrine effects. In hormone receptor-positive breast cancer, elevated insulin and IGF-1 levels are known to stimulate tumor growth via PI3K/Akt and MAPK signaling pathways. Clinical and epidemiological studies conducted in the last five years have confirmed that higher dietary glycemic load is associated with increased breast cancer risk, recurrence, and worse survival outcomes.
Recent meta-analyses and large prospective cohorts show that patients adhering to low-GL diets after diagnosis experience better overall and disease-specific survival. These findings are further supported by studies showing that LGLD improves insulin sensitivity, reduces circulating insulin and IGF-1 levels, and may positively modulate the tumor microenvironment. Moreover, LGLD contributes to weight control and reduces the risk of metabolic syndrome, both of which are relevant for breast cancer prognosis.
Considering its underlying metabolic mechanisms, clinical support, and safety profile, the low-glycemic load diet represents a promising complementary approach to conventional breast cancer treatment, particularly in metabolically compromised populations.

Keywords: breast cancer, low glycemic load, insulin, IGF-1, diet

INFANT FORMULA USE IN THE FIRST 24 MONTHS OF LIFE: A NATIONWIDE SURVEY OF CROATIAN PARENTS

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poster presentation

Although breast milk is considered the optimal form of nutrition for infants, in situations where breastfeeding is not possible, not recommended, or insufficient, infant formulas represent a safe and nutritionally adequate alternative, as they ensure the intake of essential nutrients required for proper growth and development. Their use is particularly important in infants with medical conditions such as phenylketonuria, lactose intolerance, allergies, or regurgitation, as well as in cases where breastfeeding is not possible due to social, psychological or technical reasons. A cross-sectional observational study was conducted among 1116 parents across the Republic of Croatia to explore their attitudes and practices regarding the use of infant formulas in children up to the age of 24 months. The majority (92.7%) stated that breast milk is the best food for infants, while 89.2% considered infant formulas a suitable substitute when breastfeeding is not possible or sufficient. Standard infant formulas were the most commonly used (69%), and more than a quarter of infants were fed formulas for specific medical conditions: anti-colic (10.5%), anti-reflux (8.4%) and hypoallergenic or lactose-free formulas (7.5%). Formula feeding was initiated from birth in 31.5% of infants, while in 15% it was introduced within the first four weeks of life. Exclusive breastfeeding was reported in 28.7% of children. In 50% of cases, the introduction of formula was recommended by health professionals. The results show that parents recognize the value of breastfeeding, but also accept infant formulas as an appropriate alternative when breastfeeding is not possible. The findings further underscore the widespread use of formulas in infant feeding and highlight the importance of informing parents about the individual nutritional needs of their children, as well as providing professional support in making informed feeding decisions.

Keywords: infant formula, breastfeeding, parental attitudes, infant nutrition, nationwide survey

FERRITIN AND ANOREXIA NERVOSA – IS IT RELATED TO NUTRITIONAL STATUS?

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poster presentation

Anorexia nervosa (AN) is a serious and complex eating disorder, characterized by an intense fear of gaining weight and significant body weight loss.This retrospective study included 58 patients treated at the Pediatric Department and the Center for Eating Disorders of the Sestre milosrdnice University Hospital Center. The sample comprised participants aged 9.5 to 18 years (mean age 14.36 ± 2.16 years), with the majority of patients aged between 13 and 16 years, 56 girls and 2 boys.The main objective was to assess ferritin levels in relation to indicators of nutritional status, with a particular focus on the relationship between ferritin concentration and the percentage of body weight loss in children and adolescents diagnosed with AN. Most patients had elevated ferritin levels, and none had values below the reference range. A statistically significant positive correlation ($\rho = 0.30$; $p \leq 0.02$) was found between ferritin concentration and the percentage of body weight loss, indicating that greater body weight loss was associated with higher ferritin levels.These findings support the possibility that ferritin reflects the nutritional status in children and adolescents with AN, however, further research is needed to confirm its diagnostic value.

Keywords: Anorexia nervosa, ferritin, weight loss, nutritional status, adolescents

THE IMPACT OF THE KETOGENIC DIET ON REGRESSION OF METABOLICALLY ASSOCIATED FATTY LIVER DISEASE (MAFLD)

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oral presentation

Metabolically associated fatty liver disease (MAFLD), formerly known as NAFLD, has become a global public health concern, with a prevalence exceeding 30% and proven strong association with insulin resistance and metabolic syndrome. While there is no currently approved pharmacological treatment for MAFLD, emerging evidence highlights the potential of the ketogenic diet (KD) as an effective non-pharmacological intervention. This presentation outlines the key mechanisms by which KD may promote MAFLD regression: improving insulin sensitivity, reducing body weight, eliminating fructose and monosaccharides, restricting total carbohydrate intake, exerting anti-inflammatory effects through ketone bodies, and modulating the gut microbiome. Clinical studies show significant improvements in hepatic steatosis, insulin sensitivity (HOMA-IR), lipid profiles, and inflammatory markers (CRP, IL-6, TNF-α) within just weeks of following a well-formulated very low-calorie ketogenic diet. These findings support the role of dietary interventions in the prevention and management of MAFLD and justify further clinical research in this area.

Keywords: MAFLD, ketogenic diet, insulin resistance, fructose, inflammation, dietary therapy

CONSUMPTION AND ATTITUDES TOWARDS SOY AND SOY-BASED PRODUCTS AMONG WOMEN WITH BREAST CANCER

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poster presentation

Interest in dietary approaches to disease management, especially among women diagnosed with breast cancer, has led to increased attention on soy and its potential health effects. Triggered by the current fitness fixation era, revived soy primarily for its high protein content and phytoestrogens. However, a large number of contradictory findings regarding soy's health effects, particularly regarding breast cancer, led to its relatively low consumption outside of Asia. We conducted an online survey on the consumption frequency and attitudes towards soy and soy-based products among women with breast cancer. Forty-four women aged 27 to 68 years, 86% with hormone-dependent and 14% with hormone-negative breast cancer, 30% of whom are in remission, completed the study-specific survey. Soy and soy-based products are regularly (daily) used by only 5% of women who used them prior to their diagnosis, 2% consume them on a weekly basis, 7% consume them several times a month and the remaining 86% rarely or never consume these products. The most commonly used products are tofu, soy milk, edamame, soy yoghurt and soy protein powder. When asked whether soy consumption could affect the course of breast cancer, none said that soy is useful, 18% said that it does not affect the course of breast cancer, 68% said they are not sure, and 14% said that soy is harmful. Additionally, 11% of women said they consume fewer soy products after the diagnosis, indicating a degree of caution among them. Our results support the need for a straightforward, evidence-based communication on soy and its health effects towards consumers, particularly those with health issues.

Keywords: soy, breast cancer, consumption, attitudes

DYNAMICS OF SERUM ALBUMIN IN HOSPITALIZED PATIENTS WITH METASTATIC COLORECTAL CANCER

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poster presentation

Albumin is one of the acute-phase proteins associated with inflammation, and its concentration decreases in response to inflammation. Moreover, low albumin concentration reflects malnutrition caused by cancer and is a negative prognostic factor.

43 patients (28 men and 15 women) who were hospitalized in the University Hospital for Tumors Zagreb were followed for 4 months of first-line chemobiological treatment of metastatic colorectal cancer. NRS-2002 was used to assess nutritional risk, and patients were categorized into two groups: high (score ≥3) and low nutritional risk (score <3). All patients identified as at risk received enteral nutritional support with commercialized formulations. Serum albumin levels were measured at the beginning and end of the first-line treatment.

There were 12 patients in the group with high nutritional risk (H-NR) and 31 in the group with low nutritional risk (L-NR). Albumin level at the beginning of treatment in the L-NR group was 45.7 g/L and at the end 44 g/L ($p = 0.25187$). Albumin level at the beginning of treatment in the H-NR group was 42.6 g/L and at the end of treatment 41.2 g/L ($p=0.26355$). Serum albumin was significantly higher in the L-NR group compared to the H-NR group at the end of the treatment (44.4 g/L vs. 41.2 g/L, $p = 0.024$).

Despite standard enteral nutritional support, patients at high nutritional risk have an unsatisfied need for a high-protein diet from the start of treatment with personalized and clear recommendations aimed at improving outcomes.

Keywords: albumin, colorectal cancer, malnutrition, nutritional risk, nutritional support

COORDINATED FUNCTION OF GASTROINTESTINAL HORMONES IN ENERGY AND METABOLIC HOMEOSTASIS: A KEY FACTOR IN THE PREVENTION AND TREATMENT OF OBESITY AND METABOLIC SYNDROME

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oral presentation

Obesity, as a chronic metabolic disease, has reached pandemic proportions and represents one of the greatest global health challenges. Recent research has highlighted the pivotal role of gastrointestinal (GI) hormones in regulating energy and metabolic homeostasis through the gut–brain–mesentery–liver (GBML) axis. Synchronization of GI hormone signaling with the circadian rhythm may be crucial not only for the prevention but also for the personalized, multidisciplinary treatment of clinical obesity and metabolic syndrome.

Aim was to synthesize current knowledge on the role of GI hormones in metabolic regulation and to explore new approaches to the classification and treatment of obesity and its comorbidities. A review of scientific articles indexed in PubMed, Scopus, and Web of Science was conducted, covering clinical and experimental studies on the GBML axis, with focus on therapies involving GLP-1, GIP, PYY, and ghrelin analogs. The GI tract transmits key signals about food composition during ingestion, playing a central role in energy balance. GI hormone based therapies have shown significant effects on weight loss, insulin sensitivity, and other components of metabolic syndrome.

Appetite regulation and energy homeostasis depend on GI signaling during and after meals. GI hormones influence insulin secretion, resistance, and energy expenditure via central and peripheral pathways. Targeting these pathways with hormone analogs offers a promising therapeutic strategy. Such treatments require an individualized approach, awareness of the potential side effects, and mandatory lifestyle changes.

Keywords: GI hormones, gut–brain axis, GLP-1, obesity, metabolic syndrome

GUT MICROBIOTA – OUR SECOND FINGERPRINT: CASE REPORT

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oral presentation

The human gastrointestinal (GI) tract harbours a complex and dynamic population of microorganisms collectively known as the gut microbiota, which significantly influence the host physiology in both health and disease. Among the multifactorial determinants shaping the human gut microbiota composition throughout life, diet is recognised as a principal modulator. Intestinal bacteria play a crucial role in maintaining immune and metabolic homeostasis and protecting against pathogens. This case report focuses on the gut microbiome profile of a healthy individual, offering a comprehensive overview of microbial composition. The report includes interpretive insights and a dedicated question-and-answer section aimed at optimising gut microbiome health.

The home test comes to the address and after the stool sample is taken, it is returned by delivery service to the laboratory Biomes in Germany. The method used for the analysis is sequencing of the 16s rRNA amplicon. Venous blood samples were collected at baseline and at the end of the intervention to assess systemic inflammation, metabolic status, and micronutrient levels, including C-reactive protein (CRP), complete blood count (CBC), serum vitamin B12, fasting glucose, and lipid profile (total cholesterol, LDL, HDL, and triglycerides).

Initial testing (October 2023) revealed a moderate gut health score (60/100), low bacterial diversity (46%), and deficient SCFA-associated markers. Follow-up analysis after three months, nutritional interventions and exercise for 30 minutes per day. (February 2024) showed significant improvement: overall score rose to 85, diversity increased to 73%, and inflammation markers reached optimal levels (100%). Appetite and cholesterol regulation also improved markedly (from 57% to 86%). However, mucosal barrier function declined (71% to 43%), warranting dietary attention, and vitamin B12 production remained absent throughout.

These findings underscore the gut microbiota's dynamic responsiveness to lifestyle factors and highlight the importance of continuous monitoring to guide personalised dietary and probiotic interventions aimed at restoring and maintaining microbial homeostasis.

Keywords: gut microbiom, gut microbiom test, analysis, microorganisms

BENEFITS OF GLP-1 RECEPTOR AGONISTS AND NUTRITION IN THE TREATMENT OF OBESITY IN PATIENTS WITH TYPE 2 DIABETES

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invited lecture

Obesity and type 2 diabetes mellitus (T2DM) are major public health challenges due to their rising prevalence and strong interconnection. Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) are increasingly used in the treatment of these conditions. In addition to improving glycemic control, they contribute to significant weight loss and long-term weight maintenance, with positive cardiovascular effects. These drugs slow gastric emptying, reduce appetite and food cravings, and lower the preference for fatty foods. This paper aims to present the synergistic effect of GLP-1 RA therapy and proper nutrition in managing obesity in individuals with T2DM, in accordance with current clinical guidelines and recent research.

The combination of GLP-1 receptor agonists and nutritional interventions represents one of the most effective approaches in treating obesity in patients with T2DM. Receptor agonists GLP-1 have shown significant effects in reducing and maintaining body weight, improving glycemic control, and lowering the incidence of major cardiovascular events. Meta-analyses report that semaglutide, when combined with proper diet in obese individuals without diabetes, results in an average weight loss of 14.9% compared to placebo. Over time, this effect remains significantly better than placebo. In obese individuals with T2DM, the average weight loss is lower, ranging from 3–5% in most studies.

Glucagon-like peptide-1 receptor agonists may cause side effects, including common gastrointestinal symptoms and, less frequently, skin reactions at the injection site, acute pancreatitis, dizziness, and fatigue. Treatment should be carefully monitored by healthcare professionals, with an individualized approach that weighs risks and benefits for each patient.

Integrating GLP-1 RAs with a well-structured dietary plan offers an effective and sustainable treatment model for obesity in patients with T2DM, with the potential to reduce complications and enhance quality of life.

Keywords: obesity, GLP-1 receptor agonists, type 2 diabetes, nutrition

FUNCTIONAL FOOD AND FOOD SUPPLEMENTS

DEVELOPMENT OF NUTRITIVE ENRICHED SPELT BASED ECO-PRODUCTS

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poster presentation

The Republic of Croatia faces several key problems in the agricultural sector: declining soil quality, low added value of products, innovation, high levels of waste in agriculture, low self-sufficiency, deficit in agricultural trade of 717.5 million euros in 2020 (EUROSTAT). The diet of a large part of the world's population is based on cereals, or cereal-based food products.
The project development is based on the application of circular economy (from field to fork) and innovation to reduce waste generation and increase production sustainability. The main objective of the project is the development of innovative organic food products from spelt and emmer enriched with fiber and minerals. A special emphasis of the research is on the development of an innovative process for extracting fiber from waste generated during the processing of spelt. The aforementioned process has the potential to be applied also for extracting fiber from waste during the processing of other cereals.
The project results will contribute to the reduction of waste, i.e. the reduction of greenhouse gas emissions and sustainable resource management, which is a key objective of the "Sustainable Carbon Cycles" strategy. Furthermore, the project results will contribute to the development of innovations, increasing the added value of organic agricultural and food products, which can ultimately lead to an increase in organic production.

Keywords: spelt, extrusion, eco-products, fibers

QUALITY CONTROL OF *ALOE VERA* AND SLIPPERY ELM DIETARY SUPPLEMENTS IN VARIOUS DOSAGE FORMS

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poster presentation

The use of dietary supplements containing *Aloe vera* or slippery elm bark has increased due to their potential to relieve symptoms of inflammatory diseases. However, there are reported hidden dangers associated with inadequate quality control of dietary supplements. Therefore, we evaluated the physicochemical properties of six commercially available dietary supplements containing *Aloe vera* or slippery elm bark. Three samples contained *Aloe vera,* and three others contained slippery elm bark. Depending on the pharmaceutical form (soft capsules, tablets, or powder), the samples were analyzed for weight variation, friability, release of the active ingredient, loss on drying, swelling index, disintegration, as well as bulk and tapped density, following the Pharmacopeia standards. All tested samples complied with the weight variation criteria (<10%) and the friability criteria (<1%). Additionally, the analyzed samples were in accordance with the release of the active ingredient, which was within the acceptable limit (within 15 minutes) for all samples. Loss on drying was within the permitted range (<12%), with the highest recorded value being 6.67% in one slippery elm bark powder sample. The swelling index was highest (240) in the slippery elm bark powder. However, one slippery elm tablet failed to meet the disintegration time limit (30 minutes), which may impair active ingredient release. Bulk and tapped density tests indicated poor flow properties in two slippery elm bark powder samples, as their compressibility indexes exceeded 40%, potentially limiting their suitability for industrial production. These findings highlight the need for stricter quality control and further investigation of such dietary supplements.

Keywords: dietary supplements, *Aloe vera*, slippery elm bark, inflammatory diseases, quality control

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GREEN EXTRACTION TECHNIQUES FOR RECOVERING BIOACTIVE COMPOUNDS FROM *PALIURUS SPINA-CHRISTI* MILL. FRUITS (CHRIST'S THORN)

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poster presentation

Paliurus spina-christi Mill. (Rhamnaceae), commonly known as Christ's thorn or Jerusalem thorn, is a plant widely distributed in the Mediterranean region, including Bosnia and Herzegovina. Its fruits have traditionally been used for their anti-inflammatory properties in treating kidney stones, as well as chest and eye infections. This study aimed to explore the potential of ultrasound-assisted extraction (UAE) and supercritical fluid extraction (SFE-CO_2) for recovering bioactive compounds from P. spina-christi fruits. Dried fruits were collected in August 2024. UAE was conducted at two amplitudes (50% and 100%), two pulse modes (50% and 100%), and three extraction times (1, 5, and 10 minutes) to evaluate the effects of these parameters on extraction yield, total phenolic content (TPC), and concentrations of rutin, quercetin, and procyanidin B2. Data are presented as mean value ± SD of triplicate. Variances of mean values were statistically analyzed with a 95% confidence interval by one-way ANOVA followed by Tukey multiple comparisons HSD test using XLSTAT software 2014 1.04. Extraction yields ranged from 3.41% to 8.09%, with TPC values between 27.72 and 44.32 mg GAE/g. SFE-CO_2 was performed at 300 bar pressure, 40 °C, and a CO_2 flow rate of 1.4 kg/h to analyze both extraction yield and the composition of volatile and semi-volatile compounds. Gas chromatography–mass spectrometry (GC–MS) analysis identified 9 monoterpenes and 29 other non-terpene compounds, including alcohols (aliphatic and aromatic), carboxylic acids, aldehydes, lactones, ethers, phenols, sulfones, aliphatic hydrocarbons, and aromatic heterocycles. Vanillin, borneol, and linalool were the most abundant among compounds detected. The results demonstrate that both UAE and SFE are effective techniques for extracting valuable bioactive and volatile compounds from *Paliurus spina-christi* fruits, highlighting their potential for further pharmacological and phytochemical applications.

Keywords: *Paliurus spina-christi*, ultrasound-assisted extraction, supercritical fluid extraction

VALUABLE BY-PRODUCT: HARNESSING THE POTENTIAL OF GREEN WALNUT SHELLS

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poster presentation

The green walnut husk (*Juglans regia* L.) is a largely overlooked by-product of walnut processing, traditionally treated as agricultural waste. However, recent studies have revealed that this material is a rich source of bioactive compounds, particularly phenolic acids and juglone, with significant antioxidant and antimicrobial potential. This review provides an overview of the chemical composition of green walnut husk and highlights key findings from the literature regarding its biological activity and potential applications. In addition, various extraction methods are discussed, including conventional solvent-based techniques and more sustainable alternatives such as supercritical fluid extraction. Special attention is given to the advantages of binary solvent systems, which have been shown to enhance the recovery of phenolic compounds. By compiling current knowledge, this paper emphasizes the potential of green walnut husk as a valuable raw material for use in the food, pharmaceutical, and cosmetic industries, supporting its transition from waste to resource within a sustainable bioeconomy framework.

Keywords: bioactive compounds, extraction, fruit and vegetable waste, green walnut husk sustainable processing

TRADITIONAL MEDICINE IN FERIČANCI MUNICIPALITY

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poster presentation

An ethnobotanical study on the use of wild and cultivated plants was carried out between June 2023 and March 2025 among inhabitants of the Feričanci Municipality. A total of 27 informants completed a survey that gathered data on plant taxa, including their local names, parts used, methods of preparation, and whether the plants were collected from the wild or cultivated. Among the 27 informants, 22 were women, aged between 24 and 82, with most having completed secondary education. The informants reported 88 plant taxa belonging to 40 families. The most frequently mentioned species was *Sambucus nigra*, cited by 85% of informants, followed by *Rosmarinus officinalis* (59%) and *Urtica dioica* (56%). To assess the level of agreement among informants regarding the use of plants for treating specific categories of disease, the Informant Consensus Factor (ICF) was calculated. The highest ICF was recorded for respiratory disease (0.74), followed by skin (0.70), digestive (0.65), psychological (0.64), and locomotory system disease (0.64). Several plant taxa were noted for their use across multiple disease categories. *Hypericum perforatum* was cited in six categories, while *Portulaca oleracea, Lavandula angustifolia* and *Rosmarinus officinalis* were each mentioned in five. Of the 88 documented plant species, only three were identified as invasive: *Helianthus tuberosus*, *Robinia pseudoacacia*, and *Oenothera biennis*. The results indicate that plants represent an important natural resource for the local inhabitants in the study area as they are an important component of their health care and the traditional knowledge on the use of valuable plants should be preserved.

Keywords: ethnobotany, medicinal plants, traditional knowledge

INNOVATIVE APPLICATION OF ENCAPSULATED BLACKTHORN (*PRUNUS SPINOSA* L.) FLOWER EXTRACTS IN PHYTOTHERAPY, FOOD TECHNOLOGY AND COSMETICS

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oral presentation

Plant extracts, including blackthorn flower extract (*Prunus spinosa* L.), are gaining importance due to their multiple applications in phytotherapy, food and cosmetic industries. Blackthorn contains a rich phenolic profile with proven antioxidant, antimicrobial, anti-inflammatory and antitumor activity. Due to problems such as low solubility and instability, encapsulation of extracts is preferred, most often by spray drying, which improves the bioavailability, stability and efficacy of bioactive compounds. In the food industry, extracts are used as natural preservatives, food fortification agents and in edible films and coatings to extend shelf life. In cosmetics, phenolic compounds from blackthorn show strong anti-radical activity and the ability to inhibit enzymes such as tyrosinase, thereby helping to combat skin aging and hyperpigmentation. Despite the advantages, the application of extracts may be limited due to possible adverse effects on the taste, smell or appearance of the product, which can also be mitigated by encapsulation. Blackthorn shows excellent potential for the development of functional and cosmetic products with natural, biologically active ingredients.

Keywords: blackthorn (*Prunus spinosa* L.) flowers, encapsulated extracts, innovative application, phytotherapy, functional food

BIOACTIVE COMPOUNDS OF EDIBLE AND MEDICINAL MUSHROOMS

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poster presentation

Edible and medicinal mushrooms have attracted a great deal of attention due to their nutritional composition and their diverse bioactive compounds with potential health benefits. They are characterised by a rich nutritional profile, including high quality proteins, dietary fibre, essential minerals and vitamins, which contribute to their role as functional foods. In addition to these nutrients, mushrooms contain various bioactive components such as polysaccharides (especially β-glucans), terpenes, phenolic compounds and sterols. These bioactive compounds are associated with numerous biological activities, including antioxidant, antimicrobial, anticancer, immunomodulatory, anti-inflammatory and neuroprotective activities. The combined nutritional and bioactive profile of edible and medicinal mushrooms supports their use in dietary strategies for health promotion and disease prevention. This review provides a comprehensive overview of the nutritional composition and bioactive components of edible and medicinal mushrooms, highlighting their promising role in promoting health and their potential in the production of functional foods and nutraceutical products. Special attention is given to some representative mushroom species, including *Hericium erinaceus*, *Ganoderma lucidum* and *Lentinula edodes*. Given the growing interest in natural health-promoting compounds, mushrooms represent a promising and sustainable resource for the future development of functional foods and nutraceuticals.

Keywords: edible mushrooms, medicinal mushrooms, bioactive compounds, functional foods

THE IMPACT OF NANOPARTICLES ON THE MEDICINAL MUSHROOM HERICIUM ERINACEUS

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poster presentation

Hericium erinaceus (lion's mane) is a well-known medicinal and edible mushroom recognized for producing bioactive compounds such as erinacines, hericenones, polysaccharides and phenolic substances, which exhibit significant neuroprotective, immunomodulatory and antioxidant properties. Given the growing interest in enhancing the biological value and yield of such organisms, some studies have explored the application of nanomaterials, particularly fullerene-based nanoparticles ($C_{60}(OH)_{24}$), in mushroom cultivation. This review paper analyses current knowledge on the use of fullerene nanoparticles in biological systems, focusing on their potential role in stimulating the biosynthesis of secondary metabolites through the modulation of oxidative stress. Additionally, their ecotoxicological fate is discussed, including findings showing that some mushrooms can oxidize and degrade fullerol to CO_2, with partial incorporation into cellular lipids. These findings suggest the possibility of biotransformation in other basidiomycetes such as *H. erinaceus*. Beyond the potential for biofortification of mycelium and fruiting bodies, this approach offers opportunities for the valorisation of agricultural residues, development of circular biotechnological processes and reduction of the environmental impact of nanomaterials. This paper provides an overview of current knowledge, challenges and research opportunities at the intersection of nanotechnology, mycology and sustainable food production.

Keywords: edible medicinal mushrooms, *Hericium erinaceus,* bioactive compounds, functional foods

The study was financed through the Grants for research projects in agriculture in the area of Osijek-Baranja County in 2024 awarded to the project "Possibilities of using carbon-based nanoparticles in the cultivation of the medicinal edible lion's mane mushroom".

QUANTITATIVE ANALYSIS OF OLEUROPEIN POLYPHENOLS IN OLIVE LEAVES OF INDIGENOUS OLIVE CULTIVARS

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poster presentation

Olives are not only a rich source of nutrition but also contain high levels of polyphenols and antioxidants. These beneficial compounds are present in various parts of the olive tree, including the fruits, leaves, and virgin olive oil. Tree pruning delivers large volumes of wasted leaves associated with economic and environmental costs, often used as a local food source for small ruminants, and more recently recycled in the food, medicine, and cosmetic industries. Olive leaves are rich in bioactive compounds that hold considerable promise for human health: their diverse biological activities, including antimicrobial, antioxidant, anticancer, antidiabetic, anti-inflammatory, and antiatherogenic effects. They have a high content of phenolic compounds, with oleuropein being the most prevalent.

The aim of this research is quantitative determination of oleuropein in olive leaf samples of 14 indigenous olive cultivars defined genotypes from trees planted in the National Collection of Indigenous Olive Cultivars in Vodnjan.

Phenolic compounds were extracted for 30 minutes at room temperature in an ultrasonic bath using an ethanol: water (80:20 v/v) solvent mixture. Ethanol and water were used to ensure the resulting extracts are safe for human consumption as dietary supplements, therapeutics, and cosmetic products. The percentage of oleuropein in the ethanolic extracts was determined by High-Performance Liquid Chromatography (HPLC). For quantitative analysis, calibration curves were prepared using standard solutions. The obtained oleuropein concentration ranged from 37.81 to 257.47 mg per gram of dry extract.

Studies on the biological impact of olive leaf extracts in various cell cultures are presently ongoing.

Keywords: polyphenols, oleuropein, olive leaf, HPLC

EVALUATION OF GLUTEN IN HERBAL DIETARY SUPPLEMENTS: FOCUS ON ALOE VERA AND SLIPPERY ELM BARK

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poster presentation

Gluten is a group of proteins naturally found in certain grains such as wheat, rye, and barley. In individuals with celiac disease or non-celiac gluten sensitivity, the intake of gluten can cause a range of adverse reactions, including gastrointestinal disturbances, inflammation, and deterioration of overall health. Despite growing public and clinical awareness of gluten-free dietary regimens, the presence of gluten in dietary supplements is often overlooked, and scientific data on this issue remains limited.

The aim of this study was to determine the presence and quantity of gluten in dietary supplements containing aloe vera and slippery elm bark, plant ingredients commonly used for digestive issues. A total of 28 dietary supplement samples were collected in the form of hard capsules (22), soft capsules (2), tablets (2), and powders (2), from food health stores, local pharmacies, and purchased from the Internet. The samples were classified into two categories: monopreparations (12) and multipreparations (16). Gluten content was analyzed using the enzyme-linked immunosorbent assay (ELISA) method, with all samples tested in duplicate before their expiration date.

Gluten was detected in 92.9% of the samples. In two soft capsule samples containing aloe vera, the gluten concentration was below the limit of quantification (LOQ, 0.15 ng/ml). The highest measured concentration was 36.5 ng/g, and the lowest was 5.1 ng/g, both in hard capsules containing aloe vera and slippery elm bark. The mean value of all quantified samples was 16.2 ng/g. All analyzed samples contained gluten levels below the threshold defined by the FDA (20 ppm).

Keywords: gluten, dietary supplements, aloe vera, slippery elm bark, quality control

ENHANCING THE VALUE OF SPENT COFFEE GROUNDS AND POMEGRANATE PEELS THROUGH ELECTROSPUN BIOACTIVE NANOFIBERS

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poster presentation

Agro-industrial waste is a valuable source of bioactive compounds, and its reuse enables the formulation of products with high added value. Recent research has shown that by-products from the food industry are rich in dietary fibres, proteins, phenolic compounds, terpenoids, alkaloids, etc. In the present study, spent coffee grounds and pomegranate peel were investigated as natural sources of polyphenolic compounds to be encapsulated in the form of nanofibers using the innovative technique of electrospinning. The polyphenolic plant extracts were analysed for total and individual polyphenol content and antioxidant capacity using spectrophotometric and chromatographic (HPLC-PDA) methods. The prepared extracts were encapsulated using mixtures of pullulan and collagen hydrolysate (12%, *w/w*) as carriers, prepared in ratios of 50:50, 60:40 and 80:20, with the addition of Tween 20 (0.9 %). During electrospinning, the applied voltage was 11-15 kV, the distance between needle and collector was 10-14 cm and the flow rate was 1 mL/h. The formulated nanofibers were subjected to the analysis of polyphenolic composition and *in vitro* digestion, while the morphology was examined using a scanning electron microscopy. Caffeine (0.15 mg/mL), chlorogenic (0.12 mg/mL), neochlorogenic (0.03 mg/mL) and cryptochlorogenic (0.06 mg/mL) acid were detected in the extract of spent coffee grounds, while ellagic (55.94 µg/mL), protocatechuic (143.54 µg/mL) and gallic (50.86 µg/mL) acid were detected in the extract of pomegranate peel. In the case of spent coffee grounds nanofibers, the highest encapsulation efficiency of total phenols (98.35 %) was achieved with a mixture of pullulan and collagen hydrolysate in a 50:50 ratio, while among pomegranate peel systems, the highest encapsulation efficiency was achieved using a mixture of these polymers containing 60 % pullulan.

Keywords: agro-industrial waste, bioactive compounds, electrospinning, pomegranate peel, spent coffee grounds

ENCAPSULATION OF COMMON REED POLYPHENOLS VIA ELECTROSTATIC EXTRUSION FOR ADVANCED CONTROLLED RELEASE SYSTEMS

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poster presentation

Phragmites australis, commonly known as common reed, is a wetland species that has been historically utilised for various purposes. In recent years, interest in its use for biofuel production, wastewater treatment, and soil remediation has steadily increased. The aim of the present study was to investigate the under-researched polyphenolic composition of common reed and to formulate delivery systems that would allow a continuous and controlled release of its polyphenols. The prepared common reed water extract was analysed for total and individual polyphenol content and antioxidant capacity using spectrophotometric and chromatographic methods. Encapsulation was then carried out by electrostatic extrusion using sodium alginate as a base (75 % of the dry mass of the delivery solution) for binary carrier solutions (2 %) in combination with gellan gum, tamarind gum, carboxymethyl cellulose, and nutriose. The bioactive characterisation of the obtained beads included the determination of the encapsulation efficiency of the total and individual polyphenols. In addition, the release kinetics of total phenols in fluids simulating the gastric and intestinal phases were analysed. HPLC-PDA analysis revealed the presence of rutin (0.30 mg/g) and quercetin-3-glucoside (0.27 mg/g) in the common reed. The highest encapsulation efficiency of 76.86 % for total polyphenols was obtained by the combination of sodium alginate with carboxymethyl cellulose, while their controlled and continuous release during simulated digestion was observed in all samples.

Keywords: alginate, common reed, electrostatic extrusion, encapsulation, polyphenols

This work was supported by the Croatian Science Foundation under the project: "Biorefinery system for biofuels and biochemicals production from non-food lignocelulosic raw materials" (IP-2022-10-3075).

POLYPHENOLS AND ANTIOXIDANT ACTIVITY OF COMPLEXES BASED ON PLANT PROTEINS AND BLACKBERRY JUICE

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poster presentation

Polyphenols are recognized for their many health-promoting characteristics but also their high instability, thus significant efforts are made to overcome this barrier in the form of complexes with biopolymers. Valuable plant biopolymers which can be used for the preparation of plant-based functional food additives in combination with polyphenols are proteins. In this research, we used pea and rice protein matrices with 85% of proteins, and pumpkin and almond with 50% of proteins in combination with blackberry juice to investigate if these matrices can be used as efficient biopolymers for adsorption of polyphenols. Obtained complexes were evaluated for total polyphenols, proanthocyanidins, and antioxidant potential by spectrophotometric analysis, and for individual polyphenols by HPLC. Additionally, IR spectra screening of complexes was conducted to evaluate changes in biopolymers structure. The highest total polyphenols and proanthocyanidins contents were determined on pumpkin protein/blackberry complex (10.55 mg GAE/g and 587.77 mg PB2E/g, respectively). Also, this complex had the highest antioxidant potential determined by ABTS, FRAP and CUPRAC assays. Binding of blackberry juice polyphenols caused changes in structure of protein matrices which was confirmed by screening of IR spectra. This type of complexation can be perceived as a green approach in the preparation of functional food additives, which can be further used to enrich differnt products with polyphenols and proteins.

Keywords: blackberry juice polyphenols, pea proteins, rice proteins, almon protein, almond proteins

CONVERSION OF MUSSEL SHELL WASTE INTO HYDROXYAPATITE FOR SUSTAINABLE MATERIAL DEVELOPMENT

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poster presentation

Hydroxyapatite (HAP, $Ca_{10}(PO_4)_6(OH)_2$), the most thermodynamically stable form of calcium phosphate, is widely recognized for its biocompatibility and structural similarity to human hard tissue. These properties make HAP an invaluable asset for biomedical applications such as bone regeneration, dental implants and drug delivery systems. Its unique apatite crystal structure also gives it a high ion exchange capacity, which increases its usefulness in environmental remediation.
Conventional HAP synthesis methods often rely on chemical reagents and processes that can have a negative impact on the environment. In line with global sustainability goals and green chemistry principles, there is a growing interest in environmentally friendly synthesis strategies. In this study, the use of mussel shells, a by-product of the fishing industry, as a natural and renewable source of calcium for HAP synthesis is investigated. The reuse of these mussel shells not only reduces environmental waste, but also supports the circular economy by converting by-products of the food industry into valuable biomaterials
Using hydrothermal methods under different pH conditions, HAP was successfully synthesized from calcium of mussel shells. Comprehensive chemical and structural characterizations confirmed the quality and applicability of the synthesized materials. The results underline the potential of sustainable materials from waste for the development of advanced biomaterials and show an innovative approach for the valorization of waste in the food industry.

Keywords: biomaterials, calcium phosphates, mussel shell waste, hydroxyapatite, sustainable synthesis, food industry by-products

SMART SUPPLEMENTATION

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oral presentation

In the era of smartphones, smart TVs, smart watches and in the context of a less healthy & less "natural" lifestyle, is the well-known increasing use of dietary supplements. Needless to say the rational use of food supplements is likely an increasingly important topic. In accordance with the European Union Law, dietary supplements are defined as concentrated sources of vitamins, minerals, or other substances (eg, amino acids, essential fatty acids, probiotics, plants and herbal extracts) with a nutritional or physiological effect intended to supplement a regular diet. In the US, over 50% of adults declare supplement use. The statistics are similar in Europe. Studies showed that in Poland, supplement use has been reported by 30 - 78% of adolescents and adults; and by approximately 40% of children. A recent Croatian study conducted on 312 respondents showed that 45.5% use dietary supplements almost all year round, 18% use them several times a year, 26.9% only when they feel the need, and 9.6% have tried food supplements several times.
It is obvious that supplementation has become an integral part of today's busy culture; therefore, the purpose of this presentation is to speak about the current scientific evidence addressing the real need for supplementation of certain substances.
The most researched supplement today is vitamin D, followed by vitamin C, and other vitamins. Of all minerals, calcium has been the most researched, & magnesium is becoming an increasingly popular supplement. According to the research results available to date, it is important to point out that dietary supplements are not universally needed & may not represent a substitute for a healthy, balanced diet. However, they can be beneficial for certain individuals or groups, particularly those at risk of nutrient deficiencies, which include pregnant women, older adults, patients with specific medical conditions, and individuals who restrict certain food groups.

Keywords: dietary supplements, vitamins, minerals, supplement use, supplementation

CONSUMER ATTITUDES ON FUNCTIONAL FOOD IN THE BRČKO DISTRICT

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poster presentation

Functional food is food that, in addition to the basic energy and nutritional value, positively affects one or more targeted functions of the body, reducing the risk of developing certain diseases. The paper aims to analyze the attitude of consumers in the Brčko District towards functional food and how it influences the desire to consume it; whether a healthy lifestyle influences a positive attitude towards functional food, whether there are things that motivate or prevent consumers from leading a healthy lifestyle, and whether the consumption of functional food has increased among consumers who eat healthier. The method used was a survey questionnaire adapted from the research of Küster-Boluda & Vidal-Capilla, Downes and Urala & Lähteenmäki. The results obtained during the research were statistically processed using SPSS 22.0 Software Inc USA. The research was conducted on 142 respondents from the Brčko District via an online questionnaire that contained 18 questions, 7 of which related to general information that provide a picture of the respondents and categorize them into groups. Generally, barriers that correlate with the implementation of good habits are the inability to afford vegetables every day and living in an area where it is not possible to perform physical activity outside the home. The connection between consumers and respondents who eat healthily and their consumption of functional food, or rather their desire and positive attitude towards it, was confirmed. The motives for adopting healthy habits are preserving health and achieving or maintaining the desired body weight. Analysis of barriers to healthy habits shows that the belief that such habits require extra time is still common, although they actually support and enhance regular activity. Recognition and knowledge of functional foods has resulted in the conclusion that labeling should, and is, mandatory, be clear and concise to the extent that it meets the goal, that is, reaches the potential and desired "audience". Possession of healthy habits and awareness of their benefits is at a relatively low level and the lack of habits for "small" good habits, such as eating fruits and vegetables in the daily diet, is deeply ingrained. Around 50% of respondents do not agree that they have good lifestyle habits, while 40% of respondents have a negative attitude towards the positive effects of consuming functional foods. The motives for good lifestyle habits for 50% of respondents are to be healthy. 42% of them had a positive attitude towards functional foods, while 46% of them had a negative trust towards functional foods.

Keywords: functional food, attitudes, Brčko District, Bosnia and Herzegovina

VALORIZATION OF *ROSA CANINA* L. PEEL AND SEEDS HERBAL DUST WITH GREEN EXTRACTION TECHNIQUES

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poster presentation

This study aimed to investigate the extraction of phenolic compounds from *Rosa canina* L. seeds and peel herbal dust by-products using Ultrasound-Assisted Extraction (UAE) with a sonotrode and Subcritical Fluids Extraction (SBFE). The extractions were performed under definite temperature (120°C, 140°C, 160°C and 180°C for SBFE) and time parameters (3 and 10 min for UAE), using three different solvents, ethanol 96%, pure water, and ethanol-water (50:50). Quantitative analysis was conducted using HPLC-PDA, while qualitative analysis was performed using (HR) LC-ESI-QTOF MS/MS. The main phenolic compounds identified in both by-products included gallic acid derivatives, ellagic acid, and flavonoids such as quercetin and quercetin-3-*O*-glucoside (only in the peel). Furthermore, the Folin-Ciocalteu's assay was employed to establish the Total Phenolic Content (TPC). The highest TPC for SBFE was observed in samples extracted with ethanol-water (50:50) at 140°C, yielding 2637.86 Gallic Acid Equivalent (GAE) mg/L for peel and 1030.00 GAE mg/L for seeds. For UAE, the highest TPC was obtained with ethanol-water (50:50) at a 10 minute extraction time, resulting in 2773.81 GAE mg/L for peel and 957.86 GAE mg/L for seeds. These findings reveal the considerable phenolic content in *Rosa canina* L. peel and seeds herbal dust by-products during filter tea production, indicating its potential exploitation in the health, food, cosmetic, nutraceutical, and pharmaceutical industries.

Keywords: by-products, phenolic compounds, HPLC-PDA, LC-MS/MS, green extraction techniques

NOVEL APPROACHES IN PLANT - BASED MILK ALTERNATIVES PRODUCTION

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poster presentation

The demand for functional foods has spread rapidly due to the growing awareness of the impact of nutrition on health and the prevalence of lifestyle-related diseases. Their composition is diverse and contains functional ingredients such as bioactive compounds, vitamins, minerals and essential fatty acids. Functional beverages that have recently become particularly prominent are plant-based milk alternatives (PBMAs). PBMAs are oil-in-water emulsions produced by homogenising plant material with water in a specific ratio. PBMAs are on the rise due to their wide range of bioactive compounds, like phenolic compounds and terpenoids, which are rich in dietary fiber, do not contain cholesterol, and lactose. The emerging plant matrices are quinoa, hemp seeds, and potatoes that contain ingredients with high bioavailability without allergens like gluten or soy, and could be considered as low-calorie food. Traditional production methods have been complemented by innovative technologies that significantly improve the nutritional value, texture and stability of the final product, which can otherwise be lost during preparation, and are efficient in removing existing antinutrients from the plant material. A few non-thermal and thermal technologies that stand out in the effectiveness of the production of PBMAs are ultrasound, high-pressure processing, ultraviolet radiation and ultra-high temperature processing. In addition to traditional chemical fortification, there are innovative approaches used to enrich the final nutritional and sensory properties, such as enzymatic treatment and fermentation. Consumption of these alternatives enables several health benefits, including anti-hypertensive, anti-diabetic, anti-inflammatory, and antioxidative properties, and further manages conditions such as diabetes and cardiovascular diseases.

Keywords: functional foods, plant-based milk alternatives, fortification, health benefits

ANTIOXIDANT POTENTIAL AND PHYSICOCHEMICAL CHARACTERISTICS OF PROPOLIS FROM UNA-SANA CANTON

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poster presentation

Propolis is a natural bee product rich in biologically active compounds, known for its antioxidant, antimicrobial, and anti-inflammatory properties. The aim of this study was to examine and compare the antioxidant activity and physicochemical characteristics of propolis samples collected from five locations in the Una-Sana Canton, Bosnia and Herzegovina. Antioxidant activity was determined using spectrophotometric DPPH and FRAP methods. The DPPH test showed similar free radical scavenging capacity across all samples, while the FRAP method revealed significant differences in reducing power, likely due to variations in the concentrations of flavonoids and polyphenols associated with different botanical origins. Physicochemical analyses included the determination of moisture, ash, wax, and balsam content. The results indicated good quality and appropriate storage conditions of the samples, while the variability in wax content may suggest the presence of impurities. The sample from Bihać, with the highest balsam content, demonstrated the greatest biological potential. In addition, total phenolic and flavonoid contents were determined, along with colourimetric parameters (L*, a*, b*) to assess the visual characteristics of the samples. The highest total phenolic content was recorded in the sample from Bosanski Petrovac, and the highest flavonoid content in the sample from Cazin. Darker colour shades were associated with higher total phenolic content, while more pronounced yellow tones were linked to higher flavonoid content. The results confirm the importance of geographical origin and botanical diversity on propolis quality and support the use of colourimetry as a rapid method for preliminary quality assessment.

Keywords: propolis, antioxidant activity, phenolics, flavonoids, Una-Sana Canton

UNLOCKING THE POTENTIAL OF BERRY BY-PRODUCTS: A SUSTAINABLE AND HEALTH-BOOSTING APPROACH TO FOOD INNOVATION

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invited lecture

Berries are known worldwide as fruits with attractive flavour and as compact nutrient stores that provide a complex matrix of vitamins, minerals, carbohydrates, fibre and a variety of bioactive compounds (BACs) - all with emerging potential to regulate health and disease pathways. Fruit processing produces large quantities of berry by-products such as pomace, stems and leaves, which are rich in phenolic compounds and other phytochemicals that provide various health benefits, including antioxidant, anti-inflammatory and antimicrobial effects. In recent years, great efforts have been made to utilise berry by-products, which offer significant opportunities for sustainable development in the food industry through the extraction of valuable BACs with health-promoting properties. Advanced extraction techniques such as ultrasound-assisted extraction, microwave-assisted extraction, pressurized liquid extraction and supercritical fluid extraction have been developed to increase yield, selectivity and efficiency while minimising environmental impact. Encapsulation technologies further stabilise BACs and improve their solubility, bioavailability and shelf life so that they can be used in functional foods, beverages, baked goods, dairy and meat products. Despite challenges in terms of variability, safety and sensory properties, these innovations support waste reduction, promote environmentally friendly packaging solutions and expand the market for health-orientated products. Future research should focus on optimising large-scale extraction processes, exploring microbial and enzymatic fermentation and developing biodegradable biopolymers from berry waste. Overall, the utilisation of berry by-products not only creates economic added value, but also contributes to sustainable food production, health promotion and the reduction of environmental pollution, aligning with global efforts toward a circular bioeconomy.

Keywords: berry by-products, bioactive compounds, extraction techniques, sustainability, food innovations

FOOD VS. INFLAMMATION: CAN FUNCTIONAL FOODS TAME CHRONIC INFLAMMATION?

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poster presentation

Functional foods are gaining recognition for their role in preventing and managing chronic inflammatory diseases, primarily due to their inherent anti-inflammatory and antioxidant effects. Accordingly, a systematic literature search was conducted in PubMed/MEDLINE, ScienceDirect, and ResearchGate, focusing on studies from 2020 to 2025 related to functional food and chronic diseases. Only open-access randomized controlled trials on human subjects were included, with the selection process illustrated using a PRISMA flow diagram, resulting in 37 studies meeting the inclusion criteria. It was found that key bioactive components such as polyphenols, flavonoids, omega-3 fatty acids, and probiotics have shown potential in modulating immune responses and lowering inflammation. Research indicates that certain foods, including turmeric, berries, green tea, garlic, and oily fish, have been associated with improvements in conditions like rheumatoid arthritis, inflammatory bowel disease, and metabolic syndrome. These benefits are thought to result from mechanisms such as regulation of cytokine activity, reduction of oxidative stress, and modulation of the gut microbiota. Bioactive compounds in functional foods may reduce inflammation and improve symptoms of chronic diseases. Despite encouraging results, current evidence is limited by short study durations and small sample sizes, warranting further robust research for clinical validation and guidance.

Keywords: bioactive compounds, chronic diseases, functional foods, gut microbiota

THE ROLE OF NUTRITION IN ENHANCING ENDOMETRIAL RECEPTIVITY DURING IVF

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poster presentation

Endometrial receptivity – the ability of the uterine lining (endometrium) to accept and support an embryo is a critical factor in the success of embryo implantation during in vitro fertilization (IVF). While ovarian stimulation protocols and embryo quality have been widely standardized, increasing attention is being paid to optimizing the uterine environment, particularly through lifestyle modifications such as nutrition. In recent years, growing attention has been directed toward nutritional protocols that may improve endometrial quality and increase the chances of pregnancy. An optimal diet can have anti-inflammatory effects, promote better blood flow to the uterus, and support hormonal balance – factors that all contribute to a favourable environment for implantation.

The Mediterranean diet, rich in fruits, vegetables, whole grains, olive oil, and omega-3 fatty acids, has shown positive effects on fertility and endometrial receptivity. For women undergoing IVF, it is also recommended to consume foods high in antioxidants while avoiding processed foods and refined sugars, which may trigger inflammation.

Supplements such as vitamins D, E, and C, folic acid, coenzyme Q10, and L-arginine are often included in fertility protocols. These compounds support endometrial tissue regeneration, improve microcirculation, and enhance cellular energy production. Additionally, there is increasing interest in the role of probiotics and the proper function of the gut and endometrial microbiome in reproductive outcomes.

Individualized nutritional approaches – developed in collaboration with nutritionists and reproductive specialists – represent a valuable complement to standard IVF protocols. These strategies can positively influence the outcome of infertility treatment by creating a more receptive uterine environment and supporting overall reproductive health.

Keywords: IVF, endometrium, nutrition, diet, supplements

DEVELOPMENT OF QUALITY FILLING FOR HONEY COOKIES: FUNCTIONAL PROPERTIES, SENSORY QUALITY AND CONSUMER ACCEPTABILITY

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poster presentation

Since bee products are beneficial for human health, the aim of this study was to evaluate the nutritional, functional and sensory characteristics of biscuits with a new filling formulation based on bee products and fruit filling. The content of natural and total sugars, the content of bioactive components, and the sensory quality and acceptability of the product were monitored in the produced biscuits. Bearing in mind the importance of bioactive components, it could be concluded that all biscuit variants are a rich source of bioactive compounds. The results showed that this type of food would be an excellent alternative for preserving bioactive compounds such as antioxidants and phenolic components. The sensory properties of the samples were mainly influenced by the type of filling used. The new biscuit filling formulations significantly improved the sensory properties of the product, especially its smell, aroma, and taste. The acceptability test of biscuit samples with filling showed good acceptance by potential consumers, as well as a better sensory result of taste and aroma than biscuit samples without filling. Finally, the obtained results represent a good basis for further optimization of ideal ratios of new functional fillings for the production of honey biscuits characterized by good functional, nutritional, and sensory properties.

Keywords: bioactive components, bee products, honey, functional properties

FOOD ENGINEERING FOR HEALTH IMPACT: IN-VITRO ASSAY FOR CANCER CELL VIABILITY AND PROLIFERATION TO SCREEN ANTI-CANCER BIOACTIVITY OF FRUIT, VEGETABLE AND FUNGI SOURCES AND SELECT TECHNOLOGIES FOR THEIR PROCESSING AND PRESERVATION

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invited lecture

Objectives of this presentation are i) investigate potential for maximization of health-promoting functionality/retention of bioactive compounds of fruit, vegetable and fungal materials by novel methods for continuous flow microwave processing; ii) use established assays to evaluate anti-cancer activity of tested materials; iii) use obtained results for screening, strategic decision-making, selection of materials, varieties, ingredients and processing methods. *In-vitro* MTT assay (well established, rapid, colorimetric technique) was selected for cancer cell viability and proliferation to screen potential anti-cancer bioactivity of fruit, vegetable and fungi sources and comparisons with clinically established effective chemotherapeutic drugs for colorectal cancer cell and glioblastoma cell cultures. As a result, for each tested group of materials (berry fruits, stone fruits, root vegetables, purple-fleshed sweetpotatoes, mushrooms) and for each tested cancer cell culture, at least one or more material has been identified as possessing a comparable or higher anti-proliferative efficiency compared to the respective clinically established chemotherapeutic substance for each of the tested cancer types (temozolomide for glioblastoma cells, 5-fluoroacil for colon cancer cells).

Keywords: anti-cancer bioactivity, fruit, vegetable and fungi sources, food engineering

FOODS THAT NATURALLY STIMULATE GLP-1 SECRETION IN PEOPLE WITH OVERWEIGHT AND OBESITY

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poster presentation

Over the past 40 years, the concept of overweight and obesity has become an increasing public health challenge, both in the world and in Croatia. The aim of this review is to provide insight into foods that can naturally stimulate the secretion of incretin hormones and thus help in weight reduction. Glucagon-like peptide 1 (GLP-1), a gastrointestinal peptide and a central mediator of glucose metabolism, is secreted by L cells in the intestine in response to food intake. Postprandial secretion of GLP-1 is mediated by nutrient sensing via G-protein-coupled transporters and receptors (GPCRs). GLP-1 secretion may be lower in adults with obesity/overweight (OW). However, physiologically stimulated GLP-1 secretion by diet may be a preventive or synergistic method for improving glucose metabolism in individuals with OW. Furthermore, the influence of relevant dietary factors (e.g., specific diets, meal composition and size, phytochemical content, and gut microbiome) that could influence fasting and postprandial GLP-1 secretion is discussed. Meal composition, especially the relationship between macronutrients and microbiome-targeted interventions, can influence postprandial GLP-1 secretion. This paper presents foods that have positive nutritional and physiological stimulations on GLP-1 secretion. In addition, this paper shows that GLP-1 secretion can be exogenously modified through dietary interventions. Foods high in protein, fiber, and healthy fats can trigger the release of GLP-1, an important hormone that helps regulate blood sugar levels and promotes a feeling of fullness. Foods that increase GLP-1 levels are eggs, nuts, high fiber grains, avocado, olive oil, oats, legumes, berries, and leafy vegetables.

Keywords: foods, stimulate secretion, GLP-1, overweight, obesity

ACCEPTABILITY OF NUTRITIONALLY ENRICHED GINGERBREAD

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poster presentation

Gingerbread are sweet cookies with a special taste that makes them a unique and popular dessert. Their characteristic taste comes from honey, spices such as cinnamon, cloves and ginger, and flour with the addition of eggs, dairy additives and fat. In addition to their cultural and gastronomic value, gingerbread also has certain nutritional benefits. The aim of this paper is to present the nutritional profile of gingerbread, highlight the possible functional benefits of their ingredients and point out the possibilities of modification for the needs of modern food trends, including reduced sugar content, gluten-free variants and the addition of dietary fiber. For this purpose, recipes were designed to produce a healthier, nutritionally enriched version of gingerbread. The initial idea was to modify the traditional recipe with more nutritionally acceptable ingredients. Four types of gingerbread were prepared. One according to the traditional recipe and three nutritionally enriched. The nutritional value of each of the four gingerbread samples was calculated according to the recipes set. Sensory methods were used to test the acceptability of the produced gingerbread. The gingerbread prepared according to the traditional recipe had the highest energy value and the highest carbohydrate content, while the gluten-free gingerbread with chia seeds had the lowest energy value and the lowest protein and fat content. Replacing sugar with maple syrup resulted in a lower share of total carbohydrates and a lower energy value. Adding avocado instead of butter resulted in a reduction in fat content. According to the results of the sensory evaluation, the creamy texture and neutral taste of avocado perfectly matched the taste of the gingerbread, and date syrup, as a better alternative to refined sugar, did not affect the sweetness of the final product. Based on the research conducted, it can be concluded that the respondents accepted the gingerbread with maple syrup and date syrup better than the gluten-free gingerbread, which was primarily designed as a dessert for people with celiac disease.

Keywords: gingerbread, honey, spices, functional food, sensory evaluation

NUTRITIONAL STRATEGIES IN CANCER PREVENTION: THE ROLE OF CALCIUM IN COLORECTAL CANCER

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oral presentation

This study investigates the role of calcium-rich foods in the prevention of colorectal cancer. It examines the relationship between dietary calcium intake and the risk reduction of these malignancies. Colorectal cancer is a major public health problem, with diet being one of the most influential modifiable risk factors. Calcium, a vital nutrient essential for bone health, also plays an important role in cellular processes, including the regulation of cell growth, apoptosis and gene expression. Recent studies suggest that calcium may inhibit the proliferation of cancer cells, particularly in the colon and rectum, by binding to bile acids and fatty acids, thereby reducing their carcinogenic effects. Through a comprehensive review of recent clinical trials, epidemiological studies and animal models, this article highlights the biological mechanisms by which calcium influences cancer cell behaviour and the gut microbiome. It also examines how different sources of calcium – such as dairy products, green leafy vegetables and fortified foods – affect the reduction of colorectal cancer risk. New evidence suggests that a higher calcium intake may not only reduce the risk of developing colorectal cancers, but also reduce the recurrence of these cancers in patients with a previous diagnosis. The study concludes with a call for further longitudinal studies to clarify the exact mechanisms behind the protective effects of calcium and to develop targeted dietary guidelines for cancer prevention. These findings are crucial for public health recommendations as they emphasise the potential role of calcium in reducing cancer risk through dietary interventions.

Keywords: calcium, colorectal cancer, nutritional strategies, prevention, dietary intake

HEALTH BENEFITS OF FRUIT VINEGARS

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poster presentation

Fruit vinegars, which are produced by alcoholic and acetic fermentation of fruit substrates, are increasingly recognised as functional foods with potential health benefits. Their biological value results from the presence of organic acids (especially acetic acid), polyphenols, flavonoids, vitamins, minerals and other bioactive compounds derived from the fruit and microbial metabolism during fermentation. Numerous studies have reported antioxidant, antimicrobial, hypolipidemic and hypoglycaemic effects of fruit vinegars, particularly those made from apple, plum and grape. Favourable results have also been observed in the regulation of body weight, glucose and cholesterol metabolism and in maintaining the health of the intestinal microbiota. In addition, the presence of specific phenolic compounds can contribute to the prevention of oxidative stress and chronic non-communicable diseases. The biological activity of fruit vinegars is strongly influenced by the type of fruit used, the production methods, the microbial dynamics and the duration of fermentation. Despite the growing body of evidence, further clinical studies are needed to confirm their efficacy, safety and optimal dosage for human consumption. The aim of this review is to consolidate the current knowledge on the composition, mechanisms of action and potential applications of fruit vinegars to promote human health, focussing on evidence-based findings and future research perspectives.

Keywords: fruit vinegar, bioactive compounds, functional food, antioxidant activity, human health

PORK BLOOD PLASMA AS A PROTEIN SOURCE IN FUNCTIONAL COCOA CREAM PRODUCTS

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oral presentation

Pork blood plasma is a purified protein derived from pork blood, a by-product of the meat industry. With increasing food overconsumption leading to greater waste generation, valorizing such by-products offers a sustainable solution to reduce waste. One approach is to isolate and purify proteins from by-products and incorporate them into food products to enhance their nutritional value i.e. confectionery products. Cocoa cream products are widely consumed confectionery items consisting of cocoa, sugar, and milk powder particles dispersed in vegetable fat. While they are highly palatable, their composition is typically characterized by high sugar and fat content with relatively low protein levels. In response to growing consumer demand for healthier alternatives, the food industry has been actively exploring ways to improve the nutritional profile of such products. However, reformulating confectionery items requires careful consideration of factors such as texture, taste, and overall sensory acceptability to ensure consumer satisfaction. This study aimed to evaluate the potential of pork blood plasma as a protein source for developing a nutritionally improved cocoa cream product. Formulations enriched with different concentrations of pork blood plasma (10, 12.5 and 15%) were analyzed for particle size distribution, rheology, color, and sensory properties.

Keywords: pork blood plasma, protein, by-product, confectionery, cocoa cream product

FUNCTIONAL BREAD WITH CAROB PULP FLOUR AND CAROB POWDERED EXTRACT

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poster presentation

Carob pulp flour (CF), derived from the dried pods of the carob tree (*Ceratonia siliqua* L.), is gaining attention as a functional ingredient in food products. Although CF is rich in dietary fibers, minerals and polyphenols and thereby offers several health benefits, it remains insufficiently utilized for human nutrition. In the aim to valorize CF by developing functional carob bread, two approaches were applied. First, 15% of wheat flour was substituted with CF (sample CFB). Obtained sample represented special bread type due to characteristics that differ from white bread. In order to achieve satisfactory physical properties and sensory attributes, 10% of commercial dry sourdough was added into CFB raw material composition. Secondly, the extraction of bioactive compounds from CF was performed using microwave-assisted extraction with previously optimized conditions: irradiation power 600 W, time 25 min, ethanol concentration 40% (w/w) and liquid-to-solid ratio 30 mL/g. The obtained extract (CE) was spray dried with the addition of maltodextrin as a carrier, and as such was introdcued into bread formulation in the amount of 5% (sample CEB). Mentioned sample had similar characteristics as the white bread and could be classified as a basic bread type. The content of K, Ca, Mn and Cu was higher in both CFB and CEB compared to control white bread. Furthermore, both samples had higher content of dietary fibers (soluble and insluble) in regards to the control, while TDF content in CFB was sufficient for the nutritional claim "high in fiber". Polyphenols identified in CFB and CEB were: gallic acid, chlorogenic acid, caffeic acid, rutin, quercitrin and quercetin. Higher quantities of listed compounds were present in CFB compared to CEB. In control bread only chlorogenic acid was detected.

Keywords: carob, bread, dietary fibers, mineral content, polyphenols

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EXPLOITATION OF WILD CARDOON (*CYNARA CARDUNCULUS* VAR. *SYLVESTRIS*) LEAF BY-PRODUCT: EXTRACTION OPTIMIZATION, PHENOLIC PROFILE, ANTIOXIDANT ACTIVITY AND NANOFORMULATION

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poster presentation

Wild cardoon (*Cynara cardunculus* L. var. *sylvestris* (Lam.) Fiori) is an endemic plant of the Mediterranean basin with food and health applications. Fresh wild cardoon leaf waste product was extracted with either a 20:80% v/v EtOH:H_2O or an 80:20% v/v EtOH:H_2O mixture. The quali-quantitative profiles of the extracts were analysed by (HR) LC-ESI-QTOF MS/MS and HPLC-PDA, revealing hydroxycinnamic acids as the predominant phenolic compounds (121.37 ± 0.88 mg/g dr for 80:20% v/v EtOH:H_2O and 13.38 ± 0.11 mg/g dr for 20:80% v/v EtOH:H_2O), followed by flavonoids (37.87 ± 0.40 mg/g dr for 80:20% v/v EtOH:H_2O and 15.93 ± 0.18 mg/g dr for 20:80% v/v EtOH:H_2O). Total polyphenol content was determined via the Folin–Ciocalteu's assay, showing a significantly higher concentration in the 80:20% v/v EtOH:H_2O extract (237.19 ± 6.47 mg GAE/g dr). Antioxidant and free radical scavenging activities were assessed using DPPH$^{\bullet}$, ABTS$^{\bullet+}$, CUPRAC and FRAP assays, consistently demonstrating enhanced activity for the 80:20% v/v EtOH:H_2O extract. This extract was incorporated into nanosized enteric polymer-coated liposomes that exhibited a high entrapment efficiency of the extract's bioactive marker compounds. The nanoformulation showed stability during storage and in fluids that simulate the stress conditions of the gastrointestinal tract. This study shows that wild cardoon leaf waste can be a useful source of antioxidant (poly)phenols and highlights the importance of choosing the right solvent to maximise extraction efficiency. Overall, these findings are intended to optimize the application of *C. cardunculus* var. *sylvestris* extracts in pharmaceutical, nutraceutical, and cosmetic products.

Keywords: by-products, wild cardoon, phenolic compounds, antioxidants, nanoformulation

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FOOD SAFETY

SELECTED TECHNIQUES FOR THE DETECTION AND REMOVAL OF HEAVY METALS FROM WASTEWATER

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poster presentation

Heavy metal contamination represents one of the major environmental challenges of the modern era. Their presence in the environment is primarily attributed to natural and industrial processes, and household activities. The uncontrolled discharge of wastewater into the environment often results in serious ecological and public health consequences. As heavy metals are non-biodegradable, they tend to bioaccumulate in living organisms. Consequently, the removal of heavy metals from contaminated media has become a matter of critical concern. A broad range of conventional and advanced treatment technologies has been developed and implemented to address this issue. Commonly employed methods include chemical precipitation, coagulation, flocculation, flotation, ion exchange, adsorption, and membrane filtration. While each of these techniques offers specific advantages, they also present limitations in terms of efficiency, cost-effectiveness, and applicability under varying environmental conditions. In addition to conventional approaches, advanced oxidation processes and electrochemical methods: electrodeposition, electrocoagulation, and membrane electrolysis, are increasingly being explored for their effectiveness in heavy metal removal. The selection of the most appropriate treatment method depends on multiple factors, including the composition and volume of the wastewater, initial metal concentrations, pH levels, capital and operational costs, and overall environmental sustainability. For the detection and quantification of heavy metal concentrations before and after treatment, various electrochemical techniques can be employed. These include cyclic, square wave, differential pulse, anodic stripping, cathodic stripping, and adsorptive stripping voltammetry. These methods offer high sensitivity, selectivity, and potential for real-time monitoring of metal ions in complex matrices.

Keywords: heavy metals, wastewaters, electrochemical methods, detection tehniques, removal techniques,environment

MICRO PARTICLES – MACRO PROBLEMS: THE THREAT OF MICROPLASTICS TO THE HUMAN FOOD CHAIN AND HUMAN HEALTH IN LIGHT OF TWO DECADES OF RESEARCH ON MICROPLASTIC POLLUTION

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invited lecture

Microplastics (MPs) are aptly described as ubiquitous in the environment, meaning that they are everywhere. This fact raises concerns about the potential uptake of microplastics into the human food chain, and research studies over the past two decades have shown that humans ingest plastic from a variety of sources. The extent of the risk of environmental pollution from MPs with its negative impact on the food chain and therefore on human health is emphasised in this paper. A detailed account of these contaminants in relation to the food categories most at risk of contamination and the disruption mechanisms at the level of living food sources, but also in the body, helps to paint a more complete picture of the devastating effects of microplastics on the environment and the safety of food intended for human consumption. In addition, this work will highlight the potential damage caused by microplastics in various human organs and systems and emphasise the need for further research into their mechanisms of action. MPs such as polystyrene, polypropylene and polyethylene have a significant impact on human health as they cause inflammation of the respiratory and gastrointestinal tracts, impair immune function and increase the risk of cardiovascular disease and neurotoxicity. These effects are largely attributed to MP's role in disrupting hormone regulation, which can lead to reproductive disorders and an increased risk of cancer.

Keywords: microplastics pollution, food chain, human health

MYCOTOXINS IN BEE POLLEN: IMPLICATIONS FOR HONEYBEE HEALTH AND HUMAN CONSUMPTION

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oral presentation

Bee pollen is a mixture of pollen, nectar and honeydew. It contains numerous nutrients, including proteins, carbohydrates, fatty acids, minerals, and vitamins, as well as bioactive components such as polyphenols and carotenoids. While essential for honeybees, these constituents are also important in human nutrition. Thanks to its rich nutritional composition, bee pollen is widely used in food supplements, functional foods, and even traditional medicine. However, there is a risk of possible contamination of pollen with mycotoxins.

Mycotoxins, toxic low-molecular-weight secondary metabolites produced by certain fungi, are commonly found in plant materials, e.g. grains, fruits, and pollen. The most common mycotoxins in bee pollen are aflatoxins, trichothecenes, zearalenone, ochratoxins, and fumonisins produced by the fungal genera *Aspergillus*, *Penicillium* and *Fusarium*. Contamination is usually the result of fungal growth on flowers or plants in favourable humid environments, although other factors, like insect damage, could be necessary for mycotoxin accumulation. The impact of climate change on fungal growth patterns and mycotoxin production is also a growing concern that could exacerbate the contamination problem. Improper storage and handling of pollen in hives, poor storage conditions, e.g. excessive moisture or inadequate ventilation due to weather conditions, may create ideal conditions for further fungal growth. Observed adverse effects of mycotoxins in bee pollen include a shortened honeybee lifespan, altered foraging behaviour and ability to efficiently collect nectar and pollen, a weakened immune system, reduced fertility, and, ultimately, lower hive productivity.

In addition, mycotoxins in bee pollen can affect human health. Given the fact that bee pollen is a highly valued product due to its health benefits, it is important to recognize the risks of mycotoxin contamination. Understanding the sources, aggravating and mitigating factors, as well as prevention approaches is essential to protect both human and honeybee well-being.

Keywords: mycotoxins, honeybees, bee pollen, health risk, food safety

HOW TRADITIONAL APPLE CULTIVARS SAY NO TO INFECTION BY *PENICILLIUM EXPANSUM*

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poster presentation

Penicillium expansum is a widespread necrotrophic plant pathogen that causes blue mould rot in apples during transport, storage and sale. In addition to the reduction of apple quality, secondary metabolism of *P. expansum* leads to the production of the mycotoxin patulin that has a negative effect on human health and food safety. Although the mechanism of apple resistance to fungal diseases has not yet been sufficiently investigated, some studies suggest that polyphenolic compounds can impact fungal growth. Accordingly, attention has been drawn to traditional apple cultivars, which contain higher amount of polyphenolic compounds and antioxidant activity. To contribute with new knowledge, this study deals with monitoring the growth of *P. expansum* on selected traditional (´Wagener´, ´Mašanka´, ´Francuska Kožara´) and conventional (´Granny Smith´, ´Idared´, ´Jonagold´) apple cultivars, patulin detection by LC/MS-MS, determination of polyphenol profile by HPLC-PDA method, and evaluated the effect of polyphenolic compounds on fungal growth and patulin production after harvest. The results showed that traditional apple cultivars contained higher concentrations of polyphenolic compounds and higher antioxidant activity. The highest total polyphenol content was detected in the traditional apple cultivar ´Francuska Kožara´ (812.5 ± 2.05 mg/kg). At the same time, traditional apple cultivars showed higher resistance to infection by *P. expansum* than conventional ones. Patulin was detected only in the conventional apple cultivar ´Idared´ (327.0 µg/kg). Overall, this study highlights the potential of polyphenols in traditional apple cultivars as natural defences against fungal infections.

Keywords: polyphenols, patulin, antioxidant activity, *Malus domestica*

THE IMPACT OF CLIMATE CHANGE ON FOOD QUALITY AND FOOD SAFETY

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oral presentation

The growth of agricultural production and food processing throughout the 20th century has had a profound impact on the environment, contributing to the degradation of freshwater ecosystems, loss of biodiversity, soil depletion, deforestation, and the accumulation of pollutants. These substances are increasingly entering the food chain, posing a direct threat to food security and human health. In recent years, the food industry has faced additional challenges—how to ensure the availability of sufficient quantities of high-quality food while simultaneously reducing greenhouse gas emissions and minimizing negative environmental impacts. Moreover, the industry must comply with increasingly stringent European Union food safety standards. At the same time, it is continuously seeking solutions to strengthen the resilience of the "field-to-fork" chain to the consequences of climate change and the growing frequency of extreme weather events. Climate change poses a serious threat to the production of quality and safe food. Numerous scientific studies have already confirmed its significant negative impact of climate change on the food sector, further undermining its stability and security. Key challenges include: rising average global temperatures; more frequent and intense precipitation events, which increase the presence of mycotoxins in raw materials and food products; the spread of pests and plant and animal diseases to new areas; and the effect of elevated CO_2 levels in reducing the protein, zinc, and iron content of staple crops such as rice, wheat, and corn. This paper presents the results of scientific and expert research on the current and projected impacts of climate change that are most likely to affect the stability of production, quality, and food safety.

Keywords: climate change, food industry, food quality, food safety

FOOD IS NOT WASTE!

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invited lecture

Food waste is a global problem that occurs at all stages of the food production and supply chain. According to the latest statistical data, in the Republic of Croatia, around 286,000 tonnes of food are wasted annually, of which the edible portion amounts to 106,000 tonnes. The results show that around 76% of food waste occurs in households, 14% in primary production, 5% in the hospitality industry, 3% in processing and manufacturing, and 2% in retail and other food distribution. The Republic of Croatia has made a significant step forward in preventing food waste through the implementation of measures and activities contained in the National Food Waste Prevention and Reduction Plan. The objective of the National Plan is to reduce food waste by 30% by 2028. The measures include encouraging and further improvements of the food donation system, promoting food waste reduction, fostering corporate social responsibility in the food sector, raising consumer awareness and knowledge about preventing and reducing food waste, monitoring food waste quantities, and investing in research and innovative solutions that contribute to food waste prevention. Efforts can be seen through the increase of the amounts of donated food. Last year's data compared to data from 2019, when official monitoring began, shows an increase of 20%. All of the mentioned activities and information on the topic can be found at the online platform for food waste prevention, launched by the Ministry of Agriculture, Forestry and Fisheries.

Keywords: consumer awareness, food waste, national plan, prevention, statistical data

HOW TO TURN CHALLENGES INTO OPPORTUNITIES FOR IMPROVEMENT

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oral presentation

Biokom Trendafilov is a company that offers innovative solutions for the safety and hygiene of raw materials, finished products and surfaces throughout the food industry. Our primary goal is to protect human health by safe production and distribution of quality food in the food chain "from field to table". Together with leading scientists and experts, we develop innovative products tailored to the needs of our customers. United by the common cause of preserving human health, we conduct science from the field.

That's how we developed our tests for the detection of antibiotic and aflatoxin residues Biokom. Tests are available in different options and for different types of milk.

Another innovation is our newest product for effective cleaning and biofilm removal is a natural cocktail of 7 enzymes managed specifically for each industry. They clean as in closed systems and on open surfaces. Our enzymes are the best weapon in the fight against the spread of bacteria and viruses because they clean permanently, efficiently and with less actions, saving resources.

By using our enzyme solutions, you GUARANTEE yourself a longer product shelf life, increased quality and productivity, reduction of corrosion.

For safe and sustainable hygiene in production, it is necessary to have appropriate monitoring after the good, enzymatic cleaning.

EnSURE® Touch is our elegant and rapid solution to verify the level of hygiene and taking corrective action immediately. With EnSURE® Touch, in just 10 seconds, you can report an apparently clean surface that could lead to contamination as really clean or not. In addition to analyzing the level of hygiene, the system also comes with an option for a rapid microbiological control in 6 hours. Information from all results is stored on the SureTrend® Cloud software. Through visualization in the software, you have a comprehensive overview of the status of your production lines, which helps you identify critical areas and manage and eliminate the risk.

Keywords: quality, monitoring, ATP, enzyme, tests

MICROBIAL SYNERGY FOR A GREENER FUTURE THROUGH PHB PRODUCTION FROM SUGARS

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oral presentation

Biopolymers are natural macromolecules derived from living organisms, increasingly studied due to their biodegradability and potential to replace synthetic plastics. Among them, polyhydroxyalkanoates (PHAs), particularly polyhydroxybutyrate (PHB), are prominent due to their favorable material properties and microbial origin. PHAs are typically produced under conditions of excess carbon and limited nitrogen via submerged fermentation (SmF).
In this study, a series of SmF experiments were conducted over a period of five days using the bacterial strain *Cupriavidus necator*. The experiments were designed to evaluate the influence of different carbon sources on PHA production. In the first three setups, fructose, glucose, and a defined mixture of fructose, glucose, and sucrose were used as primary substrates. The final experimental setup introduced a mixed microbial culture composed of *C. necator* and *Pseudomonas putida*, in order to explore the potential benefits of microbial synergy in PHA production. In addition to pure sugar substrates, fermentable sugars derived from the pretreatment of agroindustrial food waste were also incorporated into the fermentation medium. This waste originated from the food processing company, Podravka d.d., and was subjected to a hydrolysis procedure to release monosaccharides suitable for microbial metabolism. The inclusion of these sugars aimed to investigate the feasibility of using food industry by-products as cost effective and sustainable carbon sources for biopolymer production.
PHB was successfully synthesized in all setups, with a maximum yield of approximately 60%. The produced polymer was identified and confirmed using gas chromatography–mass spectrometry (GC-MS).

Keywords: SmF, *Cupriavidus necator, Pseudomonas putida, sugars, PHB, GC-MS*

This research was conducted as part of the project „Production and development of compostable packaging from waste biomass for the packaging of industrially processed food products" (NPOO.C3.2.R3-I1 .04.0059) funded by National Recovery and Resilience Plan (funded by the European Union, NextGenerationEU).

INCREASED SHELLFISH TOXICITY DUE TO THE PRESENCE OF OKADAIC ACID IN RAŠA BAY, CROATIA

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oral presentation

Toxicological studies on rodents have shown that okadaic acid (OA) is widely distributed in organism after oral ingestion and has pronounced cytotoxic, genotoxic, neurotoxic and tumour-promoting effects. There is also increasing evidence that the toxins of the OA group affect fish populations by impairing behaviour and survival at different life stages, which is a significant ecological problem. In addition to bivalves, fish - especially planktivorous species - can also act as vectors for marine biotoxins and contribute to their transmission through higher levels of the food chain. Climate change and increased anthropogenic activities are increasing the frequency and intensity of harmful algal blooms. In spring 2025, elevated toxicity levels were detected in Mediterranean mussels harvested in the Bay of Raša, Croatia due to the accumulation of OA. During one month, OA concentrations ranged from 40.08 to 208.66 µg OA equivalents/kg, with one third of the samples exceeding the maximum permitted level (MPL) of 160 µg OA equivalents/kg. Although shellfish harvesting was suspended during the peak of toxicity to prevent acute poisoning, shellfish with OA levels below the MPL may still have reached the market. This poses a potential risk of exceeding the acute reference dose (ARfD) for consumers of large portions (400 g, as defined by EFSA), increasing the risk of chronic toxicity. These findings emphasise the potential for long-term adverse effects of OA on both human health and marine ecosystems - even at concentrations below those that cause acute symptoms. Continued research, comprehensive monitoring of marine biotoxins in seafood beyond shellfish, and re-evaluation of current maximum levels are essential to mitigate the risks associated with acute and chronic exposure to this toxin.

Keywords: okadaic acid, marine biotoxins, mussels, toxicity

FOOD-SIGNATURE TRACING THROUGH AI AND MULTIOMICS

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poster presentation

Food-signature tracing through multiomics merges high-resolution molecular read-outs to map what we eat far more objectively than questionnaires. Metabolomics captures thousands of small-molecule diet derivatives and host metabolites; lipidomics resolves food-specific alkyl-resorcinols, odd-chain fatty acids and carotenoids; while metagenomics links gut-microbial genes to fibre, polyphenol and amino-acid fermentation. By integrating these layers with machine learning, researchers can reconstruct complex dietary patterns, quantify compliance and reveal biosynthetic steps that connect diet to physiology. Early proof-of-concept comes from the COPSAC2010 pregnancy cohort, where 1) a composite plasma–microbiome "Western diet" score—distilled from validated food biomarkers—predicted offspring ADHD and autism risk, emphasising the developmental importance of maternal nutrition and 2) a toxicology study using food-related xenobiotics showing risk compounds existing in the blood samples.

Keywords: food-signature, multiomics, COPSAC2010

CUMULATIVE RISK OF PERSISTENT ORGANIC POLLUTANTS (POPs): CHALLENGES IN EXPOSURE AND REGULATION

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poster presentation

Persistent organic pollutants (POPs) are chemicals that degrade slowly in the environment and remain present for long periods of time. Due to their lipophilic nature, they accumulate in living organisms, and their toxic effects – even at low concentrations – can lead to adverse health effects, including endocrine disruption, neurotoxicity, and carcinogenicity. Humans are constantly exposed to these substances through all environmental media, and workplace exposure may be the main route of intake in certain occupational groups. Individuals may be exposed to various chemicals via multiple sources and exposure pathways, with additive, synergistic ("cocktail effect") or antagonistic interactions. Legislation often assesses each substance individually, ignoring cumulative exposure and the cocktail effect, which is of particular concern as it can lead to an underestimation of health risks. In vulnerable groups, adverse effects may occur at lower exposure levels than in the general population, underlining the need for targeted prevention and monitoring. Exposure assessment is based on data from dietary habits, environmental measurements and biomonitoring. By summing the hazard quotients (HQ) of substances acting on the same target system, a hazard index (HI) is calculated, which indicates the potential risk. While assessments are often based on additive effects, the possibility of synergistic interactions leads to considerable uncertainty and may lead to underestimation of cumulative risk. Effective management of cumulative risk requires an urgent redefinition of regulatory approaches which still do not take combined exposures into account. Mandatory assessment of mixture effects, stronger legal protection of vulnerable groups and systematic integration of biomonitoring into national health policies are essential for timely risk identification and prevention.

Keywords: persistent organic pollutants, cumulative exposure, adverse effect, endocrine disruptors, risk assessment

CAFFEINE REMOVAL FROM CONTAMINATED WATER USING MODIFIED BIOCHAR

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poster presentation

Caffeine has emerged as a contaminant of concern due to its presence in wastewater and surface waters. Although not classified as highly toxic, studies indicate caffeine may negatively impact aquatic organisms, including algae, invertebrates, and fish. In Slovenia, nationwide monitoring between 2020 and 2023 detected caffeine concentrations ranging from 0.018 to 1.5 µg/L in rivers such as the Ledava, Bloščica, Ljubljanica, and Drava.

To mitigate this contamination, an adsorption treatment was developed using biochar (BC) derived from wood biomass, sieved to 63 – 128 µm. Three BC variants were tested: unmodified, acid-treated (1 M HCl), and sequentially treated with acid (1 M HCl) and base (1 M NaOH). Batch adsorption experiments were conducted, adsorbing caffeine from a 20 mg/L solution onto BC for two hours under controlled conditions. UV-Vis spectrophotometry quantified the adsorbed caffeine. Experiments varied solution pH (3 – 10) and BC dosage (3 – 30 mg per 10 mL solution) to identify optimal adsorption conditions.

The findings of the study indicated that the most effective adsorption occurred at a pH of 7 when using BC that had been modified with both HCl and NaOH, achieving a maximum adsorption capacity of 5.50 mg/g and an efficiency of 28.6%, in comparison to a mere 1.70 mg/g for unmodified BC. The optimal dosage of BC, which yielded the highest adsorption capacity of 5.66 mg/g, was determined to be 5 mg. These findings support the potential of chemically modified BC as a low-cost, sustainable adsorbent for caffeine removal from wastewater.

Keywords: caffeine removal, wastewater treatment, biochar modification, water purification

THE OCCURRENCE OF MOLDS ON MAIZE DEPENDING ON THE LOCATION

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poster presentation

The most common molds on maize are *Fusarium*, *Aspergillus* and *Penicillium* species, some of which produce mycotoxins and can therefore significantly affect the quality and safety of the grain and consequently human and animal health. The occurrence of molds varies depending on the location, as climatic conditions, soil type, and cultivation techniques significantly influence the development of molds. In order to determine the types of molds that occur most frequently on corn in different parts of the Republic of Croatia, a total of 67 corn samples were taken from the eastern part (n = 32) and the central part of the Republic of Croatia (n = 35), where this type of grain is one of the most common. The maize samples were taken in the period from October to November 2024. after the harvest. The molds were identified to species level using molecular methods by amplification of genes characteristic of each genus. In the eastern part of the Republic of Croatia, where it is warmer and drier and intensive, repetitive maize cultivation prevails, the occurrence of molds of the genus *Aspergillus* is significant, namely the species *Aspergillus flavus*, followed by *Fusarium*. In central Croatia, the most frequently isolated species were *Fusarium* and *Penicillium*, which are more suitable for growth in humid environments. In both regions, the most frequently isolated species of the genus *Fusarium* was the mycotoxicogenic species *Fusarium verticillioides*. The occurrence of molds of the genus *Cladosporium*, a very widespread genus, is also common in both regions. It is not a typical producer of mycotoxins, but is often found in damaged and poorly developed grains. As mold genera have been isolated in both regions, some of which can produce mycotoxins, regular monitoring and analysis of the grain for mycotoxins is necessary, which is crucial for the safety of the food chain.

Keywords: maize, moulds, Croatia

DEOXYNIVALENOL (DON) AND ITS MODIFIED FORM DON-3-GLUCOSIDE (DON-3G) IN MAIZE FROM CROATIAN FIELDS

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poster presentation

Deoxynivalenol (DON), the most abundant trichothecene mycotoxin in nature, is mainly produced by the moulds *Fusarium graminearum* and *Fusarium culmorum*. Previous studies have shown that cereals in Croatia, as in many other European countries, are frequently contaminated with *Fusarium* mycotoxins, with infestation occurring more frequently in colder and rainy periods. DON is associated with health problems as it causes diarrhoea, vomiting, weight loss, gastrointestinal inflammation and immunological disorders, which is why its maximum levels are set in legislation for various categories of food and feed. Its modified and main masked form DON-3-glucoside (DON-3G) is an important plant metabolite that has been recognised as another "emerging" food safety issue in recent decades, but its maximum levels are not set by legislation. In this study, DON and DON-3G were analysed by high-performance liquid chromatography-tandem mass spectrometry (LC-MS/MS) in maize samples (n = 67) from four Croatian regions. DON was detected in 34% of the analysed samples with the highest concentration of 1,483.23 µg/kg, while DON-3G was present in 15% of the total samples and in 39% of the DON-positive samples. DON-3G maximum concentration of 82.86 µg/kg was determined in the maize sample with the highest detected DON concentration. Considering the toxicity of these mycotoxins, further studies should be conducted on their occurrence and synergistic effects in the body as well as on the conditions of biotransformation of DON-3G into DON upon ingestion of contaminated grain into the human digestive tract.

Keywords: trichothecene mycotoxins, *Fusarium*, DON and DON-3-glucoside, biotransformation, maize

UNCOVERING THE DUAL FUNCTIONAL PROFILE OF *PSEUDOMONAS* SPP. IN SPOILED MEAT

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poster presentation

Pseudomonas spp. are common spoilage organisms in chilled meat products, known for their adaptability, biofilm formation, and enzymatic activity. In this study, *Pseudomonas* strains were isolated from spoiled pork, chicken and fish and confirmed at the genus level by sequencing the 16S RNA. We characterized their phenotypic traits, including biofilm formation, pyoverdin production and proteolytic activity at different temperatures (5 °C, 15 °C and 30 °C). In addition, we determined their antimicrobial resistance profile and evaluated their role in interacting with pathogens commonly found in the food environment (*Listeria monocytogenes*, *Staphylococcus aureus*, *Salmonella* Typhimurium, *Campylobacter jejuni*). Based on pyoverdin production, we were able to categorize the strains into two groups, which also differed significantly in terms of biofilm formation and protease activity – two key properties associated with spoilage and persistence in the environment. These activities were most pronounced at 15 °C, suggesting that mild temperature abuse can strongly promote spoilage behavior. Furthermore, screening for antimicrobial resistance revealed resistance to several antibiotics, raising concern about the potential role of these strains as reservoirs of resistance genes in the food environment. Co-culture assays with selected pathogens showed that *Pseudomonas* isolates can modulate the growth of pathogenic bacteria, indicating possible competitive or synergistic interactions relevant to food safety. Overall, our findings underline the dual role of *Pseudomonas* spp. as spoilage organisms and potential contributors to the spread of antimicrobial resistance. The temperature-dependent expression of key traits also emphasizes the importance of strict cold chain management in the meat industry.

Keywords: pyoverdin, temperature effect, meat spoilage, food safety, food quality

The research was financially supported by ARIS (grant. no. Z4-4551, P4-0116).

GLOBAL TRENDS IN WATER AND FOOD SAFETY: THE IMPACT OF CLIMATE CHANGE ON THE QUALITY OF FOOD PRODUCTS

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poster presentation

Nutritious, sufficient, and safe food is vital for individual well-being. However, due to the impacts of climate change, unsustainable food systems have become an increasingly urgent public health issue. A holistic approach, addressing every stage of the food supply chain – from agricultural production to consumption – is essential to anticipate and mitigate potential risks, ensuring food quality and safety throughout the entire "farm to fork" process.

The changing climate is exposing consumers to greater risks from contaminants in both food and water. Rising temperatures, unpredictable extreme weather, and the loss of biodiversity are disrupting food systems and, in turn, threatening public health. These shifts affect soil fertility, water availability, crop yields, and nutrient levels, among other factors. As a result, there is an urgent need to reassess strategies and seek innovative solutions for human adaptation and long-term survival. Poor-quality food and water can elevate the risk of non-communicable and infectious diseases, making this issue even more pressing.

Technological innovations and advanced tools in food and water management, along with sustainable agricultural practices such as climate-resilient crops, offer promising pathways to improve food security. Key innovations like desalination technologies, new filtration methods, water recycling, crop biofortification, targeted food fortification, and blockchain-enabled traceability systems are at the forefront of addressing global food and water security challenges. Furthermore, real-time monitoring through the Internet of Things (IoT), allergen-free product development, biodegradable and smart packaging, and transparent labeling initiatives all play crucial roles in addressing global food and water security challenges.

To protect public health, a multidisciplinary approach integrating sustainable innovation and robust regulatory frameworks will be essential in the years to come.

Keywords: food safety, water, climate change, innovations

PHOTOSYNTHETIC EFFICIENCY DURING FLAG LEAF SENESCENCE AND ELEVATED TEMPERATURES AFFECTS WINTER WHEAT GRAIN YIELD AND QUALITY

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oral presentation

Preserving wheat grain yield and quality in the context of climate change is essential for human nutrition, functional properties in end-use applications, and overall commodity value. In this study, chlorophyll *a* fluorescence from early until late senescence of flag leaves, and agro-morphological traits were compared for three winter wheat advanced lines grown in field conditions in a vegetative season 2020/2021. Temperatures during the investigated season exceeded the 30-year average, especially during grain filling period. Due to similar light intensity and duration, all lines had similar photosynthetic performance and similar grain yield. However, the decrease in photosynthetic performance was less intense in line with the earliest heading date. The other two lines showed a significant decrease in the energetic connectivity between the photosystem II (PSII) units and in the density of active reaction centres per excited cross-section. The earliest line also exhibited the highest test weight compared to the other two lines. We hypothesize that the longer functionality of PSII units in the earliest line contributed to its better agronomical performance. Since the test weight is considered an accurate tool for assessing the overall grain quality of wheat and indicates the environmental conditions to which the wheat plants were exposed during growth, we can assume that the earliest line also had the best grain quality. Such findings imply that even delicate variations in the photosynthetic performance during the grain filling period could assist in selecting genotypes with a greater grain yield and quality under temperature stress conditions.

Keywords: chlorophyll *a* fluorescence, winter wheat, grain yield and quality, temperature stress

FOOD ANALYSIS

IDENTIFICATION OF PHENOLIC COMPONENTS IN EDIBLE *TROPAEOLUM MAJUS* L. LEAVES AND ITS *IN VITRO* DIGESTION

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poster presentation

Plant *Tropaeolum majus* L. belongs to the Tropaeolaceae family and is known for its therapeutic and medicinal properties. *T. majus* is considered an unconventional food plant, and highly valuableedible plant due to the polyphenols, the glucosinolate glucotropaeolin and fatty acids it contains. The phenolic compounds present in plants have high antioxidant activity and their consumption as functional foods may have a positive effect on human health. Static *in vitro* digestion models typically involve three phases (the oral, gastric and intestinal phases) to determine the bioaccessibility of the compounds of interest after digestion. Therefore, the aims of this research were: (1) the extraction of bioactive compounds from fresh *T. majus* leaves by maceration extraction and ultrasound assisted extraction techniques; (2) the *in vitro* digestion of *T. majus* extracts with commercially available enzymes; and (3) the identification of their chemical composition by LC-MS/MS analysis before and after *in vitro digestion*, as well as the investigation of the bioactive compounds' bioaccessibility after *in vitro* digestion.
Overall, the main compounds before and after *in vitro* digestion using commercially available enzymes and using 80% ethanol as the solvent were *p*-hydroxybenzoic acid, protocatechuic and chlorogenic acids. *p*-hydroxybenzoic acid, protocatechuic acid, *o*-coumaric acid, ferulic acid, and chlorogenic acid were the main compounds before *in vitro* digestion and *p*-coumaric acid, *o*-coumaric acid and chlorogenic acid were the main compounds after digestion when water was used as the solvent.

Keywords: Tropaeolum majus L., phenolic compounds, *in vitro* digestion, LC-MS/MS

VOLATILE COMPOUNDS OF WORCESTERSHIRE SAUCE

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poster presentation

Worcestershire sauce is a savory, fermented condiment known for its complex, umami-rich flavor. It originated in the early 19th century in Worcester, England, where it was developed by pharmacists John Wheeley Lea and William Henry Perrins, and introduced to the market in 1837. During the 19th century, sauces like this were especially popular because they added flavor to otherwise bland dishes and helped tenderize tougher cuts of meat. Worcestershire sauce is made from a vinegar base and flavored with ingredients such as molasses, sugar, salt, onions, garlic, tamarind, and anchovies. Depending on the brand, additional flavorings like lemon juice or soy sauce may be used in producing this sauce, giving each product a unique taste. The aim of this study was to identify and compare the volatile compound profiles of Worcestershire sauces produced by four different producers. Volatile compounds were isolated by headspace solid-phase microextraction (HS-SPME) using two fibers of different polarity, and identified by gas chromatography-mass spectrometry (GC-MS). The identified volatile compounds can be classified into several chemical classes, such as carboxylic acids, terpenes, phenylpropanes, and organosulfur compounds. Among these, acetic acid, limonene, eugenol, and caryophyllene were the most abundant compounds. Variations in the aromatic profiles of the investigated samples reflect differences in their formulation and production processes.

Keywords: worcestershire sauce, volatile compounds, HS-SPME, GC-MS

THE USE OF PRICKLY JUNIPER FRUIT (*JUNIPERUS OXYCEDRUS* L.) IN THE PRODUCTION OF GIN

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poster presentation

The aim of this work was to find the major volatile compounds responsible for the aromatic quality of gin samples produced from prickly juniper (*Juniperus oxycedrus* L.) fruit and/or common juniper (*Juniperus communis* L.) fruit and to carry out a sensory evaluation of the samples. Prickly juniper has reddish-brown berry-like fruit, while common juniper, traditionally used for gin production, has dark blue fruit. Gin samples were produced at Family-Farm OPG Marko Duvančić. The coastal area of Croatia and Šibenik-Knin County abounds in prickly juniper while common juniper is not so common in immediate area of family-farm in question. For the production of six gin samples, the same recipe was used with the only difference in the main ingredient: prickly juniper or common juniper or both plants in various proportions. Pomace brandy of 42 vol % ethanol was used as the base; the distillation took place in a 30 L boiler at a temperature of 97 °C. Volatile compounds were isolated by headspace solid-phase microextraction and analyzed by gas chromatography and mass spectrometry. The following sensory properties of gin samples were evaluated: clarity, aroma, taste, aftertaste and overall acceptability. According to the results obtained, prickly juniper gives off a much more pronounced earthy aroma (due to cadenine, cedrol and thujopsene), compared to common juniper where the aroma of conifers dominates (due to alpha-pinene, beta-pinene and limonene). For some sensory properties evaluated, there are statistically significant differences between the samples. Prickly juniper is a promising plant in terms of its medicinal properties, as well as production and promotion of local products derived from it.

Keywords: gin, *Juniperus oxycedrus* L., volatile compounds, sensory evaluation, local products

SELECTED RHEOLOGICAL PROPERTIES OF ANNEALED STARCH ROASTED WITH SHIITAKE MUSHROOM EXTRACT

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poster presentation

The present study aimed to determine the feasiblity of producing modified starch preparations via annealed starch roasting with a Shiitake mashroom extract and to evalued the effect of various temperatues of the roasting process on selected rheological properties of pastes and gels formed by these preparations.
Annealed starch was produced by heating an aqueous suspension of potato starch at a temperature of 2 °C below the specified onset temperature of pasting, followed by its rinsing with water and ethanol. Part of thus prepared starch was soaked with a 10% extract from Shiitake mushrooms and roasted at 40 °C, 60 °C, 80 °C, 100 °C, and 120 °C. The resulting starches (starches roasted with the Shiitake mushroom extract) were divied into two portions (by weight). One portion was rinsed with water and ethanol. In addition, a sample without the Shiitake mushroom extract addition was prepeared for each roasting temperature variant. All produced preparations were analyzed for color profile changes and for selected rheological properties of starch pastes and gels they formed.
The conducted physical and chemical modifications of potato starch, entailing its annealing and esterification with compounds contained in the mushroom extract, strongly influenced the rheological properties of the modified preparations, with the extent of the observed changes depending on the type of physical modification and esterification conditions. The value of the color darkening coefficient of the starch preparations produced with the addition of the Shiitake mushroom extract increased along with their roasting temperture increase. Viscosity of the pastes formed by the annealed starch was nearly twofold higher compared to this of the pastes formed by the starch heat-treated with the mushroom extract without rinsing. Starch esterification with the mushroom extract was also observed to significantly affect an increase in the yield point. The gels formed by the annealed starch roasted with the Shiitake mushroom extract showed an increase in the elastic component and a decrease in the viscous element, depending on esterification temperature. Starch esterification with organic compounds of the mushroom extract had a strong impact on the properties of the formed gels – an increase in roasting temperure led to the strengthening of the structure of the formed starch system after cooling.

Keywords: potato starch, annealing, Shiitake, extract, rheology of modified starch preparations

EXTRACTION SOLVENT AS A KEY FACTOR IN ENHANCING THE ANTIOXIDANT ACTIVITY OF *LIPPIA CITRIODORA*

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poster presentation

Lippia citriodora (lemon verbena) is an aromatic medicinal plant rich in polyphenols, flavonoids, and essential oils, and is recognized for its notable antioxidant, anti-inflammatory, and antimicrobial properties. The aim of this study was to evaluate the effect of different green solvents, including natural deep eutectic solvents (NADES), on the antioxidant activity of *Lippia citriodora* extracts, and to compare their efficiency with that of conventional solvents. Dried leaves were extracted using conventional solvents (water, 50% ethanol, and 70% ethanol) and a selection of natural deep eutectic solvents (NADES), including trehalose:glycerol (1:30), betaine:glycerol (1:2), betaine:lactic acid (1:2), betaine:ethylene glycol (1:3), urea:glycerol (1:4), lactic acid:glucose (5:1), choline chloride:glycerol (1:2), and choline chloride:lactic acid (1:2). Extraction was carried out using ultrasound-assisted extraction (UAE) at 60 °C for 60 minutes. Antioxidant activity was evaluated using DPPH, FRAP, CUPRAC assays, along with total phenolic content (TPC). Among all solvents investigated, 50% and 70% ethanol yielded the highest antioxidant activity, with 50% ethanol performing slightly better (37.10 ± 3.81 mmol Fe^{2+}/L; 21.65 ± 2,38 mmol Fe^{2+}/L; 95,07 ± 0,25 % DPPH inhibition, 376,53 ± 5,27 mgGAE/g). Among the NADES tested, choline chloride:lactic acid (1:2) showed the highest activity in the FRAP and CUPRAC assays, while trehalose:glycerol (1:30) was the most effective in the DPPH assay and in terms of total phenolic content. These findings demonstrate the relevance of solvent choice, especially green alternatives, for optimizing antioxidant extraction and highlight the potential of *Lippia citriodora* extracts for use in the food and cosmetic industries. Moreover, this study introduces a novel perspective by providing valuable insight into the applicability of ethanol and natural deep eutectic solvents as sustainable extraction media for obtaining bioactive-rich extracts, which may be further utilized in food and pharmaceutical formulations.

Keywords: extraction, deep eutectic solvents, antioxidant activity

PHENOLIC CONTENT OF WILD POMEGRANATE PEEL: NUTRITIONAL CONTRIBUTION IN THE CONTEXT OF HEALTH PRESERVATION

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poster presentation

Phenolic compounds represent a diverse group of plant secondary metabolites with expressed bioactive properties, including antioxidant, anti-inflammatory, antimicrobial, and potentially anticancer effects. Their presence in the diet has been associated with beneficial impacts on human health, particularly in the prevention of chronic non-communicable diseases. Ellagic acid, as one of the key phenolic compounds, demonstrates a strong ability to neutralize free radicals, reduce oxidative stress, and regulate enzyme processes involved in inflammation. These functional properties contribute to its important role in health preservation, especially through the prevention and modulation of metabolic and cardiovascular disorders, as well as certain types of cancer. Wild pomegranate (*Punica granatum* L.) grows spontaneously in the region of Herzegovina and is most commonly used for juice production, while the chemical composition of its peel remains underexplored. The aim of this study was to determine the content of total phenolics and ellagic acid in dried wild pomegranate peel, collected at full ripeness from three locations in Herzegovina. Ultrasound-assisted extraction was used to determine total phenolics, at amplitudes of 100% and 50%, with a solid-to-solvent ratio of 1/59 g/mL, and extraction time determined by temperature (max.60 °C). Energy consumption was monitored during extraction. Total phenolic content was measured spectrophotometrically, using Folin Ciocalteu assay, while ellagic acid content was quantified using high performance liquid cromatography (HPLC). The results showed a considerable presence of total phenolic compounds, ranging from 60.18 mg GAE/g to 79.96 mg GAE/g of dry matter, with ellagic acid being one of the major constituents. These findings contribute to a better understanding of the nutritional and functional potential of wild pomegranate peel in the context of food application.

Keywords: phenolic compounds, wild pomegranate fruit, elagic acid, health benefits

WHEAT HYDROCOLLOIDS IN BAKING AND BREWING INDUSTRY

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poster presentation

Hydrocolloids are used to retain moisture in bread and baked goods. The most used hydrocolloids are xanthan gum, sodium carboxymethyl cellulose or CMC, alginates, gellan gum, pectin, and locust bean gum. As they affect the moisture content, they affect starch molecules' texture and retrogradation enthalpy as well. Hydrocolloids naturally present in wheat are called pentosans. They constitute approx. 2% of wheat flour. Arabinoxylans and β-glucan are common hemicelluloses in wheat and are mostly found in the cell wall. In the baking industry, they can be useful and improve the dough properties. In the brewing industry, they can improve the foam stability, but at the same time, they can hinder the filtration process. This review paper aims to give an overview of pentosan properties and to emphasize the significance of these macromolecules in the baking and brewing industries.

Keywords: pentosanes, arabinoxylans, β-glucans, baking, brewing

DOUBTS IN DECLARING CERTAIN TYPES OF HONEY

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oral presentation

Consumers expect accurate and reliable information when purchasing products, particularly food. However, labelling certain products, such as honey, according to their content can be challenging. Honey is a unique and complex food, valued not only for its nutritional properties but also for its botanical and geographical origin. According to the Honey Regulations (NN 122/2009, NN 53/2015, NN 47/2017), honey is classified based on its origin into two main categories: nectar honey and honeydew honey (also known as forest honey). In this context, it is essential to highlight the responsibility of analytical laboratories to determine, by using specific analytical methods, the correct classification of a given honey sample. Classification without conducting pollen analysis, especially in borderline cases, may not be straightforward. In this study four key parameters were determined in 23 honey samples from Croatia: moisture content (by refractometry), electrical conductivity, hydroxymethylfurfural (HMF) content (by HPLC/DAD method) and microscopic pollen analysis. The results underscore the crucial role of pollen analysis in accurately classifying honey into specific categories based on botanical origin.

Keywords: honey, pollen, honeydew honey, classification

THE INFLUENCE OF SALINITY ON THE RIPENING AND QUALITY OF EARLY UNSHIU MANDARIN (*CITRUS UNSHIU* MARC.) CULTIVARS IN THE NERETVA VALLEY

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oral presentation

Mandarin (*Citrus unshiu* Marc.) is one of the most important fruit crops in the Neretva Valley, however increased salinity of irrigation water caused by climate change and seawater intrusion negatively affect fruit growth, ripening, and quality. The aim of this study was to determine the impact of different salinity levels on the maturity index, physicochemical composition, and pomological characteristics of early mandarin cultivars ('Zorica rana', 'Iwasaki', and 'Ichimaru').

The research was conducted over three growing seasons (2022–2024) at four microsites (Vidrice, Jasenska, Modrič, and Bostanac) with varying degrees of salinity. The highest average salinity was recorded at Vidrice (total dissolved solids, TDS: 3.262 mg/L; electrical conductivity, EC: 5.132 µS/cm), followed by Jasenska in winter, while Modrič and Bostanac remained within acceptable irrigation limits.

The results showed that salinity stress reduced fruit weight (up to 26.2%), juice content (up to 5.7%) and maturity index (average decrease 14.2%). In addition, fruits from high-salinity areas exhibited delayed ripening. At locations with increased salinity, where the EC values reached up to 5132 µS/cm, fruit peel coloration was poorer, and physiological disorders were more frequent. Among the tested cultivars, cultivar 'Ichimaru' showed the highest tolerance through higher sugar content and lower acidity, while 'Iwasaki' was the most sensitive.

These findings highlight the importance of selecting salinity-tolerant cultivars, while future research should focus on analysing bioactive compounds to better assess the nutritional value of mandarin fruit under salinity stress.

Keywords: mandarin, salinity stress, ripening, quality

ANTIOXIDANT STATUS AND ANTIBACTERIAL ACTIVITY OF GRAPE EXTRACTS FROM INTERSPECIFIC HYBRIDS (PiWi VARIETIES)

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poster presentation

Interspecific hybrids of grapevine (PiWi varieties) are the result of breeding programs aimed at developing disease-resistant cultivars adaptable to various climatic conditions. Their resistance to fungal diseases reduces the need for pesticides, enhancing the sustainability of viticulture. Additionally, PiWi grape varieties are rich in bioactive compounds such as polyphenols and flavonoids, which contribute to their antioxidant status and potential antibacterial activity. In this study, antioxidant status and antibacterial potential of extracts from 14 PiWi grape varieties (Felicia, Allegro (N), Sauvignon Rytos, Calardis Blanc, Muscaris, Calardis Musque, Solaris, Calandro (N), Regent (N), Reberger (N), Sauvignon Gris, Hibernal, Johanniter, and Phoenix), harvested at the experimental field in Mandićevac, were analyzed. Phenolic compounds were extracted by ultrasound-assisted extraction using 70% ethanol. Total phenolic content as well as antioxidant capacity were determined. Antibacterial activity of the extracts was tested against *Staphylococcus aureus, Bacillus subtilis, Escherichia coli*, and *Pseudomonas aeruginosa*. PiWi extracts showed variable phenolic content and antioxidant capacity. Although stronger antibacterial activity was generally expected against Gram-positive bacteria, the extracts showed the highest activity against *Pseudomonas aeruginosa*. This study identified varieties with high antioxidant and antibacterial potential applicable in the food industry.

Keywords: PiWi varieties, grapevine, antioxidants, antibacterial activity, phenolic compounds

INSIDE MEDIUM TOASTING: HOW BARREL TOASTING INTENSITY AFFECTS PHENOLIC COMPOUNDS IN CABERNET SAUVIGNON DURING ONE-YEAR AGEING?

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poster presentation

Phenolic compounds have been widely investigated due to their contribution to the sensory, chemical and health-promoting properties of red wine. Grape variety, vinification techniques, storage and ageing conditions are showing a great effect on phenolic composition. Most common ageing vessels are oak barrels that are usually toasted for flavour enhancement.

The aim of this study was to determine the effect of barrel medium toasting intensities (medium, medium plus and medium long) on the phenolic composition of Cabernet Sauvignon wine during one year of ageing. As control, wine also aged in a stainless steel tank. Samples were collected every three months, using spectrophotometric methods and HPLC to measure total polyphenols, flavonoids, anthocyanins, and other phenolic subclasses.

The results showed that there was a significant difference in phenolic composition between wine from stainless steel tank and wine from oak barrels, but also between different medium toasting intensities. This is reflecting the impact of toasting on extraction and polymerisation dynamics. During first three months of ageing, in all vessels a slight increase of total polyphenols occurred, but a decreasing trend followed it with prolonged ageing. The decrease of anthocyanin concentrations and the increase of polymeric colour reflect the influence of mycrooxygenation and polymerisation. While medium toasted barrel favoured the condensed tannins and phenolic acids retention, the highest concentrations of anthocyanins, phenolic acids and flavanols after one-year ageing were measured in medium long toasted barrel. The highest concentration of flavonoids and hydrolysable tannins were determined in medium plus toasted barrel after 12-month ageing.

Keywords: toasted oak barrel, Cabernet Sauvignon, phenolic compounds, ageing

VOLATILE AROMA COMPOUNDS OF CAPER

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poster presentation

Capparis orientalis Veill., known as spineless caper or rock caper, is a perennial shrub of the *Capparaceae* family which grows wild all over the Mediterranean. In Croatia this plant grows wild along the Adriatic coast and on the islands. The caper is adapted to poor soils and harsh environmental conditions, so it can be found growing on rocky areas, sea cliffs, stone walls and bastions. In Croatia, the flower buds, and sometimes the fruits, are usually picked at locations where the plant grows wild and pickled in vinegar or salted. Prepared in this way, capers are delicacies that have long been used in the culinary tradition of the Mediterranean part of Croatia. *C. orientalis* Veill. is a species rich in bioactive compounds, with positive effects on human health, such as anticancerogenic and antioxidant effects, and can be considered a functional food.

In this study volatile aroma compounds were isolated separately from caper leaves, flower buds and fruits. Isolation was performed by two methods, hydrodistillation and headspace solid-phase microextraction (HS-SPME). All samples, essential oils and headspace volatiles, were analysed by gas chromatography-mass spectrometry (GC-MS) using a non-polar column. The main constituents of the essential oils of caper leaves and flower buds were diterpene alcohol phytol (62.9% and 24.3%, respectively) and cyclic octaatomic sulfur, S_8 (14.7% and 24.0%, respectively), while the main constituents of caper fruit essential oil were fatty acids, namely lauric acid (38.7%) and myristic acid (24.7%). The predominant compound in headspace volatiles of caper leaves, flower buds and fruits was methyl-isothiocyanate (87.3%, 96.2% and 96.4%, respectively), a degradation product of the glucosinolate glucocapparin. Methyl-isothiocyanate was not identified in all studied caper essential oils.

Keywords: *Capparis orientalis* Veill., essential oil, headspace volatiles, GC-MS analysis

CHALLENGES IN USING SENSORY EVALUATION TO IMPROVE QUALITY: INSIGHTS FROM THE FOOD INDUSTRY

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poster presentation

Sensory evaluation is one of the key tools in food quality control, as it enables the assessment of fundamental product attributes such as taste, smell, appearance, and texture using human senses. To ensure consistent quality of finished products, the manufacturer's specification must include clearly defined quality parameters, including a detailed product description, physico-chemical, microbiological, and other relevant requirements. However, in practice, descriptions of sensory attributes are often missing, which hinders quality control and calls for additional standardization. Establishing an effective sensory evaluation system involves forming a trained panel of assessors, testing sensory sensitivity, selecting appropriate evaluation methods, and defining visual and descriptive references. At IFFCO Velvet, the quality control department faced a number of challenges in implementing sensory evaluation—including the lack of standardized sensory descriptors, subjectivity in assessments, difficulties in maintaining reference samples, and choosing the most suitable evaluation method. By applying a consensus-based descriptive method, the team succeeded in defining internal sensory standards for finished products, which improved the reliability of quality assessment, alignment with customer expectations, and reduced the number of complaints. This paper presents practical experiences and solutions that may serve as useful guidelines for other companies in the food industry.

Keywords: sensory evaluation, quality control, food industry, descriptive method

AROMATIC PROFILES OF VINEGAR ENRICHED WITH MOUNTAIN SAVORY

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poster presentation

Vinegars, acetic condiments in use worldwide for millennia, are rich in a variety of nutrients and bioactive compounds, with antibacterial, anti-inflammatory and antidiabetic properties. Recently, more and more food products have been flavoured to enhance their sensory properties, satisfy consumers' needs and contribute to better market placement, often by adding aromatic plants for their contribution to odor, taste and helath benefits. *Satureja montana* L., or mountain savory, is a perennial aromatic wild shrub common in the Adriatic, used traditionally in folk medicine and as a spice, with documented antibacterial, antifungal, andtioxidant and other benefits. The aim of this study was to analyse the composition and content of aroma compounds of red wine vinegar infused with mountain savory collected from the Dalmatian hinterland. Vinegars with fresh savory; dry savory; supercritical CO_2 savory extract, as well as the original vinegar, dry savory and supercritical CO_2 savory extract were subjected to solid phase microextraction (HS-SPME) and analysed by gas chromatography-mass spectrometry (GC-MS). The analysis identified a total of 64 compounds across all samples, most of them present in the supercritical extract and dry plant, but also in the vinegars containing them, resulting in diverse volatile profiles. The detected compounds are monoterpenes and monoterpenoids, sesquiterpenes, aromatic compounds (including phenols), esters, alcohols, carbonyl compounds and aromatic hydrocarbons. All red wine vinegars fortified with mountain savory have an enhanced volatile complexity, with supercritical extraction proving most effective for preserving bioactive compounds.

Keywords: vinegar, mountain savory, aroma compounds, HS-SPME, GC-MS

APPLICATION OF ELECTROCHEMICAL BIOSENSOR FOR THE ASSESSMENT OF THE ANTIOXIDANT ACTIVITY OF BIOACTIVE COMPOUNDS IN SASKATOON WINE

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poster presentation

Saskatoon, a Mongolian berry plant, originates from North America and appears like blueberry but it belongs to the family *Rosacea*. Primarily is consumed as syrups, jams, wines, cedars, and beers. Saskatoon is a rich source of polyphenols, fibres, minerals and vitamins. The aim of this study was to explore the applicability of an electrochemical biosensor for the determination of antioxidant activity of bioactive compounds in Saskatoon fruit wine, produced through alcoholic fermentation using selected *Saccharomyces* and non-*Saccharomyces* wine yeasts. A series of microfermentation experiments was conducted, during which fermentation activity was monitored by measuring CO_2 evolution and the rate of CO_2 production. The influence of the selected yeast strains on fermentation kinetics, and the physicochemical properties of the obtained Saskatoon wines was investigated. The determination of the content of total polyphenols was carried out by the spectroscopic Folin-Ciocalteu method. Cyclic voltammetry was applied to determine the content of the total polyphenols and vitamin C. An electrochemical DNA biosensor was created and applied to track the antioxidant effect of bioactive substances in samples. In addition, an electrochemical adaptation of the ABTS assay was carried out. The results show that the samples of Saskatoon wine which has the highest content of polyphenols had shown the highest antioxidant effect. The content of vitamin C had shown that the lowest content was the Saskatoon wine with the lowest content of the total polyphenols.

Keywords: Saskatoon wine, Mongolian blueberry wine, *Saccharomyces* and non-*Saccharomyces* wine yeasts, bioactive compounds, electrochemical analysis

THE EFFECT OF DRYING ON THE CHEMICAL COMPOSITION AND NUTRIENT CONTENT OF WILD ROSE HIP FRUITS (*ROSA CANINA* L.) FROM THE HERZEGOVINA REGION

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poster presentation

In recent years, there has been growing interest in the consumption of wild edible plant species, although their nutritional profiles remain insufficiently explored. In the Herzegovina region, wild rose hip (*Rosa canina* L.) is among the most valued of these species. Its fruits have traditionally been used to treat colds, coughs, flu, and gastrointestinal disorders. The medicinal properties of rose hips are attributed to their rich content of phytochemicals, including polyphenolic compounds, carotenoids, unsaturated fatty acids, and especially high levels of vitamin C. The chemical composition of rose hip fruits varies significantly depending on genotype, ripeness, environmental conditions, and processing. Since the fruit is rarely consumed fresh, drying is the most common method of preservation; however, the structural variability of the fruit influences the rate of water loss during this process. The aim of this study was to investigate the effect of drying process (40 °C, 3 h) on changes in the chemical composition of the fruit compared to fresh samples. The contents of moisture, ash, fructose, glucose, total sugars and acids, as well as macro- and microelements (Ca, K, Na, Fe), were analyzed in samples collected from the localities of Stolac, Međugorje, Grude, and Čitluk. The results revealed statistically significant differences in nearly all parameters, except for calcium and sodium content, with a general trend of increased concentrations following drying. The obtained data confirm the importance of optimizing processing methods in order to preserve the nutritional value of wild rose hip fruits, with the aim of their valorization in functional nutrition.

Keywords: rose hip, chemical composition, drying, sugars, minerals

PRODUCTION OF SAFE FOOD AND FOOD WITH ADDED NUTRITIONAL VALUE

IMPACT OF COLD-PRESSED OILSEED CAKES ON THE ANTIOXIDANT PROPERTIES OF FUNCTIONAL ICE CREAMS

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poster presentation

This study investigates the influence of cold-pressed oilseed cake flours – specifically hemp, almond, and pumpkin – on the total phenolic content (TPC) and antioxidant properties of ice cream. The antioxidant activity of the enriched formulations was evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH), 2,2′-Azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS), and ferric reducing antioxidant power (FRAP) assays. Besides a control formulation, experimental ice creams were prepared by replacing skim milk powder (SMP) with hemp (25.0, 37.5, and 50.0%), almond (25.0, 50.0, 75.0, and 100.0%), or pumpkin (12.5, 25.0, and 37.5%) press cake flours. All enriched samples demonstrated a significant increase in antioxidant capacity compared to the control. The control sample exhibited the lowest antioxidant activity (14.29% inhibition in DPPH, 0.351 mg Trolox/g in ABTS, and 0.294 mg Trolox/g in FRAP assays) and the lowest TPC (19.50 mg GAE/100 g). Conversely, the sample in which SMP was fully substituted with almond press cake flour (100.0%) showed the highest antioxidant activity (36.05% inhibition in DPPH, 2.777 mg Trolox/g in ABTS, and 1.009 mg Trolox/g in FRAP), alongside the highest TPC. However, when comparing samples with an equal level of SMP replacement (25.0%), hemp press cake flour resulted in superior antioxidant activity. These findings indicate that cold-pressed oilseed cakes, particularly hemp, are promising functional ingredients for dairy applications, contributing not only to enhanced nutritional value but also to sustainable food system practices through by-product valorisation.

Keywords: ice cream, functional food, cold-pressed cake, antioxidant properties, by-products

LYOPHILISED BEE DRONES AS A POTENTIAL SOURCE OF PROTEINS

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poster presentation

The continuous growth of the global population has led to an increasing demand for larger quantities of high-quality protein rich food. In recent years, there is a growing interest in food products with higher protein content and a reduced proportion of fat. Commonly used proteins in the production of protein-enriched food (e.g. yogurts and protein bars) include dairy proteins, especially whey or plant-based proteins. Bee products are well known for their positive effect on human health. In addition to widely known products such as honey, bee pollen, propolis, royal jelly, and bee venom, relatively little is known about bee drone homogenate (BDH), also known as apilarnil. BDH is produced by homogenization of drone larvae, the male bees in the colony, whose development cycle lasts 24 days. Drone larvae are most often collected between the 4th and 14th day of development (before increasing the amount of chitin, which compromises organoleptic properties, quality and possible gastronomic usability). Beekeepers commonly use drone brood as biological method for controling of the *Varroa destructor* mite. As a result of this practice, drone brood at the end of the development cycle becomes waste. In this research, drone larvae were collected at different stages of development (7th, 9th and 14th day) from strong honey bee colonies in a single apiary. The collected drone brood was homogenised and lyophilised and the chemical composition of lyophilised samples was determined. The results showed that lyophilised BDH is rich in proteins (38.2 – 54.3 %), with the highest protein content found in 7-day-old larvae, while total lipids amount was the lowest in that stage (11.8 %). This findings suggest that BDH could be a valuable high-protein by-product of beekeeping, leading to a need for further research on its potential applications in nutrition and food technology.

Keywords: drones, lyophilisation, chemical composition, protein enriched food

THE STABILITY OF ASTAXANTHIN EXTRACTED FROM SHRIMP (*PARAPENAEUS LONGIROSTRIS*) BY-PRODUCTS UNDER DIFFERENT STORAGE CONDITIONS

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poster presentation

The stability of astaxanthin extracted from shrimp by-products is influenced by factors such as light, oxygen, temperature and the matrix in which it is stored. The aim of this study was to investigate the stability of astaxanthin extracted in cold-pressed sunflower oil under different storage conditions: i. in the dark at room temperature (RT), ii. in the dark in a refrigerator at 4 °C and iii. in the dark in a freezer at -18 °C. The shrimp by-products were freeze-dried and ground. The powder was extracted by ultrasonic-assisted extraction (UAE) in sunflower oil at 60 °C for 1 hour and filtered. The samples were stored for 31 days (one month) and the concentration of astaxanthin in the oils was measured spectrophotometrically at 479 nm at regular intervals. The concentration of astaxanthin in the samples stored in the refrigerator and in the freezer decreased by 9 and 3 %, from 3.98 ± 0.01 to 3.64 ± 0.01 μg/ml and from 4.01 ± 0.01 to 3.91 ± 0.01 μg/ml, respectively, by the end of the storage period. Samples stored in the dark at RT showed the best stability, the astaxanthin concentration did not decrease. The measured values were 4.92 ± 0.01 μg/ml at the beginning and 4.96 ± 0.00 at the end of the storage period. These results show that the best storage conditions for astaxanthin extracted in vegetable oils are in the dark at RT.

Keywords: astaxanthin, shrimp by-products, stability, green extraction

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BIOPLASTICS FOR FOOD: FUNCTIONAL AND SAFETY INSIGHTS FROM THE BIOPHA-COMFPACK PROJECT

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poster presentation

Biodegradable and compostable packaging is the most desirable and challenging option for replacing traditional plastic materials used in food packaging. The food industry is expected to ensure that biodegradable materials have the same functional properties as traditional materials (PE, PET, PA, PTT, others) throughout the entire supply chain (production, distribution, storage, retail, consumption). In the experimental design of the eco-innovative packaging within the BioPHA-ComFPack project (NPOO.C3.2.R3-Il.04.0059), monitoring of the organoleptic quality and health safety of the food product under different temperature regimes (-18 °C, 20 °C, 30 °C) has preliminarily shown no significant deviations, but further monitoring is necessary.

Keywords: bioplastic, food product, quality & safety

This research was conducted as part of the project „Production and development of compostable packaging from waste biomass for the packaging of industrially processed food products" (NPOO.C3.2.R3-Il .04.0059) funded by National Recovery and Resilience Plan (funded by the European Union, NextGenerationEU).

PHYSICAL AND FUNCTIONAL PROPERTIES OF BROAD BEAN (*VICIA FABA*) AEROGELS

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poster presentation

Food-grade aerogels are recognized as promising materials for various food-related applications, particularly in moisture and oil absorption, bioactive compound delivery, and as food packaging components. According to IUPAC, aerogels are defined as non-fluid networks composed of interconnected colloidal particles dispersed in a gas, typically air. These materials are characterized by ultra-low density, high specific surface area and a coherent porous structure.
In this study, aerogels were produced using broad bean (*Vicia faba*) protein isolate. Broad bean protein was hydrated in water at concentrations ranging from 5–30% (*w/v*) and then each sample was divided into 3 aliquots, which were adjusted to a pH value of 4.5, 7 and 9.5. Broad bean protein aqueous dispersions were subjected to thermal gelation followed by freeze drying. The freeze-drying process was performed as a two-step process: pre-freezing at −18 °C to solidify the wet gel and sublimation under vacuum (0.375 mbar) to create porous aerogel structures. The resulting aerogel particles were characterized regarded to color changes, water activity, bulk density, and water and oil binding capacity. The resulting aerogel particles exhibited pH-dependent color variation, low water activity, and a unique hierarchical microstructure formed by aggregated dried gels. One gram of aerogel was able to structure from 2.9 g to 5.3 g of oil and from 3.53 g to 6.11 g of water, highlighting their potential for oil structuring and formulation of functional products.

Keywords: aerogel, broad bean, oil binding capacity

This work was supported by the Croatian Science Foundation under the project number HRZZ-2022-10-1960.

COMPARATIVE VOLATILE PROFILE ANALYSIS OF FERMENTED MILK BEVERAGES DEVELOPED USING AUTOCHTHONOUS AND COMMERCIAL STARTER CULTURES

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poster presentation

Three distinct high-quality fermented milk beverages were developed using the autochthonous cultures *Lactococcus lactis* subsp. *lactis* ZGBP5-51, *Enterococcus faecium* ZGBP5-52 and *Enterococcus faecalis* ZGBP5-53, which were isolated from fresh soft cheese (AC beverage), the commercial starter culture Bioprox DI-PROX M229 (CC beverage) and a combination of autochthonous and commercial starter cultures (CAC beverage). During the 3-week storage period, the AC beverage met all the requirements necessary to achieve the techno-functional probiotic properties, which were reflected in the highest viability of the bacterial cells and the stability of the pH value. Using headspace solid-phase microextraction coupled with gas chromatography-mass spectrometry, a total of 103 aroma volatile compounds (AVCs) were identified and categorized into 17 chemical groups, of which ketones were most prevalent in the CC (49.84 ± 12.29%) and CAC (35.63 ± 31.65%) beverages, while the lowest prevalence was found in the AC beverage (15.25 ± 12.93%). Ultimately, the principal component analysis emphasised the crucial role of starter culture selection in shaping the volatile profiles of fermented milk beverages.

Keywords: autochthonous, starter culture, fermentation, aroma volatile compounds, milk beverages

COLD PLASMA TECHNOLOGY MODIFIES PLANT SECONDARY METABOLITE PROFILE BOOSTING NUTRIENT CONTENT IN SPROUTS

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invited lecture

Over the last ten years, there has been a broad amount of evidence in applying cold plasma technology (CPT) to promote plant growth. Cold plasma (CP) is generated by direct exposure of inert or active gas to an electric or electromagnetic field, forming a mixture of electrons, photons, reactive oxygen (ROS), and nitrogen species (RNS) with a net neutral charge. When plasma-created particles come into contact with a water medium, they undergo a series of reactions and chemical transformations, producing the plasma-activated water (PAW). Young crop seedlings (sprouts) contain health-beneficial substances that are categorised as functional foods. Various approaches can be used to stimulate the plant to produce more bioactive compounds in its natural habitat. For instance, application of elicitors (triggers of plant´s immune response), LED light-associated treatments, biostimulators, and nanofertilizers. CPT and PAW have proven to be a promising strategy for eliciting stress responses in plants through the modulation of biosynthesis pathways, resulting in higher accumulation of secondary metabolites and overall nutrient content. This lecture will give a concise overview of the latest findings related to plasma-induced phytochemicals. Moreover, the author will present both published and unpublished results confirming the promotional effect of CP treatment on the germination, growth, and enhanced induction of polyphenols and flavonoid compounds in different cereal sprouts exposed to optimal and drought conditions.

Keywords: plasma technology, plasma activated water, sprouts, phytochemicals

THE PRODUCTION AND STABILIZATION OF COLD-PRESSED HAZELNUT OIL OF THE TRABIZONE VARIETY

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poster presentation

Hazelnuts are a source of omega-3 fatty acids. Omega-3 fatty acids have a number of benefits for the heart and have been shown to reduce the risk of cardiovascular disease. In this study, the influence of the parameters of the pressing process of hazelnut kernels (Trabizone variety) on the yield and quality of the cold-pressed oil was investigated. During the pressing process, in which a screw with a thread depth of 10 mm was used, various process parameters were changed: the extension of the cake outlet, the temperature of the pressing head and the frequency of the electric motor. The basic quality parameters (peroxide value, free fatty acids, moisture content, and content of insoluble impurities) in the cold-pressed hazelnut oil produced were examined. The oxidation stability of the hazelnut oil was then investigated by adding various antioxidants and synergists using an oxidation stability test at 63 °C (Schaal oven test). The results allow the conclusion that the process parameters during pressing influence the yield of hazelnut oil. The basic quality parameters of cold-pressed hazelnut oil meet the requirements of the regulation. The results of the oxidative stability test of cold-pressed hazelnut oil showed that rosemary extract (type Oxy´Less® CS) has the best antioxidant effect after 10 days among the natural antioxidants with added citric acid and ascorbic acid.

Keywords: hazelnut oil, screw press, yield, antioxidants, oil quality

DYNAMICS OF PHYTOBIOTICS AND FOOD SAFETY

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poster presentation

Phytobiotics, natural plant compounds, are playing an increasing role in veterinary medicine, especially in livestock farming, due to their therapeutic properties and potential to improve the health of domestic animals. These compounds, which include various plant extracts, essential oils and other plant substances, are known for their antibacterial, antimicrobial, antioxidant and anti-inflammatory properties. The use of phytobiotics in the food industry can significantly contribute to preserving food quality, reducing the risk of contamination by pathogenic microorganisms, and extending the shelf life of products. However, their application must be carefully regulated, as improper use or excessive concentration can lead to negative effects on the health of domestic animals and, consequently, humans. Analysis of the use of medicinal plants in veterinary medicine shows that certain types of plants can be useful for treating diseases, improving production and general animal health. Furthermore, the use of these plants must be regulated, as irresponsible or excessive use can lead to the presence of residues of these plants in animal products, which may pose a risk to human health. In addition, the quality of medicinal plants, which may be contaminated with pesticides, heavy metals, or microorganisms, must be carefully monitored to prevent negative effects on animal health and food safety. In the context of food safety, it is crucial to ensure proper identification, dosage and quality control of phytobiotics to achieve the desired effect without risk to animals and consumers. Therefore, the dynamics of phytobiotics in food safety involves balancing their benefits with potential risks, thus ensuring the health of animals, consumers and the food industry's sustainability.

Keywords: phytobiotics, animal nutrition, food safety

UNDERSTANDING CONSUMER PREFERENCES FOR FOOD IN BIODEGRADABLE PACKAGING

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poster presentation

In 2021, the average amount of packaging waste per capita in the EU was 188.7 kg, with projections exceeding 200 kg by 2030. Plastic accounts for 20% of this waste. Improper disposal of fossil-based plastics poses a major environmental issue, as they are not biodegradable but break down into micro- and nanoplastics, which have proven harmful effects on ecosystems and human health. By 2030, all packaging in the EU must be recyclable. A recent study found that consumers perceive food packaged in recycled plastic more negatively than in recyclable packaging, mainly due to contamination concerns. Bioplastics offer a sustainable alternative to conventional plastics, as they are derived from renewable sources such as plants, algae, and microorganisms, while maintaining comparable functional properties. A specific category of bioplastics is biodegradable plastic, which can decompose into CO_2 and water through microbial activity. Although bioplastics currently represent less than 1% of total plastic production, scientific and industrial efforts are underway to scale up production and improve performance. Biodegradable single-use packaging and food products with biobased packaging are already available on the market, often labeled to communicate their sustainable origin. To support the growth of this market, it is essential to understand what motivates consumers across different regions to choose bioplastic-packaged products. These insights are key to guiding research, innovation, and marketing strategies toward sustainable materials and accelerating the transition to a circular economy.

Keywords: biodegradable packaging, food, consumers

This research was conducted as part of the project „Production and development of compostable packaging from waste biomass for the packaging of industrially processed food products" (NPOO.C3.2.R3-Il .04.0059) funded by National Recovery and Resilience Plan (funded by the European Union, NextGenerationEU).

COMPARISON OF FOAM AND EMULSION TEMPLATE METHODS FOR THE PRODUCTION OF OLEOGELS BASED ON FABA BEAN PROTEIN

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poster presentation

Awarness among consumers is growing regarding negative impact of trans and saturated fatty acids on human health. Edible oleogels provide great properties as a replacement for that in food products. They are based on oils which are rich in unsaturated fatty acids. This study explored emulsion and foam templated methods for oleogel fabrication based on faba bean protein isolate. For both methods, sunflower oil was used, as well as xanthan which had supportive role in forming protein polymer network where oil droplets are incorporated in pores. Regarding foam-templated oleogels, pH values of water, faba bean protein isolate and xanthan mixtures were adjusted at 3, 5, 7, 9 to test influence of different pH values on oleogels. To obtain foams from these mixtures, air was incorporated by kitchen mixer. Frozen foams were lyophilized to produce aerogels, which are mixed with oil to form foam-templated oleogels. In contrast, for emulsion-templated oleogels, mixtures of faba bean protein isolate, water and xanthan were homogenized with oil (20, 25 and 30%) using dispersion unit. Obtained emulsions were dried with convection oven at 60 °C. Received dry film was grinded to obtain the final product. Afterwards, textural properties were defined with texture analyser. Also, the CIE L*, a*, b* color coordinates were measured with chroma meter. Oleogel stability was also tested. In general, emulsion-templated oleogels were darker since L* value was lower compared to foam-templated oleogels. Furthermore, foam-templated oleogels showed higher oleogel stability, as well as higher values of hardness compared to emulsion-templated oleogels.

Keywords: oleogel, faba bean protein isolate, xanthan, emulsion-templated oleogels, foam-templated oleogels

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CRAFTING HEALTHIER BREWS: INNOVATIONS AND INSIGHTS INTO BEER'S ROLE IN NUTRITION

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poster presentation

Beer is a complex beverage containing a variety of bioactive compounds, notably polyphenols, flavonoids, vitamins, and minerals, which contribute to its nutritional value and potential health effects. Recent experimental research demonstrates that moderate beer intake can exert beneficial metabolic effects, such as mitigating the development of metabolic dysfunction-associated steatotic liver disease (MASLD) in animal models, likely through the modulation of lipid metabolism, inflammation, and short-chain fatty acid pathways - mechanisms attributed to beer's polyphenol content and antioxidant capacity. However, epidemiological data highlight that the health impact of beer is highly context- and dose-dependent. While moderate consumption may offer some protective cardiovascular and metabolic effects, excessive or chronic intake is a well-established risk factor for liver disease, certain cancers, and other chronic conditions. Moreover, population-level studies indicate that beer-only drinkers tend to have lower overall diet quality and higher rates of unhealthy behaviours such as smoking and physical inactivity, which can compound the negative health impacts of alcohol and increase the risk of chronic diseases. To improve the nutritional value of beer and increase its potential health effects, a large number of primarily craft breweries produce beers enriched with various extracts (e.g. mushroom, dandelion, nettle). There are also increasingly popular non-alcoholic beers whose consumption does not have the negative health effects caused by alcohol. In summary, moderate beer consumption may confer certain metabolic and antioxidant benefits, primarily due to its polyphenolic content, but these must be weighed against the risks associated with excessive intake and the broader lifestyle context of beer drinkers.

Keywords: beer, human health, nutritional value

GROWTH AND SURVIVAL OF *LACTOBACILLUS ACIDOPHILUS* IN ICE CREAM

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poster presentation

The study investigated the growth and survival of *Lactobacillus acidophilus* in ice cream during 30 days of storage at -18 °C. The main objective was to evaluate the viability of *L. acidophilus* in ice cream and its influence on the physicochemical properties of the product. Ice cream samples were prepared without (control) and with different concentrations of *L. acidophilus* (0.2, 0.6, 1.2 and 1.6 g L^{-1}). Analyses were performed after 0, 7, 14 and 30 days of storage. The microbiological analyses included the determination of *L. acidophilus* count as well as the total count of bacteria, yeast, mould and enterobacteria. The physico-chemical analyses included the pH value, titratable acidity, melting rate, overrun, colour, texture and viscosity. In the samples inoculated with 0.6, 1.2 and 1.6 g L^{-1} lactobacilli, the lactobacilli count was around 6 log CFU ml^{-1} on all storage days, which corresponds to the probiotic minimum. The pH values of the samples gradually increased, and the titratable acidity decreased, indicating reduced bacterial metabolic activity over time. The addition of the highest probiotic concentration resulted in an increased melting rate. In addition, changes in colour and texture, as well as a general decrease in viscosity, were observed in the samples with the highest probiotic concentrations. Ice cream with an added concentration of 0.6 g L^{-1} showed the best results in terms of lactobacilli count and the physico-chemical properties.

Keywords: probiotic ice cream, *Lactobacillus acidophilus*, viability, physico-chemical properties

HEALTHY LIFESTYLES

DIETARY HABITS OF FEMALE DANCERS

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poster presentation

Proper nutrition plays a crucial role in supporting the physical performance, recovery, and long-term health of dancers. Due to the high physical and aesthetic demands of dance, dancers require balanced, nutrient-rich diets tailored to individual energy expenditure and training intensity. This study investigates the dietary and lifestyle habits of 39 female dancers from various dance styles. Data were collected using an anonymous online questionnaire distributed via Google Forms. The survey included 41 questions covering personal characteristics, health conditions, medication use, dance training frequency and duration, meal regularity, food consumption patterns, hydration, and body image perception. Although most participants reported long-term engagement in dance and regular weekly training, the results revealed inconsistencies between their nutritional habits and physical needs. Fruit, vegetable, and fish intake was below recommended levels, while breakfast was frequently skipped. Sweets and snacks were commonly consumed, and healthier fat sources were underutilized. Hydration practices were also suboptimal, with many dancers drinking less than the advised amount of water. Moreover, 69 % expressed concerns about body image, reflecting the psychological pressures within dance culture. These findings emphasize the importance of targeted nutritional education to promote healthier eating patterns and support dancers' performance and well-being.

Keywords: dance, dancers, nutrition, eating habits, body image

SYNTHESIS, STRUCTURAL CHARACTERISATION AND THERMAL STABILITY OF A COPPER(II) CHROMONE COMPLEX WITH ANTIBACTERIAL ACTIVITY

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poster presentation

A novel mononuclear copper(II) complex derived from chromone-2-carboxylic acid and pyridine was synthesised and extensively characterised with a focus on its structural and thermal properties. Single crystal X-ray diffraction revealed a fivefold coordinated Cu(II) centre exhibiting a distorted square-pyramidal geometry and coordinated by both oxygen and nitrogen donor atoms. Thermal analytical techniques (TGA/DSC) confirmed the high thermal stability of the complex, with decomposition occurring only at elevated temperatures, indicating strong metal–ligand interactions and the potential for application under challenging environmental conditions. Supplementary data from FT-IR and UV-Vis spectroscopy as well as elemental analysis confirmed the proposed coordination environment. The compound was also analysed for its antibacterial properties against selected Gramme-positive and Gramme-negative bacterial strains. In particular, a remarkable inhibitory effect was observed against *Staphylococcus aureus* and *Escherichia coli*, emphasising its dual potential as a thermally robust and biologically active coordination compound with relevance for antimicrobial applications.

Keywords: antibacterial activity, chromone, copper(II) complex, crystallography, food safety

GREEN SYNTHESIS OF SILVER NANOPARTICLES BY USING *LIGUSTICUM MUTELLINA* (L.) CRANTZ. EXTRACTS

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poster presentation

Green synthesis of nanoparticles utilizes natural and eco-friendly materials, such as plant extracts, which act as reducing agents and stabilizers. The plants are rich in active compounds, such as polyphenols, flavonoids, and proteins, which can effectively replace chemical reagents as reducing agents in the process of metal ion reduction. In this work, green synthesis of silver nanoparticles (AgNPs) was conducted using extracts of *Ligusticum mutellina* (L.) Crantz. and aqueous solution of $AgNO_3$. Synthesized silver nanoparticles were characterized using FT-IR analysis, UV-visible spectrophotometry, powder X-ray diffraction – PXRD and TEM. The results of the characterisation of the synthesized nanoparticles indicate the successful synthesis using *Ligusticum mutellina* (L.) Crantz. extract as a reducing agent, with UV-Vis absorption peak at cca. 410 nm. The size of silver nanoparticles was 11 nm which was determined using Scherrer's equation. The FT-IR analysis enables the identification of functional groups of biomolecules involved in the successful synthesis of AgNPs. Synthesized nanoparticles demonstrated antibacterial properties against *E. coli*, *P. aeruginosa*, *B. subtilis*, and *S. aureus*. Additionally, antioxidative activity was also measured by using DPPH, FRAP methods and total soluble phenolic content.

Keywords: silver nanoparticles, green synthesis, *Ligusticum mutellina* (L.) Crantz

MEDITERRANEAN DIET – A LIFESTYLE

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poster presentation

The Mediterranean diet is not just a list of groceries and an example of a menu, but rather a unique lifestyle in which food is valued and respected. It also encompasses physical activity, movement, shared meals, and a balanced and seasonal diet, with an emphasis on local food production. The Mediterranean lifestyle emphasizes a balance between work on one hand, and rest and private life on the other.
American physiologist Ansel Keys studied the impact of diet on health, and in the 1960's he defined the Mediterranean diet, which eventually became one of the most famous and well-researched dietary patterns. In 2013, the Mediterranean diet was inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity. This paper was written as a review paper by researching the literature using the following key words: mediterranean diet, olive oil, cardiovascular disease, ageing. The aim of the paper was to analyze the impact of the Mediterranean diet on health.
Chronic non-communicable diseases such as cardiovascular disease, diabetes, and obesity are the result of the interaction of multiple factors, and are associated with an unbalanced and unhealthy diet, among other things. Numerous observational studies and clinical trials have highlighted the beneficial effects of the Mediterranean diet on the outcomes of cardiovascular diseases, and the aforementioned lifestyle is also associated with the concept of healthy aging. The main characteristic of the Mediterranean diet is the regular consumption of extra virgin olive oil, which contains essential fatty acids, and the polyphenols present in it have an antioxidant effect. In 2023, Harvard Health Publishing published a practical guide to the Mediterranean diet, and their first recommendation is to gradually replace all fats with extra virgin olive oil. Other important guidelines include the consumption of nuts, whole grains, legumes, fresh fruits and vegetables, and fish, and wine is also indispensable.
According to the results of a randomized study published in May 2022 in The Lancet, the group that followed the Mediterranean diet had a 26% lower risk of developing heart attack and stroke compared to the control group that was on a low-fat diet. In conclusion, once again the excellent results of the Mediterranean diet have been demonstrated.

Keywords: Mediterranean diet, olive oil, cardiovascular disease, ageing

MOBILIZING SMART ECOLABELS AND CITIZEN SCIENCE FOR ADVANCING FOOD LITERACY AND ENABLING SUSTAINABLE TRANSITIONS IN FOOD SYSTEMS

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poster presentation

Type Food waste and food loss remain pressing challenges across the European Union (EU) and the Western Balkans, particularly as these regions seek to transition toward sustainable and resource-efficient food systems. In 2023, an estimated 58 million tons of food were wasted within the EU, with over 50% of this waste originating at the household level. Similar patterns are evident in the Western Balkans, where insufficient infrastructure and limited regulatory enforcement exacerbate the issue. A key driver of waste is improper food handling and low consumer awareness of optimal storage and consumption timelines.

This study presents the development and implementation of smart ecolabels as a practical and scalable solution to this challenge. These labels provide continuous, real-time monitoring of temperature exposure, offering consumers and stakeholders in the cold supply chain timely indicators of food product freshness and safety.

In addition to technological validation, the study incorporates citizen science approaches and strategies to improve food literacy as part of a broader behavior change framework. The effectiveness of smart ecolabels is evaluated within the Water-Energy-Food-Ecosystems (WEFE) Nexus, offering a systems-level assessment of reduced resource consumption, improved household practices, and minimized spoilage. This integration highlights the potential of digital ecolabel innovations to drive sustainable transitions in food systems, especially in regions with emerging regulatory environments.

The results underscore the efficacy of smart ecolabels as a low-cost, high-impact tool for reducing food waste, preserving embedded resources, and supporting environmental policy development at both national and regional levels. This research not only informs ongoing strategies within the EU Green Deal and Farm to Fork initiatives but also contributes to capacity-building for food system resilience and sustainability in the Western Balkans through improved citizen engagement and informed consumption.

Keywords: smart ecolabels, food waste reduction, citizen science, food literacy, WEFE Nexus

TRENDS AND REGIONAL DIFFERENCES IN CHILDHOOD OVERWEIGHT AND OBESITY IN CROATIA: RESULTS FROM THREE ROUNDS OF THE CROCOSI STUDY

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poster presentation

The Croatian Childhood Obesity Surveillance Initiative (CroCOSI), as part of the WHO European COSI network, has conducted three nationally representative rounds of monitoring overweight and obesity among 8-year-old children (2015/2016, 2018/2019, 2021/2022). We examined the published CroCOSI findings to explore key national and regional trends. Results consistently show a high and increasing prevalence of overweight and obesity, with Croatia ranking among the top European countries. In the latest round, 36.1% of children were overweight or obese (33.7% girls, 38.5% boys), compared to the European average of 24–30%. Boys are persistently more affected than girls. Regional analysis reveals that in the second round, the Adriatic region had the highest prevalence (girls 30.3%, boys 40.2%), while in the third round, the Pannonian region showed the highest rates, with 38.9% of children overweight or obese and nearly one in five being obese. Key contributing factors include insufficient fruit and vegetable intake, high screen time, and low physical activity, trends exacerbated during the COVID-19 pandemic. Parental underestimation of children's weight status remains a concern. Despite national and regional interventions, the gap between Croatia and the European average has not narrowed; Croatia remains among the countries with the highest prevalence of childhood overweight and obesity in Europe, especially among boys. This review highlights the urgent need for comprehensive, multisectoral strategies targeting schools, families, and communities, with a focus on promoting healthy eating and physical activity, and addressing regional disparities. These CroCOSI data provide essential insight for guiding future policy and intervention efforts in Croatia.

Keywords: children, obesity, overweight, public health

NUTRITION AND APPEARANCE OF A BALLERINA'S BODY

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poster presentation

Ballet is a performing art most often seen on stage, characterized by elegance, grace, athleticism, and refined aesthetic expression. As a physical discipline over three centuries old, classical ballet demands not only technical perfection but also a specific body appearance that aligns with ideals of lightness and slenderness. Achieving excellence in ballet requires a synergy of physical fitness, strength, coordination, flexibility, and above all, proper nutrition. Nutrition plays a key role in meeting daily energy demands, maintaining health, and enhancing physical performance. For ballerinas, whose performances require both endurance and strength, ensuring sufficient energy intake is essential. However, the ballet world's strong emphasis on thinness often leads dancers to manipulate their caloric intake in potentially harmful ways. This creates constant pressure and can compromise both health and performance. The aim of this paper is to highlight the critical importance of balanced nutrition and a healthy body image for ballerinas, advocating for performance-oriented dietary strategies over restrictive practices.

Keywords: ballet, ballerina, nutrition, body image, physical appearance

DETERMINANTS OF MENTAL HEALTH AND DIETARY AND LIFESTYLE HABITS – AN OBSERVATIONAL STUDY

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oral presentation

Mental health is an essential and integral part of overall health and well-being, and closely linked to physical health. This relation becomes even more visible once a person is under stress or feels depressed. An observational study was conducted on 185 participants to examine the relationship between mental health, body weight and dietary habits. Aspects of mental health (depression, stress and anxiety) were assessed with DASS-21 scale. Although half of the participants had a normal Body Mass Index (BMI), over 47% were overweight or obese. Nearly one-third of the participants had been diagnosed with a mental illness, and 19.5% used medication for mental disorders (mainly antidepressants). More than half of the medication users reported weight gain. Participants diagnosed with a mental illness scored significantly higher on the DASS-21 scales. On the other hand, among those without a diagnosis, there were no significant differences in levels of stress, anxiety, and depression, nor their BMI. No significant differences were found in dietary preferences, but it was observed that participants who were using medications for their issues more frequently consumed specific foods for emotional regulation purposes like sweets. The results highlight the need for an integrated approach to the treatment of mental disorders, incorporating dietary habits as important factors in maintaining both mental and physical health.

Keywords: mental health, body weight, nutrition, medication, dietary habits

LIFESTYLE AND DIETARY HABITS OF EDUCATION PROFESSIONALS

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poster presentation

Lifestyle encompasses individual habits shaped by social and temporal contexts, including work routines, leisure activities, and dietary behavior. In recent years, its influence on health has garnered growing research interest. This study aimed to assess lifestyle-related behaviors, specifically dietary habits and physical activity, among employees of the Secondary Medical School in Slavonski Brod. A total of 49 staff members participated by anonymously completing an online questionnaire, having first provided informed consent. The survey included sociodemographic questions and items assessing nutrition and physical activity. Results show a high level of awareness among participants regarding the importance of a healthy lifestyle. Most respondents reported regular consumption of nutritious foods and acknowledged the value of a balanced diet in maintaining health. Physical activity was also well-represented: walking was the most frequent form of movement, and most participants were classified as moderately physically active. Respondents indicated that physical activity positively affects their well-being, increases energy levels, and contributes to satisfaction with their physical appearance. Notably, many participants reported opting for stairs instead of elevators, demonstrating a preference for incorporating physical activity into daily routines. Although they reported spending at least two hours per day in a seated position, this suggests a relatively balanced lifestyle considering their professional obligations. Based on these findings, it can be concluded that education professionals exhibit generally healthy behaviors, with moderate physical activity levels, conscious dietary choices, and strong awareness of lifestyle's role in overall well-being.

Keywords: dietary habits, health awareness, lifestyle, physical activity

DIETARY HABITS OF PHYSICALLY ACTIVE INDIVIDUALS DURING GRAPE HARVEST IN CchampagNE REGION

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poster presentation

During the grape harvest in the French region of Champagne, a weekly food diary was kept for workers engaged in physically demanding vineyard activities. Based on the recorded meals, an analysis of dietary habits was conducted using the online application "Program prehrane." The reference model in the application was set as an average harvest worker: a 40-year-old man, 180 cm tall, weighing 75 kg, with a moderate to high level of physical activity. The recommended daily energy intake for this profile was 3242 kcal. The analysis showed that daily energy intake was generally below the recommended level, ranging from 2561.4 to 2874.8 kcal. The proportion of carbohydrates ranged from 34.6% to 53.3% of total energy intake (recommendation: 45-65%), protein from 9.6% to 17.1% (recommendation: 10-20%), while fats accounted for up to 50.9% of total energy intake (recommendation: 20-35%). Saturated fat intake regularly exceeded the recommended maximum of 36 g, with the highest recorded value at 64.3 g. Cholesterol levels reached up to 403 mg per day (recommendation: ≤300 mg), and sodium up to 7512.3 mg (recommendation: ≤2300 mg). It is recommended to introduce snacks, reduce the intake of fatty and processed foods, and increase the share of whole grains.

Keywords: nutrition, grape harvest, Champagne, physical activity

INTERMITTENT FASTING AND MENTAL HEALTH: NEUROBIOLOGICAL INSIGHTS, THERAPEUTIC POTENTIAL AND CHALLENGES

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poster presentation

Intermittent fasting (IF) has emerged as a promising intervention not only for metabolic health but also for improving mental health outcomes. Recent evidence suggests that IF may positively influence neurobiological pathways involved in mood regulation, cognitive function, and neurodegeneration. Key mechanisms include the activation of autophagy, upregulation of brain-derived neurotrophic factor (BDNF), and reduction in neuroinflammation and oxidative stress through modulation of cytokines (e.g., IL-6, TNF-α) and markers such as C-reactive protein (CRP) and malondialdehyde (MDA). Additionally, IF affects metabolic and endocrine parameters – glucose, insulin, cortisol, leptin, and ghrelin – contributing to improved hypothalamic–pituitary–adrenal (HPA) axis regulation.
Despite these promising effects, IF is not without risks. In vulnerable individuals, it may provoke or worsen symptoms of anxiety, dysphoria, irritability, or exacerbate eating and mood disorders. Caution is warranted in individuals with psychiatric comorbidities, hormonal imbalances, or a history of disordered eating.
In conclusion, intermittent fasting holds therapeutic potential as a complementary strategy in mental health care. However, its implementation must be individualized, clinically supervised, and further validated through rigorous, controlled studies.

Keywords: intermittent fasting, mental health, BDNF, autophagy, euroinflammation

THE IMPACT OF BODY WEIGHT AND BODY FAT PERCENTAGE ON INFLAMMATION IN POSTMENOPAUSAL WOMEN

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poster presentation

Postmenopause is the period in a woman's life after the last menstruation, accompanied by numerous changes in the physiology of the body due to the dynamics of hormonal changes that precede it. Changes in lipid metabolism are key in the development of dyslipidemia and insulin resistance in obesity as part of metabolic syndrome. Estrogen deficiency during this period is the cause of centripetal obesity, and adipose tissue has been associated with chronic low-intensity inflammation. This is explained by the fact that adipose tissue is an active endocrine organ with an impact on immune function, appetite regulation, and inflammation through cytokine secretion. Our study examined the influence of body mass index, fat, and visceral tissue percentage on inflammatory markers in postmenopausal women. Obese subjects had significantly higher neutrophil granulocyte counts (P=0.007) and a significantly higher neutrophil/lymphocyte ratio (NRL) (P=0.02); these values were also significantly higher in subjects with excess body weight (P=0.04; P=0.04). Analyses showed a significant positive association between the percentage of fat tissue and RDW (Rho=0.247; P=0.04), percentage of neutrophil granulocytes (Rho=0.289; P=0.02), and NLR (Rho=0.245; P=0.04). Body

mass index was also positively correlated with the percentage of neutrophil granulocytes (Rho=0.280; P=0.02) and NLR (Rho=0.225; P=0.07). Similarly, numerous studies have connected obesity, body fat, and inflammation. The findings of this study emphasize the necessity of early detection of obesity and monitoring of inflammatory alterations, as inflammation is a major contributor to the development of cardiovascular disease. Early detection allows for preventive actions, such as lifestyle and dietary adjustments.

Keywords: body composition, inflammation, menopause, neutrofil/lymphocyte ratio

THE IMPACT OF BODY WEIGHT AND BODY FAT PERCENTAGE ON COGNITIVE FUNCTION IN POSTMENOPAUSAL WOMEN

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poster presentation

Obesity is one of the leading public health challenges, with a high prevalence in Croatia. Increased body mass not only poses a risk to physical health but also has a negative impact on cognitive function, which can have long-term consequences on educational and life outcomes. This study examined the association of obesity (defined as body mass index ≥ 30 kg/m^2), percentage of total body fat, and amount of visceral fat with cognitive function in postmenopausal women. Body fat percentage was defined as low if it was below 24.0 %, normal if it was between 24.0 % and 35.9 %, and high if it was above 36.0 %. An increased amount of visceral fat was considered to be ≥ 10 %. This study included 71 subjects. Obesity was recorded in 28 % of the subjects, while 44 % of the subjects had excess body weight. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA) and Mini-Mental State Examination (MMSE-1). The results showed a significant

negative correlation between the MoCA scores and the percentage of body fat (Rho = -0.319; P = 0.008) and visceral fat (Rho = -0.364; P = 0.002). Similarly, MMSE-1 scores were negatively correlated with the percentage of body fat (Rho = -0.293; P = 0.02) and visceral fat (Rho = -0.343; P = 0.004), while body mass index was not significantly associated with cognitive outcomes. In conclusion, the results indicate the importance of monitoring body composition, especially visceral fat, to preserve cognitive health.

Keywords: body composition, cognitive function, menopause, visceral fat

METFORMIN AS THE ELIXIR OF LIFE

Branislava Teofilović*

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invited lecture

Metformin, a widely used antidiabetic agent, has recently emerged as a promising candidate in the field of geroscience due to its potential to influence aging-related pathways. Originally derived from galegin, an alkaloid found in the French lilac (*Galega officinalis*), metformin has been used for decades in the treatment of type 2 diabetes mellitus, offering favourable safety and cost-effectiveness profiles. Beyond its glucose-lowering effects, accumulating evidence indicates that metformin may play a role in modulating cellular and molecular processes associated with aging. Recent studies suggest that metformin influences several hallmarks of aging, including mitochondrial function, oxidative stress, chronic inflammation, and cellular senescence. Its ability to activate adenosine monophosphate-activated protein kinase (AMPK) and inhibit mitochondrial Complex I appears central to many of these effects, leading to improved metabolic homeostasis, reduced reactive oxygen species production, and enhanced autophagy. Moreover, metformin has demonstrated protective effects in age-associated disorders such as cardiovascular diseases, neurodegenerative conditions, and certain cancers. Given its systemic action, low toxicity, and long-standing clinical use, metformin is currently under investigation in large-scale clinical trials aimed at evaluating its geroprotective potential. This review explores the emerging role of metformin as a modulator of aging-related mechanisms, highlighting its promise as a modern "elixir of life". Understanding the full scope of metformin's biological effects could pave the way for novel therapeutic strategies aimed at promoting healthy aging and longevity.

Keywords: metformin, geroscience, aging, AMPK activation, autophagy

CARDIOVASCULAR RISK, ADHERENCE TO MEDITERRANEAN DIET, AND BUTYRATE LEVELS IN POPULATION OF HOMELAND WAR VETERANS DIAGNOSED WITH PTSD

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poster presentation

Post traumatic stress disorder (PTSD) is a mental health condition triggered by experiencing or witnessing a traumatic event. Due to the Croatian War of Independence in the 1990s levels of PTSD in the Croatian population are the highest in the EU. As PTSD is associated with an increased risk of cardiovascular disease (CVD), the aim of the study was to assess cardiovascular risk, and the lifestyle in the population of Homeland war veterans from Split-Dalmatia county. A total of 137 veterans participated in the study. Their adherence to the Mediterranean diet was determined using the Mediterranean Diet Serving Score (MDSS) Questionnaire, cardiovascular (CV) risk was determined based on the measuring levels of Advanced Glycation End products (AGEs) in the skin and plasma butyrate levels (used as an indirect measure of abundance of butyrate-producing bacteria in the gut microbiota) were measured. Key findings included that 65% of the tested population had complex PTSD and that significant proportion had a "definite" CV risk (39.7%). Results also show very low adherence to the Mediterranean Diet (MD) with only 5.8% of the tested population adherent to MD, and only 2.2% of complex PTSD subjects adherent. These findings are in discrepancy with the determined levels of butyrate in blood plasma which ranged from 4 to 8 μmol/L, and are considered to be within the normal range.

Keywords: Mediterranean diet, cardiovascular risk, butyrate, PTSD

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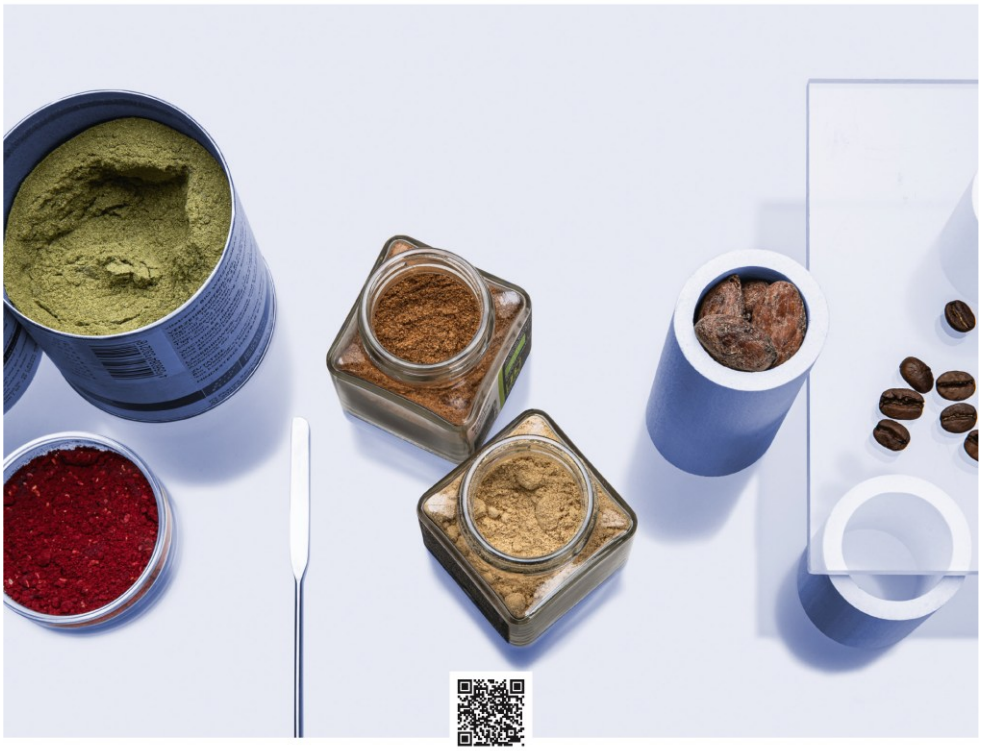

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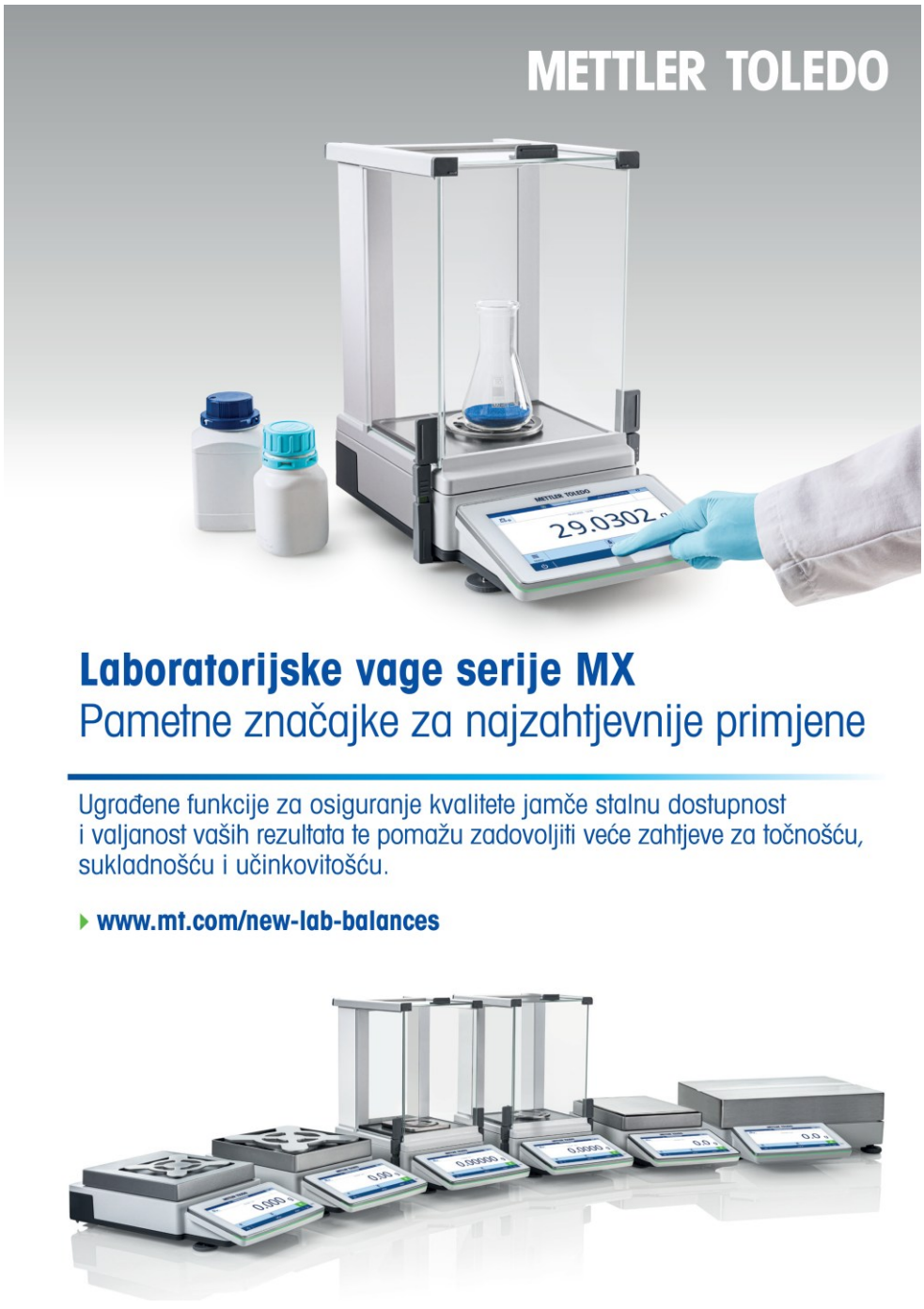

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Kada je riječ o sigurnosti i kvaliteti hrane - proizvođači, prerađivači i potrošači moraju se oslanjati na sigurne sastojke.
Kompletan Shimadzu asortiman analitičkih instrumenata za analizu hrane i pića pruža Vam potpuno povjerenje u hranu!

Naša rješenja!

- Masena spektrometrija s induktivno spregnutom plazmom (ICP-MS)

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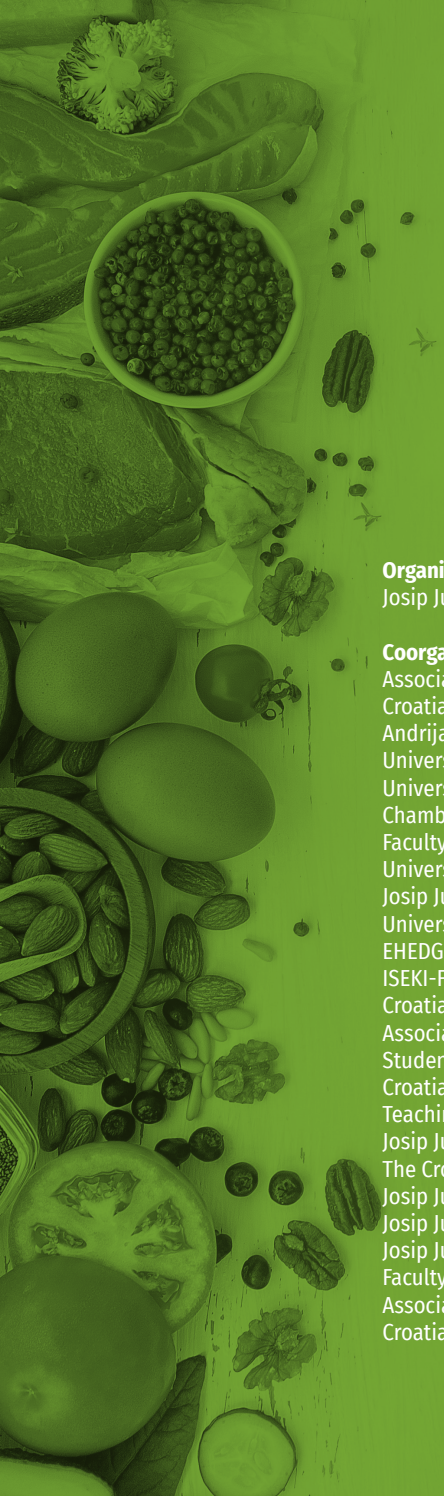

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