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Abstracts of the 6th International Congress on Food Safety and Quality "Food and Health"

Crikvenica, Croatia
11–14 November 2026



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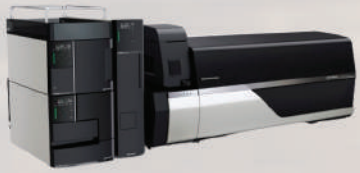
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Dear colleagues and associates,

It is my great honour and pleasure to welcome you on behalf of the Organising and Scientific Committees to the 6th International Congress on Food Safety and Quality "Food and Health", which takes place in Crikvenica from 11 to 14 November 2026.

Once again, the International Congress on Food Safety and Quality will be held under the distinguished patronage of the relevant authorities and institutions. It is organised by the Andrija Štampar Teaching Institute of Public Health, co-organised by the University of Zagreb Faculty of Agriculture, and supported through collaboration with numerous distinguished institutions in Croatia and abroad.

Food safety and quality remain fundamental issues that directly affect the health of every individual and the community as a whole. At a time of rapid technological change, climate-related challenges, and increasingly complex food systems, we must continually reassess risks and identify innovative solutions that ensure access to safe, nutritious food.

This year's Congress will focus on current and increasingly important topics shaping contemporary approaches to food safety. We will discuss environmental and processing contaminants and explore what may be present in the food we consume every day. Particular attention will be given to hidden risks, such as allergens, and ways to identify and prevent them.

We will also emphasise the importance of a healthy diet as a foundation for good health, including the role of nutrients and dietary supplements. The microbiological safety of food – including viruses, bacteria, and their toxins – will remain a key area of scientific and professional discussion.

In response to growing concern among the public and the scientific community, we will address microplastics and persistent organic pollutants in food, as well as the safety of food contact materials and articles. A particularly engaging part of the programme will focus on "smart food", exploring the role of technology and artificial intelligence in improving the safety and quality of food systems.

The Congress will also feature a round-table discussion entitled "The Use of Alternative Plant Proteins and the Impact of Climate Change on Dietary Habits", opening a dialogue on the future of food and the sustainability of our dietary choices.

Previous congresses have brought together large numbers of participants and leading experts from Croatia and around the world, establishing this event as an important forum for sharing knowledge, experience, and best practices. Building on this foundation, we are developing an even stronger and more comprehensive Congress programme, with the aim of strengthening interdisciplinary collaboration and improving food safety systems.

The Congress is intended for food producers, distributors, representatives of scientific and professional institutions, and all stakeholders involved in the farm-to-fork system. Everyone within this system shares responsibility for protecting and improving public health by ensuring high standards of food safety and quality. Scientific and professional gatherings such as this are particularly valuable, as they facilitate the exchange of knowledge and experience, raise awareness, and strengthen professional expertise in food safety and quality.

We thank you in advance for your participation and welcome you to Crikvenica!

Sincerely,
Nebojša Kirigin, MSc
Congress President

Abstracts of the 6th International Congress on Food Safety and Quality "Food and Health"

Plenary lectures

Plenary lecture
Smart food: how are technology and artificial intelligence changing food safety?

AI4Science at the EFSA: use cases supporting scientific risk assessment

Leonard Matijević, Federica Barrucci, Carsten Behring, Marzia Bocchia, Valeria Ercolano, and Yannick Spill

European Food Safety Authority (EFSA), Parma, Italy

leonard.matijevic@efsa.europa.eu

The European Food Safety Authority (EFSA) is developing artificial intelligence (AI) tools to support scientific risk assessment through its "AI for Science" initiative. These tools aim to reduce time spent on repetitive tasks and facilitate the retrieval, processing, and organisation of scientific evidence. The three complementary use cases described here illustrate the application of AI across different stages of scientific literature review. The "AutoCAT" tool identifies and highlights information in scientific publications, supporting scientists in addressing predefined appraisal questions and assessing the risk of bias, while ensuring that scientists retain full control over the final risk-of-bias assessment. "AICorpusQuery" (AICQ) is a flexible solution that integrates recent Large Language Models (LLMs) to support screening and information extraction in systematic literature reviews and enables comparison of outputs generated by different LLMs. The third use case demonstrates how AI can support the risk assessment process of regulated products: the "90-day toxicity study application" is designed to extract and organise information from full study reports into standardised, structured summaries, facilitating review and discussion by scientific experts. These applications are at different stages of development and testing, with scientific users actively contributing to the refinement of their functionality and usability. Together, these use cases provide practical insight into both the opportunities and challenges of integrating AI into scientific workflows, raising important questions concerning output verification, validation, confidentiality, reproducibility, and appropriate human oversight. While AI can assist in retrieving and organising evidence, its outputs require critical review, and scientific interpretation and final risk assessment judgements remain the responsibility of scientists.

KEY WORDS: evidence extraction; human oversight; large language models; risk-of-bias assessment; systematic literature review

Plenary lecture
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Quality labels for agricultural and food products as a tool for the strategic branding of Croatia on the international market

Sanja Kolarić Kravar

Ministry of Agriculture, Forestry and Fisheries, Zagreb, Croatia

sanja.k-kolaric@mps.hr

The increasing importance of food quality, authenticity, origin, and sustainability has transformed agricultural and food products from basic consumer goods into significant components of cultural identity, heritage, and destination appeal. Within this context, quality schemes represent an important instrument for differentiating products, creating added value, and strengthening their market positioning. Croatian agricultural and food products protected under European quality schemes, including Protected Designation of Origin (PDO), Protected Geographical Indication (PGI), and Traditional Speciality Guaranteed (TSG), as well as products included in the national quality scheme "Dokazana kvaliteta" ("Proven Quality"), represent products with added value while preserving Croatia's gastronomic heritage and local identity. Quality-labelled products can therefore be regarded as important ambassadors of Croatia in the international food and gastronomy landscape. Their value extends beyond the product itself, as they contribute directly to sustainable rural development, the promotion of local and domestic production, and the preservation of traditional production practices. Increasingly informed consumers have higher expectations regarding the quality, origin, authenticity, and sustainability of the food they purchase, creating both opportunities and challenges for producers. These products also contribute to strengthening the connection between agriculture, gastronomy, and tourism by enriching the national and regional gastronomic offer. In the context of sustainable food systems and food security, based increasingly on local and sustainable production, quality-labelled Croatian products have significant potential to strengthen the country's international positioning.

KEY WORDS: "Dokazana kvaliteta"; PDO; PGI; quality schemes; TSG

Plenary lecture
What's hiding in food? Environmental and process contaminants

Who's eating off your plate? Industry, fear, and the myth of free food choice

Natko Beck

HOOD – Association for the Prevention, Promotion and Protection of Health, Zagreb, Croatia

tajanaisbeck@gmail.com

Think you're in control of what you eat? Think again. From products engineered to keep us reaching for more to fear-driven messages that turn health into a marketing opportunity, our food choices are shaped by forces we rarely see. And while we are told to "just eat healthier", time, money, and access to better options often stand in the way. So, who really profits from our appetites? This talk takes a closer look at the forces shaping what ends up on our plates – and challenges the myth that healthy eating is simply a matter of personal choice.

KEY WORDS: healthy diet; nutrition; public opinion

Plenary lecture
Smart food: how are technology and artificial intelligence changing food safety?

Quo vadis, food safety?

Dražen Knežević

Croatian Agency for Agriculture and Food, Centre for Food Safety, Osijek, Croatia

drazen.knezevic@hapih.hr

The European food safety system is at a pivotal moment. Over the past two decades, the EU has developed one of the world's most robust food safety frameworks, founded on independent risk assessment, precautionary principles, transparency, and the farm-to-fork approach. However, the future of food safety will be shaped by challenges that extend far beyond traditional paradigms. Climate change, globalised supply chains, geopolitical instability, and the transformation of food production systems are creating new and increasingly complex risks. At the same time, emerging issues such as microplastics, per- and polyfluoroalkyl substances (PFAS), antimicrobial resistance (AMR), and cumulative exposure to multiple contaminants are expanding the scope of food safety science and regulation. Technological innovation is also reshaping the field. Artificial intelligence, big data analytics, and predictive modelling are enabling a shift from reactive risk management towards the early identification and prediction of emerging threats. Food safety authorities are increasingly expected not only to assess known risks, but also to foresee and prepare for those of the future. Simultaneously, novel foods, precision fermentation, alternative proteins, and new genomic techniques (NGTs) are opening unprecedented opportunities for a more sustainable food system while raising new scientific, regulatory, and societal questions. Ensuring that innovation is accompanied by rigorous, science-based safety assessment will remain a central challenge. In this evolving landscape, food safety can no longer be viewed solely as a matter of risk assessment. It is increasingly becoming a question of system resilience, preparedness, and public trust. The future of food safety in Europe will therefore rest on three interconnected pillars: prediction, resilience, and trust.

KEY WORDS: complex risks; consumer trust; food system resilience; new paradigms; sustainability

Plenary lecture
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Nanoplastics in food: can we measure what we need to regulate?

Ivana Vinković Vrček

Institute for Medical Research and Occupational Health, Zagreb, Croatia

ivinkovic@imi.hr

The increasing presence of plastic particles in the environment has raised concern about human exposure to micro- and nanoplastics through food, yet reliable occurrence and exposure data for the nanoscale fraction remain scarce. This presentation aims to critically examine the current evidence on the entry of nanoplastics into the food chain and assess whether available analytical capabilities can generate data sufficiently robust for exposure and risk assessment. Potential sources will be considered across the food chain, including environmental contamination of raw materials, processing, packaging, storage, and preparation, with particular attention to particles originating from food-contact materials. Current spectroscopic, microscopic, particle-based, and mass-spectrometric approaches will be evaluated with respect to sample preparation, complex food matrices, size detection limits, chemical identification, quantification, and contamination control. Major methodological limitations include the lack of suitable reference materials, harmonised analytical procedures and approaches capable of distinguishing environmental particles from those generated during food processing and use. Recent activities by the European Food Safety Authority (EFSA) and Organisation for Economic Co-operation and Development (OECD) will be discussed to illustrate how advances in particle characterisation, sample preparation, dosimetry, toxicokinetics, and nanospecific safety assessment are strengthening the methodological basis for regulatory evaluation. Despite this progress, a substantial gap remains between detecting nanoplastics, reliably quantifying human exposure, and generating evidence sufficiently robust to support regulatory risk assessment.

KEY WORDS: analytical methods; exposure assessment; particle characterisation; reference materials; risk assessment

Plenary lecture
What's hiding in food? Environmental and process contaminants

Supporting food and feed safety across Europe: the role of the European Union reference laboratory for mycotoxins and plant toxins

Josipa Grzetic Martens

Wageningen Food Safety Research, Wageningen, Netherlands

josipa.grzeticmartens@wur.nl

Reliable monitoring of mycotoxins and plant toxins in food and feed depends on analytical results that are scientifically robust and comparable across laboratories. The European Union Reference Laboratory for mycotoxins and plant toxins in food and feed (EURL MP), hosted by the Wageningen Food Safety Research, supports this goal by working with the European Commission and national reference laboratories (NRLs) to strengthen the evidence base for official controls across the EU. This presentation will describe how the EURL MP's activities contribute to that shared effort. Proficiency testing provides a means to evaluate laboratory performance, identify sources of interlaboratory variability, and determine where further support is needed. These findings guide method development, training, and the preparation of practical guidance for laboratories. Current work addresses both established and emerging toxins, including analytical approaches for complex food and feed matrices using liquid chromatography-tandem mass spectrometry (LC-MS/MS) and high-resolution mass spectrometry. The presentation will also consider how analytical practice is kept aligned with evolving regulatory requirements. This includes guidance on method performance, harmonised reporting and compliance assessment, and standardisation activities by the European Committee for Standardization (CEN). Selected research will illustrate how the EURL anticipates analytical needs for emerging and less well-characterised hazards. Together, these efforts connect laboratory performance, analytical science, and regulatory practice. By supporting consistent methods and sustained collaboration across the EURL/NRL network, the EURL MP contributes to reliable official controls and a stronger capacity to address future food and feed safety challenges.

KEY WORDS: emerging toxins; EURL-NRL network; guidance; harmonisation; proficiency testing

Invited lectures

Invited lecture
Smart food: how are technology and artificial intelligence changing food safety?

Electron paramagnetic resonance spectroscopy in evaluating the quality and safety of food processed with innovative non-thermal technologies

Nadica Maltar Strmečki, Franka Markić, and Senada Muratović

Ruđer Bošković Institute, Zagreb, Croatia

nstrm@irb.hr

The increasing demand for high-quality, microbiologically safe, and minimally processed food has driven the application of innovative non-thermal technologies. This study aims to evaluate the impact of non-thermal treatments on food quality and safety using electron paramagnetic resonance (EPR) spectroscopy as an important analytical tool for performance assessment and optimisation. Tomato samples were selected as the research subject and processed using three widely used non-thermal techniques: pulsed electric field, cold plasma, and ultrasound. Various process parameters were applied, including differences in treatment duration, voltage, frequency, amplitude, and field intensity. The effects of these treatments were evaluated using EPR spin-trapping to detect, identify, and characterise free radicals, transition metal ions, and other paramagnetic species. Additionally, the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method was used to determine changes in antioxidant activity, while traditional analytical techniques monitored the content of bioactive components, specifically carotenoids and polyphenolic compounds. The results indicate that process conditions significantly affect the formation and stability of reactive species and antioxidant activity in the tomato samples. Treatment intensity played a crucial role: milder treatments generally preserved the food's functional properties, whereas more intense treatments resulted in more pronounced oxidative changes. In conclusion, EPR spectroscopy proved to be a rapid, precise, and highly suitable method for monitoring antioxidative modifications. Its application contributes to a better understanding of the effects of non-thermal processing, helping to optimise industry parameters to ensure both food safety and the preservation of nutritional quality.

KEY WORDS: bioactive compounds; food processing; free radicals; oxidative changes; spin-trapping

Invited lecture
What's hiding in food? Environmental and process contaminants

What lies behind the numbers? Long-term trends in pesticide residues in food and their implications for consumer health

Iva Pavlinić Prokurica

Croatian Agency for Agriculture and Food, Zagreb, Croatia

iva.pavlinic.prokurica@hapih.hr

The presence of pesticide residues in food is an important issue in food safety and consumer health protection. Long-term systematic monitoring within the framework of official controls provides insight into their occurrence, identifies non-compliance with maximum residue levels (MRLs), and enables the identification of trends and potential risks. However, neither the presence of pesticide residues nor the exceedance of MRLs necessarily implies an unacceptable health risk. Risk assessment is essential for the appropriate interpretation of analytical results, as it integrates the toxicological properties of pesticides with estimated consumer exposure. Particular importance is placed on acute risk assessment using the European Food Safety Agency Pesticide Residue Intake Model (EFSA PRIMo), which provides a scientific basis for decision-making within official food controls and the Rapid Alert System for Food and Feed (RASFF). Long-term monitoring results reveal varying trends, with pesticide residues consistently representing the leading hazard category in terms of the number of non-compliant samples each year. Nevertheless, acute risk assessments indicate that only 2–4 % of non-compliant samples pose a potential acute health risk, highlighting the importance of distinguishing regulatory non-compliance from health risks.

KEY WORDS: cumulative risk assessment; EFSA PRIMo model; maximum residue levels; RASFF; risk assessment

Invited lecture
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

REACH and CLP regulations as the basis for the regulatory control of hazardous chemicals

Ivana Vrhovac Filipović

Ministry of Health, Zagreb, Croatia

ivana.vrhovacfilipovic@miz.hr

The control of hazardous chemicals in the European Union is a dynamic regulatory process. In that process, scientific evidence is translated into legally binding measures affecting substances, products, and entire supply chains. Under REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) and CLP (Classification, Labelling and Packaging) regulations, information on hazardous properties, uses, and exposure provides the basis for regulatory action. The European Chemicals Agency (ECHA) drives this process by coordinating scientific assessment and stakeholder input. Regulatory action starts with the identification of a substance of concern, followed by the preparation of a regulatory proposal, public consultation, and scientific evaluation by the ECHA's committees for Risk Assessment and Socio-Economic Analysis. The process considers not only the intrinsic hazard of a substance, but also actual uses, exposure patterns, risks to workers and consumers, technical feasibility, socio-economic consequences, and the availability of safer alternatives. It can result in an authorisation requirement or in restrictions on specific uses, products, or articles. Recent examples such as EU restriction on intentionally added microplastics, the ongoing regulatory process for per- and polyfluoroalkyl substances (PFAS), and measures concerning bisphenols and lead, show how these decisions influence product formulation, material selection, and substitution strategies. For food contact materials, these developments are particularly relevant because chemical substances may be subject simultaneously to the general EU chemicals framework and specific food contact requirements. Understanding the ECHA regulatory process and its practical implications is crucial for predicting regulatory changes and assessing their potential impact on the safety, composition, and continued use of materials and articles intended to come into contact with food.

KEY WORDS: hazard classification; regulatory framework; restrictions; risk management; substances of very high concern

Invited lecture
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

The regulatory status of monacolin K from red yeast rice in food supplements

Lea Pollak and Iva Ladan

Croatian Institute of Public Health, Zagreb, Croatia

lea.pollak@hzjz.hr

The development of food supplements is expanding alongside advances in phytopharmacy. Plant species and botanicals are subject to regulatory oversight, as are other biologically active substances, authorised and "on-hold" health claims, and labelling requirements. One of the more effective biologically active substances is monacolin K, derived from red yeast rice. In 2010, following scientific and safety evaluations, the European Food Safety Authority (EFSA) proposed specific dosage levels and a health claim relating to hypercholesterolaemia, which the European Commission subsequently authorised in 2012. Subsequent evaluations in 2022 led to a reduction in the recommended daily dose and the withdrawal of the authorised health claim. Further evaluations followed, culminating in the announcement of a total ban on the use of monacolin K in food supplements. Consequently, the industry has begun reformulating food supplements using new biologically active ingredients.

KEY WORDS: ban; health claim; legislation; phytopharmacy; statins

Invited lecture
What's hiding in food? Environmental and process contaminants

When sweetness turns bitter: the hidden photochemical hazards of chlorinated aspartame and related artificial sweeteners

Davor Šakić, Kristina Pavić, Antonio Ljulj, Valerije Vrček, and Irena Žuntar

University of Zagreb, Faculty of Pharmacy and Biochemistry, Zagreb, Croatia

davor.sakic@pharma.unizg.hr

The use of artificial sweeteners is expected to increase because of growing demand for sugar-reduced products and the rising global burden of diabetes. In 2024, diabetes affected an estimated 589 million adults worldwide, while 853 million are projected to be affected by 2050. Aspartame, the third most widely consumed high-intensity artificial sweetener by volume in Europe, was selected as the principal model compound. Besides its extensive use in foods and beverages, it is also used as a sweetening excipient in pharmaceutical formulations, including chewable tablets and oral liquids. Its global market is projected to grow by approximately 3–4 % annually through 2030. Increased use of the structurally related sweeteners neotame, advantame, and alitame is also anticipated, with particularly strong growth projected for neotame and advantame. Chlorination is the predominant method of water disinfection, creating opportunities for nitrogen-containing compounds to react with hypochlorous acid during treatment or following their release into wastewater. However, the transformations of amino-acid-derived sweeteners during chlorination and subsequent light exposure remain insufficiently characterised. Evidence will be presented that chlorination of aspartame forms a photolabile N-Cl bond and that irradiation initiates radical rearrangements, yielding imines and secondary carbonyl products. Transformation products were characterised by mass spectrometry, while reaction kinetics and radical intermediates were monitored by nuclear magnetic resonance and electron paramagnetic resonance spectroscopy with direct photoirradiation inside the instrument cavities. Rearrangement pathways were investigated computationally, and the toxicity, genotoxicity, and carcinogenicity of identified products were predicted using *in silico* approaches. Previously unrecognised products were thereby prioritised for subsequent experimental toxicological assessment.

KEY WORDS: food contaminants; imine compounds; *in silico* toxicology; photochemistry; transformation products

Oral presentations

Oral presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Impact of diet on the presence of aflatoxin B1 in breast milk and risk assessment for infant health

Amir Ibrahimagić[1], Jasmina Kišija-Bajrić[2], Dženana Hasanbašić[1], Nermin Imamović[1], Benjamin Čaušević[1], and Muamer Mandra[1]

[1] Institute for Health and Food Safety, Zenica, Bosnia and Herzegovina
[2] Medicana Hospital, Sarajevo, Bosnia and Herzegovina

ibrahimagic.amir@gmail.com

Aflatoxin B1 (AFB1) is a highly toxic and carcinogenic mycotoxin that can be transferred into breast milk through maternal diet, posing a potential health risk to infants. The aim of this study was to evaluate the influence of diet on AFB1 occurrence in breast milk and to assess infant exposure and associated health risks. Breast milk samples (n=50) were analysed before and after dietary modification. AFB1 levels were determined using an accredited ELISA (enzyme-linked immunosorbent assay) method in accordance with international standards. Data on maternal dietary habits and infant characteristics (age and body mass) were collected. Statistical analysis was performed using a paired t-test, while exposure and risk were assessed using the Estimated Daily Intake (EDI) and Margin of Exposure (MOE) approaches. The mean AFB1 concentration before dietary intervention was 2.87±1.48 μg/kg, which significantly decreased to 1.95±0.55 μg/kg after intervention ($p<0.001$). Frequent consumption of cereals, dairy products, and nuts was associated with higher AFB1 levels. Exposure assessment indicated that infants were ingesting AFB1 through breast milk, with higher exposure observed in younger infants with lower body mass. MOE values before intervention indicated a potential health concern (MOE<10,000), whereas post-intervention values increased, indicating reduced risk. Maternal diet significantly influences AFB1 levels in breast milk. Dietary modification results in a statistically significant reduction in AFB1 concentrations and associated health risk for infants. Nutritional education is a key preventive strategy.

KEY WORDS: health risk; infants; maternal diet; MOE; mycotoxin

Oral presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

The role of veterinary public health in improving the safety of local food products from small-scale producers

Majda Fetahagić, Nermin Imamović, and Muamer Mandra

Institute for Health and Food Safety, Zenica, Bosnia and Herzegovina

mfetahagic@gmail.com

Veterinary public health plays an important role in preventive action, producer education, and the establishment of mechanisms that simultaneously protect consumer health and support the development of small-scale producers. The aim of this paper is to propose a model for improving the safety of locally produced food products through a system of professional support, education, and control. Based on an analysis of food safety requirements and the specific characteristics of small-scale production, a proposed model was developed encompassing the assessment of production hygiene conditions, definition of basic hygiene requirements, producer education, laboratory testing of food products, and establishment of appropriate documentation. Particular attention was given to the development of practical and comprehensible guidelines that would enable small-scale producers to more easily fulfil food safety requirements. A proposed model was developed integrating professional support, hygiene criteria, producer education, laboratory testing, and documentation of production processes. The proposed model enables a more systematic approach to the identification and control of potential food safety hazards while taking into account the specific characteristics and capacities of small-scale producers. Its implementation is expected to contribute to improved hygiene conditions in production, increased knowledge and competencies among producers, enhanced food safety, and improved opportunities for the market placement of locally produced food products. The proposed model provides a basis for developing a practical system that, through preventive action, education, professional oversight, and laboratory testing, could contribute to improving the safety of local food products.

KEY WORDS: education; food safety; hygiene conditions; One Health

Oral presentation
What's hiding in food? Environmental and process contaminants

Ochratoxin A as a food contaminant: risk assessment for Croatian children and adolescents

Sanja Miloš[1], Vlatka Buzjak Služek[1], Dražen Knežević[1], Jelka Pleadin[2], Irena Jug[3], and Maja Šegvić Klarić[4]

[1] Croatian Agency for Agriculture and Food, Osijek, Croatia
[2] Croatian Veterinary Institute, Zagreb, Croatia
[3] J.J. Strossmayer University of Osijek, Faculty of Agrobiotechnical Sciences, Osijek, Croatia
[4] University of Zagreb, Faculty of Pharmacy and Biochemistry, Zagreb, Croatia

sanja.milos@hapih.hr

Ochratoxin A (OTA) is a secondary metabolite produced by moulds of the geni *Aspergillus* and *Penicillium*. OTA is considered one of the most toxic mycotoxins frequently contaminating food of plant and animal origin. OTA most commonly occurs in cereals and cereal-based products, cured meat, and traditional meat products. OTA is genotoxic both *in vitro* and *in vivo*; however, its mechanisms of genotoxicity remain unclear. In order to characterise potential health risks, the Croatian Agency for Agriculture and Food's Centre for Food Safety performed a dietary exposure to OTA across various food products classified according to the EFSA FoodEx2 system (a food classification and description system) for three age groups of children (aged ≥3 months to <10 years) and adolescents (aged ≥10 to <18 years). Concentration data were sourced from national food monitoring programmes (2020–2023) and a study conducted by the Croatian Veterinary Institute (2019–2021). Following data validation, a total of 863 analytical results were included in the exposure assessment. Food consumption data were obtained from national dietary surveys. Risk characterisation was performed using the Margin of Exposure (MOE) approach, based on benchmark dose lower confidence limits ($BMDL_{10}$) for non-neoplastic and neoplastic effects. The results showed that, for both mean and 95th percentile exposure levels, MOE values for non-neoplastic effects indicated a low level of health concern for children and adolescents. However, for neoplastic effects, the calculated MOE values indicated a public health concern. Cereals and cereal-based products had the largest contribution to total OTA exposure across all of the age groups.

KEY WORDS: exposure; margin of exposure (MOE); mycotoxin; public health; risk characterisation

Oral presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

The role of vitamin D in maintaining bone density in women: the importance of diet and supplementation in osteoporosis prevention

Martina Đotlo, Mateja Ibrišimbegović, Ermina Kukić, and Sead Karakaš

Public Health Institute of the Central Bosnia Canton, Travnik, Bosnia and Herzegovina

matejapaklarcic987@gmail.com

Vitamin D plays an important role in maintaining bone health by regulating calcium and phosphorus balance, calcium absorption, and bone mineralisation. Inadequate vitamin D intake may contribute to reduced bone mineral density and an increased risk of osteoporosis, particularly in postmenopausal women. This review aimed to examine the role of vitamin D in maintaining bone mineral density and to highlight the importance of adequate nutrition, fortified foods, and supplementation in osteoporosis prevention. Randomized controlled trials, systematic reviews, and observational studies investigating vitamin D, dietary intake, and bone health in postmenopausal women were reviewed using PubMed/MEDLINE, Web of Science, Google Scholar, and ScienceDirect. A systematic review of 15 randomized trials involving 3,054 postmenopausal women showed that vitamin D supplementation and food fortification improved vitamin D status and may have beneficial effects on bone mineral density, particularly at the femoral neck. In a one-year study of fortified milk, the vitamin D concentration increased from 63.1 to 74.8 nmol/L, or approximately 18.5 %. A meta-analysis of 11 randomized trials involving 43,869 women showed a modest improvement in pelvic bone mineral density with combined calcium and vitamin D supplementation, but no significant reduction in overall fracture risk. The findings emphasized the importance of adequate nutritional status, particularly in postmenopausal women with a vitamin D deficiency. A balanced diet, fortified foods, and targeted supplementation in individuals at increased risk may contribute to maintaining bone health and preventing osteoporosis.

KEY WORDS: calcium; food fortification; fracture risk; micronutrients; nutritional status

Oral presentation
Smart food: how are technology and artificial intelligence changing food safety?

A multi-purpose facility for food-ionising radiation and vector insect control: supporting pollinator sustainability under climate change

Ivica Prlić[1], Mateo Jakac[2], Nediljko Landeka[2], Luka Pavelić[1], and Maksim Moralić[3]

[1] Institute for Medical Research and Occupational Health, Zagreb, Croatia
[2] Teaching Institute of Public Health of the Istria County, Pula, Croatia
[3] Kutjevo d.d., Kutjevo, Croatia

iprlic@imi.hr

Public interest in technical and policy decisions regarding safe, organic food production has grown significantly in recent years. This comes against the backdrop of rapid climate change, which accelerates the migration of biological species via imported food outside their native habitats. Croatia is already facing – and will increasingly experience – the impacts of invasive species introduced through food imports from tropical and subtropical regions. While current Croatian measures focus primarily on irradiating specific imported goods like tea for further processing, a substantial amount of food entering the EU (such as meat, and even flowers) is already irradiated prior to arrival. A new Croatian regulation on food subjected to ionising radiation has recently been drafted. While it could support climate-smart agriculture as a component of sustainable horticultural pest management, it falls short of fully leveraging the Croatian market's potential to irradiate domestic food products for export and local distribution. A critical component of Croatia's agricultural export is seed-grade material. However, storage and transport losses currently exceed 60 % due to inadequate preservation methods. To address this, we propose introducing advanced irradiation technologies for agricultural seeds and semi-finished food products (particularly meat). These operations can be integrated into the same multi-purpose facilities used for Sterile Insect Technique (SIT) applications to combat invasive species. Furthermore, such an integrated facility can be scaled up for broader applications, including the sterilisation of medical and veterinary equipment, blood irradiation, medical honey production, and the sterilisation of animal feed.

KEY WORDS: climate-smart agriculture; food irradiation; seed preservation; Sterile Insect Technique (SIT); vector insects

Oral presentation
Smart food: how are technology and artificial intelligence changing food safety?

Sarcopenia is preventable by resistance training, a protein diet, and supplements

Josip Čulig

Croatian Academy of Medical Sciences, Collegium of Public Health, Zagreb, Croatia

josip.culig@klinpharma.hr

Sarcopenia was defined by the European Working Group on Sarcopenia in Older People (EWGSOP) as a syndrome characterised by progressive and generalised loss of skeletal muscle strength and functions with a risk of adverse outcomes. Currently, 6−19 % of the global population over the age of 60 suffers from sarcopenia. Some evidence has shown that an adequate intake of protein (aminoacids), vitamin D, antioxidant nutrients, and long-chain polyunsaturated fatty acids is beneficial for improving sarcopenia. The anabolic potential of proteins correlates with amino acid composition, which is supported by the finding that plasma concentrations of leucine, isoleucine, and tryptophan are reduced in patients with sarcopenia. The "leucine trigger" hypothesis has been proposed, which predicts that the magnitude and rate of postprandial blood leucine increase may modulate the magnitude of the postprandial muscle protein synthesis (MPS) response to protein intake. The currently acceptable recommended intakes for each nutrient are: protein 1–1.2 g/kg/day for healthy elderly persons; leucine 2.5–2.8 g per meal; vitamin D 800–1,000 IU/day; vitamin E 400 IU/day; vitamin C 45–90 mg/day; magnesium 300 mg/day for men and 270 mg/day for women; selenium 25–75 μg/day; calcium 1,000–1,200 mg/day; inorganic nitrate 3.7 mg/kg/day; collagen 50 mL/day; polyphenols >500mg. Clinicians or health care providers need to screen adults in their fifties for risk of sarcopenia and then potentially advise resistance training and diet and protein optimisation programmes. Supplements are recommended.

KEY WORDS: leucine; magnesium; old age; omega-3; vitamin D

Oral presentation
What's hiding in food? Environmental and process contaminants

Occurrence of pesticide residues with obesogenic potential in plant-based food on the Slovenian market

Vesna Viher Hrženjak, Tatjana Marjanovič, and Urška Blaznik

National Institute of Public Health, Ljubljana, Slovenia

vesna.viher.hrzenjak@nijz.si

Obesogens are environmental chemicals that may increase white adipose tissue mass following exposure *in vivo*. As food is considered a major source of human exposure to obesogens, pesticide residues in food may represent a relevant source of exposure. The aim of this study was to investigate the occurrence of pesticide residues with obesogenic potential in plant-based foods on the Slovenian market. Our study included food samples analysed for pesticide residues as part of the official food control programme in Slovenia between 2019 and 2023. The number of samples analysed varied between pesticide residues according to the analytical scope. Only a limited number of pesticide residues with obesogenic potential were detected. Chlorpyrifos-ethyl was detected in 61 of 5,030 analysed samples (1.21 %), chlorpyrifos-methyl in 41 of 5,030 samples (0.82 %), malathion in 36 of 4,789 samples (0.75 %), and permethrin in 3 of 5,030 samples (0.06 %). Other selected pesticides with obesogenic potential were not detected. Among the pesticide residues routinely monitored in foods under Slovenia's official food control programme, only a limited number of residues with obesogenic potential were detected, and at low concentrations. However, these findings alone do not allow us to conclude that potential human exposure is negligible with regard to possible obesogenic effects. Further research is needed to determine whether exposure to obesogens at current environmental levels may contribute to obesogenic effects in the general population. Exposure to obesogenic chemicals remains an underrecognised and understudied potential contributor to the obesity pandemic.

KEY WORDS: chemical exposure; environmental contaminants; food control programme; food safety; obesity

Oral presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

The importance of self-assessed reasons for placement in long-term institutional care for preparing food menus for older adults in nursing homes

Nada Tomasović Mrčela[1,2], Marina Sušac[3], Branko Kolarić[1,4,5], and Ana Puljak[1]

[1] Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia
[2] University of Split, Faculty of Health Sciences, Split, Croatia
[3] Službenice Milosrđa Monastery, Kaštel Sućurac, Croatia
[4] University of Rijeka, School of Medicine, Rijeka, Croatia
[5] Academy of Medical Sciences of Croatia, Zagreb, Croatia

nada.tomasovic-mrcela@stampar.hr

This study was carried out as part of a research project of the University of Split Faculty of Health Sciences entitled "Self-assessed needs of older adults for the services of gerontological centers (non-institutional care) in Split" (SOZS-IP-2020-5). The main goal of the projects was to determine the chief reasons for placing members of the population aged 65 and over in long-term institutional care in nursing homes. Nutrition in nursing homes is one of the key services associated with accommodation and comprehensive care for older adults. A telephone survey using contacts from the official waiting list for accommodation in the Split Nursing Home on Vukovarska street was conducted in October 2021 with anonymity and with persons aged 65 and over. The results of the study showed that the primary reason for placement in long-term institutional care in nursing homes for the respondents (n=182) was "illness" with an average importance level of 1.63 (SD 1.07) on a scale of 1–3. The second reason was the "need for nursing care" with 1.18 (SD 1.03). Based on the results of this study, it can be concluded that "illness" and "need for nursing care" are the highest ranked reasons for placement in nursing homes according to the self-assessment of older adults. Such results undoubtedly confirm the importance of applying geronto-nutritional norms with guidelines oriented towards specific illnesses in individual users of nursing homes.

KEY WORDS: geronto-nutritional norms; illness in older adults; nutrition in nursing homes; self-assessed needs of older adults

Oral presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Challenges in the determination of curcumin as a food colouring in potato-based snacks

Iva Ladan, Tea Agić, Lea Pollak, and Dubravka Marija Kreković

Croatian Institute of Public Health, Zagreb, Croatia

iva.ladan@hzjz.hr

The determination of curcumin (E100) in food products can be challenging, particularly in complex matrices such as potato-based snacks. During the evaluation of European interlaboratory testing (EURL-FIA 2026/1), results variability between laboratories was observed for curcumin determination in potato-based snack samples containing curcuminoids. Among the twenty laboratories registered for the Proficiency Testing (PT) scheme, only five achieved fully satisfactory results. We observed that laboratories applying acidified acetonitrile extraction in combination with a QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe)-based procedure generally achieved more consistent results than those using alternative extraction solvents and/or clean-up procedures, including direct extraction without clean-up. The laboratory of the Croatian Institute of Public Health conducted two preparation approaches for the sample: QuEChERS extraction using acidified acetonitrile and direct solvent extraction followed only by filtration. Although both procedures demonstrated satisfactory apparent recoveries in spiked samples, differences in measured curcumin concentrations were observed between the approaches. This indicated that recovery alone may not be sufficient to demonstrate method equivalence in complex food matrices. In contrast, the determination of curcumin as an active substance in food supplements was less problematic, with direct dissolution and filtration providing satisfactory results. This difference was likely related to matrix complexity. These findings highlight the importance of matrix-specific validation and harmonised sample preparation for reliable determination of E100 in complex foods.

KEY WORDS: acidified acetonitrile extraction; curcuminoids; interlaboratory variability; matrix effects; QuEChERS

Oral presentation
Smart food: how are technology and artificial intelligence changing food safety?

The role of FAO in shaping international policy in the field of food security

Marina Deur

Ministry of Agriculture, Forestry and Fisheries, Zagreb, Croatia

mdeur@mps.hr

Enhancing the well-being and addressing the economic and social challenges of the world's population are and always have been topics of international relevance. Poverty, inequality, and food security are problems that humanity has faced since ancient times. The Food and Agriculture Organisation of the United Nations (FAO) has been present in the international community for eighty years. Dynamic international relations in that period left their mark in the development of this international organisation, established with a mandate to promote food security, increase general well-being and agricultural productivity, and encourage rural development. FAO is the largest organisation within the United Nations and represents a key factor in conducting international policy, developing a normative framework, and implementing operational measures in the field of agriculture and food security worldwide. FAO is a source of knowledge and information that helps developing countries and those in transition to modernise and improve agricultural, forestry, and fisheries practices and ensure food security. In the fight against world hunger, FAO's goal is to provide "food for all" and ensure that people have regular access to sufficient, high-quality food to lead an active and healthy life. Since 1991, the European Union has been, in addition to its Member States, a member organisation of FAO. The European Union recognises the key contribution of FAO in fostering the transition to sustainable agri-food systems and addressing the intrinsically linked challenges of the climate crisis, biodiversity loss, and natural resource degradation. As a major donor, the European Union supports FAO in implementing its programme of work to achieve food security and "food for all", a goal that has been severely undermined by unjustified and unprovoked conflicts in various parts of the world.

KEY WORDS: "food for all"; healthy life; high-quality food; normative framework; sustainable agri-food systems

Oral presentation
Smart food: how are technology and artificial intelligence changing food safety?

The "Živjeti zdravo" certification mark in the selection of nutritionally superior products

Lea Pollak, Jasmina Hasanović, Ivana Šimić, and Sanja Musić Milanović

Croatian Institute of Public Health, Zagreb, Croatia

lea.pollak@hzjz.hr

Consumers are increasingly focusing on products of higher nutritional quality. Purchasing decisions are influenced by label information, price, and personal preferences; however, the growing amount of data on labels can confuse consumers. Over the past two decades, various forms of supplementary labelling have emerged – particularly front-of-pack nutrition labeling (FOPNL) – aimed at simplifying nutritional information on packaging, helping consumers choose nutritionally better products, and encouraging product reformulation toward a more nutritious composition. The World Health Organisation (WHO) recommends such labelling as a policy tool to combat the global epidemic of obesity and diet-related non-communicable diseases. The European Commission encourages, evaluates, and reviews these labels, given that many countries across Europe have developed their own labelling systems for use by food manufacturers and retailers. In the Republic of Croatia, the "Živjeti zdravo" (translation: Living Healthy) FOPNL is awarded within the framework of the "Živjeti zdravo" National Programme, adopted by the Croatian Government in 2015. The Croatian Institute of Public Health is responsible for its implementation at the national level. From 2016 to 2023, the activities of the Programme were implemented through a project co-funded by the European Social Fund. Following the completion of the project, the implementation of activities continued within the framework of the Programme. "Živjeti zdravo" is a holistic public health programme comprising five components, one of which is "Health and Nutrition". This paper presents product categories and selection criteria, examines the impact on the choice, and compares the system with other FOPNLs.

KEY WORDS: FOPNL; holistic public health programme; products with better nutritional quality; selection criteria; supplementary labelling

Oral presentation
What's hiding in food? Environmental and process contaminants

Contaminant analysis from a laboratory point of view: how to obtain a reliable outcome?

Ruben Thomaes

Eurofins Food & Feed Testing Netherlands, Heerenveen, Netherlands

ruben.thomaes@ftbnl.eurofins.com

In a rapidly changing world, food safety is becoming more and more a hot topic and people have become more aware about what they eat. Therefore, international guidelines and limits are stretched and we as a laboratory need to keep up with these changes pushing us to the limit. The goal of this presentation is to inform the audience about the health risks, detection methods, and implemented maximum limits of mineral oil saturated hydrocarbons (MOSH), mineral oil aromatic hydrocarbons (MOAH), and monochloropropanediol (MCPD) within the European Union. Insights are also provided in the changed approach of cereulide testing in infant food formula and how to obtain more accurate results in dioxin testing by adapting the pre-treatment. Regarding food safety, it is very important to get reliable results of contaminant analysis instead of merely a limit <LOQ (limit of quantification).

KEY WORDS: cereulide testing; dioxin testing; food safety; maximum limits; mineral oil hydrocarbons

Oral presentation
What's hiding in food? Environmental and process contaminants

The role of standardisation in ensuring food safety and quality – responding to new challenges

Dražen Biošić and Gordana Tabain

Croatian Standards Institute, Zagreb, Croatia

drazen.biosic@hzn.hr

Food safety and quality are currently facing numerous challenges, including the emergence of new contaminants and allergens, the presence of microplastics and persistent organic pollutants, as well as the application of new technologies in food production, processing, and analysis. At the same time, reliable risk assessment requires analytical results to be generated using clearly defined and validated procedures, ensuring that they are accurate, reproducible, and comparable. Standardisation in this process serves as an important link between scientific knowledge, regulatory requirements, and practical application in laboratories and the food sector. Standards define common requirements and procedures that ensure a consistent approach to sampling, testing, and the application of analytical methods and enhance the comparability of results. This presentation will outline the role of the Croatian Standards Institute (HZN) as the national standards body of the Republic of Croatia, as well as the connection between Croatian standardisation and the European and international standardisation systems. Special attention will be given to areas in which scientific knowledge and technologies are rapidly developing, such as the determination of per- and polyfluoroalkyl substances (PFAS) and microplastics, and the application of new technologies and artificial intelligence in the food sector. Selected examples will demonstrate how standardisation contributes to the reliability of laboratory testing, the comparability of results and the response to emerging risks in the food chain. The importance of involving experts from the scientific, laboratory, food industry, and standardisation communities in the development and implementation of standards will also be highlighted.

KEY WORDS: analytical methods; emerging risks; food standards; laboratory testing; risk assessment

Oral presentation
What's hiding in food? Environmental and process contaminants

PFAS pesticides in the food chain: a food safety perspective

Gordana Jurak

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

gordana.jurak@stampar.hr

Per-and polyfluoroalkyl substances (PFAS) are persistent fluorinated compounds that have received increasing attention because of their widespread environmental occurrence and potential effects on human health. Some active substances used as pesticides contain fluorinated structures that fall within broader PFAS definitions. Their use is therefore of particular interest from both an environmental and food safety perspective. The aim of this review was to examine PFAS pesticides in the context of food safety, with focus on their chemical characteristics, environmental persistence, occurrence in food, and potential contribution to dietary exposure. Relevant scientific literature and European regulatory documents were reviewed to identify pesticide active substances associated with PFAS definitions. Information on their chemical structures, use, environmental fate, degradation and transformation products was considered. Available information on pesticide residues in food and current approaches to their monitoring and risk assessment were also evaluated. The reviewed literature showed that PFAS pesticides represent a heterogeneous group of substances with different chemical properties and environmental behaviour. Their fluorinated structures may contribute to persistence, while degradation or transformation can result in other fluorinated compounds. This creates challenges in determining which substances should be included in monitoring programmes and how their contribution to overall PFAS exposure should be assessed. Data on the occurrence of individual PFAS pesticides and their residues in food remain limited for some substances. PFAS pesticides deserve greater attention within the assessment of chemical risks in the food chain. Further data on their occurrence in food, transformation products, and dietary exposure are needed to support appropriate monitoring and risk assessment.

KEY WORDS: dietary exposure; environmental persistence; monitoring programme; per- and polyfluoroalkyl substances; pesticide residues

Oral presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Can we achieve remission of type 2 diabetes using the Mediterranean diet, physical activity, and psychological support? The preliminary results of a randomized clinical trial (REMeDI2ME)

Ivana Kolčić[1,2], Ivana Grgić[1], Nikolina Polić[3], Ivana Žižić Efendić[4], Silvija Vladislavić[5], Tanja Dragun[1], Barbara Gilić Škugor[6], Antonia Peroš[7], Dora Bučan Nenadić[8], Anela Novak[8], Sanja Došen Janković[4], Mario Marendić[5], Nikola Pavlović[1], Daniela Šupe Domić[6], Marko Kumrić[1], Ivana Mudnić[1], Josipa Bukić[1], Doris Rušić[1], and Joško Božić[1]

[1] University of Split, School of Medicine, Split, Croatia
[2] Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia
[3] Šibenik-Knin County General Hospital, Šibenik, Croatia
[4] Split-Dalmatia County Health Centre, Split, Croatia
[5] University of Split, Faculty of Health Studies, Split, Croatia
[6] University of Split, Faculty of Kinesiology, Split, Croatia
[7] University of Split, Split, Croatia
[8] University Hospital Centre Split, Split, Croatia

ikolcic@stampar.hr

The aim of this study was to demonstrate the effectiveness of lifestyle intervention in individuals with type 2 diabetes mellitus (T2DM), with particular focus on achieving T2DM remission (HRZZ IP-2024-05-3757). The intervention consisted of applying the Mediterranean diet with reduced caloric intake, psychological support for stress management, and a structured exercise program. A total of 120 participants from Split were enrolled in the REMeDI2Me project after referral by family physicians, and they were randomly assigned to either the experimental group (EG) or control group (CG). The intervention was conducted between October 2025 and May 2026, with data collected at baseline, as well as three and six months after. A total of 114 individuals were included in this analysis; 60 in the EG (53.3 % women) and 54 in the CG (40.7 % women). The mean age was 56.0±7.9 years in the EG and 56.9±6.4 in the CG (p=0.302). The baseline weight in the EG was 101.4±16.5 kg, and 100.6±16.3 in the CG (p=0.840). After the intervention, the average weight was 95.8±17.1 kg in the EG and 98.7±16.3 in the CG (p=0.381). The baseline glycated haemoglobin (HbA1c) in the EG was 6.5 % (IQR 0.8) and 6.5 % (1.0) in the CG (p=0.503), while after the intervention, HbA1c was reduced to 6.2 % (0.7) and 6.4 % (1.0), respectively (p=0.016). Based on the specific criterion of HbA1c <6.5 %, T2DM remission was achieved in 58.2 % of participants in EG, and 35.3 % in CG (p=0.018), demonstrating the preliminary success of the program.

KEY WORDS: HbA1c; lifestyle intervention; reduced caloric intake; stress management; structured exercise

Acknowledgements

Data were collected as part of the project "Remission of type 2 diabetes with Mediterranean diet, physical activity, and psychological support: a randomized clinical trial" (REMeDI2ME; HRZZ IP-2024-05-3757).

Oral presentation
Smart food: how are technology and artificial intelligence changing food safety?

The innovative BSSB system: honey bee survival and sustainable beekeeping

Ivan Bračić

PIP d.o.o., Pisarovina, Croatia

ivan.bracic@pip.hr

A honey bee colony is a complete organism, biologically made up of the queen, worker bees, drones, and the brood for which the colony cares. Bees cannot survive without the care of people who have the knowledge, skills, and commitment to work with them. We view bees through the lens of food production for humanity, the ecosystem, and the One Health principle. The One Health principle is based on the belief, acceptance, and implementation of the idea that the health of humans, animals, and the environment is inseparable. Bees pollinate most of the plants that serve as food for humans and animals. The presence of numerous, vital honey bee colonies is an indicator of environmental quality. For the past decade or so, I have invested my knowledge, skills, and energy in a system for honey bee survival and sustainable beekeeping. Varroosis is a disease of honey bees and bee brood that represents the greatest threat to beekeeping. It is caused by the mite *Varroa destructor*. ApiBonum forte is a veterinary medicinal product for the control and suppression of *V. destructor* in honey bees. It is innovative in its natural composition, efficacy, prolonged action through controlled evaporation, conditions of use, cartridge design, as well as in its suitability for all hive types, into which it is easy to insert. It can be used throughout the year, in all climate, weather, temperature, biological, and forage conditions. A graduate thesis on ApiBonum was completed at the Faculty of Veterinary Medicine of the University of Zagreb. In their research, scientists from Croatia and Slovenia confirmed ApiBonum's acaricidal effect on the Varroa parasite, as well as an immunomodulatory effect that stimulates the hygienic behaviour of bee colonies. The colonies become vital and resistant to many microorganisms harmful to bees.

KEY WORDS: ApiBonum forte; ecosystem; honey bee colony; One Health principle; *Varroa destructor*

Oral presentation
Smart food: how are technology and artificial intelligence changing food safety?

The effectiveness of health counselling for people with excess body weight at the Health Counselling Centre of the Andrija Štampar Teaching Institute of Public Health

Hrvoje Radašević, Sanja Jelušić, Jelena Čvrljak, and Ana Puljak

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

hrvoje.radasevic@stampar.hr

The aim of this study was to evaluate the effectiveness of the Health Counselling Centre within the Public Health Department of the Andrija Štampar Teaching Institute of Public Health and analyse selected outcomes of its activities. The analysis included 29 users aged 18–78 years who attended the Centre at least five times during 2025 for issues related to excessive weight and obesity. During the study period, a total of 190 individuals used the Centre's services, which included nutritional and kinesiology counselling with medical support. Nutritional counselling involved dietary history assessment, a 24-hour dietary recall, and recommendations for dietary modifications aimed at weight reduction. Kinesiology counselling included individualised physical activity plans tailored to users health status, age, and preferences, with recommendations regarding frequency, duration, and intensity. Body composition was assessed at each visit using bioelectrical impedance analysis (BIA) with the InBody 270 device. The analysis of the 29 users revealed the following mean changes: body weight decreased by 9.4 kg (from 103 to 93.6 kg), fat mass by 8.1 kg, body fat percentage by 4.4 percentage points (from 44.9 % to 40.5 %), body mass index (BMI) from 36.2 to 32.9 kg/m², and visceral fat level from 17.7 to 15.7. Mean muscle mass decreased by 0.8 kg, from 30.8 to 30.0 kg. Most of the observed weight loss was attributable to a reduction in fat mass, with a relatively small decrease in muscle mass. Despite these improvements, BMI and body fat percentage remained elevated, highlighting the importance of continued individualised nutritional and physical activity interventions.

KEY WORDS: dietary habits; obesity; overweight; physical activity; weight loss

Oral presentation
What's hiding in food? Environmental and process contaminants

What is hidden in potato tubers? An analytical approach to geographical origin authentication

Adela Krivohlavek[1], Martina Ivešić[1], Ana Tot[1], Ivana Mandić Andačić[1], Maja Budeč[1], Nataša Mikulec[2], Jasminka Špoljarić[2], Sanja Slunjski[2], Ivone Jakaša[3], Damir Iveković[3], and Milan Poljak[2]

[1] Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia
[2] University of Zagreb, Faculty of Agriculture, Zagreb, Croatia
[3] University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

adela.krivohlavek@stampar.hr

The geographical origin of agricultural and food products has become an increasingly important factor in consumer decisions on the globalised food market. This reflects growing interest in the distinctive culinary and sensory characteristics of regional foods, confidence in the safety and quality of local products, and environmentally sustainable production practices, frequently associated with small local producers. Within the project "Development of Methodology for Verification of Geographical Origin and Conventional/Ecological Production of Potatoes" (EcoPGO), 97 potato tuber samples were collected in 2025 across five Croatian counties: Istria, Dubrovnik-Neretva, Lika-Senj, Međimurje, and Požega-Slavonija. The project aimed to establish a multivariate authentication model capable of distinguishing potatoes by geographical origin and production system, with potential benefits for food quality control and consumer protection. Potato tubers were characterised using conventional and advanced analytical methods. The investigated parameters included dry matter, starch content, pH, nitrate concentration in fresh tissue, elemental composition determined by inductively coupled plasma mass spectrometry (ICP-MS), free amino acids, low-molecular-weight organic acids, mono- and disaccharides, and pesticide residues analysed by liquid and gas chomatography-tandem mass spectrometry (LC-MS/MS and GC-MS/MS). Structural and morphological characteristics of starch granules were analysed by scanning electron microscopy (SEM). Stable isotope ratios were additionally measured by elemental analysis-isotope ratio mass spectrometry (EA-IRMS). The combined analytical dataset was evaluated using chemometric techniques to investigate its suitability for differentiating potato samples according to geographical origin and conventional or ecological production systems. Ultimately, the chemical and isotopic fingerprints hidden within potato tubers may provide valuable clues to their origin, offering new opportunities for food authentication and consumer protection.

KEY WORDS: analytical methods; chemometrics; contaminants; food safety; food quality; EcoPGO project

Acknowledgements

This work was supported by the Croatian Science Foundation under project HRZZ IP-2024-05-5900 and Food Safety and Quality Center (KK.01.1.1.02.0004), and co-funded by the European Regional Development Fund (ERDF).

Sponsor presentations

Sponsor presentation
What's hiding in food? Environmental and process contaminants

NIR spectroscopy for fast and reliable food analysis

Andrea Gelemanović

Primalab d.o.o., Zagreb, Croatia

andrea.gelemanovic@metrohm.hr

Near-infrared spectroscopy (NIRS) is a rapid, non-destructive analytical technique that enables the simultaneous determination of multiple quality parameters in food products within seconds. By eliminating the need for chemicals, extensive sample preparation, and time-consuming laboratory procedures, NIRS helps food manufacturers improve efficiency, reduce costs, and accelerate quality control. Suitable for applications ranging from grains, dairy products, oils, beverages, and confectionery to spices and coffee, NIR technology provides a modern solution for routine food analysis and process monitoring. Metrohm OMNIS NIR analyzers combine speed, accuracy, and ease of use, delivering reliable results from a single measurement while supporting sustainable, reagent-free laboratory operations.

KEY WORDS: chemical-free testing; food industry; food quality control; OMNIS NIR analyzer; sustainable analytics

Poster presentations

Poster presentation
Smart food: how are technology and artificial intelligence changing food safety?

Reducing alcohol levels in wine by reverse osmosis: effects on aroma composition

Karin Kovačević Ganić, Filip Macner, Irena Zanini, Josip Ćurko, Marin Matošić, and Natka Ćurko

University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

karin.kovacevic.ganic@pbf.unizg.hr

Climate change has contributed to increased sugar accumulation in grapes and, consequently, to wines with higher alcohol levels. Reverse osmosis is a relevant technology for ethanol reduction, with aroma composition being a key quality parameter that should be preserved. This study evaluated partial dealcoholization by reverse osmosis of Plavac mali wine (15 % vol.) at transmembrane pressures (TMPs) of 25 and 35 bar and alcohol reductions of 2 and 4 % vol., using a Veolia VinoCon RO7 AP1812 membrane. Terpenes, higher alcohols, esters, fatty acids, and volatile phenols were analysed by solid phase microextraction-gas chromatography mass spectrometry (SPME-GC/MS). Both alcohol reduction and TMP influenced aroma composition, with effects varying among aroma groups. At a 2 % vol. reduction, aroma composition was relatively well preserved, with no significant differences in total terpene, fatty acid, and volatile phenol concentrations compared with the control at either TMP ($p>0.05$). Differences in total higher alcohol and ester concentrations were less pronounced when individual compounds were considered. At 25 bar, individual higher alcohols did not differ significantly from the control, while a similar trend was observed for individual esters at 35 bar. More pronounced changes occurred at a 4 % vol. reduction, with lower total ester, higher alcohol, and higher total terpene concentrations. Overall, changes in aroma were more strongly associated with the extent of alcohol reduction, while TMP effects were compound-dependent.

KEY WORDS: aroma compounds; dealcoholization; climate change; red wine; SPME-GC/MS

Acknowledgements

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Poster presentation
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Analysis of polycyclic aromatic hydrocarbons and highly polar pesticides in milk within the EKOREG project

Marija Denžić Lugomer, Tiana Novosel, Maja Đokić, Vesna Jaki Tkalec, Sanja Furmeg, Nina Bilandžić, Ana Končurat, Željko Cvetnić, Ivana Kmetič, Teuta Murati, and Damir Pavliček

Croatian Veterinary Institute, Veterinary Institute Križevci, Križevci, Croatia

denzic.vzk@veinst.hr

Cow's milk is an important part of the human diet because of its high nutritional value, providing high-quality proteins, essential fatty acids, fat- and water-soluble vitamins, and minerals. Due to its unique and complex chemical composition, which combines a significant lipid content with an aqueous phase, milk serves as an excellent bioindicator of contamination with both persistent, lipophilic environmental pollutants such as polycyclic aromatic hydrocarbons (PAHs) and highly hydrophilic polar pesticide residues originating from agricultural activities. Although maximum residue levels (MRLs) are established at EU level to ensure consumer safety, continuous monitoring of animal-source foods remains essential, particularly in areas with intensive agricultural production. The aim of this preliminary study was to determine the occurrence and concentrations of 10 polar pesticides and their metabolites, as well as PAH4 residues (benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, and chrysene) in 41 milk samples collected from small-scale farms in north-western Croatia. Sampling was conducted during two periods (June and October 2025) in the city of Križevci and six neighbouring municipalities, within the framework of the EKOREG project (Next Generation EU). Polar pesticides were extracted using 1 % formic acid, while PAHs were extracted using acetonitrile, followed by clean-up using a modified QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe) method. Instrumental analysis was conducted using advanced multi-residue chromatography techniques coupled with mass spectrometry [liquid chromatography-tandem mass spectrometry (LC-MS/MS) and gas chromatography-tandem mass spectrometry (GC-MS/MS)]. No exceedances of EU MRLs were observed, underscoring the safety of the samples and the importance of continued monitoring.

KEY WORDS: cow's milk; GC-MS/MS; LC-MS/MS; monitoring; PAH

Poster presentation
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Population exposure to PFAS compounds through consumption of different species of marine fish

Nina Bilandžić, Ines Varga, Jelena Kaurinović, Božica Solomun Kolanović, Marija Sedak, Ivana Varenina, Maja Đokić, Bruno Čalopek, Đurđica Božić Luburić, Tanja Bogdanović, Sandra Petričević, Bosiljka Mustać, Bruna Petani, and Slavica Čolak

Croatian Veterinary Institute, Zagreb, Croatia

bilandzic@veinst.hr

Perfluoroalkyl substances (PFAS) are persistent organic pollutants with high potential for bioaccumulation in the food chain. Fish are considered the main dietary contributors to human exposure to these compounds. Since PFAS accumulate over time, the European Food Safety Authority (EFSA) has set a health-related exposure limit for a sum of the four PFAS (∑4PFAS) that are the largest contributors to human exposure through food – perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), and perfluorohexane sulfonic acid (PFHxS)) – as a tolerable weekly intake (TWI) of 4.4 ng/kg body weight. In this study, concentrations of 30 PFAS compounds in eight species of small pelagic and demersal fish from the Adriatic Sea were determined. Nine PFAS were detected in red mullet and garfish, while only five in wild seabream. PFOS was the predominant compound in all species, measured within 0.04–1.34 μg/kg. The highest mean PFOS was observed in Atlantic horse mackerel (0.67 μg/kg). Perfluorotridecanoic acid (PFTrDA) and perfluoroundecanoic acid (PFUnDA) were the next most abundant contributors, measured within the range 0.05–0.68 μg/kg. The highest mean sum of the ∑4PFAS was found in red mullet (0.75 μg/kg). The order of mean ∑4PFAS was red mullet > Atlantic horse mackerel > European pilchard > anchovy > Mediterranean sand smelt > hake > garfish > wild seabream. Risk characterisation was performed by comparing the weekly intakes (WI) of mean ∑4PFAS values with the TWI across age groups: toddlers, children, adolescents, and adults. Exposure was very low for all of the age groups when consuming wild seabream. In the case of hake and garfish consumption, only toddlers were exposed to elevated levels exceeding the TWI. For anchovy and Mediterranean sand smelt, WI exceeded the TWI for toddlers and children. Consumption of red mullet, Atlantic horse mackerel, and European pilchard resulted in WI values above the TWI across all age groups. In conclusion, toddlers and children are the most vulnerable to PFAS exposure through fish consumption.

KEY WORDS: Adriatic Sea; demersal fish; food safety; risk assessment; small pelagic fish

Acknowledgements

This study was funded by the European Union – NextGenerationEU, project PFASsFoodWildlife.

Poster presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

An overview of the role of inulin as a functional ingredient in maintaining gastrointestinal health

Mirjana Zukić and Daniela Čačić Kenjerić

J.J. Strossmayer University of Osijek, Faculty of Food Technology, Osijek, Croatia

mirjanazukic2@gmail.com

Inulin is a non-digestible fructan and soluble dietary fiber naturally occurring in plants, including chicory, Jerusalem artichoke, garlic, and onion. This review aimed to evaluate recent evidence on the role of inulin as a functional food ingredient in maintaining gastrointestinal health, with emphasis on gut microbiota, short-chain fatty acid production, bowel function, and constipation. Primary human studies published between 2023 and 2026 were searched in PubMed, Scopus, and Web of Science using terms related to inulin, prebiotic effects, gut microbiota, short-chain fatty acids, intestinal function, constipation, and irritable bowel syndrome. Eleven primary human studies were reviewed, of which five met the predefined criteria for analysis of the main gastrointestinal effects of inulin. The findings indicated that inulin can modulate gut microbiota composition and microbial metabolic activity and influence short-chain fatty acid production, although responses may vary depending on dose, health status, and baseline gut microbiota composition. In a randomized, double-blind, placebo-controlled crossover trial involving 39 adults with functional constipation, 12 g/day of chicory inulin for four weeks significantly increased stool frequency, improved constipation-related quality of life, alleviated abdominal symptoms, and increased the relative abundance of potential butyrate-producing bacterial genera. The observed interindividual variability highlighted the importance of considering host and microbiota-related factors when evaluating the functional effects of inulin. In conclusion, recent human evidence indicates that the prebiotic properties of inulin, its modulation of gut microbiota and microbial metabolism, and its beneficial effects on bowel function support its potential role as a functional food ingredient in maintaining gastrointestinal health.

KEY WORDS: bifidobacterium; bowel function; gut microbiota; prebiotics; short-chain fatty acids

Poster presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Utilisation trends of vitamin and mineral medicinal products in Croatia 2019–2025: a national drug utilisation study

Krunoslav Peter, Željka Bažulić Štimac, and Katarina Gvozdanović

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

kruno.peter@stampar.hr

Vitamins and minerals are used in both medicinal products and dietary supplements. National drug utilisation data provide information on the use of products classified as medicines and can be used to monitor population-level utilisation trends. To assess national utilisation trends of vitamin and mineral medicinal products in Croatia from 2019 to 2025, with a particular focus on the active substances contributing most to overall utilisation, a retrospective descriptive drug utilisation study was conducted using annual national drug-consumption data published by the Croatian Agency for Medicinal Products and Medical Devices (HALMED). Utilisation was assessed according to the Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) methodology and expressed as defined daily doses per 1,000 inhabitants per day (DDD/1000/day). Trends were analysed for ATC groups A11 (vitamins) and A12 (minerals), their major subgroups, and individual active substances. Vitamin and mineral medicinal products showed divergent utilisation trends in Croatia between 2019 and 2025. The marked increase in vitamin utilisation was largely attributable to cholecalciferol, while mineral utilisation showed a modest overall decline. National ATC/DDD data can be used to monitor changes in medicinal-product utilisation and identify substances contributing most to population-level trends. These data do not capture vitamins and minerals marketed exclusively as dietary supplements.

KEY WORDS: annual national drug-consumption data; cholecalciferol; minerals; pharmacoepidemiology; vitamins

Poster presentation
What's hiding in food? Environmental and process contaminants

Occurrence of undeclared animal species in commercial meat products as determined by ELISA

Božica Solomun Kolanović, Ines Varga, Jelena Kaurinović, Maja Đokić, Ivana Varenina, Marija Sedak, Bruno Čalopek, and Nina Bilandžić

Croatian Veterinary Institute, Zagreb, Croatia

solomun@veinst.hr

Fraud associated with the adulteration of meat products involves the intentional substitution of meat with lower-quality meat, accompanied by the provision of inaccurate information regarding product composition for financial gain. Such practices pose a threat to food safety due to potential health risks, including allergic reactions and metabolic disorders, and may even conflict with consumers' religious beliefs. Therefore, a reliable analytical methods for the verification of declared animal species, together with effective control systems, are important for consumer protection and ensuring product authenticity. This study investigated the occurrence of undeclared animal species in canned meat products collected from various retail chains and butcher shops during 2020–2026, with the aim of identifying product groups with the highest frequency of non-compliance. The samples included various types of dry-cured sausages, minced meat products, pâtés, and luncheon meats. The presence of bovine, porcine, poultry, and ovine proteins was determined using a validated enzyme-linked immunosorbent assay (ELISA) method. Samples were considered non-compliant when an undeclared animal species was detected or when a declared species was absent. Non-compliance was detected in several product groups, most frequently involving the presence of pork in products labelled as containing beef or turkey. The highest frequency of non-compliance was observed among ham products (20.0 %) and sausages (17.9 %), whereas the majority of analysed pâtés were compliant. Of the 242 samples analysed, 16 were found to be non-compliant, corresponding to an overall non-compliance rate of 6.6 %. No potentially mislabelled products were identified among the canned pork products.

KEY WORDS: adulteration; consumer protection; Croatia; food safety; health risk

Poster presentation
What's hiding in food? Environmental and process contaminants

Ancient oil under modern light: photo-NMR investigation of traditional Adriatic "seawater olive oil"

Valerije Vrček, Mladen Lučin, and Robert Hadžić

University of Zagreb, Faculty of Pharmacy and Biochemistry, Zagreb, Croatia

vvrcek@pharma.hr

The centuries-old Mediterranean tradition of storing harvested olives in seawater before oil production is still practiced on Croatian Adriatic islands. Although modern production generally favors immediate processing of freshly harvested fruits, "seawater olive oil" represents an intriguing link between traditional food processing and contemporary questions concerning food quality, bioactive constituents and oxidative stability. Previous studies demonstrated that oils obtained from seawater-stored olives retain a substantial fraction of biologically relevant phenolic compounds, raising the question of whether this unconventional processing also affects their response to environmental stress. Here, we introduce an *in situ* photo-NMR (nuclear magnetic resonance) approach for probing the photochemical stability of olive oils. Olive-oil samples were examined by ^{1}H and ^{13}C NMR spectroscopy before, during, and after controlled irradiation delivered directly into the NMR sample using an optical-fibre setup. Narrow-band irradiation at 368 and 382 nm and broad-band irradiation with a halogen lamp (400–750 nm) were employed, and spectral changes were compared with those of reference extra-virgin and commercial olive oils. Irradiation produced reproducible, sample-dependent changes in spectral regions associated with primary and secondary lipid oxidation. Particularly informative were the evolution of hydroperoxide resonances around 8 ppm, aldehydic products in the 9–10 ppm region and the appearance of a distinct, well-resolved multiplet at approximately 5.7 ppm, proposed as a sensitive marker of light-induced lipid transformation. The results demonstrated that photo-NMR provides a direct molecular-level approach for comparing the photochemical stability of olive oils and may help connect traditional processing practices with modern assessment of food quality and stability.

KEY WORDS: antioxidants; lipid oxidation; oxidative stability; seawater processing; traditional food processing

Poster presentation
What's hiding in food? Environmental and process contaminants

HOCl-mediated formation of 5-chlorouracil: NMR and DFT insights connecting food chlorination chemistry with inflammatory DNA damage

Irena Žuntar[1], Antonio Ljulj[1], Lea Ulm[2], Adela Krivohlavek[2], Davor Šakić[1], and Valerije Vrček[1]

[1] University of Zagreb, Faculty of Pharmacy and Biochemistry, Zagreb, Croatia
[2] Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

irena.zuntar@pharma.unizg.hr

Hypochlorous acid (HOCl) is a reactive chlorine species at the interface of food safety and human health. In food processing, free chlorine and electrolyzed water are widely used to reduce microbial contamination in wash water and on food-contact surfaces, while *in vivo* HOCl is produced by myeloperoxidase during inflammatory oxidative bursts. Although HOCl is valued for antimicrobial efficacy, its reactions with nucleobase-derived organic matter remain important for understanding chlorine demand, chlorinated by-products, and biomarkers of oxidative damage. Here we present an experimental and theoretical study of uracil chlorination by HOCl as a minimal model for nucleic-acid-derived residues originating from food matrices and microorganisms. $^{1}H/^{13}C$ NMR spectroscopy was used to follow substrate consumption and product formation directly, without derivatisation. The product observed is 5-chlorouracil (5-ClU), whereas N-chlorinated intermediates are detected as intermediates. Density functional theory (DFT) calculations were used to evaluate chlorination channels and rationalise how transient nitrogen involvement can lower the barrier while rearrangement or chlorine transfer leads to the observed C5-chlorinated product. These results are relevant to "food and health" in two connected ways. First, they provide a molecular-level model for HOCl reactions with nitrogen-rich organic residues during chlorinated food sanitation, beyond the classical focus on trihalomethanes and haloacetic acids. Second, they connect exogenous food-processing chlorine chemistry with endogenous inflammatory chemistry, since 5-ClU is recognized as a marker of HOCl-mediated nucleic acid damage and may contribute to mutagenic mispairing pathways. NMR-guided chlorination of uracil therefore offers a useful model for linking sanitation chemistry, foodomics, and health-related oxidative stress.

KEY WORDS: nucleobases; oxidative stress biomarkers; reactive chlorine species; sanitiser chemistry

Poster presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Zero food poverty and macronutrient sufficiency through institutional social service

Alen Župan

City of Zagreb, Institution "Dobri dom", Zagreb, Croatia

ravnatelj@dobri-dom.hr

Zero food poverty means a state in which all people, always, have physical, social and economic access to sufficient, safe food that meets the nutritional needs for a healthy life, which is crucial for socially vulnerable and immunocompromised persons. Proper nutrition reduces the risk of malnutrition and related health problems, contains a sufficient amount of essential nutrients to meet needs and prevent deficiencies; balanced in energy (carbohydrates, proteins, fats); diverse in the variety of foods; moderate in the consumption of food ingredients harmful to health. This paper is based on macronutrient testing by analysing an entire lunch – 47 samples in the period 2023–2026 – in accordance with the Croatian Guidelines for Nutrition of the Elderly. The aim was to provide nutritious meals in accordance with the recommended standards and age structure. Overall, 47 meals were analysed, compliance with the recommended daily amounts of nutrients was determined with respect to the energy value of the meal. On average, the energy content of proteins was 15.61 %, fats 33.35 %, carbohydrates 51.03 %; mass 0.604 kg; energy value 622.95 kcal. The results showed the continuously stable energy nutritional value of the meal. Zero food poverty and macronutrient sufficiency through social services are a prerequisite for functional food and affect the quality of life as the central role for development and human dignity. A professional and systematic approach to the nutrition of persons in social protection has been proven with the long-term consistent fulfilment of the prescribed standards.

KEY WORDS: anti-poverty; functional foods; human dignity; institutional nutrition; social protection

Poster presentation
Smart food: how are technology and artificial intelligence changing food safety?

Effect of forward osmosis dealcoholization on red wine color and anthocyanin composition

Natka Ćurko, Irena Zanini, Josip Ćurko, Filip Macner, Marin Matošić, Lucija Surać, and Karin Kovačević Ganić

University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

natka.curko@pbf.unizg.hr

Higher ethanol concentrations in wine, driven by climate change, may negatively affect sensory properties by enhancing perceptions of hotness, sweetness, and bitterness, while altering aroma intensity and suppressing fruitiness. Forward osmosis (FO) is an emerging membrane technology driven by an osmotic pressure gradient without external pressure, offering mild, non-thermal processing and relatively low energy requirements. Despite these advantages, its application to wine dealcoholization remains largely unexplored. This study evaluated the effect of partial dealcoholization by FO on the chromatic characteristics and anthocyanin composition of Plavac mali red wine (16.7 % vol.) at ethanol reductions of 2 and 4 % vol., using batch and single-pass modes, an Aquaporin HFFO2 hollow-fiber membrane, and 90 g/L NaCl as the draw solution. Total anthocyanins and chromatic characteristics (L*, a*, b*, C*, and H*) were determined spectrophotometrically, while free anthocyanins were analysed by ultra-high performance liquid chromatography coupled with ultraviolet detection and mass spectrometry (UHPLC-UV/MS). At a 2 % vol. ethanol reduction, total anthocyanin concentrations did not differ significantly from the control in either mode ($p>0.05$), whereas at 4 % vol. they decreased significantly. Despite minor changes in chromatic parameters, C* remained comparable to the control in all wines. Batch processing preserved L* and a* values, while single-pass processing maintained hue values comparable to the control. Overall, ethanol reduction had a stronger effect on total anthocyanins, whereas chromatic changes were more closely associated with operating mode. These findings indicate that moderate FO dealcoholization can preserve the colour-related parameters of red wine.

KEY WORDS: ethanolic reduction; phenolic compounds; sensory properties; UHPLC-UV/MS

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Poster presentation
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Microplastics as an emerging threat to public health and water ecosystems

Sanja Bijelović, Stanka Bobić, Marija Joksimović, and Emil Živadinović

Institute of Public Health of Vojvodina, Novi Sad, Serbia

sanja.bijelovic@izjzv.org.rs

Microplastics (1 μm–5 mm) represent an emerging public health concern because they can adsorb contaminants, leach chemical additives, and potentially trigger inflammatory responses. The Interreg IPA Hungary-Serbia project "MICROPLASTICS" aimed to identify pollution sources and assess microplastic contamination in water ecosystems across the Bačka/Bács-Kiskun cross-border region, focusing on areas including Novi Sad and Bačka Palanka. Open-surface water samples in Serbia were collected using a Manta Net with a 300 μm mesh size, filtering approximately 10,000 liters per sample. Collected samples underwent laboratory digestion, density separation, sieving, microscopy, and polymer characterisation. The identified particles were predominantly secondary microplastics originating from human activities, with polyethylene (PE), polypropylene (PP), ethylene-vinyl acetate (EVA), and polyethylene terephthalate (PET) detected in surface waters. While particles in open surface waters in Serbia generally ranged between 100 and 1000 μm, the particles in protected surface waters near Novi Sad were smaller than 100 μm. Despite lower overall concentrations, smaller particles in protected zones pose a higher ecological risk by entering aquatic food webs more easily. Additionally, educational workshops engaged elementary schools in Novi Sad and Bačka Palanka to build community awareness. Microplastic contamination in the region is directly tied to human activity. Mitigating this health and environmental risk requires source prevention, standardised monitoring, and continuous public education.

KEY WORDS: environmental health; environmental monitoring; open-surface water; protected-surface water

Poster presentation
What's hiding in food? Environmental and process contaminants

Fusarium mycotoxins in cereals: the safety implications of existing and new maximum levels

Nina Kudumija, Sanja Furmeg, Tina Lešić, Ana Vulić, Jelka Pleadin, and Manuela Zadravec

Croatian Veterinary Institute, Zagreb, Croatia

kudumija@veinst.hr

During field growth, crops can be colonised by mycotoxin-producing Fusarium fungi, posing a risk to human and animal health. The aim of this study was to determine the concentrations of Fusarium mycotoxins and compare them with the current maximum levels (MLs) for cereals as feed as well as with new ones that come into force mid-2027. A total of 273 samples were analysed: 133 maize, 62 wheat, 36 barley, 23 triticale, and 21 oat samples. Zearalenone (ZEA), deoxynivalenol (DON), fumonisins B_1 and B_2 (FBs), and T-2 and HT-2 toxins (T-2/HT-2) were determined by liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS). Concentrations ranged from 19.98 to 6,945.93 µg/kg for ZEA, from 1.09 to 5,652.08 µg/kg for DON, from 24.01 to 10,101.05 µg/kg for FBs, and from 2.21 to 653.41 µg/kg for T-2/HT-2. Two maize samples exceeded both the current (3,000 µg/kg) and the new (2,000 µg/kg) ML for ZEA. Three maize samples exceeded the ML of 200 µg/kg for T-2/HT-2, which has remained unchanged under the new criteria. One wheat sample complied with the current ML for DON (8,000 µg/kg) but not with the new one (4,000 µg/kg). Overall, five samples (1.83 %) were non-compliant with the current MLs and six (2.20 %) were non-compliant with the newly established MLs, specifically for ZEA and T-2/HT-2 in maize and DON in wheat. These findings highlight the need for stricter legal limits and continued analytical monitoring of mycotoxins to minimise exposure and safeguard human and animal health.

KEY WORDS: contamination; deoxynivalenol; maize; wheat; zearalenone

Poster presentation
What's hiding in food? Environmental and process contaminants

Safety aspects of mushrooms as an alternative protein source

Maja Lazarus, Antonija Sulimanec, Tatjana Orct, Andreja Jurič, Blanka Tariba Lovaković, Jasminka Senčar, Branko Petrinec, Nikica Šprem, and Ivan Širić

Institute for Medical Research and Occupational Health, Zagreb, Croatia

mlazarus@imi.hr

Mushrooms have emerged as rich sources of high-quality protein and an alternative to the costly production of animal proteins. An important prerequisite for any food intended for human consumption is its safety. The aim of this study was to assess the compliance of edible parts of commonly consumed cultivated (common mushrooms *Agaricus bisporus,* and the oyster mushroom *Pleurotus ostreatus*) and wild *Boletus* mushrooms with maximum contaminant levels set by Commission Regulations for nicotine, cadmium (Cd), lead (Pb), and caesium radionuclide (^{137}Cs). Nicotine, quantified [headspace solid phase microextraction (HS-SPME) followed by gas chromatography-mass spectrometry (GC-MS)] in eight dried *Boletus* mushroom samples from Croatia, was lower than the levels found in samples from southeastern European, non-EU countries (n=54), among which one (2.82 mg/kg) exceeded the provisionally set maximum level (2.3 mg/kg). In wild (n=84) and cultivated (n=8) mushroom species from Croatia, as well as *Boletus* mushrooms from non-EU countries (n=128), Pb [acid digestion followed by inductively coupled plasma mass spectrometry (ICP-MS)] was below legal limits. In contrast, maximum Cd levels were exceeded, although rarely, in wild mushrooms of the *Boletus* genus in both Croatian (3/84, northern region) and non-EU samples (1/128). Common (n=4) and oyster mushrooms (n=4) bought on Croatian markets and in shops complied with legal limits for Cd in cultivated mushrooms. Activity concentrations of ^{137}Cs (gamma-spectrometry) were at least three times lower in all *Boletus* mushroom samples than the legal limit of 600 Bq/kg. Regarding the investigated contaminants, mushrooms can generally be considered safe; however, consumption of *Boletus* mushrooms (100 g wet mass) should be limited to once a week to keep Cd intake within a safe range for adults.

KEY WORDS: caesium radionuclide; food contaminants; metals; nicotine; wild and cultivated fungi

Poster presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Analysis of the lifestyle habits of students in Split and Osijek

Anita Rakić[1,2], Ines Banjari[3], Marijana Mijaković[1], and Nada Rakić[4]

[1] Teaching Institute for Public Health of the Split-Dalmatia County, Split, Croatia
[2] University of Split, Faculty of Health Sciences, Split, Croatia
[3] J.J. Strossmayer University of Osijek, Faculty of Food Technology, Osijek, Croatia
[4] University of Split, School of Medicine, Split, Croatia

anita.rakic@nzjz-split.hr

A balanced diet is an important factor in improving and maintaining health. The aim of this study was to determine whether there are differences in the lifestyle habits of students from two major university cities, Split and Osijek. Students from the universities of Split and Osijek participated in the study, which was conducted using an anonymous questionnaire as part of the institutional project "Health Literacy of the Student Population". A chi-square (χ^2) test was used to examine differences in student responses between the two cities, with a significance level of $p<0.05$. No statistically significant differences were found between students from the two cities regarding daily water intake ($\chi^2=1.14$; $p=0.887$), dietary supplement use ($\chi^2=1.62$; $p=0.769$), active sports participation ($\chi^2=1.68$; $p=0.194$), or self-assessed physical activity ($\chi^2=2.40$; $p=0.300$). However, the study revealed a difference between the cities among male students ($\chi^2=6.43$; $p=0.04$) regarding self-assessed physical activity. Specifically, students in Osijek were evenly distributed across the inactive, moderately active, and highly active groups, whereas significantly fewer students in Split identified as inactive compared to those who were moderately or highly active. The results of the study indicate that male students in Split showed greater interest in physical activity compared to those in Osijek, whereas the level of interest among female students is consistent across the two cities.

KEY WORDS: anonymous questionnaire; balanced diet; health literacy; intake of dietary supplements; physical activity

Poster presentation
What's hiding in food? Environmental and process contaminants

Lead exposure assessment through drinking water and food in Bosnia and Herzegovina

Amir Ibrahimagić, Dženana Hasanbašić, Nermin Imamović, Benjamin Čaušević, and Muamer Mandra

Institute for Health and Food Safety, Zenica, Bosnia and Herzegovina

ibrahimagic.amir@gmail.com

The aim of this study was to determine lead concentrations in water and food samples and assess potential health risks. A total of 87 samples were analysed, including drinking water and various food products (fruit, vegetables, milk, honey, and others). An exposure assessment was conducted using the Estimated Daily Intake (EDI) approach, while risk characterisation was performed using the Hazard Quotient (HQ) methodology according to the United States Environmental Protection Agency guidelines, with interpretation aligned with World Health Organisation and European Food Safety Authority recommendations. Lead concentrations in water ranged from below detection limit to 3.376 μg/L. Detectable levels were found in eight samples (0.927–3.376 μg/L), but all remained below regulatory limits, indicating acceptable drinking water quality. In food samples, concentrations ranged from 0.000 to 0.427 mg/kg. Four samples exceeded permissible limits, including one vegetable sample (pumpkin, 0.1136 mg/kg) and three milk samples (0.276, 0.058, and 0.068 mg/kg). Other food categories (fruit, honey, jam, juice, and eggs) showed no exceedances. Exposure assessment indicated that water contributed minimally to total lead intake, while food showed greater variability. Milk and vegetables were identified as potential contributors to increased exposure in cases of contaminated samples. The risk assessment showed that most scenarios did not pose a significant health risk. However, consumption of contaminated samples resulted in elevated HQ values, indicating potential concern under chronic exposure conditions. This concern may be greater among sensitive population groups, including children and individuals with a lower body mass index (BMI), as the same intake results in higher relative exposure in these groups.

KEY WORDS: dietary exposure; Estimated Daily Intake; food contamination; Hazard Quotient methodology; health risk assessment

Poster presentation
What's hiding in food? Environmental and process contaminants

Comparison of the composition and quality parameters of Varaždin Pumpkin Seed Oil from different certified producers

Dunja Šamec and Dragutin Vincek

University North, Varaždin, Croatia

dsamec@unin.hr

Varaždin Pumpkin Seed Oil is a virgin edible oil obtained by roasting and mechanically pressing the seeds of the hull-less oilseed pumpkin (*Cucurbita pepo* L.). It is protected at EU level under the Protected Geographical Indication scheme. Only producers from the Varaždin County who comply with the requirements laid down in the product specification may market Varaždin Pumpkin Seed Oil in specially designed packaging bearing the corresponding designation and labels. Although the production process is governed by a common specification, the characteristics of the raw material and certain processing parameters may influence the oil's composition and quality. This study aimed to determine and compare selected quality parameters of Varaždin Pumpkin Seed Oil from different producers. Oil samples from nine certified producers, obtained from pumpkin seeds harvested in 2023, were analysed. Carotenoid and chlorophyll contents, peroxide value, insoluble impurity content, free fatty acid content, and fatty acid composition were determined. Pigment contents differed significantly among the individual samples. The free fatty acid content ranged from 0.25 to 0.58 %, while the peroxide value ranged from 0.99 to 3.09 mmol O_2/kg. The insoluble impurity content in all samples was below the maximum permitted level of 0.05 %. The predominant fatty acids were linoleic acid, accounting for 41.89–49.48 %, and oleic acid, accounting for 30.80–38.51 %. The results indicate that certain differences in composition existed among the analysed oils despite their compliance with a common product specification. These differences may have resulted from the natural variability of the raw material and variations in processing parameters within limits.

KEY WORDS: carotenoids; chlorophylls; free fatty acids; geographical indication; peroxide value

Poster presentation
What's hiding in food? Environmental and process contaminants

The importance of extracting pyrrolizidine and tropane alkaloids from plant materials

Ana Peić, Jasna Bošnir, and Vladimira Maković

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

ana.peic@gmail.com

Pyrrolizidine alkaloids (PAs) and tropane alkaloids (TAs) are secondary plant metabolites that can contaminate agricultural crops and food, posing a risk to consumer health. PAs possess hepatotoxic, genotoxic, and carcinogenic potential, while TAs act as potent anticholinergics with rapid, acute effects on the central nervous system. The maximum permitted levels for these substances in specific food categories are established by Regulation (EU) 2023/915. The complex chemical composition of plant-based materials can influence the extraction of PAs and TAs; consequently, sample extraction and clean-up are critical stages of the analytical procedure. The extraction process begins with sample homogenisation, followed by weighing the sample into a centrifuge tube. An internal standard is added, and the sample is dissolved in 0.05 % formic acid. Subsequently, 2.5 mL of acetonitrile is added, along with a salt mixture consisting of anhydrous magnesium sulfate (800 mg) and sodium chloride (200 mg). A portion of the acetonitrile layer is transferred into tubes containing salts (for dispersive solid-phase extraction, d-SPE), vortexed, and centrifuged. The purified extract is further filtered through a PTFE membrane filter, and the PAs and TAs are determined using liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS). The application of an appropriate sample extraction and cleanup procedure contributes to reducing matrix effects and enables the reliable identification and quantification of PAs and TAs, thereby supporting food safety monitoring and public health protection.

KEY WORDS: cleanup procedure; LC/MS-MS; matrix effect; Regulation (EU) 2023/915; sample extraction

Poster presentation
Hidden risks in food: allergens and how to avoid them

Determination of histamine in fish and canned fish products by HPLC: assessment of compliance with Commission Regulation (EC) No 2073/2005

Martina Bevardi, Maja Budeč, and Jasna Bošnir

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

martina.bevardi@stampar.hr

The aim of this study was to determine histamine concentrations in fish and canned fish products using high-performance liquid chromatography (HPLC) and to assess the compliance of the analysed products with the criteria laid down in Commission Regulation (EC) No 2073/2005. A total of 200 samples of fish and canned fish products were analysed, including anchovies, mackerel, sardines, and tuna. Histamine concentrations were determined using an HPLC method. The obtained values were compared with the regulatory criteria for fishery products from fish species associated with a high level of histidine. Of the 200 samples analysed, 186 (93 %) complied with the established criteria, whereas 14 samples (7 %) were classified as non-compliant. The non-compliant samples belonged to the groups of anchovies, mackerel, sardines, and tuna. The mean histamine concentration in the non-compliant samples was 801 mg/kg, corresponding to approximately four times the upper regulatory limit of 200 mg/kg. Although the majority of the analysed samples complied with the established criteria, the detection of non-compliance in 7 % of samples highlights the importance of continuous monitoring of histamine levels in fish and fishery products. Systematic laboratory surveillance and the application of appropriate analytical methods are essential for the timely detection of products with elevated histamine concentrations and for ensuring food safety and protecting consumer health.

KEY WORDS: food safety; histamine contamination; histidine; monitoring; upper regulatory limit

Poster presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

The caloric delusion: protein distribution gaps in institutionalised elderly care

Judita Grzunov Letinić[1], Jozica Raljević[1], Danijela Peroš-Pucar[1], and Zdenka Pelaić[2]

[1] Public Health Institute Zadar, Zadar, Croatia
[2] University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

jgrzunov@zjz-zadar.hr

According to statistics, 19–36% of institutionalised elderly in Croatia suffer from malnutrition. National legislation lacks quantitative meal quality standards and mandatory quality control. Basic energy adequacy does not guarantee sufficient protein to prevent sarcopenia. This study evaluated the protein adequacy of institutional menus via direct chemical analysis against the European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines and the muscle anabolic threshold. Daily meals (breakfast, lunch, dinner) from two nursing homes, caring for more than 600 residents, were analysed for macronutrient and energy content. Protein content results were benchmarked against a 65 kg reference weight [protein ESPEN target: 1.0 g/kg body weight (BW)/day] and the muscle anabolic threshold (25 g of protein/meal). Total daily energy did not significantly differ between facilities (Home 1: 1788.16±216.66 kcal vs Home 2: 1668.14±226.93 kcal; $p>0.05$), meeting basic caloric needs. However, chemical analysis revealed a striking protein disparity: Home 1 supplied only 37.9 g/day (0.58 g/kg BW/day; <60% of ESPEN minimum), whereas Home 2 provided 73.6 g/day (1.13 g/kg BW/day), achieving compliance. Home 1 failed to achieve the 25 g anabolic threshold in any meal. Breakfast was severely deficient in both institutions (76 % kcal). Although the caloric provision was adequate, the protein content and distribution failed to meet nutritional guidelines. These findings underscore the critical need to revise national legislation to define comprehensive meal quality standards for the elderly and establish mandatory dietary quality control. Increasing the protein content of individual meals is necessary to ensure optimal muscle protein synthesis in older adults.

KEY WORDS: dietary quality control; elderly nutrition; energy value; muscle anabolic threshold; protein content; protein distribution

Poster presentation
Microbiological food safety (viruses, bacteria, and bacterial toxins)

Long-term microbiological air quality in food-contact packaging manufacturing: a nine-year indoor-outdoor assessment

Ivona Majić

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

ivona.majic@stampar.hr

Airborne microorganisms may contribute to environmental contamination in facilities manufacturing materials intended for direct food contact, yet long-term data on microbiological air quality in such environments remain limited. This study aimed to evaluate the temporal and spatial patterns of airborne microbial contamination in a food-contact packaging manufacturing facility over nine consecutive years (2018–2026). Air samples were collected annually at 11 predefined indoor locations representing different production and supporting areas, with outdoor air sampled concurrently as an environmental reference. Aerobic mesophilic bacteria (AMB) and moulds were quantified as colony-forming units per cubic meter of air (CFU/m^3) using an impaction-based culture method. In the absence of sector-specific microbiological limits, results were evaluated against predefined indoor-outdoor reference criteria: indoor mould concentrations were required to be lower than corresponding outdoor concentrations, while indoor AMB concentrations were compared with the corresponding outdoor concentration plus 350 CFU/m^3. Overall, 99 indoor measurements were evaluated for each microbiological parameter. The mould reference criterion was exceeded in 15/99 measurements (15.2 %), with most exceedances occurring in 2019 (n=10). The AMB criterion was exceeded in only 3/99 measurements (3.0 %), including one in 2019 and two in 2020. No exceedances for either parameter were observed in 2023, 2024, or 2026. The findings indicated that microbiological deviations were predominantly sporadic or temporally clustered rather than persistent. Long-term indoor-outdoor surveillance provides a useful approach for identifying temporal deviations and supporting risk-based hygiene management in facilities producing materials intended for food contact.

KEY WORDS: aerobic mesophilic bacteria; airborne mesophilic bacteria; bioaerosols; environmental monitoring; food safety; moulds

Poster presentation
Microbiological food safety (viruses, bacteria, and bacterial toxins)

Is the ice in your glass microbiologically safe? A five-year analysis of ice from food service establishments

Dijana Begić Šinjori[1], Anita Ptiček Siročić[2], and Ivana Boltižar[1]

[1] Institute for Public Health of the Varaždin County, Varaždin, Croatia
[2] University of Zagreb, Faculty of Geotechnical Engineering, Varaždin, Croatia

dijanabs@zzjzzv.hr

Food safety is a public health priority, and microbiological contamination may originate from ingredients added to food and beverages immediately before consumption. Ice used in food service establishments is part of serving food and drinks and, if not produced and handled hygienically, may become a source of microbial contamination. The aim of this study was to assess the microbiological quality of ice used in food service establishments and identify common indicators of microbiological non-compliance. A retrospective analysis was performed on 443 ice samples submitted to the laboratory between 2022 and 2026. Testing included coliform bacteria, *Escherichia coli*, intestinal enterococci, colony count at 22 °C after 72 h, and colony count at 36 °C after 48 h. Overall, 122 samples (27.5 %) were non-compliant for at least one of the tested parameters. The most frequent cause of non-compliance was coliform bacteria, detected in 88 samples, followed by elevated colony counts at 22 °C/72 h in 71 samples and at 36 °C/48 h in 66 samples. Intestinal enterococci caused non-compliance in 33 samples, while *E. coli* was non-compliant in 9 samples. More than one quarter of the analysed ice samples failed to meet microbiological criteria. The predominance of coliform bacteria and elevated colony counts may indicate deficiencies in hygiene related to ice production, handling, and equipment maintenance, whereas the lower frequency of *E. coli* suggested that faecal contamination was not the predominant cause. These findings highlight the importance of regular cleaning and maintenance of ice-making equipment, the hygienic handling of ice, and systematic microbiological monitoring.

KEY WORDS: coliform bacteria; *Escherichia coli*; hygiene indicators; intestinal enterococci; microbial contamination

Poster presentation
Smart food: how are technology and artificial intelligence changing food safety?

Monitoring the free amino acid dynamics and ripening profiles of cheese by integrated HPLC-DAD, NIR spectroscopy, and chemometrics

Snježana Kazazić[1], Nataša Mikulec[2], Jasminka Špoljarić[2], Fabijan Oštarić[2], Zoran Kiralj[1], and Jasenka Gajdoš Kljusurić[3]

[1] Ruđer Bošković Institute, Zagreb, Croatia
[2] University of Zagreb, Faculty of Agriculture, Zagreb, Croatia
[3] University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

snjezana.kazazic@irb.hr

Free amino acids (FAAs) are key products of proteolysis that form during cheese ripening and significantly influence the sensory quality profile. The aim of this study was to monitor the changes in the profile of 20 free amino acids (FAAs) over 120 days of cheese ripening, and to investigate the feasibility of applying near-infrared (NIR) spectroscopy as a rapid and non-destructive method for monitoring changes associated with cheese ripening and quality. Cheese samples were analysed at defined time points throughout the 120-day ripening period. Individual FAAs were quantified using high-performance liquid chromatography with diode-array detection (HPLC-DAD). Simultaneously with the chromatographic analysis, the NIR spectra of the samples were recorded. Multivariate data analysis and visualisation of sample behavior over time were performed using principal component analysis (PCA). HPLC-DAD analysis confirmed a continuous increase in the total concentration of FAAs during ripening. In the later stages of ripening, particularly after 90 days, the most abundant amino acids included glutamic acid, valine, phenylalanine, leucine, and lysine. PCA analysis of the chromatographic data enabled the separation of samples according to their ripening time. The NIR spectra also demonstrated chronological clustering of the samples, reflecting changes in the cheese matrix during the ripening process. The obtained results demonstrated that the free amino acid profile can serve as a chemical marker for the ripeness of cheese, while NIR spectroscopy in an integrated approach with chemometrics showed potential for the rapid and non-destructive monitoring of the ripening process and quality control.

KEY WORDS: chemical marker; chromatography; principal component analysis; proteolysis; quality control

Poster presentation
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Application of single particle inductively coupled plasma mass spectrometry (spICP-MS) for determination of metallic nanoparticles (MPNs) in poly(ethylene terephthalate) (PET) for potential food contact use

Bernarda Marković, Nino Dimitrov, Ivona Vidić Štrac, Nikša Krstulović, and Rafaela Radičić

Croatian Institute of Public Health, Zagreb, Croatia

bernarda.markovic@hzjz.hr

The development of nanotechnology in food industry has been driven by the need for safer and more efficient packaging in terms of extended shelf life with maintenance of nutritional quality. Among the various groups of nanomaterials, metal oxide nanoparticles (MNPs) such as Cu, ZnO, Ag, and TiO_2 are the most common. Added to polymers, MPNs can reduce oxidative spoilage to a significant extent, improve the mechanical strength, thermal stability, barrier qualities, and ensure that packaged food will stay fresh. In this study, poly(ethylene terephthalate) (PET)/ZnO and PET/Ag composites with different ZnO and Ag clean nanoparticle (NPs) concentrations were synthesised in a laboratory with assisted atmospheric pressure plasma jet (APPJ) procedure. The polymer is treated by drop coating with ZnO and Ag MNP colloidal solution synthesised via pulsed laser ablation in water. This step enables that the nanoparticles are firmly embedded on the PET surface. In order to check material properties and confirm the tight incorporation of MNPs in the polymer, a leaching test was performed. Leaching conditions were chosen according to food contact material legislation. The content of leached MNPs in ultra pure water was tested by single particle inductively coupled plasma mass spectrometry (spICP-MS). Results showed that the content of leached MNPs was neglectible with regard to the total content of metals in PET polymer (<0.03 % w/w). The obtained results indicated that MNPs were emebedded in the PET polymer surface. These findings may be the first step in the application of MNPs for antimicrobial activity in PET composite food packaging.

KEY WORDS: active food packaging; assisted atmospheric pressure plasma jet; food contact materials; nanomaterials; polymers

Poster presentation
Proper nutrition as the foundation of health: the role of nutrients and dietary supplements

Melissopalinological analysis of linden honey

Barbara Stjepanović and Ana Večenaj

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

barbara.stjepanovic@gmail.com

Honey is defined as a natural sweet substance produced by bees of the species *Apis mellifera* L. from the nectar of plants or secretions of living plant parts, as well as from secretions of insects that suck plant sap from living plant parts. Honey is a food product of natural origin and the only natural sweetener that can be consumed by humans without prior processing, which gives it considerable economic importance. Natural linden honey is a valuable source of biologically active compounds and is readily and rapidly absorbed by the human body. Croatia is characterised by rich biodiversity and favorable climate conditions that provide an ideal environment for the production of high-quality bee products. Among the most valued is linden honey, which mainly originates from the floral nectar of linden trees. Melissopalynological and sensory analysis of linden honey samples from the Croatian market collected during 2026 were conducted to determine the botanical origin of the honey. The analysis identified the presence of 17 different pollen types. Linden pollen accounted for an average of 42 %. Among the other most abundant pollen types were those belonging to the cabbage family (*Brassicaceae*), as well as *Amorpha fruticosa* L. (false indigo), *Castanea sativa* Mill. (sweet chestnut), and *Helianthus annuus* L.(sunflower). Sensory analysis revealed the characteristic organoleptic properties of linden honey: a yellow to amber color, a strong aroma reminiscent of linden blossom, menthol, or lemon peel, and a medium-intensity flavor reminiscent of fresh walnuts or cooked linden blossom. All of the tested samples complied with requirements.

KEY WORDS: botanical origin; linden; melissopalynology; pollen; sensory analysis

Poster presentation
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Safety of children's products intended for food contact: monitoring results for the city of Zagreb 2025–2026

Lidija Barušić, Lidija Baričević, Željka Kuharić, Ivana Augustić, and Iva Majsak

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

lidija.barusic@stampar.hr

Food contact materials and items are subject to legal requirements designed to ensure a high level of human health protection. Chemical migration is a key parameter in safety assessment, particularly for products intended for infants and children, who represent perhaps the most vulnerable consumer group. This study aimed to assess the safety of food contact products intended for children based on migration testing of samples collected through monitoring activities in the city of Zagreb in 2025 and 2026. A total of 20 samples were analysed, including bottles, pacifiers, plates, bowls, and cutlery made of glass, plastics, melamine, and elastomers. Testing covered overall and specific migration, including heavy metals, bisphenol A, amines, formaldehyde, phthalates, and nitrosamines. Analyses were performed using appropriate instrumental techniques, and results were evaluated against applicable legislative requirements. All of the analysed samples complied with the applicable legal requirements for the migration parameters tested. The findings indicated a satisfactory level of safety among the products examined but cannot be generalised to all products in this category. Continued monitoring and migration testing are essential for identifying potential risks and maintaining a high level of health protection for infants and young children.

KEY WORDS: chemical migration; child safety; food contact materials; migration testing; safety assessment

Poster presentation
Microbiological food safety (viruses, bacteria, and bacterial toxins)

The new HACCP system regulation: key changes and their practical significance

Robert Kecerin, Zdenko Mlinar, Ivančica Kovaček, and Vedran Prahin

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

robert.kecerin@stampar.hr

On 1 September 2026, the new Regulation on Detailed Rules for the Establishment of Systems and Procedures Based on HACCP (Hazard Analysis Critical Control Point) Principles entered into force, replacing the one from 2015. The new legislation introduces a number of amendments aimed at aligning national requirements with European legislation, strengthening food safety systems, and adapting to contemporary requirements in food business operations. This paper provides an overview of the most significant differences between the previous and the new Regulation, with an emphasis on their practical implications for food business operators. Particular attention is given to changes concerning the expanded scope of application, the introduction of operational prerequisite programmes (OPRPs), food safety culture, the assessment of employee training effectiveness, digital management of HACCP documentation with a mandatory audit trail, the application of a flexible approach, and new requirements for acrylamide management. These amendments represent a significant step forward in the implementation of the HACCP systems, placing greater emphasis on risk management, the responsibility of all participants in the food chain, the digitalisation of business processes, and the more effective implementation of food safety systems in line with contemporary regulatory requirements.

KEY WORDS: acrylamide management; digitalisation of HACCP documentation; food safety; food safety culture; operational prerequisite programmes

Poster presentation
Hidden risks in food: allergens and how to avoid them

Allergen management in the food industry: results and implications of VITAL 4.0 implementation and ELISA analysis

Ivana Prskalo, Dario Lasić, and Vladimira Maković

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

ivana.prskalo@stampar.hr

Food allergens remain a significant challenge for food safety and consumer protection. The VITAL 4.0 (Voluntary Incidental Trace Allergen Labelling) system, based on scientifically established reference doses, provides a framework for assessing risks associated with the unintended presence of allergens and supports evidence-based decisions regarding precautionary allergen labelling. During 2025 and 2026, a total of 88 food samples, together with raw material and rinse-water samples from food industry facilities, were analysed using validated enzyme-linked immunosorbent assay (ELISA) methods. Samples were tested for gluten, soy, milk, egg, almond, and peanut proteins according to product composition and labelling information. Of the analysed samples, 42 were tested for gluten, 14 for soy, 5 for milk, 13 for egg, 3 for almond, and 11 for peanut proteins. No non-compliances were identified in the samples analysed for gluten, milk, egg, or almond proteins. However, two soy samples and four peanut samples contained undeclared allergens and were classified as non-compliant. Overall, six non-compliant samples (6.8 %) were identified, while 82 samples (93.2 %) complied with allergen labelling requirements. The results demonstrated a high level of compliance with allergen labelling legislation while highlighting the ongoing risk of unintended soy and peanut contamination, particularly in rinse-water samples. These findings emphasised the importance of continuous allergen monitoring and robust allergen management programmes. The integration of ELISA-based testing with the VITAL 4.0 framework enables science-based risk assessment, supports improved management of cross-contact risks, and may reduce reliance on precautionary allergen labelling, thereby enhancing consumer protection and food safety for individuals with food allergies.

KEY WORDS: consumer protection; food allergens; food safety; precautionary allergen labeling; risk assessment

Poster presentation
What's hiding in food? Environmental and process contaminants

Comparison of organic and inorganic phosphorus in food products using the spectrophotometric method

Ana Novak and Željka Pavlek

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

ana.novak@stampar.hr

The aim of this study was to determine and quantify the difference between naturally occurring (organic) and artificially added (inorganic) phosphates in food to identify highly processed items posing health risks. The subject of the study comprised ten commercial samples of diverse food products (processed meats, dairy, fish, and dietary supplements) sourced from the market. The methodology involved a laboratory analysis of total phosphates expressed as P_2O_5 using the spectrophotometric method, followed by a calculation based on Codex Alimentarius guidelines to estimate added phosphates by comparing data with natural phosphorus (P) baselines. The main results revealed immense variations among samples. The highest levels of added phosphates were detected in processed cheese spread (+464.2 mg/100 g), dry sausage (+166.4 mg/100 g), and rolled ham (+134.3 mg/100 g). Conversely, pasteurised milk, iced coffee, and whey protein showed no additive presence. The most important conclusion indicated that industrially processed foods contain critically high levels of artificial phosphates, which exhibit up to a 100 % absorption in the human body, significantly overloading the kidneys and the cardiovascular system. The findings strongly support the need to avoid highly processed products and carefully monitor E-numbers on labels to preserve health.

KEY WORDS: additives; E-numbers; preservatives; renal function; spectrophotometry

Poster presentation
What's hiding in food? Environmental and process contaminants

Metals in food and food-contact materials – from source to consumer

Borna Čulig, Željka Kuharić, and Senka Ninković

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

borna.culig@stampar.hr

Trace elements in food can originate from natural sources, the environment, technological production processes, and materials in contact with food. Assessing their presence requires a reliable analytical method and the proper interpretation of results within the context of food safety. The aim of the study was to determine the content of selected trace elements in various food matrices and food contact materials using inductively coupled plasma mass spectrometry (ICP-MS) and to compare the elemental profiles of different sample groups. Particular attention was paid to elements of significance for food safety, including lead, cadmium, arsenic, nickel, and chromium. The study was conducted on samples of various food types and selected food contact materials, including packaging and cookware. Samples were prepared using appropriate procedures and analysed via ICP-MS. The reliability of analytical results was ensured through quality control procedures, including the analysis of blanks, control samples, and recovery tests. The results were statistically processed using descriptive statistics, graphical analysis, and multivariate methods. Differences in the concentrations of specific elements were observed between various food matrices and food contact materials. Elemental profiles enabled the comparison of sample groups and the identification of elements that contributed the most significantly to their differentiation. The results obtained were evaluated against relevant regulatory requirements and the need to assess actual consumer exposure. The application of the ICP-MS method enables the efficient monitoring of a wide range of elements across various matrices and provides a valuable tool for screening and assessment.

KEY WORDS: consumer safety; element profile; EU regulation; ICP-MS; trace elements

Poster presentation
Microplastics and persistent organic pollutants in food and materials and objects in contact with food

Microplastics in honey and hive products from Croatia: occurrence, polymer composition, and particle size distribution

Vlatka Mikulec, Želimira Cvetković, Petra Besedić, and Martina Ivešić

Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia

martina.ivesic@stampar.hr

Microplastics (MPs) are ubiquitous environmental contaminants that can enter terrestrial ecosystems and the food chain. During foraging, honeybees (*Apis mellifera carnica*) interact with air, water, plants, nectar, and pollen, allowing MPs to adhere to their bodies and potentially be transported into the hive and subsequently into hive products. Honey and selected hive products were analysed for MP contamination. Honey samples were obtained from an organic family farm located in Daruvar, Croatia. Polymer identification was performed using micro-Fourier transform infrared spectroscopy (μFTIR) for propolis and honeycomb, while Raman microscopy was applied to honey samples. Particles were classified according to polymer type and size. MPs were detected in all of the analysed products, with marked differences in abundance and composition. Propolis contained the highest number of particles (128), with polyethylene (PE) being the most abundant polymer overall, while polypropylene (PP) predominated within the 10–50 μm size fraction. In honeycomb, 86 particles were detected, with PP also representing the dominant polymer and 10–50 μm the predominant size fraction. Honey contained 39 particles in total, comprising 25 particles in acacia honey and 14 in multifloral honey. In honey, polyethylene (PE) was the predominant polymer, while particles were mainly within the 10–50 μm size range. The presence of MPs in honey, propolis, and honeycomb demonstrates contamination across different hive-derived matrices. Differences in particle abundance, polymer composition, and size distribution may reflect distinct environmental and/or processing-related contamination pathways. These findings support further investigation of honey and hive products as complementary matrices for monitoring MP contamination.

KEY WORDS: μFTIR spectroscopy; *Apis mellifera carnica*; food safety; polymer identification; Raman microscopy

Poster presentation
What's hiding in food? Environmental and process contaminants

Comparative validation of a QuEChERS-UHPLC-MS/MS method targeting 335 pesticides in pepper and dried cannabis using an Agilent 6495D

Krste Tashev, Suzana Krstevska, Simona Gorgievska, and Oliver Ivanovski

Ministry of Agriculture, Forestry and Water Economy, State Phytosanitary Laboratory, Skopje, North Macedonia

tkrste@gmail.com

Reliable pesticide determination requires an analytical performance to be established for each matrix and analyte. This study evaluates a QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe) coupled with ultra-high-performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) method targeting 335 pesticides in pepper and dried cannabis using an Agilent 1290 Infinity III UHPLC coupled to a 6495D triple-quadrupole mass spectrometer operating in multiple reaction monitoring mode. Solvent and matrix-matched calibration were investigated over 0.1–100 μg/L. The validation framework addressed calibration performance, recovery, repeatability, matrix effects and candidate limits of quantification, using SANTE/11312/2021 v2026 as an analytical benchmark. Recovery experiments comprised three fortification levels with at least five retained replicates per level. Dried cannabis preparation involved 2 g of sample, hydration with 10 mL water, and extraction with 10 mL acetonitrile. Fortification at 5, 10, and 20 μg/kg corresponded to 1, 2, and 4 μg/L in the extract. Acceptance criteria were mean recovery of 70–120 %, RSDr ≤20 %, and back-calculated calibration deviations within ±20 %. Initial concentration-based screening in pepper identified 254 of the 335 analytes meeting recovery and repeatability criteria at all three levels. Cannabis showed greater variability in analytical performance, highlighting the importance of matrix-specific assessment. The validation approach supports the establishment of a fit-for-purpose analytical scope for routine monitoring, restricted to analyte-matrix combinations meeting the predefined performance criteria. Further validation will extend the method to additional commodity groups with different water contents, applying the EN 15662 QuEChERS procedure with matrix-appropriate sample preparation and hydration.

KEY WORDS: analytical quality assurance; food safety; matrix effects; multiple reaction monitoring; repeatability

Poster presentation
Smart food: how are technology and artificial intelligence changing food safety?

Potential of stable isotope analysis for geographical origin assessment, production system differentiation, and traceability of potatoes

Martina Ivešić[1], Adela Krivohlavek[1], Nataša Mikulec[2], Ivone Jakaša[3], Damir Iveković[3], and Milan Poljak[3]

[1] Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia
[2] University of Zagreb, Faculty of Agriculture, Zagreb, Croatia
[3] University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

martina.ivesic@stampar.hr

Stable isotope analysis is increasingly used in food authenticity and traceability research because it can provide information about the origin of agricultural products and the conditions under which they are produced. The ratios of carbon ($\delta^{13}C$), nitrogen ($\delta^{15}N$), hydrogen ($\delta^{2}H$), and oxygen ($\delta^{18}O$) reflect different environmental and agricultural factors, including water availability, climate, soil conditions, and fertilization practices. Since these factors vary between production areas, isotope analysis may help distinguish potatoes according to their geographical origin. The combined use of multiple isotopes may also be useful for studying differences between conventional and organic production systems. In particular, carbon and nitrogen isotope ratios may provide information about plant water-use characteristics and nitrogen sources, while hydrogen and oxygen isotope ratios can reflect local climatic and water conditions. Chemometric methods can be used to evaluate these data collectively and assess their ability to distinguish samples from different origins and production systems. The integration of isotope and chemometric data may also support the development of reference datasets and classification models for future authenticity and traceability applications. Our ongoing study investigates the potential of this approach using potato samples collected over a three-year period from five Croatian counties: Istria, Dubrovnik-Neretva, Lika-Senj, Međimurje, and Požega-Slavonia. The aim is to explore whether stable isotope analysis, combined with statistical methods, could support geographical origin assessment, production system differentiation, and traceability. The study may also provide the basis for a future reference database that could contribute to the verification of the origin and authenticity of Croatian potatoes.

KEY WORDS: chemometrics; EA-IRMS; food authenticity; isotopic signature; organic agriculture

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Poster presentation
What's hiding in food? Environmental and process contaminants

Geographical and seasonal variability of mono- and disaccharides in potato tubers cultivated in Croatia

Adela Krivohlavek[1], Martina Ivešić[1], Maja Budeč[1], Martina Bevardi[1], Nataša Mikulec[2], Ivone Jakaša[3], Damir Iveković[3], and Milan Poljak[2]

[1] Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia
[2] University of Zagreb, Faculty of Agriculture, Zagreb, Croatia
[3] University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia

adela.krivohlavek@stampar.hr

Climatic conditions, soil composition, and agricultural practices significantly influence the chemical composition of potato tubers. Among primary metabolites, mono- and disaccharides, particularly glucose, fructose, and sucrose, play an important role in determining potato quality and physiological characteristics. This study aimed to evaluate the potential of these sugars as chemical markers for discriminating the geographical origin of potato tubers cultivated in different regions of Croatia and to investigate possible variations in their concentrations between growing seasons associated with climatic conditions. As part of the project "Development of Methodology for Verification of Geographical Origin and Conventional/Ecological Production of Potatoes" (EcoPGO), potato tubers were collected from five Croatian counties (Lika-Senj, Dubrovnik-Neretva, Istria, Međimurje, and Požega-Slavonija) during two consecutive growing seasons, 2025 and 2026. Following collection, the tubers were washed under running water, rinsed with ultrapure water, and homogenised. Mono- and disaccharides were extracted with acetonitrile and water mixture from the homogenised samples and subsequently analysed by high-performance liquid chromatography with refractive index detection (HPLC-RID). Sugar concentrations varied considerably by county and growing season. In 2025, glucose generally predominated in the Dubrovnik-Neretva, Istria, and Međimurje counties, whereas sucrose was highest in Požega-Slavonija and Lika-Senj. In 2026, glucose and fructose decreased in all five counties, while sucrose showed region-dependent changes. These results indicate that sugar profiles are potentially valuable components of multivariate models for authentication.

KEY WORDS: climate changes; HPLC-RID; food safety and quality; potato quality; project EcoPGO

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Workshops

Workshop

The secrets of cheese's flavour: a sensory analysis workshop

Nataša Mikulec

University of Zagreb, Faculty of Agriculture, Zagreb, Croatia

This 90-minute workshop is intended for participants who want to gain a basic understanding of the sensory analysis of cheeses and better understand the factors that shape their taste and quality. Cheese is one of the most complex and diverse food products in the world, with more than a thousand different varieties characterised by unique sensory profiles. Although all cheeses contain similar basic components, their concentrations and mutual interactions vary significantly. The complexity of a cheese's flavour is the result of biochemical processes during ripening, including enzymatic activities, moisture loss, and technological procedures applied during production and ripening.

The workshop combines a short introductory lecture and a practical part with tasting. Participants will be introduced to the:

- principles of sensory analysis of semi-hard and hard cheeses;
- key sensory attributes (appearance, texture, body, color, aroma, and flavour);
- recognizing and describing the most common sensory defects of cheeses.

In the practical part, selected cheeses produced in Croatia will be evaluated using a standardised scoring system based on official quality assessment guidelines. Each parameter (appearance, color, cross-section, smell, and taste) will be evaluated systematically, with taste accounting for the largest share of the overall score.

Upon completion of the workshop, participants will gain practical experience in sensory evaluation of selected cheeses and better understand the connection between production technology and product sensory properties. All participants will receive a certificate of participation.

Workshop speaker

Assoc Prof Nataša Mikulec, PhD
University of Zagreb, Faculty of Agriculture

Workshop

Wine sensory analysis workshop

Manuela Panić and Natka Ćurko

University of Zagreb, Faculty of Food Technology and Biotechnology, Laboratory for Technology and Analysis of Wine, Zagreb, Croatia

The 90-minute workshop is intended for all who want to gain basic knowledge in wine sensory analysis and expand their knowledge of the influence of technological vinification processes on the style and character of wine and their connection with gastronomy.

The workshop includes the following topics:

- principles of sensory evaluation of white and red wines;
- sensory analysis of selected wines with protected quality labels and controlled geographical origins from various wine-growing regions of the Republic of Croatia;
- recognition and description of the typical sensory defects of wine;
- application of various tests in wine sensory analysis (quantitative descriptive analysis, 100-point method).

Upon completion of the workshop, participants will complete a short test, after which they will be awarded a certificate of participation.

Workshop speaker

Assist Prof Manuela Panić, PhD
University of Zagreb, Faculty of Food Technology and Biotechnology, Laboratory for Technology and Analysis of Wine

Workshop

Prosciutto sensory analysis workshop

Sandra Petričević

Croatian Veterinary Institute, Split, Croatia

This 90-minute workshop is intended for all who want to learn basic information about the sensory techniques for tasting prosciutto and expand their knowledge of the various prosciutto production technologies, as well as review its gastronomic aspects.

The workshop will cover topics such as:

- basic techniques and conditions for tasting prosciutto;
- tasting protected types of prosciutto [conditions for Protected Geographical Indication (PGI) and Protected Designation of Origin (PDO); Drniš prosciutto/Dalmatian prosciutto/Istrian prosciutto/Krk prosciutto; differences compared to "regular" prosciutto and renowned prosciuttos from Spain or Italy; description with a specific vocabulary for the individual sensory properties of prosciutto];
- basics of the intensity classification test – defects;
- participants will receive sensory profile sheets for a joint evaluation of the prosciutto.

Upon completion of the workshop, participants will complete a short test and receive a certificate of participation.

Workshop speaker

Sandra Petričević, PhD
Croatian Veterinary Institute, Split

Workshop

MDPI academic publishing workshop: artificial intelligence in academic publishing

Jelena Milenković

MDPI d.o.o., Belgrade, Serbia

Generative artificial intelligence (AI) is having a significant impact on academic publishing. Powerful AI tools have the potential to improve the readability of manuscripts, expand the technical capabilities of researchers, and increase the efficiency of publishers' editorial processes. However, the increasing prevalence of AI in academic publishing brings significant risks. Generative AI enables the mass-production of low-quality or inaccurate content, which can be challenging for editors and publishers to detect. Furthermore, careless use of AI tools for scientific work can undermine user privacy and threaten intellectual property rights. As a large Open Access publisher, MDPI has a responsibility to safeguard the academic literature by developing and implementing effective strategies to tackle these challenges. Achieving this goal requires clear communication of journal policies, responsible use of AI tools in our own editorial processes, and engagement in the academic community's ongoing discussions around AI. In this academic publishing workshop, we introduce and discuss key issues around AI in publishing. We begin by describing possible uses of AI in scientific research and publishing. We then outline the various risks posed by the misuse of AI technologies in academic publishing. Next, we clarify MDPI's policies on AI use in academic manuscripts and provide practical guidance for authors on how to adhere to our submission requirements. Finally, we clarify how MDPI uses AI in our own editorial processes, increasing efficiency and quality while retaining humans-in-the-loop to ensure accuracy and oversight.

Workshop speaker

Jelena Milenković, PhD
MDPI d.o.o., Bulevar Milutina Milankovica 7v, 11070 Belgrade, Serbia

Author index

A

Agić T 33
Augustić I 70

B

Banjari I 59
Baričević L 70
Barrucci F 12
Barušić L 70
Bažulić Štimac Ž 50
Beck N 14
Begić Šinjori D 66
Behring C 12
Besedić P 75
Bevardi M 63, 78
Bijelović S 56
Bilandžić N 47, 48, 51
Biošić D 37
Blaznik U 31
Bobić S 56
Bocchia M 12
Bogdanović T 48
Boltižar I 66
Bošnir J 62, 63
Božić J 39
Božić Luburić Đ 48
Bračić I 40
Bučan Nenadić D 39
Budeč M 42, 63, 78
Bukić J 39
Buzjak Služek V 27

C

Cvetković Ž 75
Cvetnić Ž 47

Č

Čačić Kenjerić D 49
Čalopek B 48, 51
Čaušević B 25, 60
Čolak S 48
Čulig B 74
Čulig J 30
Čvrljak J 41

Ć

Ćurko J 46, 55
Ćurko N 46, 55, 81

D

Denžić Lugomer M 47
Deur M 34
Dimitrov N 68
Došen Janković S 39
Dragun T 39

Đ

Đokić M 47, 48, 51
Đotlo M 28

E

Ercolano V 12

F

Fetahagić M 26
Furmeg S 47, 57

G

Gajdoš Kljusurić J 67
Gelemanović A 44
Gilić Škugor B 39
Gorgievska S 76
Grgić I 39
Grzetic Martens J 17
Grzunov Letinić J 64
Gvozdanović K 50

H

Hadžić R 52
Hasanbašić Dž 25, 60
Hasanović J 35

I

Ibrahimagić A 25, 60
Ibrišimbegović M 28
Imamović N 25, 26, 60
Ivanovski O 76
Iveković D 42, 77, 78
Ivešić M 42, 75, 77, 78

J

Jakac M 29

Jakaša I 42, 77, 78
Jaki Tkalec V 47
Jelušić S 41
Joksimović M 56
Jug I 27
Jurak G 38
Jurič A 58

K

Karakaš S 28
Kaurinović J 48, 51
Kazazić S 67
Kecerin R 71
Kiralj Z 67
Kišija-Bajrić J 25
Kmetič I 47
Knežević D 15, 27
Kolarić B 32
Kolarić Kravar S 13
Kolčić I 39
Končurat A 47
Kovaček I 71
Kovačević Ganić K 46, 55
Kreković DM 33
Krivohlavek A 42, 53, 77, 78
Krstevska S 76
Krstulović N 68
Kudumija N 57
Kuharić Ž 70, 74
Kukić E 28
Kumrić M 39

L

Ladan I 22, 33
Landeka N 29
Lasić D 72
Lazarus M 58
Lešić T 57
Lučin M 52

LJ

Ljulj A 23, 53

M

Macner F 46, 55
Majić I 65
Majsak I 70
Maković V 62, 72
Maltar Strmečki N 19
Mandić Andačić I 42
Mandra M 25, 26, 60
Marendić M 39
Marjanovič T 31
Markić F 19
Marković B 68
Matijević L 12
Matošić M 46, 55
Mijaković M 59
Mikulec N 42, 67, 77, 78, 80
Mikulec V 75
Milenković J 83
Miloš S 27
Mlinar Z 71
Moralić M 29
Mudnić I 39
Murati T 47
Muratović S 19
Musić Milanović S 35
Mustać B 48

N

Ninković S 74
Novak Ana 73
Novak Ane. 39
Novosel T 47

O

Orct T 58
Oštarić F 67

P

Panić M 81
Pavelić L 29
Pavić K 23
Pavlek Ž 73
Pavličeк D 47
Pavlinić Prokurica I 20
Pavlović N 39
Peić A 62
Pelaić Z 64
Peroš A 39
Peroš-Pucar D 64
Petani B 48
Peter K 50

Petričević S 48, 82
Petrinec B 58
Pleadin J 27, 57
Polić N 39
Pollak L 22, 33, 35
Poljak M 42, 77, 78
Prahin V 71
Prlić I 29
Prskalo I 72
Ptiček Siročić A 66
Puljak A 32, 41

R

Radašević H 41
Radičić R 68
Rakić A 59
Rakić N 59
Raljević J 64
Rušić D 39

S

Sedak M 48, 51
Senčar J 58
Slunjski S 42
Solomun Kolanović B 48, 51
Spill Y 12
Stjepanović B 69
Sulimanec A 58
Surać L 55
Sušac M 32

Š

Šakić D 23, 53
Šamec D 61
Šegvić Klarić M 27
Šimić I 35
Širić I 58
Špoljarić J 42, 67
Šprem N 58
Šupe Domić D 39

T

Tabain G 37
Tariba Lovaković B 58
Tashev K 76
Thomaes R 36
Tomasović Mrčela N 32
Tot A 42

U

Ulm L 53

V

Varenina I 48, 51
Varga I 48, 51
Večenaj A 69
Vidić Štrac I 68
Viher Hrženjak V 31
Vincek D 61
Vinković Vrček I 16
Vladislavić S 39
Vrček V 23, 52, 53
Vrhovac Filipović I 21
Vulić A 57

Z

Zadravec M 57
Zanini I 46, 55
Zukić M 49

Ž

Živadinović E 56
Žižić Efendić I 39
Žuntar I 23, 53
Župan A 54

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