Arhiv za higijenu rada i toksikologiju

Archives of Industrial Hygiene and Toxicology

Arh Hig Rada Toksikol
Vol. 75/Suppl.2
Zagreb, November 2024

Institute for Medical Research
and Occupational Health,
Zagreb, Croatia

ISSN 1848-6312
UDC 613–6
CODEN: AHRTAN

Abstracts of the 5th International Congress on Food Safety and Quality "Safe food, today and tomorrow"

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Archives of Industrial Hygiene and Toxicology

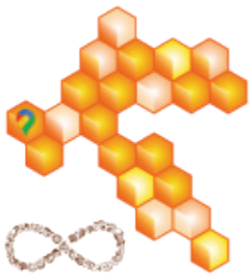
2024;75(Suppl. 2)

Abstracts of the 5th International Congress on Food Safety and Quality

"Safe food, today and tomorrow"

Poreč, Croatia

6–9 November, 2024



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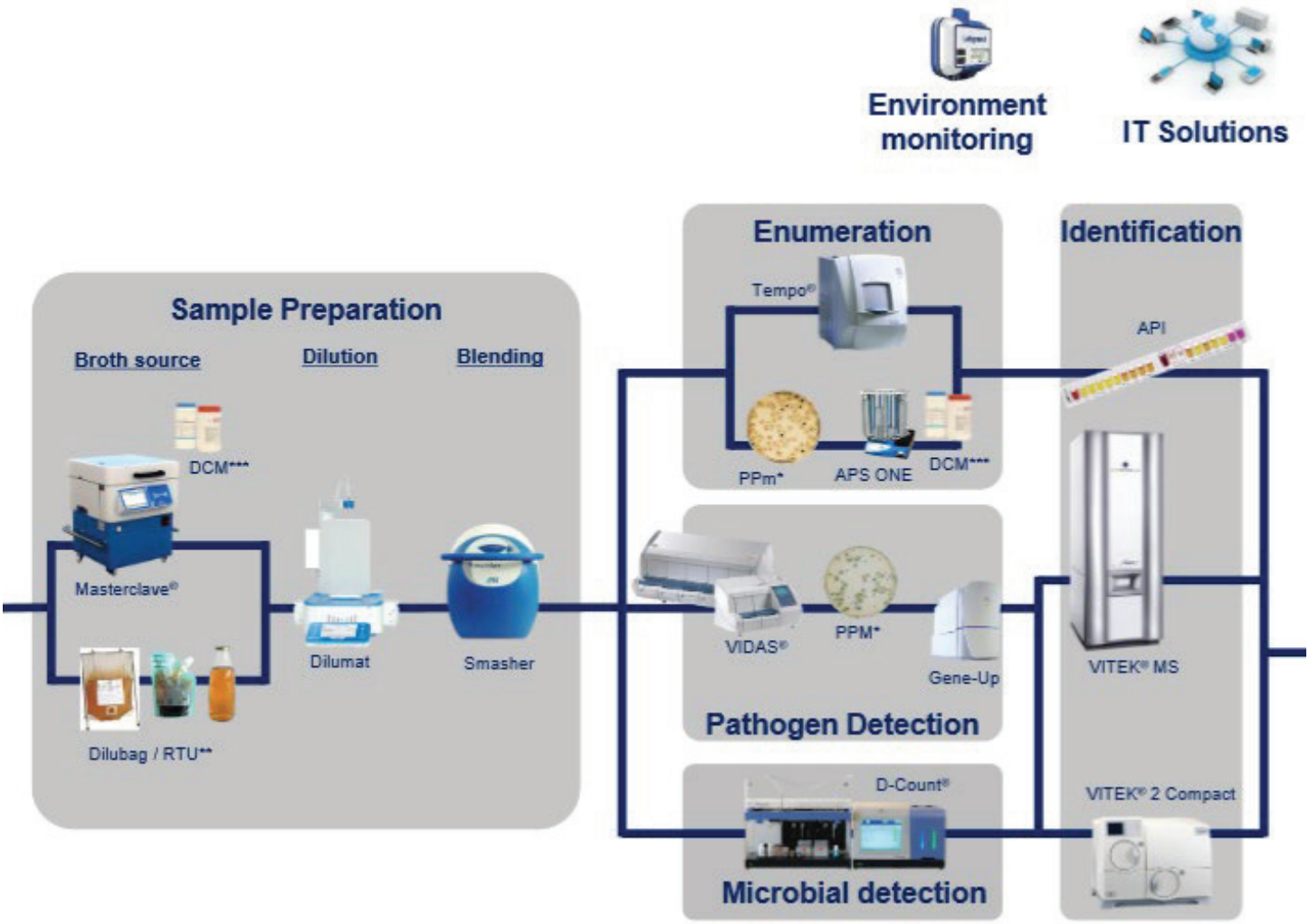

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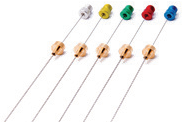


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Under the auspices of

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Ministry of Science, Education and Youth of the Republic of Croatia

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CONGRESS PROGRAMME

**SRIJEDA 6. studenoga 2024. /
WEDNESDAY, November 6 2024**

12,00 – 14,00

Registracija sudionika / Registration of participants
Dvorana / Hall: Magnolia

14,00 – 15,30

RADIONICA I – Senzorika maslinovog ulja
dr. sc. Karolina Brkić Bubola

15,30 – 17,00

RADIONICA II – Procesni faktori u analitici pesticida i procjena sigurnosti
doc. dr. sc. Iva Pavlinić Prokurica
dr. sc. Gordana Jurak, dipl. ing.

17,15 – 19,00

RADIONICA III – Senzorika meda
izv. prof. dr. sc. Dražen Lušić, dipl. sanit. ing.

21,00

Piće dobrodošlice / Welcome drink

**ČETVRTAK 7. studenoga 2024. /
THURSDAY, November 7 2024**

8,00 – 9,00

Registracija sudionika / Registration of participants
Dvorana / Hall: Magnolia

11,00 – 11,30

Svečano otvaranje kongresa / Opening ceremony

11,30 – 11,40

Izjave za medije / Statements for the media

11,40 – 12,00

Pauza za kavu / Coffee break

Food Safety and Food Quality, "Safe Food, Today and Tomorrow"
Voditelji sekcije / Moderators:
Irena Žuntar, David Matthew Smith, Adela Krivohlavek
Pozvana predavanja / Invited lectures

12,00 – 12,30
Food safety in Europe and central Asia – FAO's role and support
Mary Kenny, Organizacija za hranu i poljoprivredu Ujedinjenih naroda / Food and Agriculture Organization of the United Nations (FAO)

Pozvano predavanje / Invited lecture

12,30 – 13,00

EFSA's role in the risk assessment of food supplements

Leonard Matijević, Europska agencija za sigurnost hrane / European Food Safety Authority (EFSA)
Pozvano predavanje / Invited lecture
Online

13,00 – 13,15

Rasprava / Discussion

13,15 – 14,15

Pauza za ručak / Lunch break

14,15 – 14,45
The challenges ahead
Biljana Borzan, Europski parlament / European Parliament
Pozvano predavanje / Invited lecture

14,45 – 15,15

What does a scientific research institute have to do with food?
dr. sc. David Matthew Smith, Institut Ruđer Bošković / Ruđer Bošković Institute
Pozvano predavanje / Invited lecture

15,15 – 15,45

Applied science for a more efficient food safety system
Dražen Knežević, Hrvatska agencija za poljoprivredu i hranu (HAPIH) / Croatian Agency for Agriculture and Food (CAAF)
Pozvano predavanje / Invited lecture

15,45 – 16,00

Rasprava / Discussion

16,00 – 16,15

Pauza za kavu / Coffee break

Food Safety and Quality, "Safe Food, Today and Tomorrow"
Voditelji sekcije / Moderators:
Jasmina Ranilović, Vesna Viher Hrženjak, Dario Lasić
Pozvana predavanja / Invited lectures

16,15 – 16,45

Experiences and challenges from the field of accreditation related to the application of HRN EN ISO/IEC 17025:2017
Ana Selak, Hrvatska akreditacijska agencija / Croatian Accreditation Agency
Pozvano predavanje / Invited lecture

16,45 – 17,15

Analytical methods for pesticide residues in food: current practices and future perspectives in the EU
prof. Amadeo Rodríguez Fernández-Alba, Sveučilište u Almeriji (UAL) / University of Almeria (UAL)
Pozvano predavanje / Invited lecture
Online

17,15 – 17,45

Influence of fire from a plastic processing factory on soil quality
prof. dr. sc. Ivica Kisić, Agronomski fakultet Sveučilišta u Zagrebu / University of Zagreb Faculty of Agriculture
Pozvano predavanje / Invited lecture

17,45 – 18,00

GBO – Making a difference for life sci professionals
Agnieszka Molas-Kilianek, Application & Product Specialist CEE, Greiner Bio-One GmbH
Sponzorsko predavanje / Sponsored lecture

18,00 – 18,15

Rasprava / Discussion

21,00

Svečana večera / Gala dinner

**PETAK 8. studenoga 2024. /
FRIDAY, November 8 2024**

Naziv sekcije: 1. Chemical contaminants of food and analytical possibilities of their proof
Voditelji sekcije / Moderators:
Nives Galić, Sanja Bijelović, Gordana Jurak

9,00 – 9,20

Dithiocarbamate residue analysis of fruit and vegetables – challenges for pesticide residue laboratories

dr. Hubert Zipper, Referentni laboratorij Europske unije (EURL) / European Union Reference Laboratory (EURL)

9,20 – 9,35
Novel approach for determining ochratoxin in complex spice matrices on an HPLC/FLD instrument
Bojan Plavac

9,35 – 9,50

First comprehensive assessment of mycotoxin contamination in hops: a neglected risk for the brewing and pharmaceutical industries
Bojan Šarkanj

9,50 – 10,20

Innovative Shimadzu solutions in analytical food chemistry
Mirela Župan, Shimadzu d.o.o.
Sponzorsko predavanje / Sponsored lecture

10,20 – 10,35

qPCR detection of pathogens with an impact on food safety
Anja Perčič, mag. ing. zoot., NOACK & Co GmbH Austria
Sponzorsko predavanje / Sponsored lecture

10,35 – 10,45

Rasprava / Discussion

10,45 – 11,15

Virtualna šetnja Porečom / Poreč virtual sightseeing

11,15 – 11,45

Pauza za kavu / Coffee break

Naziv sekcije: 4. Food additives, nutrients, vitamins and dietary supplements
Voditelji sekcije / Moderators:
Nives Galić, Josip Čulig, Jasna Bošnir

11,45 – 12,00

Exploring mineral oil hydrocarbons (MOSH and MOAH), testing and evaluation
Thomaes Ruben, Eurofins Nizozemska / Eurofins Netherlands

12,00 – 12,15
Obesogenic chemicals in food and food contact materials
Vesna Viher Hrženjak

12,15 – 12,30
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Josip Čulig

12,30 – 12,45
Hemp products – monitoring, legislation, and analysis result
Iva Ladan

12,45 – 13,00
Association between selected gerontological-public health indicators with the rate of malnutrition in nursing home residents
Nada Tomasović Mrčela

13,00 – 13,15

Chromatography and mass spectrometry in food analysis: challenges of perpetual chemicals – methods for the detection and measurement of PFAS
Borna Ferčec, mag. ing. cheming., Sales Advisor – Liquid Chromatography & Mass Spectrometry, Altium International
Sponzorsko predavanje / Sponsored lecture

13,15 – 13,25

Rasprava / Discussion

13,25 – 14,15

Pauza za ručak / Lunch break

Naziv sekcije: 3. Microbiological challenges in food and feed production
Voditelji sekcije / Moderators:
Muhamed Gladan, Ivana Ljevaković-Musladin, Ivančica Kovaček

14,15 – 14,35
Sanitation programs in the service of pathogen monitoring in the production facility
Tanja Dinić, Fortenova grupa d.d.

14,35 – 14,50
Enterotoxigenic potential of *Staphylococcus aureus* isolates from domestic fresh cheese
Ivana Ljevaković-Musladin

14,50 – 15,05
Decontamination effect of organic acids against *Yersinia enterocolitica* 4/O:3 strains on pork cuts – a preliminary laboratory study
Marta Kiš

15,05 – 15,20
Natural preservation techniques: using essential oils to extend the shelf life of cherry tomatoes
Elena Petrović

15,20 – 15,35

Food is not waste
dr. sc. Sanja Kolarić Kravar, Ministarstvo poljoprivrede, šumarstva i ribarstva / Ministry of Agriculture, Forestry and Fisheries

15,35 – 15,50

How to meet high requirements for safety and hygiene in your own production in three simple steps?
Džulija Kraleva-Ivanova, Biokom Trendafilov Ltd.
Sponzorsko predavanje / Sponsored lecture

15,50 – 16,00

Rasprava / Discussion

16,00 – 16,30

Pauza za kavu / Coffee break

16,15 – 17,30
Razgledavanje i ocjena postera / Poster viewing and evaluation

17,30 – 18,45

Round table: Reduction of food waste and its donation system
Moderator
izv. prof. dr. sc. Jasna Bošnir, dipl. san. ing., prof. struč. stud.
Nastavni zavod za javno zdravstvo „Dr. Andrija Štampar“

Sudionici / Participants:
Marija Batinić Sermek, dipl. ing. preh. teh, voditeljica Službe za kvalitetu hrane i informiranje o hrani, Ministarstvo poljoprivrede, šumarstva i ribarstva/Ministry of Agriculture, Forestry and Fisheries;
doc. dr. sc. Jasmina Ranilović, dipl. ing., direktor projekata i primijenjenih istraživanja, Podravka d.d.;
Ana Marija Crnić, dipl. ing., Gradski ured za socijalnu zaštitu, zdravstvo, branitelje i osobe s invaliditetom, Grad Zagreb/ City of Zagreb;
Alen Župan, mag. soc. gerontologije, ravnatelj, Ustanova „Dobri dom“ Grada Zagreba/Institution “Dobri dom” of the City of Zagreb

18,45 – 19,00

Proglašenje najboljeg postera / Best Poster Award

SUBOTA 9. studenoga 2024. /
SATURDAY, November 9 2024

Naziv sekcije: 5. Safety of materials and articles that come into contact with food
Voditelji sekcije / Moderators:
Ivona Vidić-Štrac, Andreja Zorič, Lidija Barušić

9,00 – 9,15

Safety of metals and alloys used in food contact materials: SRL, SML, coatings and regulatory framework

Lidija Baričević

9,15 – 9,30

Biobased materials that substitute single use plastics (SUP) for direct contact with food

Nino Dimitrov

9,30 – 9,45

Phytotoxic effects of polystyrene and polymethyl methacrylate microplastics on the floating freshwater plant *Lemna minor*

Biljana Balen

9,45 – 10,00

Novel non-thermal techniques in food processing: benefits and drawbacks

Nadica Maltar-Strmečki

10,00 – 10,30

Mass spectrometry in food analytics – Challenges and solutions

Sanja Đekić, specijalist za aplikativnu podršku, Analysis d.o.o.
Sponzorsko predavanje / Sponsored lecture

10,30 – 10,35

Rasprava / Discussion

10,35 – 10,45

Pauza za kavu / Coffee break

Naziv sekcije: 2. Food quality, adulterated detection and food technology innovations

Voditelji sekcije / Moderators:
Renata Baličević, Nadica Maltar-Strmečki, Nataša Mikulec

10,45 – 11,00

Determination of cheese ripening with liquid chromatography-mass spectrometry (LC-MS) and rapid near-infrared (NIR) spectroscopy

Nataša Mikulec
Pozvano predavanje / Invited lecture

11,00 – 11,15

How can the relationship between volatile compounds and sensory properties improve the determination of virgin olive oil quality?

Karolina Brkić Bubola

11,15 – 11,30

Determining the geographical origin of olive oils from the Croatian coast through the distribution of selected metals – the project "Food Safety and Quality Control Center" KK.01.1.1.02.0004

Adela Krivohlavek

11,30 – 11,45

Product certification for consumer trust

Vlatka Šćetarić, DNV Adriatica d.o.o.
Sponzorsko predavanje / Sponsored lecture

11,45 – 12,00

Rasprava / Discussion

12,00

Zatvaranje kongresa / Closing of the Congress

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Dear colleagues, dear associates,

it is my great honour and pleasure to welcome you on behalf of the Organising and Scientific Committee to participate at the 5th International Congress on Food Safety and Quality under the slogan "Safe food, today and tomorrow", which will be held in Poreč, from 6 to 9 November 2024.

The International Congress on Food Safety and Quality will again be held under the auspices of the competent authorities and institutions and is organised by the Teaching Institute for Public Health "Dr. Andrija Stampar". The co-organisers are the Croatian Agency for Agriculture and Food, the Institute for Health and Food Safety Zenica (Bosnia and Herzegovina), the Faculty of Agriculture of the University of Zagreb, the Faculty of Agrobiotechnical Sciences Osijek, the National Institute of Public Health (Slovenia), and the Institute of Public Health of Vojvodina (Serbia), in cooperation with other eminent institutions from the country and abroad.

Food safety and quality are fundamental issues that concern every individual and every community. Our ability to provide food that is safe to consume, rich in nutrients, and produced sustainably is essential for the health and well-being of all of us.

In today's globalised world, the challenges related to food safety and quality are becoming increasingly complex. Increasing demand for food, changes in climate conditions, as well as the complexity of supply chains, require us to be innovative and proactive in addressing these challenges.

Thanks to extremely important topics and respected experts who shared their knowledge and experience with us, the first four congresses on food safety and quality enjoyed truly great interest to the satisfaction of us all. Moreover, at the congresses "New Achievements and Future Challenges" in 2017, "Food Life Cycle" 2018, "Food, Health and Climate Change" 2020, and "One Health" in 2022, a total of almost 1,300 participants and a large number of guest lecturers from the country and the world participated and presented their findings in the form of exceptional plenary lectures, excellent oral presentations, satellite symposia, workshops, and poster presentations. On the wings of these successes, our goal is to organize an even more significant, distinctive and educational 5th International Congress on Food Safety and Quality.

At the congress we will discuss new contaminants in food, such as perfloroalkyl and polyfloralkylic substances (PFAS) and pyrrolizidine alkaloids. We will also update the topics of food disposal, reducing food waste, and opening a food bank, but also the importance of controlling items and materials that come into contact with food. Food safety of animal origin will also be discussed, with an emphasis on microbiological pollution and challenges in preventing their emergence and spread.

The Congress is intended for all food producers, distributors and professional and scientific institutions dealing with food risk analysis and assessment, as well as all stakeholders of the food safety chain "from farm to fork". Given that our common task is not only to protect, but also to improve the health of our citizens. By organizing the 5th International Congress "Safe Food, Today and Tomorrow", we want to continue raising awareness of this important topic within the scope of the profession.

I would also like to express my sincerest gratitude to all of the members of the Organizing and Scientific Committees, the invited speakers, presenters, and poster contributors, for their invaluable participation in the Congress. Special thanks go to our sponsors, whose financial support made this event possible.

We thank you for your response and look forward to meeting you in beautiful Poreč in November 2024!

Sincerely,
Prof Branko Kolarić, MD, PhD
Congress President

Abstracts of the 5th International Congress on Food Safety and Quality
"Safe food, today and tomorrow"

Invited lectures

Invited lecture

Dithiocarbamate residue analysis of fruit and vegetables – challenges for pesticide residue laboratories

Hubert Zipper, Ellen Scherbaum, and Michelangelo Anastassiades
EURL-SRM hosted at the CVUA Stuttgart, Fellbach, Germany
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For pesticide residue laboratories, analysis of dithiocarbamate fungicides in fruit and vegetables poses a major challenge, as the physicochemical properties of various representatives belonging to this compound class lead to difficulties. It is important to stress that mancozeb, metiram, maneb, zineb, and propineb are practically insoluble in aqueous and organic solvents making it difficult to conduct method validation studies and develop new methods. The vast majority of laboratories analyse dithiocarbamates using methods entailing conversion of dithiocarbamates to carbon disulfide (CS_2). This common moiety approach is however very laborious, costly, requires considerable amounts of highly concentrated chemicals (e.g. hydrochloric acid), and has limited specificity, as it does not differentiate between vari ous dithiocarbamate groups. In addition, the specificity is also compromised by compounds that are either directly or through intermediate products converted to CS_2 during the digestion/hydrolysis step of (unprocessed/processed) food. Considerable levels of CS_2 were detected, especially in crops belonging to the Brassicaceae and Alliaceae family (e.g. resulting from naturally occurring mustard oil glycosides) and in shiitake mushrooms (resulting from the organosulfur compound lenthionine). One study suggests that sulfur – used against pests – could convert to CS_2 during the reductive hydrolysis and lead to false positive results. Roasted coffee and puffed rice are also suspected of causing CS_2-blind values during the common-moiety approach. Controlling compliance with EU maximum residue levels (EU-MRLs) for such commodities is thus challenging, as CS_2 contents cannot be distinguished from CS_2 generated from dithiocarbamate residues. This presentation aims to share valuable insights to regulatory bodies, food producers, and laboratories.

KEY WORDS: ethylene-bis-dithiocarbamate; EU maximum residue level; N,N-dimethyl-dithiocarbamate; propylene-bis-dithiocarbamate; ziram

Invited lecture

The challenges ahead

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EU standards for food safety and quality are becoming increasingly stringent. Many EU member states support strict regulations to protect and sustain domestic agriculture and natural farming practices. Genetically modified foods remain a significant topic within the EU, alongside the growing demand for sustainable agricultural methods. The global issue of food waste is alarming, with more than 30 % of produced food lost worldwide. The EU is proactively working on initiatives aimed at reducing waste through improved supply chain management and consumer education. Additionally, advancements in technology are facilitating the redistribution of surplus food, supporting those in need and mitigating waste. Shrinkflation and skimpflation are also becoming more pronounced, especially in the context of inflation. Shrinkflation involves reducing the product size while maintaining the same price, whereas skimpflation refers to the use of lower-quality ingredients. European consumer protection agencies are calling for greater transparency from manufacturers to ensure consumers are fully informed about product nutrition labels. The growing interest in alternative protein sources, driven by increased awareness of sustainability and ethical concerns, presents another challenge. While innovation in this sector is essential, it is equally important to emphasize the preservation and sustainability of traditional food culture and quality in food choices.

KEY WORDS: EU standards; food safety; shrinkflation; skimpflation; sustainability

Invited lecture

Determination of cheese ripening with liquid chromatography-mass spectrometry (LC-MS) and rapid near-infrared (NIR) spectroscopy

Nataša Mikulec[1], Romana Perkov Gvoić[1], Jasminka Špoljarić[1], Jasenka Gajdoš Kljusurić[2], and Snježana Kazazić[3]
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During cheese ripening, proteins break down, resulting in the formation of free amino acids that influence the development of characteristic organoleptic properties such as specific taste, smell, aroma, and texture. The Mediterranean climate, aromatic vegetation, and sea spray play a significant role in the ripening process of cheese from the island of Pag (*Paški sir*). Liquid chromatography-mass spectrometry (LC-MS) was used to determine the concentration and content of free amino acids in cheese samples (n=15) of varying maturity (0, 30, 60, 90, and 120 days), prepared in a mini cheese factory in Kolan. The LC-MS allows monitoring of the degree of ripening, based on changes in cheese composition. The samples were also scanned using near-infrared (NIR) spectroscopy with a portable device (900–1700 nm). The basic physicochemical composition of the cheese (proteins, fats, and dry matter) changed depending on the degree of ripening, and for these parameters, NIR detects vibrations of O-H, N-H, and C-H molecules. Analytical data were associated with spectra and qualitative and quantitative models for predicting ripening and quality were developed using multivariate analyses [principal component analysis (PCA) and partial least squares regression (PLSR)]. Based on the results, it was confirmed that: (i) the ripening of Pag cheese should not be shorter than 60 days, as only then does the further breakdown of peptides occur, and (ii) glutamic acid, valine, phenylalanine, leucine, and lysine are predominant amino acids that significantly contribute to its characteristic flavour. NIR spectroscopy has confirmed its qualitative effectiveness in profiling the degree of ripeness, making the increasing application of this simple, fast, and environmentally and economically friendly method justified.

KEY WORDS: degree of proteolysis; free amino acids; multivariate analyses; Pag cheese; portable NIR

Invited lecture

What does a scientific research institute have to do with food?

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The Ruđer Bošković Institute (RBI) is Croatia's largest research institution, covering fundamental research in physics, chemistry, biology, biomedicine, data science, and marine and environmental science. At first glance, the activities of the RBI might appear to be entirely independent of food quality and security. This is, however, not the case. In this presentation, the Director of the Institute will provide some insight into the present status of overlap, which includes sterilization and quality control of existing foodstuffs as well as the development of new and innovative food products.

KEY WORDS: development; detection; food science; innovation; radiation

Invited lecture

Applied science for a more efficient food safety system

Dražen Knežević, Martina Jurković, Danijela Stražanac, Sanja Miloš, and Vlatka Buzjak Služek
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Food safety risk assessment (RA) is a specialized field of applied science that involves the use of scientific data and methodologies in order to assess the risks associated with certain hazards in food and feed. The Croatian Agency for Agriculture and Food (HAPIH) is the national competent authority responsible for RA and independent scientific support to risk managers. In order to further improve the annual official control plans and other official control activities, HAPIH has developed and applied during 2023 a specific RA methodology for risk ranking (RR) of chemical contaminants in food sampled during official food controls at national level. RR aims to provide scientific support for a more efficient allocation of available human, financial, and time resources and to redirect focus to the areas that cause the most concern from the perspective of public health. An additional aim of RR is to identify gaps in occurrence data on chemical substances and food categories for which it is necessary to collect more data at the national level so that a priority order of data collection on their occurrence can also be created for them. Based on RR results, risk managers updated the national official control plans that they report to the European Commission, taking into account HAPIH's recommendations on resource allocation, especially for specific combinations of contaminants or groups of contaminants and product groups. The above-mentioned scientific methodological approach enables the highest possible level of human health protection in the field of food safety in the Republic of Croatia.

KEY WORDS: chemical contaminants; human health; official controls; risk assessment; risk ranking

Invited lecture

Analytical methods for pesticide residues in food: current practices and future perspectives in the EU

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Food safety control has significantly advanced, incorporating extensive monitoring with ultra-low detection limits and enhanced analytical accuracy. The EU now analyses millions of samples annually, highlighting the shift from viewing these controls as merely restrictive to recognizing them as vital for comprehensive residue monitoring. This shift is motivated by both human health concerns and environmental protection. Laboratories have responded by focusing on reducing analysis times, cutting costs, and minimizing organic waste to boost productivity and serve the community better. It is crucial to reevaluate multiresidue methods and explore new techniques that meet these goals efficiently, such as optimising calibration processes and injection volumes in light of recent advancements in mass spectrometry. Moreover, automation and miniaturization are key areas poised to support these broader objectives. Our research discusses the latest developments in analytical tools and techniques, including emerging technologies and those nearing implementation. We emphasize the innovative evolution of these methodologies towards greater efficiency and eco-friendliness. We have organized our examples into three phases: initially reducing sample amounts, then enhancing calibration and cleanup procedures including micro solid phase extraction (SPE) application, and finally focusing on microflow chromatography. These methods, whether new or established, have shown potential to increase sample throughput, reduce lab waste, and save costs while complying with ISO 17025 standards.

KEY WORDS: food control; food safety; ISO 17025; mass spectrometry; routine laboratories

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Invited lecture

EFSA's role in the risk assessment of food supplements

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The European Food Safety Authority (EFSA) and its scientific Panel for Nutrition, Novel Foods and Food Allergens (NDA) play an important role in the risk assessment of food supplements at the level of the European Union. However, despite the involvement of all stakeholders in food safety, some food supplements on the market raise safety concerns. Given the diversity of ingredients, from vitamins and minerals to botanicals and other bioactive compounds, it should be a collective effort to guarantee the protection of the consumers against potential health risks and to ensure that they are not given misleading information. EFSA's assessments are typically initiated when specific safety concerns for existing food supplements are identified by Member States and the European Commission, or when food supplements fall under category of regulated products such as novel foods or new nutrient sources. Another tool EFSA uses to identify emerging risks from food supplements is the EFSA Emerging Risk Exchange Network (EREN). These assessments focus on identifying potential adverse effects, examining interactions with other food ingredients or medications, and establishing Health-Based Guidance values (HBGVs), including Tolerable Upper Intake Levels (UL) for nutrients for addition to food supplements. Furthermore, EFSA evaluates health claims related to the potential health benefits of food supplements. While EFSA provides scientific opinions to inform regulatory decisions taken by the European Commission and Member States, it is ultimately the role of Member States to monitor and enforce market regulations.

KEY WORDS: EREN; food safety; health claims; health risk; novel food

Invited lecture

Influence of fire from a plastic processing factory on soil quality

Ivica Kisić[1], Darja Sokolić[2], Aleksandra Perčin[1], Hrvoje Hefer[2], and Željka Zgorelec[1]
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The soil is a thin loose layer located on the surface of the planet Earth, between the lithosphere and the atmosphere. Over 90 % of food is produced on or in soil, so its role is irreplaceable in the modern concept of sustainable economic development, which will mark the century. The soil is already today, and will be even more so in the coming decades, a factor that will certainly define the limits to the development of the ever-increasing human population. The soil acquires a new and increasingly important role in adapting and mitigating climate change through the storage of greenhouse gas emissions. At the same time, along with water, soil is the natural resource most exposed to degradation under anthropogenic influences and natural disasters. One anthropogenic incident occurred on October 4–5, 2023 in the suburban settlement of Brijest near the city of Osijek. There was a fire at an open area near a plastic waste dump in the vicinity of the Drava International plastic processing plant. The aim of this paper is to point out the possible changes that occurred in the soil, i.e. what the impact of this fire was on the quality of the agricultural soil in the vicinity of the factory. The soil samples in the disturbed state were collected by the employees of the Faculty of Agriculture of the University of Zagreb and by the Croatian Agency for Agriculture and Food from Osijek immediately after the incident (October 7) as well as again in the second half of October 2023. All soil samples were collected from agricultural areas where at that moment arable or vegetable crops were found. This lecture will also present the results of soil quality for plant production (soil reaction, concentration of plant-accessible phosphorus and potassium, concentration of organic matter, carbon, nitrogen, their mutual ratio, and sulfur) as well as potential organic ones (dioxins, polycyclic aromatic hydrocarbons, polychlorinated biphenyls) and inorganic pollution (heavy metals) in agricultural soil in the vicinity of the Drava International plant.

KEY WORDS: agricultural crops; anthropogenic influence; fire incident; plastics; pollution

Oral presentations

Oral presentation

Phytotoxic effects of polystyrene and polymethyl methacrylate microplastics on the floating freshwater plant *Lemna minor*

Biljana Balen[1], Karla Košpić[1,2], SandraVitko[1], Luka Kobelščak[1], Ana Matešković[1], Nino Dimitrov[3], and Mirta Tkalec[1]

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Plastic pollution is one of the most pressing environmental issues, driven by the increasing production of plastic products, their fragmentation into microplastics (MPs), and their long persistence in ecosystems, which affects all living organisms, including plants. Therefore, duckweed (*Lemna minor*) was exposed to commercial polystyrene (PS-MPs) and polymethyl methacrylate (PMMA-MPs) microparticles at 0.01, 0.05, and 0.1 g/L concentrations to investigate their uptake and effects on growth, photosynthesis, and oxidative stress. The uptake of both MPs was confirmed by pyrolysis-gas chromatography-mass spectrometry. PS-MPs increased the frond number and total area, while PMMA-MPs caused a decrease. Photosynthetic parameters, determined by the JIP-test, showed that both types of MPs significantly affected the maximum quantum yield of PSII (Fv/Fm), although the photosynthetic performance index (PIABS) was slightly higher for the PS-MPs compared to PMMA-MPs. PMMA-MPs also led to a reduction in photosynthetic pigment content, while lower concentrations of PS-MPs had a positive effect. Oxidative stress parameters and antioxidants were analysed spectrophotometrically. Both treatments elevated H_2O_2 content, more prominently at higher PMMA-MP concentrations. Although no lipid damage was detected, protein carbonyl content elevated at higher concentrations of both MPs. Activities of peroxidases were increased after exposure to higher PS-MP concentrations compared to control and PMMA-MPs, while increased proline content was only observed for PMMA-MPs. Our results suggest that, while both MPs affect plant physiology, PMMA-MPs seemed to be more harmful. Moreover, both MPs activated the duckweed antioxidant system, with PS-MPs stimulating a stronger enzymatic response, and PMMA-MPs having a greater impact on non-enzymatic antioxidants.

KEY WORDS: chlorophyll a fluorescence; duckweed; oxidative stress; photosynthetic pigments; plastic pollution

Oral presentation

Presence of mycotoxins in cereals and nuts sold in supermarkets in Zenica, Bosnia and Herzegovina

Amra Salkić, Ćamka Kovač, Muhamed Gladan, Selvedina Sarajlić-Spahić, Benjamin Čaušević, Senad Huseinagić, Suad Sivić, and Amir Ibrahimagić
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The prevalence of mycotoxins in foodstuffs is a significant public health concern. Health risks from mycotoxin exposure include acute poisoning, carcinogenicity, immunosuppression, infertility, and teratogenicity. Studies indicate that 25–50 % of global crops, including staple grains and nuts, are contaminated by mycotoxins. This research aimed to determine mycotoxin levels in 48 samples (16 cereals and 32 nuts). Mycotoxins were identified and quantified using enzyme-linked immunosorbent assay (ELISA) specific kits (Elabscience, Texas, USA). The median concentration of aflatoxin B1 (AFLB1) in cereals was 0.106 μg/kg, well below the reference limit of 2.0 μg/kg. In contrast, AFLB1 concentrations in nuts ranged from 0.035 to 8.297 μg/kg, with four walnut samples exceeding the regulatory threshold of 2.0 μg/kg (3.920–8.297 μg/kg). All of the cereal samples tested positive for deoxynivalenol (DON) with concentrations from 44.953 to 80.711 μg/kg, and for zearalenone (ZEA) with concentrations between 2.139 and 3.294 μg/kg, all below reference values of 750 μg/kg for DON and 75 μg/kg for ZEA. Among nuts, DON and ZEA values ranged 34.115–126.433 μg/kg and 2.863–122.420 μg/kg, respectively. These results highlight the need for continued research and policy development to address mycotoxin contamination, especially given that over the past five years, fewer than 20 nut samples have been analysed for mycotoxins as part of official control, according to the Food Safety Agency of Bosnia and Herzegovina. The number of cereal samples tested ranged from 70 to 529, which remains insufficient for the entire territory of Bosnia and Herzegovina.

KEY WORDS: aflatoxin B1; deoxynivalenol; health risk; reference limit; zearalenone

Oral presentation

Novel approach for determining ochratoxin in complex spice matrices on an HPLC/FLD instrument

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Determination of ochratoxin in complex samples such as spices is difficult due to the large number of interferences that, after multi-step separation, ultimately reach the fluorescence detector (FLD). Multi-stage separation involves a sample extraction procedure, analyte purification, and concentration on an immunoaffinity column, and separation by high-performance liquid chromatography (HPLC). Knowing the specific chemical properties of ochratoxin offers solutions regarding better chromatographic separation of ochratoxin. For this purpose, the results of the separation of ochratoxin in the stationary phase C_{18}, C_{18}/ion pair, phenylhexyl, and then NH_2 stationary phase are presented. The results show that interferences can be chromatographically separated from the analytes because ochratoxin has the ability to change interactions (strength) with the stationary phase by adjusting pH, as opposed to interferences, which do not have this ability for the same stationary phase.

KEY WORDS: HILIC; interferences; mobile phase; multi-stage separation; stationary phase

Oral presentation

Exploring mineral oil hydrocarbons (MOSH and MOAH), testing and evaluation

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The goal of this presentation is to inform the audience about the health risks, detection methods, and implemented maximum limits within the European Union for mineral oil saturated hydrocarbons (MOSH) and mineral oil aromatic hydrocarbons (MOAH). MOSH and MOAH (or mineral oils) is a contaminant that can be introduced into the food chain by several ways, such as migration out of cardboard packaging material or the misuse of lubricants in conveyor belts during processing. Contamination can also originate from the use of mineral oils as pesticides. During the presentation, the history of MOSH and MOAH will be discussed, the potential sources of contamination, and how in the end this contaminant can migrate into our food. Once the toxicity of MOSH and MOAH has been addressed, the legislation part will be discussed. First, insights into how the maximum limits, which have been set by the European Union, are implemented will be given and afterwards we shall discuss how the Dutch authorities are monitoring these maximum limits to ensure food safety. Last but not least, analysis with the help of the prescribed liquid chromatography-gas chromatography-flame ionisation detection (LC-GC-FID) method, will be discussed as well as how to deal with the complexity of positive results after analysis.

KEY WORDS: analytical method; authorities; contaminant; food; maximum limits

Oral presentation

Obesogenic chemicals in food and food contact materials

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The global prevalence and severity of obesity continue to worsen. The evidence does not support progressive increases in energy intake, or progressive declines in physical activity as the only drivers of the obesity pandemic. The aim of this study was to investigate the relationship between the presence of certain chemicals in food and food contact materials and obesity. A literature review was conducted to gather relevant studies examining the presence of obesogenic chemicals in food and food contact materials and their possible impact on the obesity pandemic. Obesogens are environmental chemicals that increase the white adipose tissue mass after exposure *in vivo*. They have been identified in water, food, especially processed foods, food packaging, food, and storage containers. Exposure to obesogens can alter the development and function of many organs, thus changing the set point for controlling the metabolism. Obesogens can determine how much food is needed to maintain homeostasis and thereby increase the susceptibility to obesity. Pre-conception, pregnancy, and early childhood are the most sensitive times for obesogens to affect tissue development via epigenetic programming leading to obesity later in life. Exposure to obesogenic chemicals is an underrecognized and understudied factor in the obesity pandemic. Confirmation of the effect of obesogens at the current exposure concentrations for the general population still requires a larger number of scientific studies. The management of obesity by including the aspect of exposure to obesogenic chemicals represents a modern challenge for action and upgrading the existing obesity management strategy.

KEY WORDS: endocrine disruptor; environmental chemicals; obesity; water; weight gain

Oral presentation

The use of processing factors in assessing compliance with the maximum residue levels (MRL) of pesticide residues in processed food

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Processed products result from the processing of unprocessed products. Changes caused by processing and/or mixing can be taken into account, for example, by using a processing factor or by an expert assessment of the processing process. In the food analysis of pesticide residues, compliance with the maximum residue levels (MRL) is defined by Regulation (EC) 396/2005. The products listed in this regulation are mostly unprocessed and some processed (dried) products. The regulation does not provide any more detail on the compliance of processed or composite food or feed, so when and how to use processing factors is still unknown by laboratories that analyse this type of samples. The aim of this work is to present different examples of the use of processing factors and how these factors affect the compliance of processed products with the Regulation. The paper shows the use of the SANTE 10704/2021 guidelines related to processing factors, processed, and composite food. In the available data provided by the European Food Safety Authority (EFSA) and the German Federal Institute for Risk Assessment (BfR), processing factors are given only for certain matrices or analytes, so laboratories often use different approaches when evaluating compliance with MRLs. The use or non-use of processing factors (Pf) significantly affects the final assessment of product compliance; however, the lack of official Pf and the contradictions in their use make decisions difficult and lead to different methodologies being applied in laboratories.

Acknowledgement: this study was funded by the European Regional Development Fund grant number KK.01.1.1.02.0004 "Food Safety and Quality Centre" project.

KEY WORDS: composite food; dried food; dilution; multiresidual pesticides; processed products

Oral presentation

The first comprehensive assessment of mycotoxin contamination in hops: a neglected risk for the brewing and pharmaceutical industries

Bojan Šarkanj, Ivana Dodlek Šarkanj, Nada Vahčić, Ksenija Markov, Josip Haramija, Natalija Uršulin-Trstenjak, Krunoslav Hajdek, Michael Sulyok, and Rudolf Krska
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This is the first report confirming widespread contamination of hops (*Humulus lupulus* L.) by *Alternaria* and *Fusarium* toxins, representing an overlooked risk in the brewing and pharmaceutical industries. A total of 62 hop samples were collected from craft breweries across all Croatian counties and analysed using a multi-toxin liquid chromatography-tandem mass spectrometry (LC-MS/MS) method. The study confirmed contamination of hops by toxins produced by *Alternaria* spp. and *Fusarium* spp., as seen on prior reports. *Alternaria* toxins, notably tenuazonic acid, were detected in all of the samples, while *Fusarium* toxins, such as deoxynivalenol, were found in 98 % of samples. No metabolites from *Aspergillus* or *Penicillium* were identified, suggesting that proper storage conditions had been maintained. In addition to *Alternaria* and *Fusarium* toxins, abscisic acid, a marker of drought stress in hops, was also detected. These findings highlight the necessity for ongoing monitoring, risk assessment, and possible regulation of *Alternaria* and *Fusarium* toxins to ensure the safety of hops in brewing and pharmaceutical applications. Furthermore, four local wild hop varieties were analysed, showing toxin contamination levels comparable to commercial varieties.

KEY WORDS: *Alternaria* spp.; craft brewery; *Fusarium* spp.; *Humulus lupulus*; LC-MS/MS

Oral presentation

Risk assessment in pesticide residue analysis

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"Pesticide residues" refers to residues either in or on products of plant or animal origin and in animal feed that are the result of using plant protection products, biocides, and agents. To protect consumers from exposure to unacceptable levels of pesticide residues in food and animal feed, maximum residue limits (MRLs) have been set according to EU Regulation 396/2005. Increasing the dose of a plant protection product, its number of applications, or not adhering with the post-harvest interval leads to increased crop residues, which is then evidence of the improper use of such products. When the MRLs are exceeded, a risk assessment is carried out using the EFSA PRIMo 3.1 model which uses a set of relevant parameters and gives a final result based on four different segments: (1) hazard identification toxicological studies; (2) hazard assessment; (3) exposure assessment; and (4) risk characterization. Food is considered safe for consumption if the estimated intake of harmful substances does not exceed the acceptable daily intake (ADI) or ArfD (acute reference dose) values. When assessment exposures are taken into account, except for data on residue concentrations, the consumption data for a particular type of food has to also be taken into account, bearing in mind the nutritional habits of a particular population. The risk assessment is a very important procedure in the area of food safety, and every new finding opens up space for improvements to the entire system of "from the field to the table".

KEY WORDS: EFSA PRIMO 3.1; feed safety; food safety; MRLs; plant protection

Oral presentation

How can the relationship between volatile compounds and sensory properties improve the determination of virgin olive oil quality?

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The aroma of virgin olive oil is attributed to the volatile compounds that are formed during and after the extraction of oil from olive fruits. Various volatile compounds have been identified in virgin olive oils, mainly aldehydes, alcohols, ketones, hydrocarbons, and esters, which contribute to their positive and negative odours directly, or in synergy with other volatile compounds. In the present study, the most relevant volatiles that contribute to virgin olive oil's aroma and the paths of their formation are discussed. Among other parameters, the quality of virgin olive oils is also determined by sensory analysis, which is an analytical procedure that uses people's senses as detectors. Although a complete description of the sensory characteristics of virgin olive oil can be obtained only by sensory analysis, the analytical methods for the determination of volatile compound composition can provide useful information about the quality of the product. The aim of this study was to find a relationship between particular volatile compounds and the sensory properties of several virgin olive oils of different sensory quality, as well as to determine the impact of volatile compounds on the sensory properties of the investigated virgin olive oils. The potential of volatile compound determination in virgin olive oils as an analytical method in terms of supporting sensory analysis is also discussed.

KEY WORDS: aroma; odour; olive fruits; sensory analysis; quality control

Oral presentation

Food is not waste

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

KEY WORDS: consumer awareness; food waste; national plan; prevention; statistical data

Oral presentation

Determining the geographical origin of olive oils from the Croatian coast through the distribution of selected metals – the project "Food Safety and Quality Control Center" KK.01.1.1.02.0004

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In total, 34 olive oils samples were collected from the Croatian Adriatic coast in 2020 and analysed for 13 selected metals by inductively coupled plasma-mass spectrometry (ICP-MS). The aim was to determine whether there were differences in the mineral composition of olive oils collected from different geographical and microclimate areas: Istria (I), central Dalmatia (CD), and southern Dalmatia (SD). Discriminant Analysis (DA) successfully identified the region of olive cultivation based on the concentration of metals at an average of up to 88.24 %. The most efficient recognition was in region 2 (CD, 93.3 %), while the lowest was recorded for SD region 3 (71.43 %). Principal Component Analysis (PCA) was performed by XLSTAT 2014.5.03. Samples from CD were positioned in the first quadrant in which the metals Cu, Mg, and Mn were also present, indicating that these values were dominant in the CD samples. Ca, Sr, Ru, and K dominated in the fourth quadrant, pointing to the highest mean values in the samples from the SD region. Al had almost equal values in the samples from the I and SD locations. Although values for Cr were very similar in all of the samples and no statistically significant difference was found in the second quadrant, where some of the samples from I were positioned, this indicated that the range of measured values was slightly higher in samples from I. Although the number of samples was uneven by region, it is clear that there was a trend of differences, especially for samples from the I location, compared to the CD and SD locations.

Acknowledgement: this activity was carried out within the "Food Safety and Quality Center" (KK.01.1.1.02.0004) project funded by the European Regional Development Fund.

KEY WORDS: Adriatic coast; Discriminant Analysis; food safety; ICP-MS; Principal Component Analysis

Oral presentation

Novel non-thermal techniques in food processing: benefits and drawbacks

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Popular innovative non-thermal techniques used in contrast to conventional thermal methods mainly include ultrasound, microwaves, pulsed electric fields, high pressure homogenisation, and cold plasma technology. The advantages and disadvantages of these techniques are presented using the results of the HORIZON2020 PRIMA project "FunTomP" as an example. The "FunTomP" project investigates the reformulation and characterization of Mediterranean ingredients integral to a Mediterranean diet (MedDiet) using various novel food processing and characterisation techniques and aims to provide a comprehensive understanding of how these novel technologies can be applied to optimise the nutritional and sensory qualities of Mediterranean ingredients while improving their health-promoting capabilities. The results of the application of non-thermal techniques are diverse. Although microbiological safety is not in question, food components can be degraded and quality improvement is questionable. The results of the "FunTomP" project help to provide an overall view of the development of non-thermal extraction and preservation processes in the food industry and facilitate the development of innovative and sustainable processing techniques, but further investigation is required. Future research efforts should therefore focus on the optimisation of operating parameters and conditions to increase efficiency and cost-effectiveness. Simultaneously, technical, economic, and regulatory challenges should be addressed and industry-specific guidelines and best practices should be established to ensure a sustainable and widespread adoption of these innovative technologies.

Acknowledgement: this study was funded by the European Union's Horizon 2020-PRIMA Section I Program under grant agreement #2032 (FunTomP).

KEY WORDS: food safety; food quality; Mediterranean diet; non-thermal processing techniques; novel technologies

Oral presentation

Association between selected gerontological-public health indicators with the rate of malnutrition in nursing home residents

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Many factors contribute to the occurance of malnutrition in elderly associated with a lower quality of life and unfavourable treatment outcomes, especially increased morbidity and mortality. The aim of this study was to explore the association between selected gerontological-public health indicators and the rate of malnutrition in nursing home residents. We included data from 89 nursing homes whose authorised persons provided responses to the Questionnaire for Monitoring Quality Indicators in Nursing Homes (2023), regularly distributed by the Department of Public Health Gerontology, Teaching Institute for Public Health "Dr. Andrija Stampar" to nursing homes in Croatia. With this questionnaire, we obtained the data that was used to analyse the selected gerontological-public health indicators in this study. The median malnutrition rate was 6.00 % (interquartile range 2.53–10.93). The Spearman rank correlation test was used to assess the association between the malnutrition rate and the selected indicators. We found a statistically significant association between the malnutrition rate and the percentage of residents of nursing homes diagnosed with dementia ($p=0.0007$), as well as those diagnosed with urinary incontinence ($p=0.0174$). The results of the study indicate a need to enhance gerontological-public health measures to prevent and detect malnutrition in early stages among nursing home residents with dementia and urinary incontinence.

KEY WORDS: dementia; nursing homes; prevention of malnutrition; questionnaire; urinary incontinence

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Oral presentation

Monitoring of pathogens from the production environment

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This presentation aims to deepen knowledge and convey best practices to experts in food safety, production, and maintenance, all of whom are involved and responsible for ensuring food safety in production facilities. With the obligation to present scientific principles and best practices in mind, the presentation follows a simple graphic guide that symbolizes the basic programs recommended by guidelines to establish effective pathogen control in a food manufacturing facility. The "so-called" Pathogen Control Equation can guide the food safety expert in determining what is essential, where to focus resources, and how to create an integrated plan for remediation. The core principles of the Pathogen Control Equation are explained to help identify focused practices essential to effective pathogen control and have been summarised as follows: Separate Raw from Ready-to-Eat, Good Manufacturing Practices and Controlled Conditions, Sanitary Facility and Equipment Design, Effective Cleaning and Sanitation Procedures and Controls, and Environmental Pathogen Monitoring. Most of this presentation focuses on monitoring for *Listeria* spp. Still, a good environmental monitoring programme encompasses all relevant pathogens and incorporates "indicator testing" to verify cleanliness and the effectiveness of plant procedures. Verifying that a processing environment is under control requires independent testing for *Listeria* spp., because, as an indicator, it provides a more conservative, more inclusive approach for detecting *Listeria monocytogenes*. Therefore, it is imperative to set up a comprehensive monitoring plan for both indicators and pathogens in production facilities and to be trained to set up timely control measures to stop the spread of contamination.

KEY WORDS: environmental monitoring plan; food safety; *Listeria*; pathogen control; sanitation programs

Oral presentation

Decontamination effect of organic acids against *Yersinia enterocolitica* 4/O:3 strains on pork cuts – a preliminary laboratory study

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Yersinia enterocolitica belongs to the group of the most important pathogenic bacteria in monitoring the safety of pork, which is also considered the most important source of human jersiniosis. As the slaughter line is the main point of meat contamination in the production chain, different decontamination technologies can be used to achieve microbiological targets on chilled carcasses. The aim of this study was to determine the decontamination effect of organic acid solutions on pork inoculated with different strains of *Y. enterocolitica* 4/O:3 under laboratory conditions and to compare their mutual effect in terms of their type, concentration, and application conditions. The decontamination effect of cold (25 °C) and warm (80 °C) 2 % and 4 % acetic and lactic acid solutions and water (control) was tested by spraying artificially contaminated meat (4 log CFU/g of *Y. enterocolitica*; attachment period 5 min) for 10 and 30 seconds. The samples were analysed immediately after treatment and after cooling at 4 °C for 24 h. In total, 20 different protocols were performed with 10 individual *Y. enterocolitica* 4/O:3 strains (N=200) and some of the results are presented herein. The results obtained showed the reduction potential of organic acids against human pathogenic *Y. enterocolitica* bioserotype 4/O:3 on pork. The most effective decontamination protocol will potentially be applicable in practice to reduce the risk of *Y. enterocolitica* 4/O:3 in the context of revising the HACCP program in slaughterhouses and pork processing.

KEY WORDS: acetic acid; decontamination; jersiniosis; lactic acid; pork meat

Oral presentation

Enterotoxigenic potential of *Staphylococcus aureus* isolates from domestic fresh cheese

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In recent years, domestic cheeses from the markets of the city of Dubrovnik have shown very poor microbiological quality. As many as 70 % of the cheeses were contaminated with high levels of *Staphylococcus aureus*. Such a high level of contamination with *S. aureus* showed the need for further investigations into the enterotoxigenic potential of isolates. For that purpose, 175 isolates were collected from 18 cheese samples. All *S. aureus* isolates were tested for classical enterotoxin genes *sea*, *seb*, *sec*, *sed*, and *see*, as well as for enterotoxin production. Modified real-time PCR method was used for gene detection, and immunoenzymatic methods such as VIDAS Staphylococcal Enterotoxin II (SET2) and reversed passive latex agglutination (RPLA) were used to detect enterotoxin production *in vitro* as proof of enterotoxin gene expression. The enterotoxin gene *sec* was detected in 34 (19.4 %) isolates, but most isolates (80.6 %) were not enterotoxigenic. Other classical genes were not detected. All isolates that carried the *sec* gene were also detected as SEC enterotoxin producers, confirming potent genes. This study also showed that cheese samples were contaminated with a mixture of non-enterotoxigenic and SEC-producing strains. Staphylococcal enterotoxins were not detected in any cheese samples despite a high level of contamination, mainly because most *S. aureus* isolates were not enterotoxigenic. However, the enterotoxigenic potential of certain strains was confirmed *in vitro*. Hence, we could not rule out enterotoxin production under favourable conditions *in vivo*.

KEY WORDS: immunoenzymatic methods; microbiological quality; real-time PCR; *sec* gene; staphylococcal enterotoxin

Oral presentation

Natural preservation techniques: using essential oils to extend the shelf life of cherry tomatoes

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Tomatoes are among the most widely consumed plant species globally, with cherry tomatoes often sold in plastic packaging to maintain freshness. *Botrytis cinerea* Pers. is a major post-harvest pathogen affecting tomatoes, commonly controlled by synthetic fungicides. Essential oils, natural volatile compounds produced by plants, play a crucial role in plant defence. This study examined the antifungal activity of essential oils in the vapour phase against *B. cinerea*. *In vitro* tests were conducted using essential oils from bay laurel (*Laurus nobilis* L.), fennel (*Anethum foeniculum* L.), holy basil (*Ocimum tenuiflorum* L.), lavender (*Lavandula angustifolia* Mill.), rosemary [*Salvia rosmarinus* (L.) Schleid], sage (*Salvia officinalis* L.), and sweet marjoram (*Origanum majorana* L.), at concentrations of 100, 50, 25, and 10 %, corresponding to vapor phase concentrations of 585, 292.5, 146.25, and 58.5 μL/L. Except for sage, all of the essential oils fully inhibited mycelial growth at the lowest concentration. The six essential oils that showed complete inhibition were further tested *in vivo* on cherry tomatoes, at 10 % (58.5 μL/L). Holy basil, lavender, rosemary, and sweet marjoram completely inhibited fungal growth after five days, while fennel showed weaker inhibition. Bay laurel slowed mycelial growth but was less effective. A sensory evaluation of cherry tomatoes treated with essential oils at 10 % was conducted with six participants, revealing differences in sensory characteristics. Holy basil received the highest ratings, followed by lavender. Our results suggest that essential oils may serve as a natural alternative for extending the shelf life of packaged cherry tomatoes.

KEY WORDS: *Botrytis cinerea*; food safety; microbial contamination; natural fungicides; post-harvest pathogens

Oral presentation

Use of certain probiotics and postbiotics in the management of *Helicobacter pylori* infections

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Since the discovery of a *Helicobacter pylori* infection in 1983, numerous studies with different therapeutic management plans have been conducted. It has been proven that an intensive eradication therapy with proton pump inhibitors (PPI) + antibiotics (usually amoxicillin, clarithromycin, or metronidazole) helps patients with a *H. pylori* infection. After a few years of intensive antibiotic treatment, the eradication rate fell below 70 %, which was unacceptable. *H. pylori* resistance rates to antibiotics are increasing in most parts of the world. This corresponds to the decline of the eradication rate in spite of using the recommended combination therapy. In regions with high resistance to clarithromycin and metronidazole (central and southern Europe), new management plans are being sought. It has been shown that a quadruple therapy across 14 days could improve the eradication rate; however, resistance to additional antibiotics is increasing (even to amoxicillin). Therapy with bismuth is an option, as is doubling the dose of PPI. Several probiotics have been studied as supplements to eradication therapy. In many patients they helped decrease the number of side-effects of intensive antibiotics treatment on the gut microbiota. *Limosilactobacillus reuteri* is one postbiotic active in the gastric environment with antigenic properties against *H. pylori*. It forms co-aggregates, inactivates, and expels from the body through the colon. The postbiotic *L. reuteri* does not have any side-effects and does not interfere with antibiotic treatment. So far, several studies have shown its effect on lowering the gastric load of *H. pylori*.

KEY WORDS: antibiotic resistance; dietary supplements; eradication therapy; *Limosilactobacillus reuteri*; management plan

Oral presentation

Thymoquinone – the health properties of a unique component of black cumin seed

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Thymoquinone is a special biologically active substance, a phytochemical compound found in the plant *Nigella sativa*, black cumin seed. It belongs to the group of monoterpenes and is used as an indicator of the authenticity and quality of such products. The tradition of application as well as the latest research are all related to the various important effects of thymoquinone. Research has shown that it acts as a hepatoprotective, anti-inflammatory, and anti-cancer agent, but its main role is as an immunity booster. For these reasons, it is widely distributed commercially and used for medicinal purposes worldwide in various pharmaceutical forms. We believe it is necessary to declare the exact amount of thymoquinone on the label, as the range of presence in various products is wide, which is why the dosage should be adjusted to levels that would have an appropriate impact on one's health. The aim of this work was to analyse products with thymoquinone, compare them with the declared values on the label and health claims, and relate them to health and functional properties. The analysis was performed on a high-performance liquid chromatograph (HPLC) and the results depended on the form and purity.

KEY WORDS: health impact; HPLC; legislative framework; *Nigella sativa*; phytochemicals

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Oral presentation

Hemp products – monitoring, legislation, and results of analysis

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An increased number of products containing hemp have been made available on the market of the Republic of Croatia. They appear in different categories – as food, food supplements, and/or cosmetics. Marketing wants to use the attention of consumers and highlights the benefits of biologically active components, for example cannabidiol (CBD). CBD is not legally regulated at EU/Croatian level in food and food supplements. It is considered a novel food. In the area of cosmetics, restrictions and prohibitions are clearly defined by law. However, there is justified fear that certain products are declared for care, and yet are used for other purposes; oral and local application. The aim of this work was to examine products that contain hemp and its biologically active substances such as CBD and tetrahydrocannabinol (THC), carry out analyses and compare the results with the values given on the product label and, at the same time, check compliance with the current legislative framework. The chief regulation is Commission Regulation (EU) 2022/1393 of August 11, 2022 amending Regulation (EC) no. 1881/2006 regarding the maximum permitted amounts of delta-9-tetrahydrocannabinol (Δ^9-THC) in hemp seeds and products derived from them. Of the preliminary analyses conducted, as many as 38 % showed that the samples contained THC and CBD, which is not in accordance with legislation. For this reason, the monitoring of this type of product on the market was initiated. The Croatian Food Agency (HAPIH) enabled the sampling of 176 samples, which were then analysed at the Croatian Institute of Public Health (HZJZ) during the last year. The samples were divided according to the type of food as prescribed by the extraction method and analysed by high-performance liquid chromatography (HPLC).

KEY WORDS: CBD; Croatian market control; HPLC; legislative framework; THC

Oral presentation

Students' knowledge about vitamins

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The aim of this study was to gain insight into health literacy, with special emphasis on the diet and lifestyle habits of students in two large "student cities", Split and Osijek. Out of all of the respondents, 24.6 % were mostly from the field of technical sciences, followed by 23.1 % from the field of biomedicine and health. When asked which food is a good source of vitamin C, 62 % of respondents showed good knowledge. However, 23.1 % of respondents answered that they did not know which food is a good source of vitamin C. Fisher's test showed that there was no statistically significant difference in answers between male and female respondents (p=0.529). The respondents also showed impressive knowledge on the impact of vitamin D on health, so 79.6 % of the respondents answered that vitamin D is necessary for normal growth and the development of bones. And in this comparison, using Fisher's test, it was proven that there was no statistically significant difference in the answers between the male and female population (p=0.172). Students at the Split and Osijek universities demonstrated a satisfactory level of health literacy. The obtained data indicated that the students were very knowledgeable about sources of vitamin C and impacts of vitamin D on health. However, due to the importance of the development of health literacy as a form of health improvement, continuous health education of young people and encouraging young people to take a more active role in caring for their own health are necessary.

KEY WORDS: eating habits; health literacy; lifestyle; vitamin C; vitamin D

Oral presentation

Biobased materials that substitute single use plastics (SUP) for direct contact with food

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To put an end to the yearly increase in plastic packaging consumption, Directive (EU) 2019/904 stipulates the reduction of the impact of certain plastic products on the environment. The result of harmonisation with the Directive is the appearance of alternative materials on the market. Most of the proposed materials are biobased and with high expectations to be an efficient substitute for single use plastics (SUP) for direct food contact. As an alternative to conventional food contact polymers like polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), polyvinyl chloride (PVC), and polystyrene (PS) for SUP, "new" materials should comply with food contact material regulations and be safe for consumers. Various types of biobased packaging are already present on the Croatian market and some of them are biodegradable. Paper, cardboard, and wood are the most common packaging materials. The trends on the EU market are such that more "new" biomaterials like bamboo, bagasse, palm leaves, sugarcane, and wheat are coming. The composition and origin of such materials is sometimes very difficult to determine and the identification of such materials is very demanding. This is particularly important for the determination of the specific migration of potentially toxic substances from these materials. For identifying "new" biobased materials on the Croatian market, pyrolysis-gas chromatography coupled with mass spectrometry (PY-GC/MS) was used. Results showed different structural compositions with various specific migration potentials. Considering the well-known fact that any conventional material when in direct contact with food is never completely non-reactive, the question arises about the health safety of its substitutes.

KEY WORDS: biodegradable polymers; food packaging; pyrolysis-gas chromatography-mass spectrometry; specific migration

Oral presentation

Safety of metals and alloys used in food contact materials: specific release limits (SRL), specific migration limits (SML), coatings, and regulatory framework

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The analysis of metal materials and objects that come into contact with food is crucial for ensuring the safety and quality of food products. Metal materials, such as aluminium, stainless steel, copper, and their alloys, are widely used due to their corrosion resistance and ease of maintenance. During use, a specific metal release may occur into food, which can pose health risks. To prevent migration and corrosion, the inner surfaces of metal cans are often coated with polymeric coatings. Epoxy resins, widely used for their chemical resistance, can contain residues of monomers and oligomers that migrate into food. The migration of compounds such as bisphenol A (BPA) and bisphenol A diglycidyl ether (BADGE) and its derivates can exceed specific migration limits (SML). The Regulatory Framework for metal materials in contact with food in the EU has not been harmonised. In Croatia, it is based on Regulation (EC) No 1935/2004 and national regulations on health safety of materials and objects in direct contact with food (OG/125/09) with reference to Regulation (EU) No 10/2011 if the inner surface of metal cans is coated with a polymeric coating. This presentation will compare the requirements of the guide "Metals and Alloys Used in Food Contact Materials and Articles" (EDQM 2024) with the requirements prescribed by the national regulation with emphasis on methods for testing and food simulants. According to new scientific findings, it is necessary to strive for the harmonisation of the legal regulations of all EU members in order to protect the health of consumers.

KEY WORDS: bisphenols; EDQM guide; health risk; health safety; polymeric coating

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Product certification for consumer trust

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A product certified against an STP (Technical Product Specification) has differentiable characteristics compared to similar products on the market. Product Certification (PC Food) aims to give "added value" to a product. It was established to preserve human health and protection and is based on continuous health monitoring. STP constitutes the "Special Regulation" relating to the certification system of agri-food products. It defines and describes the conditions and procedures applied by DNV for the certification, registration, and granting of the trademark for these products. The purpose of a PC Food verification against an STP is to ensure that the particular characteristics of the product are met through analytical measurements (chemical-physical-microbiological-sensory), document checks, and on-site checks. "Antibiotic-free" is currently the most represented PC Food verification. The system ensures that animals have not received any antibiotics at any stage of their life cycle (or in the period defined by the STP). With the wide selection of meat on store shelves today, consumers are increasingly concerned about quality and antibiotic-free breeding has become an important aspect of meat quality and the highest possible standards for the breeding process itself.

KEY WORDS: added value; audit; certification activities; technical product specification; verification

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Sponsored presentation

Quantitative polymerase chain reaction (qPCR) pathogen detection and impacts on food safety

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Salmonella is one of the most common and dangerous foodborne pathogens and, along with *Listeria monocytogenes*, it is responsible for numerous food poisoning outbreaks worldwide. Traditional culture-based testing involves time-consuming steps, which affects the timeliness of results. Quantitative polymerase chain reaction (qPCR) is a well-established laboratory method, now adapted for pathogen detection in food safety. qPCR provides rapid, highly sensitive, and specific detection of foodborne pathogens, which are major concerns for the food industry due to their potential to cause outbreaks. DNA Diagnostic has developed advanced qPCR kits that deliver results for *Salmonella* spp. and/or *Salmonella enteritidis/typhimurium* (Salmonella Velox/Salmonella SE+ST) in just 5.5 hours and *Listeria* spp. and *Listeria monocytogenes* (Listeria Velox) in 20 hours, including the necessary enrichment steps. These kits can detect as little as 1 colony-forming unit (CFU) in a 25 g sample. Certified by NordVal, they come complete with everything needed – media, extraction reagents, mastermix, and enrichment. DNA Diagnostic's kits can be used to test a wide range of samples, including those from primary production, faeces, environmental samples, ready-to-eat foods, meat products, and even complex products like those containing cocoa. The advantages of DNA Diagnostic's qPCR kits include in-house analysis, leading to faster diagnostics, which allow immediate action to prevent contamination. Faster results also enable quicker food release, reducing storage time, extending shelf life in supermarkets, improving product freshness, and reducing food waste – all while ensuring enhanced safety for consumers.

KEY WORDS: DNA Diagnostic; food poisoning outbreaks; *Listeria monocytogenes*; pathogens; *Salmonella* spp.

Poster presentations

Poster presentation

Concentrations of per- and polyfluoroalkyl substances (PFAS) in fish from the Croatian northern Adriatic: preliminary results

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Per- and polyfluoroalkyl substances (PFAS) are widely utilized because of their unique chemical and physical properties. These substances accumulate in the environment and, consequently, in both aquatic and terrestrial animals, as well as in humans. Currently, there is no available data on the presence of PFAS in marine fish in Croatia. This study investigated the preliminary concentrations of 30 PFAS compounds in six marine fish species caught in the northern Adriatic Sea of Croatia: anchovy (*Engraulis encrasicolus*), red mullet (*Mullus surmuletus*), hake (*Merluccius merluccius*), common pandora (*Pagellus erythrinus*), sea bream (*Sparus aurata*), and horse mackerel (*Trachurus trachurus*). PFAS were analysed using ultra-high-performance liquid chromatography coupled with triple quadrupole mass spectrometry (UHPLC-MS/MS). The limit of quantification for PFAS ranged from 0.025 to 0.075 μg/kg. The mean concentration of perfluorooctane sulfonic acid (PFOS) was measured within a range of 0.026 μg/kg in common pandora to 0.49 μg/kg in horse mackerel. Perfluorooctanoic acid (PFOA) and perfluorononanoic acid (PFNA) were not quantified in anchovy, sea bream, and common pandora. Mean levels of PFOA and PFNA were between 0.036 and 0.16 μg/kg. Perfluorohexane sulfonic acid (PFHxS) was not detected in six fish species. The highest total concentration of PFOS, PFOA, PFNA, and PFHxS was found in red mullet (0.67 μg/kg), while the lowest in common pandora (0.026 μg/kg). The concentrations of these four PFAS were below the maximum permitted levels prescribed by Regulation (EU) 2023/915. Mean concentrations of other PFAS compunds were quantified in the range of 0.035 to 0.24 μg/kg.

KEY WORDS: Croatia; marine fish; maximum permitted level; northern Adriatic Sea; UHPLC-MS/MS

Poster presentation

Occurrence of pesticides and polychlorinated biphenyls in meat, processed meat, and fat

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The concentrations of organochlorine pesticides (OCPs), organophosphate pesticides, pyrethroids, carbamates, and polychlorinated biphenyls (PCBs) were measured in a total of 1,095 samples of meat, processed meat, and fat collected over an eight-year period. A total of 73 compounds were analysed using gas chromatography–triple quadrupole mass spectrometry (GC-MS/MS). The limits of quantification (LOQ) for the analysed compounds ranged from 0.5 to 10 μg/kg. The frequency of detection for pesticides and PCBs revealed that only 82 concentrations exceeded the LOQ values (7.5 % of the total samples). The highest number of samples exceeding the LOQ was found in processed fat (20), beef (11), pâté (9), and pork (7). OCPs were detected in a range of 1.1 to 11.4 μg/kg. The highest frequency of quantification was observed for OCPs compounds, with a total of 40 results (3.65 % of total samples), of which 57.5 % were DDT isomers (60 % DDE). PCBs were detected in 19.5 % of the quantified results, with concentrations ranging from 0.7 to 20.7 μg/kg. Two chicken meat samples exhibited the highest concentration of PCB 52, with a mean value of 19.6 μg/kg. Only one pâté sample had resmethrin levels exceeding the maximum residue limit (MRL) established by the European Union. All other results were below the MRLs. The estimated daily intake (EDI) was calculated and a risk assessment was conducted. As all of the EDI values were significantly below the respective toxicological reference values, it can be concluded that the consumption of these products does not pose a threat to consumer health.

KEY WORDS: estimated daily intake; GC-MS/MS; maximum residue limit; meat products; risk assessment

Poster presentation

Are wild edible plants from vineyards safe for consumption in terms of potentially toxic elements?

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Although the consumption of edible wild plants is becoming increasingly popular, it can pose a risk for human health if wild plants are collected in intensive agricultural areas such as vineyards, where different pesticides and fertilizers are used. The aim of this study was to compare the content of selected potentially toxic elements (PTE; cadmium, copper, nickel, zinc) in different wild edible plants from vineyards. We sampled above-ground, green, edible parts of selected wild plants at the time when they are usually collected for consumption in an interspace in the vineyards of Goriška brda. The plant species examined were chickweed (*Stellaria media* (L.) Vill.), common chicory (*Cichorium intybus* L.), common daisy (*Bellis perennis* L.), common dandelion (*Taraxacum officinale* L.), horse mint (*Mentha longifolia* L.), mountain yarrow [*Achillea collina* (Becker ex Rhb.f.) Heimerl], narrow-leaved plantain (*Plantago lanceolata* L.), and white ballmustard (*Calepina irregularis* Thell.). The selected PTE were analysed by inductively coupled plasma-optical emission spectroscopy (ICP-OES) and graphite furnace atomic absorption spectrometry (GFAAS) after acid digestion. Chicory had the highest zinc content, while there were no significant differences in the amount of nickel between the analysed species. The highest levels of copper were detected in mint, chicory, and yarrow, three species collected later in the season when copper-based fungicides were intensively used in the vineyards. The maximum residue limit (MRL) for copper was only exceeded in mint. Chicory, white ballmustard, and daisy had higher contents of cadmium compared to the other species; for all three species, some samples exceeded the permitted maximum levels for cadmium for leafy vegetables.

KEY WORDS: cadmium; copper; nickel; wild food; zinc

Poster presentation

Unravelling undeclared gluten

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Gluten is one of the most significant allergens and individuals with a gluten intolerance have to avoid consuming wheat, barley, and other cereals rich in gluten, which are not always visually recognizable in (highly) processed foods. In addition, isolated wheat gluten can be added to food for certain technological purposes. But is the presence of gluten in foods always clearly communicated to consumers? Rapid Alert System for Food and Feed (RASFF) data related to undeclared gluten and gluten mislabelling were extracted for the 2020–2024 period, giving a total of 60 notifications not related to "gluten-free" food. The "gluten-free" statement/mark on a product with wheat flour/wheat semolina is one clear example of mislabelling, whereas stating "gluten-free" on a product that also contains the warning "may contain traces of gluten" is apparently misleading. The food categories most frequently missing gluten allergen information on their labels were other food products/mixed (20.0 %), prepared dishes and snacks (16.7 %), meat/meat products (11.7 %), herbs/spices (8.3 %), soups/broths/sauces/condiments and cereals/bakery products (6.7 % each), confectionery and fruits/vegetables (5.0 % each). Some of these products are naturally free of gluten and as such could easily mislead consumers if a source of gluten is added and/or gluten is undeclared. The notification basis was mainly the company's own check (71.7 %), but also official control on the market (23.3 %), and consumer complaints (5.0 %). A risk decision of "serious" in 85.0 % of cases and an "alert" notification in 71.7 % cases evidently supported the actions taken – destruction, withdrawal from the market/recipients, public warning/press release. Ensuring proper allergen labelling is of the utmost importance for consumer/public health.

KEY WORDS: allergens; food safety; gluten intolerance; public health; RASFF

Poster presentation

Gluten in gluten-free food(?): analytical check

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The consumption of gluten is associated with the development of intestinal mucosal abnormalities in patients with celiac disease. Individual sensitivity to gluten and the length of exposure are the determining factors of detrimental effects. Although evidence regarding the gluten threshold limit in food is unclear, according to regulatory provision of information to consumers regarding the absence or reduced presence of gluten in food, the claims "gluten-free" and "low gluten content" may only be made where the food that is ultimately sold to the final consumer contains no more than 20 and 100 mg/kg of gluten, respectively. A total of 90 cereal-based salty (n=60) and sweet (n=30) prepacked foods with "gluten-free" labelling, acquired from the Serbian market, were analysed using a commercially available sandwich enzyme-linked immunosorbent assay (ELISA) RIDASCREEN® Gliadin, which enables a detection limit of 5.0 mg/kg. In the group of salty products (flour/pasta/bread/breakfast cereals/snack; made of corn/rice/buckwheat/millet), gluten was detected in 25 % of samples, of which 40 % were in compliance with limits for "gluten-free" products, 33 % exceeded the limit to a tolerable extent (22.0–24.0 mg/kg), whereas 20 % (flour, pasta, snack), despite their "gluten free" denomination, showed concentrations corresponding to "low gluten content" (52.0–96.6 mg/kg), and 7 % (snack) exceeded as much as 100 mg/kg (maximum 196 mg/kg). Among sweet products (cookies, biscuits, chocolates, cereal-fruit bars), gluten was detected in 17 % of samples at concentrations below 20 mg/kg. "Gluten-free" labelling is clearly aimed at helping gluten-intolerant people identify and choose a varied diet, but it is precisely for this purpose that it must be trustworthy.

KEY WORDS: celiac disease; ELISA; food safety; gluten intolerance; public health

Poster presentation

Microplastics mediate the toxicity of silver nanoplastics in *Allium cepa* roots

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Although silver nanoparticles (AgNPs) are known for their beneficial antimicrobial and antifungal properties, nowadays they are recognized as emerging contaminants that pose a potential threat to the global environment. Microplastics (MPs), on the other hand, have a non-potential role in the removal of AgNPs from aquatic environments. Both MPs and AgNPs are pervasive pollutants that accumulate in plants by stacking and adsorption on root surfaces or even entering the shoots through the vascular system. Some studies suggest that the interaction of MPs and AgNPs may alter their toxicity. Therefore, the potential combined effect of AgNPs and MPs on plants is questioned. In this study, *Allium cepa* roots were exposed to 0.1, 1.0, and 2.0 g/L of polystyrene (PS-MPs) and polymethyl methacrylate microparticles (PMMA-MPs), individually and in combination with 100 µmol/L AgNPs with two different surface coatings [polyvinylpyrrolidone (PVP) and cetyltrimethylammonium bromide (CTAB)] for 72 h. To elucidate the possible interaction effects and stability of MPs and AgNPs in ultrapure water, UV-Vis absorption spectra and dynamic light scattering (DLS) analyses were recorded prior to plant exposure. Our preliminary study indicated a complex cytotoxic effect on root growth, H_2O_2 content, and peroxidase activity with both types of MPs and AgNPs.

KEY WORDS: cytotoxicity; onion; oxidative stress; polymethyl methacrylate; polystyrene

Poster presentation

Gluten-free food labelling: believe it or not?

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Gluten allergy is a public health concern and information on incidents involving gluten-free foods is crucial for risk management. Rapid Alert System for Food and Feed (RASFF) notifications with "gluten-free" in the subject were extracted for the 2020–2024 period, resulting in a total of 51 notifications, of which as many as 72.5 % were related to the presence of gluten itself, at concentrations varying from 28 (corn pasta) to 4500 mg/kg (chicken nuggets), as opposed to the limit for gluten-free products of 20 mg/kg. Cereals and bakery products were the most reported food category (48.6 %), followed by alcoholic beverages (10.8 %, beer), diet foods, meat/meat products, and other food products/mixed (8.1 % each), originating from 17 countries. The manufacturing company's own check (51.4 %) and official control on the market (32.4 %) were the main basis of the notifications, but consumer complaints were also recorded (16.2 %). As many as 82.5 % of the cases were characterized as a serious risk, which led to the "alert" classification (89.2 %), followed by recalls from consumers and withdrawal from the market as the most frequently taken actions. In the remaining 27.5 % of the cases, other hazards were detected: allergens (peanut, mustard, soy; 28.6 %), pesticide residues (ethylene oxide; 21.4 %), foreign bodies (plastic/metal particles), natural toxins (tropane alkaloids) and non-pathogenic microorganisms (mould) (14.3 % each), mycotoxins [deoxynivalenol (DON); 7.1 %]; mostly in cereals and bakery products (71.4 %), prevalently causing a "serious" risk decision and an "alert" classification (51.7 and 71.4 %, respectively). Our findings highlight the need for action in education and training in the food production and control systems.

KEY WORDS: allergens; food safety; gluten intolerance; public health; RASFF

Poster presentation

Determination of patulin in apple juices by high performance liquid chromatography (HPLC)

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The goal of this work was to determine the mass fraction of patulin in cloudy apple juices produced from last year's apples stored in a refrigerator. We compared the obtained results with the existing legal regulations and determined their conformity. A total of 53 juice samples were analysed during four summer months for the presence of patulin using the high performance liquid chromatography (HPLC) technique. The juices were produced in June, July, August, and September from apples that had been stored in a refrigerator for a year. Out of a total of 53 cloudy apple juices analysed, only two samples had a concentration of patulin higher than the maximum level allowed according to Commission Regulation (EU) 2023/915. The other juice samples were in compliance with the regulation, and nine of them had a patulin content lower than the quantification limit. Although the apples were properly stored, in order to reduce the risk of patulin formation, it is recommended to use healthy and undamaged fruits. Analytical control is therefore important to ensure that products are safe for the health of consumers.

Acknowledgement: this research was funded by the European Regional Development Fund, grant number KK.01.1.1.02.0004 "Food Safety and Quality Centre" project.

KEY WORDS: apples; fruit juices; mycotoxins; patulin contamination; quality of apples

Poster presentation

A pinch of danger: carcinogens in herbs and spices

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When contaminated with minute amounts of potent carcinogens, even a pinch of culinary herbs and spices used for flavouring of food can pose health risks to consumers. Data related to contamination of herbs and spices with carcinogens were extracted from the EU Rapid Alert System for Food and Feed (RASFF) database (2011–2023), collated, and assessed. A total of 1,100 notifications detected the presence of at least one carcinogen in products such as paprika (27.7 %), nutmeg (13.2 %), various spice mixes (11.3 %), curry (7.4 %), cumin (7.1 %), oregano (5.4 %), and others. Specifically, notifications related to any single carcinogen accounted for 1,015 cases, of which 61.2 % involved the ones from Group 1 (proven) – aflatoxins (441), ethylene oxide (133), polycyclic aromatic hydrocarbons (PAHs) (42), and cadmium (5). Representatives of Group 2A (probable) were lead (15) and pesticide residues (41; propargite, anthraquinone, chlorothalonil, and carbaryl). Among substances belonging to Group 2B (possible), pyrrolizidine alkaloids were the most numerous (130), followed by mycotoxin ochratoxin A (108), various pesticide residues (97), food additive auramine O (2), and industrial contaminant 3-monochloro-1,2-propanediol (1). Among 85 notifications reporting the co-occurrence of carcinogens, 63 involved the presence of residues of up to five pesticides belonging to Group 2B, two were related to the co-occurrence of Group 1 and 2A carcinogens, and 20 were combinations of Group 1 and 2B carcinogens. Co-occurrence amplifies health risks as each carcinogen may act independently or synergistically. Ensuring stringent measures in food production, from sourcing to processing, is essential for reduction of food hazards and protection of public health.

KEY WORDS: alkaloids; mycotoxins; pesticide residues; public health; RASFF

Poster presentation

Application of mycofixators to remove mycotoxin M1 from milk

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Contamination of milk with aflatoxin M1 (AFM1) is associated with the contamination of feed with aflatoxin B1 (AFB1), present in the diet of dairy cows, which through the process of dehydrogenation turns into AFM1. Milk containing AFM1 at amounts above 0.05 mg/L is considered unsuitable for human consumption. The deactivators (i.e. mycofixators) applied to animal feed do not have the ability to remove mycotoxins completely and can affect the health of the animal. The aim of this work was to investigate which mycofixant – β-glucan from yeast, β-glucan from oats, and live and dead lactic acid bacteria (LAB) – has the best affinity for binding and removing AFM1 from milk while simultaneously having the least negative impact on milk quality parameters, i.e. the amount of selected micronutrients (Na, Ca, Mg, and K) compared to the initial composition of milk. The used milk samples were intentionally contaminated with AFM1, and solutions of β-glucan from yeast and β-glucan from oats at two concentrations of 0.05 % and 0.1 %, and LAB live and dead, were added to the contaminated milk. The samples were monitored in the time interval from the time of adding the mycofixator and through 2, 4, and 24 h after the addition of the mycofixator. The results showed that LAB (live) had the least impact on micronutrients and suggested that, when using this mycofixator, milk can be used in further processing and in human and/or animal nutrition.

KEY WORDS: aflatoxins; β-glucan; food safety; lactic acid bacteria; oats; yeast

Poster presentation

Mineral and heavy metal content in strawberry juices from strawberries at two ripening stages and treated with high intensity pulsed electric field (HIPEF)

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Strawberries are a delicious and widely consumed fruit rich in minerals, antioxidants, vitamins, and fibres. However, due to their delicate tissue and chemical composition, they do not withstand transport well and provide an ideal environment for microbial growth. Consequently, there is an increasing demand for non-thermal technologies that can preserve valuable nutrients while ensuring food safety by preventing microbial contamination. High-intensity pulsed electric field (HIPEF) is an innovative technology that applies high-voltage pulses to a liquid food sample placed between two electrodes for a short duration. In our research, we monitored the impact of HIPEF treatment on the mineral and heavy metal composition of strawberry juice made from strawberries (*Fragaria* × *ananassa* Duch. cv. "Albion") harvested at two different ripeness levels (25 % green and 100 % ripe). The variable parameters in the HIPEF experiment were frequency (100 and 200 Hz), field strength (40 and 50 kV/cm), and treatment time (3 and 6 s). Mineral and metal content in each sample was determined by inductively coupled plasma with a mass spectrometer (ICP-MS) following microwave digestion. The most abundant minerals in the strawberry juice were potassium, calcium and magnesium and their concentrations increased under HIPEF treatment until the optimal experimental conditions were exceeded. Among heavy metals, arsenic and lead were quantified. Unfortunately, the ideal HIPEF conditions that enhanced mineral content also led to an increase in heavy metal concentrations.

Acknowledgement: this research was funded by the Croatian Science Foundation through the funding of the Hurdle Technology and 3D Printing for Sustainable Fruit Juice Processing and Preservation project, IP-2019-04-2105. This work was carried out within the project "Food Safety and Quality Center" (KK.01.1.1.02.0004). The project is co-financed by the European Union from the European Regional Development Fund.

KEY WORDS: food safety; *Fragaria* × *ananassa* Duch. cv. "Albion"; ICP-MS; maturity; microwave digestion

Poster presentation

Heavy metal contamination in fish

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Fish is a vital source of high-quality proteins, essential omega-3 fatty acids, vitamins (e.g. vitamin D and B_2), and minerals (e.g. iron, zinc, iodine, magnesium, and potassium) necessary for a healthy diet. Regular consumption of fish has been associated with various health benefits, including cardiovascular health, brain function, and overall well-being, making it an integral part of a balanced and nutritious diet. However, heavy metals might come into contact with fish through polluted water (the environment) or later through processing (industry). Inductively coupled plasma-mass spectrometry (ICP-MS) is the preferred method for detecting heavy metals in fish in the Food Safety and Quality Centre, Zagreb, due to its high reliability and robustness. We analysed a total of 61 samples for this paper and present our findings for cadmium, lead, and mercury. The analysis framework and standard operating procedures were in accordance with European Commission regulations 1881/2006 and 2016/582. Furthermore, our method has been granted accreditation according to ISO 17025. The results demonstrated that the levels of heavy metals in the tested fish samples fall within the permissible limits set by the EU, ensuring the safety and quality of these food products for consumers. Adherence to these regulations is crucial in safeguarding public health and environmental sustainability. Continued monitoring and enforcement of these standards are essential to mitigate the risks associated with heavy metal exposure through the consumption of fish.

Acknowledgement: this research was funded by the European Regional Development Fund. grant number KK.01.1.1.02.0004 "Food Safety and Quality Centre" project.

KEY WORDS: food; ICP-MS; ISO 17025; permissible limit; public health

Poster presentation

The distribution of selected metals in olive oils from the Croatian coast – an exposure assessment

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Olive oil is an integral part of the Mediterranean diet, recommended worldwide as a standard for healthy living. It contains polyphenols, vitamin E, and monounsaturated fatty acids. In addition to the quality parameters that every sample of olive oil on the EU market must meet, safety must be assessed through pesticide and metal analyses. This work aimed to determine and quantify the selected metals in olive oil collected from the Croatian Adriatic coast during 2020. In total, 34 samples were collected, 12 from Istria, 15 from central Dalmatia and 7 from southern Dalmatia. Some mineral substances are necessary for normal human development and play an important role in various metabolic processes. In contrast, heavy metals have no beneficial health effect, no nutritional value, and are extremely toxic. Rare metals are useful indicators of olive oil's geographical origin. The olive oil samples were destroyed by microwave oven using nitric acid and hydrogen peroxide and the concentrations of elements were determined by inductively coupled plasma mass spectrometry (ICP-MS). A total of 13 metals was analysed. Cd was detected above the quantification limit only in two samples (0.01 and 0.007 mg/kg). Elements were found in the following concentration ranges (mg/kg): Al 31.60–162.00, Cu 0.05–0.51, Zn 0.12–0.81, Cd<0.005–0.01, Ca 30.50–84.10, K 72.1–278.00, Cr 0.06–0.40, Mg 1.27–10.50, Mn 0.03–0.14, Ni 0.04–0.20, Fe 1.22–14.20, Ru 0.13–0.40, and Sr 0.15–0.32. The results showed that concentrations of Cu, Zn, Cd, Cr, Mn, Ni, Ru, and Sr in the analysed samples were below 1 mg/kg.

Acknowledgement: this activity was carried out within the "Food Safety and Quality Center" (KK.01.1.1.02.0004) project funded by the European Regional Development Fund.

KEY WORDS: contaminants; elements; food safety, ICP-MS; Mediterranean diet

Poster presentation

Chromatographic method for determining biogenic amines in food

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The presence of biogenic amines in food is an indicator of the freshness and quality of food products for human consumption. While low levels of biogenic amines are acceptable for human health, excessive accumulation of biogenic amines in the human body can be toxic, leading to serious health issues for the general population and food safety concerns. Biogenic amines are low molecular weight organic bases with various structures. The common biogenic amines found in food, whose levels are used as indicators of freshness and quality in most products, include four biogenic amines: histamine, tryptamine, putrescine, and cadaverine. To protect consumers, it is important to monitor the quality of food products and thus develop a reliable analytical method for complex matrices such as shellfish tissue or dairy products. The aim of this study was to develop an analytical method for determining individual biogenic amines present in the tissue of a model shellfish and in dairy products, and to use the developed method to monitor changes in the concentration of biogenic amines in mussel tissue stored under different temperature conditions and short-term storage times as well as to determine their levels in different cheese types. For this purpose, different approaches to the extraction of biogenic amines were examined, along with methods of derivatization and separation of the derivatization products using high-performance liquid chromatography coupled with a diode array detector. The developed method was subjected to validation to determine the reliability and accuracy of the obtained analytical results.

KEY WORDS: extraction; food safety; histamine; liquid chromatography; method validation

Poster presentation

Isotope-ratio mass spectrometry (IRMS), chemometrics, and additional parameters as tools for the prediction of the botanical origin of Croatian honeys

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Honey as a highly valued food achieves high market prices, which is why it is often the target of adulteration. There are several aspects of honey adulteration: the addition of sugar syrups, the excessive supplementary feeding of bees by sugars, as well as the mislabelling of the botanical or geographical origin of honey. Researchers all around the world are trying to find the most appropriate and effective method for resolving different types of adulteration, and one of the newer ones, which in its beginnings dealt with honey adulteration by sugar syrups was the determination of stable carbon isotope ratio ($^{13}C/^{12}C$). Stable isotopes can also be used for the detection of the botanical origin of honey together with chemometric analysis (PCA; principal component analysis), which was the aim of this study. For this study, 144 honey samples from Croatia were collected from six different unifloral honey types (black locust, lime, chestnut, rape, sage, and winter savory). Stable carbon ($\delta^{13}C_{honey}$ and $\delta^{13}C_{protein}$) and nitrogen ($\delta^{15}N_{protein}$) isotope ratios were determined in all of the samples, together with mineral content by inductively coupled plasma-optical emission spectroscopy (ICP-OES) and physicochemical parameters. Results of chemometric analysis showed that isotope-ratio mass spectrometry (IRMS) parameters were not sufficient for botanical origin determination due to excessive data overlap. Better results were obtained when ICP variables were added to the previous ones. The best separation of samples according to botanical origin was obtained using IRMS, ICP, and physicochemical parameters as variables, which confirmed the complexity of honey composition. An extensive database of authentic unifloral honey types and their characteristic values and ranges is a precondition for confirming the authenticity of honey. Although the IRMS parameters themselves did not prove to be the best in predicting botanical origin, the values and ranges of $\delta^{13}C$ and $\delta^{15}N$ contributed to the database for Croatian honey and its authenticity.

KEY WORDS: honey authenticity; $\delta^{13}C$; $\delta^{15}N$; ICP; physicochemical parameters

Poster presentation

Analysis of phosphodiesterase type 5 inhibitors in food supplements using liquid chromatography-quadrupole time-of-flight-mass spectrometry

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Phosphodiesterase type 5 inhibitors (PDE-5Is) are used for the treatment of erectile dysfunction (ED) and represent an important group of adulterants in food supplements. Over the past few decades, the use of herbal remedies and food supplements has greatly increased, as consumers believe that these products are a safer and more natural alternative to traditional medical treatments. However, these "natural" products are often illegally adulterated with uncontrolled amounts of pharmaceutical substances, such as PDE-5Is and their synthetic analogues. We developed and validated a method based on liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF-MS) for screening and confirmatory purposes in detecting illegally added ED drugs in food supplements. Identification was based on accurate mass measurement, retention time (if available), and fragmentation pattern data. In our study, 49 samples of food supplements for ED were analysed, and the presence of PDE-5Is and analogues were confirmed in 65 % of the tested samples. Sildenafil and tadalafil were detected as the major illegal compounds, while eight different analogues of PDE-5Is were also identified. The adulteration of food supplements with PDE-5Is and their analogues poses significant risks to consumers and regular, consistent monitoring of these products is necessary.

Acknowledgement: this work was supported by the Croatian Ministry of Science, Education and Youth, European Regional Development Fund under contract No. KK.01.1.1.02.0004.

KEY WORDS: adulteration; analogues; food supplements; LC-QTOF-MS; PDE-5Is

Poster presentation

Protein content of honey from different botanical origins

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It is considered that the protein content in different types of honey can be related to the type of pollen, and thus to the botanical origin of the honey. During this research, using the Kjeldahl method, total protein content was determined in 54 honey samples of different botanical origins from the 2022 season. The honey samples included 13 honey types such as honeydew (n=6), flower honey (n=6), meadow honey (n=6), acacia honey (n=6), chestnut honey (n=7), linden honey (n=7), amorpha honey (n=5), sunflower honey (n=4), sage honey (n=1), garland thorn honey (n=2), mandarin honey (n=2), rapeseed honey (n=1), and buckwheat honey (n=1). Buckwheat honey showed the highest protein content (0.65 %) followed by chestnut honey (0.34 %), rapeseed (0.33 %), sunflower (0.32 %), sage (0.32 %), mandarin (0.25 %), amorpha (0.22 %), flower (0.21 %), honeydew (0.18 %), and linden honey (0.17 %), while the lowest value of total protein content was registered in acacia (0.16 %), meadow honey (0.13 %), and garland thorn honey (0.13 %). Analytical results indicate higher values of total protein content in dark honey types. The variability in total protein content of honey from different botanical origins may find application in honey origin quality control.

KEY WORDS: composition criteria; honey origin; honey types; Kjeldahl method; quality control

Poster presentation

Detecting adulteration in olive oil by attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy

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A major problem in the olive oil market is the adulteration of extra virgin olive oil with cheaper oils. In the present work, experimental determinations of low cost vegetable oil content in extra virgin olive oils (EVOO) were performed using attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy as a quick, non-destructive, and non-chemical reagent method. For this purpose, a set of pure oils and mixtures of extra-virgin olive oils (EVOO) and sunflower oil (SFO) was arranged and used as experimental material. Measurements were made on pure EVOO and EVOO adulterated with varying concentrations of SFO (0.5–95.0 % wt./wt. in EVOO). Moreover, the EVOO ageing process was studied – fresh and virgin olive oils (VOOs) stored for one year were monitored. A data processing of the spectral results was performed to allow an easy and fast comparison of the samples. The classification of the different mixtures was based on the intensity ratio between selected bands. Based on our results, it is clear that ATR-FTIR spectroscopy could be successfully used as a rapid, non-destructive technique that requires minimum sample preparation for detecting EVOO adulteration.

KEY WORDS: ageing process; extra virgin olive oil; food analysis; olive oil market; sunflower oil

Poster presentation

Development and validation of a liquid chromatography time-of-flight mass spectrometry method for the analysis of phosphodiesterase type 5 inhibitors in food supplements

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Phosphodiesterase type 5 inhibitors (PDE5Is) are widely used for treating erectile disfunction, but they can also cause various harmful side-effects if used without supervision. In the last few decades, the use of herbal remedies and food supplements for treatment of erectile disfunction has increased greatly. However, they are often illegally adulterated with uncontrolled substances such as PDE5Is and their synthetic analogues. Therefore, it is important to develop analytical methods for the screening, detection, and identification of illegal substances in food supplements. In this work we present the development and validation of a liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS) method for the analysis of four PDE5Is (sildenafil, tadalafil, vardenafil, and avanafil). The developed method was validated and showed good linearity with limits of detection and quantification in the ranges 0.2–2.2 ng/mL and 2–20 ng/mL, respectively. Accuracy and precision of method were satisfactory, with values ranging from 88.5 to 115.9 % and 86.9 to 111.2 % for intra- and inter-day experiments, respectively, and RSDs ranging from 0.4 to 4.5 % and 0.9 to 5.2 %, respectively. The developed method can be applied in the analysis of real samples of food supplements.

Acknowledgement: this work was supported by the European Regional Development Fund, grant numbers KK.01.1.1.02.0004 and KK.01.1.1.02.0016.

KEY WORDS: adulteration; herbal remedies; LC-QTOF-MS; PDE-5Is; validation

Poster presentation

The purity and quality of immortelle hydrolates from Croatia

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Immortelle [*Helichrysum italicum* (Roth) G. Don, family Asteraceae] is a Mediterranean wild plant with long-lasting use in traditional medicine. As there is growing interest in the commercial use of immortelle preparations in the pharmaceutical and cosmetic industry due to their medicinal and aromatic properties, it is necessary to define the reference values of chemical and physical parameters to assess the purity and quality of immortelle preparations. The aim of this study was to compare the purity and quality of immortelle hydrolates obtained from samples collected from the Adriatic (n=6) and continental (n=6) regions of Croatia. Six different parameters (relative density, refractive index, acid value, pH value, turbidity, and essential oil content) that have already been used for determining the quality of officinal essential oils in European Pharmacopoeia were investigated. The obtained results were compared with the available data for immortelle essential oil because reference values of these parameters for hydrolates are not available in the literature. The selected physical and chemical parameters were measured and the results ranged as follows: relative density (0.9571–1.0750), refractive index (1.3328–1.3338), acid number (0.0050–0.0071 mg KOH/g) pH value (3.43–5.80), turbidity (1.18–5.20 NTU), and essential oil content (0.07–0.14 %). The results of Student *t*-test ($p>0.05$) showed no significant differences in the measured parameters between Adriatic and continental immortelle hydrolate samples. Considering the increasing use of immortelle preparations for pharmaceutical and cosmetic purposes, it is necessary to standardise the methods of testing their quality.

KEY WORDS: chemical parameters; essential oil; immortelle preparations; physical parameters; quality control; standardisation

Poster presentation

Urban agriculture as a nature-based solution (NBS) project greenscape CE – a climate-proof landscape through renaturing urban areas in central Europe

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About 55 % of the world's population lives in urban areas, and it is predicted that by 2050 this number will rise to 68 %. Nature-based solutions (NBSs) are recognized as a vital element in developing urban green systems and improving green infrastructure due to their multifunctional benefits. These benefits include biodiversity enhancement, climate change adaptation and mitigation, air quality improvement, human health and well-being added value, and social cohesion promotion. One NBS are community gardens, which affirm food cultivation in cities, strengthen the local community, and support sustainable space management. Urban agriculture manifests itself in different forms: neighbourhood, residential, institutional, and demonstrative gardens, etc. Neighbourhood gardens act as places of gathering, social interaction, recreation, lifelong education, and general health improvement. Although urban agriculture alone cannot solve food security problems, it can be one of the measures and interventions to build an ecologically, economically, and socially more sustainable and fair food supply system. The project activities include the development of indicators and assessment methodology for potential NBS solutions, regardless of their size, fragmentation, connectivity, purpose, or current condition. It helps identify problems in selected areas and suggests possible NBSs applicable to those areas and problems. It provides users with a practical checklist and a series of steps that the local community can use for green interventions. An important part of the approach is public participation and involvement in every step of the process.

Acknowledgement: this work was done within the Interreg Central Europe Project – GreenScape CE – Climate proof landscape through renaturing urban areas in Central Europe (CE0100042).

KEY WORDS: community gardens; green interventions; neighbourhood gardens; urban green systems; Zagreb

Poster presentation

Bay laurel hydrolates from the Croatian coastal regions: physical and chemical parameters in quality control

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Laurus nobilis L. (bay laurel) from the family Lauraceae is an evergreen shrub or tree best known for its fragrant leaves, widely used in cooking and traditional medicine. It grows wild or is cultivated as a spice and ornamental plant. Considering the increasing use of bay laurel preparations for pharmaceutical and cosmetic purposes, it is necessary to introduce and standardise methods for monitoring and testing their purity and quality and to carry out studies on the biological effects of laurel preparations to support or limit its use in humans. Hydrolate (also known as hydrosol or aromatic water) is a distillate which is a by-product of condensation obtained after an essential oil distillation. In this work, chemical and physical parameters (acid value, relative density, refractive index, turbidity, pH value, and essential oil content) of laurel hydrolates (LnHYs) from three different coastal regions of Croatia (northern, central, and southern Adriatic) were measured in order to investigate their purity and quality. The results of LnHYs' quality testing were as follows: relative density (0.959–1.0239), refractive index (1.3331–1.3334), turbidity (0.72–3.41), acid value (0.0087–0.0098 mg KOH/g), pH (3.60–4.26), and essential oil content (0.0065–0.014 %). Since there are no reference values for LnHY parameters, the measured values were compared with the available data for similar specimens (rosemary hydrolates). According to the available quality requirements, all LnHYs had adequate quality and did not show significant differences in the measured physical and chemical values between the investigated *L. nobilis* hydrolates.

KEY WORDS: chemical and physical values; hydrosol; *Laurus nobilis* L.; quality monitoring; standardisation

Poster presentation

Determination of diastase and hydroxymethylfurfural content in honey

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In this research, a total of 42 honey samples (acacia n=21; multifloral n=21) from Croatia were analysed for some of the most important quality parameters: diastase activity and amount of hydroxymethylfurfural (HMF). The diastase activity determination is carried out by using a spectrophotometer measuring at 620 nm. The result is expressed as diastasis number (DN). HMF is identified and quantified using the high-performance liquid chromatography (HPLC) technique with UV detection at 285 nm. According to the Croatian national regulation on honey and EU Directive on honey, diastase activity must be greater than 8 DN. If the value is lower, the compliance depends on the result of the HMF, which must not be greater than 15 mg/kg. Otherwise, the HMF content must not exceed 40 mg/kg. The results show that diastase activity in multiflower honey ranged 8.2–23.9 DN, while in acacia honey 6.4–24.6 DN. In two samples of acacia honey, diastase activity was less than 8 DN, but considering the value of HMF, it was considered correct. HMF results in floral honey ranged from <1.25 to 22.1 mg/kg, except for one sample that was considered non-compliant because the value obtained was 49.9 mg/kg. In the case of acacia honey, the values obtained ranged from <1.25 to 23.2 mg/kg. According to our results, we conclude that the values of diastase activity and HMF content are somewhat higher in flower honey than in acacia honey.

KEY WORDS: acacia honey; HPLC; multifloral honey; quality; spectrophotometer

Poster presentation

Hydrolates from *Laurus nobilis* L. growing in Croatia: identification of volatile components and antioxidant capacity

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Bay laurel (*Laurus nobilis*, Lauraceae) is a Mediterranean evergreen shrub or small tree widely used in cookery and traditional medicine for numerous health problems, such as dermatological, neurological, rheumatic, gastrointestinal, and respiratory disorders. Hydrolates (also known as hydrosols) are by-products obtained after essential oil distillation and recent scientific research has indicated their bioactive potential. The objective of this work was to identify the volatile compounds in *L. nobilis* L. hydrolates (LnHYs) from the coastal regions of Croatia (northern, central, and southern Adriatic), as well as to evaluate the antioxidant potential of LnHYs using a standardised ORAC (Oxygen Radical Absorbance Capacity) method. The isolation of free volatile compounds was performed by microwave-assisted extraction and the chemical composition of the isolates was determined by gas chromatography-mass spectrometry (GC-MS). GC-MS analysis showed that oxygenated monoterpenes predominated in all LnHYs (61.72–97.00 %), with the highest proportion of 1,8-cineole (52.25–81.89 %). LnHYs from the northern Adriatic had the highest content of volatiles. Significant antioxidant potential was recorded for all LnHYs using the ORAC method. The ORAC values of LnHYs were expressed as μmol of Trolox equivalents (TE) per mL of a tested sample and ranged 0.0553–2.283 μmol TE/mg of LnHY volatiles. The highest antioxidant activity was found in LnHYs from the central Adriatic. Based on the results of GC-MS and antioxidant analysis, significant bioactive potential was observed, especially for the northern and central Adriatic specimens. Therefore, they could be the starting point for further scientific research of the bioactive potential of Croatian bay laurel populations.

KEY WORDS: bay laurel; GC-MS; hydrosol; microwave extraction; ORAC

Poster presentation

Prevalence of phenotypic resistance of the indicator commensal *Escherichia coli* originating from fresh beef and meat preparations from the territory of the Federation of Bosnia and Herzegovina (FBIH)

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The aim of this study was to determine the prevalence of antimicrobial resistance (AMR) of commensal *Escherichia coli* isolated from fresh beef, which is a good indicator of AMR due to its ubiquity. A total of 64 isolates of commensal *E. coli* were randomly collected from the area of the Federation of Bosnia and Herzegovina (FBIH). Isolation of *E. coli* was carried out in accordance with BAS ISO 16649-2:2008. The AMR was tested by disk diffusion method and double-disc synergy test was used to test for the presence of suspected extended-spectrum β-lactamase strains. The results showed a prevalence of 68.75 % of complete sensitive strains, while the prevalence of resistance to at least one antimicrobial agent was 31.25 %. The tested isolates had the highest prevalence of resistance to tetracyclines (21.9 %), followed by resistance to norfloxacin (12.5 %), chloramphenicol (9.4 %), and gentamicin (4.7 %). Resistance to cefalexin, amoxicillin with clavulonic acid, quinupristin-dalfopristin, trimethoprim-sulfamethoxazole, colistin, aztreonam, nitrofurantoin, and cefixime was very low. None of the isolates had putative extended-spectrum β-lactamases. Nine isolates (14.06 %) showed multi drug resistance (MDR). The resistance patterns of MDR strains always involved tetracyclines and most patterns involved fluoroquinolones, chloramphenicol, sulphonamides, and aminoglycosides. The results of this research did not deviate significantly from the results reported by the European Food Safety Agency and other similar studies, but they do not diminish the importance of monitoring the AMR indicator commensal *E. coli* as a reservoir of resistance genes. It is extremely important for FBIH to establish a national AMR monitoring plan.

KEY WORDS: antimicrobial resistance; disk diffusion method; double-disc synergy test; ESBL; multi drug resistance

Poster presentation

Monitoring ready-to-eat (RTE) food in supermarket RTE meals

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For several years, the City of Zagreb has been allocating financial resources and conducting systematic monitoring of food [food ready for consumption, hot and cold ready-to-eat (RTE) meals] in Zagreb. The monitoring plan has always been based on the evaluation of the results of previous years according to predetermined parameters following legal regulations. The goal of the monitoring is to assess food safety in facilities of public importance from the aspect of microbiological food safety and through the proposal of measures to improve the situation where results were not satisfactory, to provide healthy food, and to improve the production and preparation processes. The microbiological indicators used in food analysis are defined by the provisions of Commission Regulation (EC) no. 2073/2005 and recommended microbiological criteria according to the Guide for Microbiological Criteria for Food. The results obtained by monitoring during the last 10 years point to the fact that a significant number of RTE food samples sampled in supermarket RTE meals did not meet the criteria prescribed by law. This speaks in favor of the fact that, during food preparation, the principles of good production practice were not fully met. Given the presented results, increased control of the microbiological cleanliness of the facility and food is needed to confirm that facilities in food preparation adhere to the prescribed hygiene measures, all of which should serve to reduce the number of microorganisms in food.

KEY WORDS: food safety; HACCP; hygiene; microbiological criteria; microbiological indicators

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Poster presentation

Mycotoxin contamination in Bosnia and Herzegovina: a systematic review on aflatoxins and climate change

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This systematic review investigated mycotoxin contamination, focusing on aflatoxins and with an emphasis on the relationship between climate change and contamination levels in cereals and dairy products. The primary objective was to analyse data on aflatoxins and other mycotoxins in the region's agricultural commodities and assess the potential public health risks. Data was collected from studies published between 2010 and 2023, focusing on cereals, maize, and dairy products. The analysis synthesized findings from peer-reviewed literature and reports. Studies showed significant aflatoxin B1 (AFB1) and aflatoxin M1 (AFM1) contamination in maize, feed, and dairy products. In maize and feed, 26.2 % of samples had AFB1 levels above 5 µg/kg, but most remained within legal limits for animal feed. AFM1 in milk varied seasonally, with higher contamination in winter; the Tuzla Canton showing the highest average (27.00 ng/L). Although most dairy products were safe, some isolated samples exceeded limits. Other mycotoxins like ochratoxin A, fumonisins, and deoxynivalenol were also detected, often co-occurring and complicating management. Climatic conditions, particularly warmer, variable weather, correlated with increased mycotoxin levels. The review highlights the significant public health risk posed by mycotoxins in Bosnia and Herzegovina. The findings suggest that ongoing climate change will exacerbate contamination levels, necessitating improved monitoring, storage practices, and regulatory frameworks to mitigate the risks. Further research is needed to develop effective mitigation strategies tailored to the region's unique climatic and agricultural conditions.

KEY WORDS: cereals; dairy products; food contaminants; maize; public health risk

Poster presentation

Prepare for the unexpected: norms, procedures, and regulatory requirements against microbiological challenges in food preparation and distribution

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Ensuring microbiological safety in food preparation and distribution is essential for consumer health. The aim of this study was to demonstrate how the City of Zagreb Institution "Dobri dom", through the implementation of HACCP, ISO 9001, ISO 14001, and ISO 45001 standards, as well as compliance with all regulatory requirements, successfully maintains the microbiological cleanliness of its facilities, equipment, and finished products. These results serve as evidence of the effective 17-year work of the institution's interdisciplinary teams. The study is based on samples taken from "Dobri dom" facilities over a five-year period, including analyses of surfaces, employee hands, work clothing, and finished meals. Standard microbiological methods were used to assess the presence of microorganisms and compare the results with legally prescribed limits. The results showed that all of the samples were within allowable limits, confirming the effectiveness of the implemented procedures. Regular microbiological analyses demonstrated consistency in maintaining high hygiene standards, ensuring the safety of the work process and all of the stakeholders involved. The study concludes that the systematic application of standards and procedures is key to preventing microbiological risks in the food preparation and distribution sector. "Dobri dom" demonstrates that consistent compliance with regulatory requirements can achieve and sustain a high level of microbiological cleanliness.

KEY WORDS: facility hygiene; food safety procedures; microbiological cleanliness; regulatory compliance; risk management

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Poster presentation

Perception and consumption of wild edible plants in the Osijek-Baranja County

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The tradition of utilizing wild edible plants is frequently overlooked, along with the valuable knowledge that accompanies it, in both urban and rural areas. Given their potential to contribute to nutritional diversity and support sustainable practices, an online survey was conducted in Croatia's Osijek-Baranja County with 156 participants to explore individuals' perceptions of wild edible plants and their frequency of foraging, purchasing, and consuming them. Additionally, the survey assessed the respondents' perceptions and attitudes towards education on wild plants and their use as functional foods. The results revealed that respondents felt inadequately informed about wild plants, highlighting the need for increased education. A significant number of respondents indicated that they collected wild plants in nature, while an almost equal number reported purchasing them at markets and supermarkets; however, those from rural areas were more inclined to forage. Approximately 50 % of respondents used wild plants at least once a week, primarily for nutritional and medicinal purposes. Various species were employed in different forms, including fresh and processed into teas, syrups, tinctures, and as ingredients in culinary dishes and alcoholic beverages. The most frequently mentioned species were mint (*Mentha* spp.), oregano (*Origanum vulgare*), chamomile (*Chamomilla recutita*), dog rose (*Rosa canina*), elderberry (*Sambucus nigra*), and nettle (*Urtica dioica*). More than two-thirds of respondents agreed that investing in education about wild plants is important, with similar numbers viewing them as functional foods and considering their origin important when purchasing or foraging.

KEY WORDS: functional foods; knowledge gaps; plant foraging; survey; sustainable food sources

Poster presentation

Determination of water-soluble vitamins by high-performance liquid chromatography

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The aim of this paper was to optimise a method for the simultaneous determination of water-soluble vitamins in dietary supplements. The obtained results were compared with existing legal regulations to verify their compliance with the information provided on the label. The samples were analysed using high-performance liquid chromatograph (HPLC) with a diode array detector (DAD) at four different wavelengths by gradient method. A total of 32 dietary supplement samples, primarily capsules and instant vitamin drinks, were evaluated during 2023 and 2024. They were tested for eight water-soluble vitamins (vitamin C and B-complex), depending on their presence in the product itself. All of the tested samples contained the recommended amount of water-soluble vitamins in accordance with Regulation (EU) No 1169/2011. The allowed deviation for vitamins is -20 % and +50 %. Vitamin C was most often added in excess because it is extremely sensitive and unstable. Dietary supplements available on our market comply with requested quality and safety standards. The amount of water-soluble vitamins is fully aligned with the information on the product label and corresponds to their actual content. Consumers can rest assured that the dietary supplements they use contain the amount of vitamins stated on the label.

Acknowledgement: this research was funded by the European Regional Development Fund grant number KK.01.1.1.02.0004 "Food Safety and Quality Centre" project.

KEY WORDS: B-complex vitamins; dietary supplements; HPLC; safety standards; vitamin C

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Poster presentation

Analysis of fatty acid profiles in selected fish oil dietary supplements using gas chromatography

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Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are commonly found in fatty fish, seafood, and dietary supplements containing fish oil, algae oil, and krill oil. Concentrated pharmaceutical-grade preparations of EPA and DHA are also available and are highly relevant to the prevention and treatment of cardiovascular diseases. The aim of this study was to review dietary supplements with fish oil and other sources of EPA and DHA on the Serbian market, examine the fatty acid profile, and verify the composition in relation to the declared values in selected samples using gas chromatography. A survey conducted across multiple pharmacy chains identified 56 dietary supplements containing fish oil and 3 products containing EPA and DHA from other sources (krill oil and algae oil). Of the identified products, 33 contained additional active substances besides EPA and DHA. The fatty acid composition analysis of selected fish oil supplements revealed significant variability in the content of different classes of fatty acids. The levels of saturated, monounsaturated, and polyunsaturated fatty acids were found to vary within a wide range. However, omega-3 fatty acids were present in the highest quantities in all of the samples, confirming that they are the main active ingredients in these supplements. Deviations in actual omega-3 fatty acid levels from what was declared on product labels were observed in a few products. EPA and DHA are well-known for their role in promoting health benefits. The quality of omega-3 supplements is crucial in ensuring that consumers get the desired health outcomes.

KEY WORDS: omega-3 sources; pharmaceutical-grade; product labelling; quality control; supplement composition

Poster presentation

Foods, food additives, and gut microbiota: recent findings and knowledge gap

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Gut microbiota have been the focus of extensive research, both regarding their impact on various health outcomes, and the impact of food on microbiota composition, abundance, and metabolic activity. Many studies have confirmed that dietary patterns have the propensity to alter the gut microbiota. The effect can be evident after a very short period of time, such as within a single day after switching between nutrient contents. A particularly thoroughly investigated dietary pattern is the Mediterranean diet (MD), which has been shown to have a favourable impact on health in general, but also on gut microbiota. One hypothesis is that MD's positive effects on cardiovascular, metabolic, and mental health are at least partly due to the impact on gut microbiota. The MD incorporates primarily unrefined plant-based foods, such as vegetables, fruits, cereals, nuts and seeds, legumes, olive oil, and wine. These foods provide substrates for beneficial changes in gut microbiome composition and their metabolic activity, e.g. increase in short chain fatty acids synthesis. On the other hand, the ingestion of ultra-processed foods can lead to gut dysbiosis and chronic low-grade inflammation. Food additives are common ingredients in industrially processed foods, and their effects on the human gut microbiota have gained more attention lately. However, early findings using *in vivo* animal models and *in vitro* bacteria cultures, range from beneficial to quite worrisome, highlighting the wide knowledge gap. The overall agreement of published studies is that further research on the influence of food additives on microbiota is warranted.

KEY WORDS: gut dysbiosis; *in vitro* bacteria cultures; *in vivo* animal models; Mediterranean diet

Arh Hig Rada Toksikol 2024;75(Suppl. 2):23–96

Poster presentation

Consumer attitudes about food supplements based on beehive products and the beehive products included in their composition

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The aim of this study was to determine and present consumer attitudes about food supplements and beehive products. For the purposes of the study, a questionnaire was created and filled out by 1,018 examinees of the general population in the Republic of Croatia. The collected answers were a significant factor in the comprehensive assessment of the safety of food supplements and beehive products on the Croatian market. The research results showed that 22 % of examinees acquired food supplements based on beehive products and that safety and health were considered to be of the utmost importance. The fact that only 11 % of examinees prioritized health when choosing food supplements was seen as worrying. In cases of doubt about food supplement safety, almost 21 % of the respondents admitted they would not turn to any public institution, while only 7 % disclosed they would turn to the Ministry of Health. In case of doubt about the safety of beehive products, 25 % of respondents admitted they would not contact anyone and only 6 % answered they would contact the Ministry of Agriculture. Such numbers show the consumers' deficits in knowledge regarding who should be contacted and how to act. They also raised the question of confidence into the system and the institutions responsible for food supplements as well as beehive products. As many as 65 % of respondents did not know what the term "nutrivigilance" stands for, while 68 % could not answer whether its introduction would or would not increase the level of safety of food supplements on the market.

KEY WORDS: assessment; food safety; health; nutrivigilance; questionnaire

Poster presentation

Stability of repeated use materials and articles in contact with food on the Croatian market in terms of multiple metal migrations

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The aim of this study was to review repeated use materials and articles (RUM) in contact with food on the Croatian market with regard to point 2.1.6. of Commission Regulation (EU) 10/2011. For RUM, the migration tests are carried out three times on the same sample. Each successive specific migration must not exceed the value of the previous specific migration. Samples were analysed in the reference laboratory for food contact materials at the Croatian Institute of Public Health. All of the samples were obtained from retail chains and the State Inspectorate as part of monitoring and official control and were examined in the period from 2021 to 2024. The analysed samples included baking and muffin tin, kettle, knife, plastic reusable cutlery, food container, water bottle, and an air fryer. Triple successive migration was carried out in suitable model solutions under conditions suitable for the purpose of the product according to Commission Regulation 10/2011. The specific migrations of 18 metals (antimony, aluminium, arsenic, barium, cadmium, chromium, cobalt, copper, europium, gadolinium, iron, lanthanum, lead, lithium, manganese, mercury, nickel, terbium, and zinc) were determined using inductively coupled plasma mass spectrometry (ICP-MS). Results showed a non-compliance of the tested samples with the stability rule. A total of 60 % of samples did not comply to the rule for two metals, and 40 % for three or more metals. The most unstable metals were copper, zinc, and iron. This study yielded unsatisfactory results and indicated the need for the proper testing of such items due to possible risks to consumer health.

KEY WORDS: food contact materials; inductively coupled plasma mass spectrometry; metals; specific migration; successive migration

Poster presentation

Official control testing of food contact articles made from paper and board in Slovenia in the period 2019–2023

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Paper and board have traditionally been used as food contact materials for various applications; mainly packaging, but also for food preparation at high temperatures. Due to the negative environmental impacts of fossil-based materials and regulatory requirements, there is even an increasing demand for the use of natural-origin materials like paper, board, and other cellulosic materials for food contact. Recycled cellulosic fibres are often used for the production of such articles, which may lead to additional sources of risk that are not observed with the use of virgin fibres. The results of official control with laboratory testing of food contact articles made from paper, board, and paper analogues in Slovenia over a 5-year period (2019–2023) are presented herein. As there is no national legislation in place for paper and board, German recommendations (BfR XXXIV) and the Council of Europe's technical guide on paper and board were used as references for the testing methods and the assessment of resulting migration levels. Among the parameters tested, the results showed migration of biocides isothiazolinones, primary aromatic amines and aluminium. Substances which probably originate from recycled fibres, i.e. bisphenol A and phthalates, were also found. However, most of the migration levels of these substances did not exceed the recommended limit values.

KEY WORDS: food contact materials; migration; packaging; recommended limit values; recycled fibres

Poster presentation

Production and development of compostable packaging from waste biomass for the packaging of industrially processed food products (BIOPHA-COMFPACK) – goals of the project co-financed by the National Recovery and Resilience Fund

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In the EU, nearly 47 % of plastic packaging is recycled, so the real problem is the disposal of the remainder into the environment. The natural decomposition of conventional plastic from fossil fuels can last from ten to a thousand years, which is not an environmentally acceptable option. The small fragments of decomposition (microplastics) in the environment represent a real risk for the health of people, animals, and plants. Therefore, packaging and food manufacturers have decided reduce their ecological footprint in another way, by increasing the proportion of biobased plastic. Biopolymers, such as polyhydroxyalkanoates (PHA), have almost the same functional properties as the polymers incorporated in conventional plastics, the difference being that they are much more environmentally friendly, because they can be composted either at home or industrially, and they decompose on carbon dioxide, water, and compost. The goal of the BioPHA-ComFPack project (2024–2026) is to produce PHAs using microorganisms from secondary sources (byproducts from fruit and vegetable processing) and optimise their production, to prepare a compostable PHA-based blend and develop foils for multi-component packaging of processed food products, and to monitor the quality of food products over a longer period. Through the Life Cycle Assessment methodology, an analysis of the environmental impact of biopolymer packaging will be made. The applicant of the project is the Faculty of Chemical Engineering and Technology of the University of Zagreb, while the partners are the Faculty of Food Technology of the J. J. Strossmayer University of Osijek, Podravka d.d., and Rotoplast d.o.o.

KEY WORDS: biobased plastic; biopolymers; Life Cycle Assessment methodology; microplastics; plastic disposal

Poster presentation

Preservatives in paper straws – potential safety risk

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Single-use plastic products represent a major problem for environmental pollution and human health. Plastic straws are among the disposable plastic tableware that can no longer be placed on the EU market. Today, eco-friendly paper straws are in use, which unfortunately are not stable in prolonged contact with liquids and this makes their health safety also questionable. Various additives added with the purpose of improving the water resistance and strength of a material represent substances that can migrate into food and drink. Europe currently does not have harmonised regulations for paper, cardboard, inks, and coatings as materials that come into contact with food. Croatia applies its national legislation. The aim of this paper was to determine the content and type of preservatives most often used in paper straws. The tested preservatives were benzisothiazolinone (BIT) and a mixture of methylchloroisothiazolinone (CMI) and methylisothiazolinone (MI). These are preservatives with good bactericidal and fungicidal effectiveness and a wide range of applications (in emulsion paints, sealants, varnishes, adhesives, detergents, etc.). They are considered very toxic to aquatic organisms, are harmful if swallowed, and can cause irritation and allergic reactions on the skin. The analysis was carried out using high-performance liquid chromatography (HPLC) in an extract of the finished product. Increased concentrations of tested preservatives were found in a certain number of analysed samples. The obtained results indicate that a reconsideration of the safety of paper straws would be justified with special emphasis on their wide application among the most sensitive groups of consumers.

KEY WORDS: benzisothiazolinone; HPLC; methylchloroisothiazolinone; methylisothiazolinone; single-use plastic products

Arhiv za higijenu rada i toksikologiju
Archives of Industrial Hygiene and Toxicology

THE OFFICIAL JOURNAL OF
Croatian Medical Association – Croatian Society on Occupational Health
Croatian Society of Toxicology
Slovenian Society of Toxicology
Croatian Radiation Protection Association
Croatian Air Pollution Prevention Association

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This journal is supported by the Ministry of Science and Education of the Republic of Croatia.

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Arhiv za higijenu rada i toksikologiju

Archives of Industrial Hygiene and Toxicology

Arh Hig Rada Toksikol • Vol. 75 • Suppl.2 • ZAGREB, CROATIA 2024

ISSN 0004-1254

IZDAVAČ / PUBLISHER:

Institut za medicinska istraživanja i medicinu rada Zagreb, Hrvatska

Institute for Medical Research and Occupational Health Zagreb, Croatia