International Association for Food Protection

GIDA GÜVENLİĞİ DERNEĞİ TURKISH FOOD SAFETY ASSOCIATION

8th International Food Safety Congress

9-10 May 2024 Istanbul-TURKIYE

"Food Safety is Our Responsibility"

ABSTRACT BOOK

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SCIENTIFIC PROGRAM

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KEYNOTE

Fraudulent Activities and Corporate Business Culture in Food Supply Chains

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Food fraud is an ancient and contemporary issue at the same time. It is a broad term that encompasses the deliberate and intentional substitution, addition, tampering or misrepresentation of food, food ingredients or food packaging: of false or misleading statements made about a product, for economic gain that may impact consumers health. At the root of the food fraud dilemma lies not a microbe or a pollutant like with many food quality and most safety issues, but rather a human adversary. It is the conscious decisions made by individuals to transgress ethical boundaries, either for personal gain or on behalf of a company. In this respect we can distinguish 'loyal' employees including crisis responders, opportunity takers, opportunity seekers, and criminal professionals. The level of personal integrity is an important indicator, however, the corporate environment is of fundamental importance as well since the culture in food businesses and across food supply chains is a proxy for these illicit activities. Research has demonstrated significant correlations between poor ethical business cultures and criminal offences in food supply chain networks. The importance of behavioural and cultural risk factors in food fraud cannot be overstated. Perpetrators, primarily criminal food industry professionals rather than professional criminals, are significantly influenced by their cultural and environmental surroundings. Control measures can mitigate the food fraud threats faced and involve often technological measures, such as fraud monitoring with analytical schemes, track and trace systems, and mass balance checks. However, to counteract the motivational drivers, managerial controls are crucial as well.

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KEYNOTE

New Era of Smarter Food Safety

Frank Yiannas

Smarter FY Solutions, Bentonville, Arkansas, USA

These are challenging times in the world as the global food system faces unprecedented headwinds. And these are challenging times as we find ourselves re-evaluating how to best achieve our public health mission to ensure consumers have access to safe, nutritious, and available food.

The sheer scope and scale of the global food system is daunting. On top of that, food safety awareness is at an all-time high, new and emerging threats to the food supply are being recognized, and foodborne outbreak detection is improving and, in some instances, outpacing prevention. Moreover, coming out of the pandemic, the food system is in the midst of a food revolution. Many believe we will see more changes in food over the next 10 years than we have over the past several decades. Foods are being reformulated, new foods and new food production methods are being realized, and the food system is becoming increasingly digitized.

But these challenges give birth to opportunity. They shape a vision of what the future could be, looking beyond what we currently do to what we CAN do in the future with new and emerging technologies, smarter tools and approaches for prevention, and new ways to collaborate through increased data sharing.

Attend this session to hear from Frank Yiannas, a renowned food safety leader at Disney, Walmart and, most recently, at the U.S. Food and Drug Administration, to gain a greater perspective from his balcony level view and experience on the future of a New Era of Smarter Food Safety.

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ORAL

Food Safety: Emerging Residues and Contaminants Control

Thomas Gude

ETH Zürich /Thomas Gude GmbH, Switzerland

When talking about food safety in general the residues and contaminants topic shows up quickly. More or less every week new substances and problems related to food safety are published in media. This is a huge challenge for any food industry. Moreover, the topics raised are getting increasingly complex as not only “classical” food borne risks have to be considered, but also any environmental impact, i.e. influence of production and processes. Besides that, the new chemical strategy of the EU has a significant impact on materials to be used in the production but also in food contact materials. In the latter area the recycling topic with its mostly unknown contaminants is becoming increasingly a hot topic. The current talk highlights several topics which need to be controlled in food production to guarantee food safety. The topics to be discussed will deal with PFAS, Mineral oil, Endocrine disruptors and generally food contact materials. All these topics is common, that they have either its origine in the environment or in common materials. Especially endocrine disruptors are ambivalent as they could also be present in food itself. For several topics, the current analytical challenges will shortly be discussed with a strong focus to NTS (non-target screening) and bioassays (Ames, UmuC, planar Yes etc.). These new methodological approaches are promising but they are facing pros and cons. However, in the foreground of the talks is, how industry could deal with these topics in terms of risk assessment. As industry is increasingly challenged to produce “chemical free” food to guarantee a reliable food safety, this term will be discussed, too, with above topics as examples. Generally, the talk gives a wide overview on current topics potentially influencing food safety and recognition in media leading to huge challenges for the food industry. But not everything which has a high hazard is leading to emerging risk.

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ORAL

Interventions to Mitigate Antimicrobial Resistance (AMR) in the Food Value Chain - A Global Perspective

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Globally, over 70% of antibiotics are utilized in food-producing animals, with meat consumption projected to surge by 50% between 2013 and 2030. Alarmingly, 25% of all countries still report the use of antibiotics for growth promotion in animals. However, recent data indicates a glimmer of hope as antibiotic usage (AMU) in animals decreased by 13% over the last three years (World Organisation for Animal Health, 2023).

The escalation of antibiotic usage in the pursuit of ensuring food security and combating infectious diseases has inevitably led to the rise of antibiotic resistance (AMR), particularly accentuated in Low-and-Medium Income Countries (LMICs). Despite the availability of evidence-based interventions to address AMR, the majority have been formulated and trialed within high-income nations, posing challenges for direct translation to LMIC contexts. In response to this critical disparity, the International Centre for Antimicrobial Resistance Solutions (ICARS) tests AMR solutions in LMICs and advocates for a holistic One Health approach.

Through strategic partnerships with ministries, academia, and practitioners in LMICs, ICARS spearheads initiatives aimed at mitigating AMU and AMR by implementing locally adapted interventions and scalable solutions. At the beginning of 2024, 15 projects targeting the animal sector (aquaculture, cattle, pigs, and poultry) were in co-development or implementation. Interventions address key priorities and needs in countries. For example, in Zambia and Zimbabwe, poultry farmer field schools are established and assessed, using outcome measures such as farm biosecurity, AMU, and antibiotic residues in meat. In Vietnam and Tanzania, projects are optimizing and evaluating the management and effectiveness of vaccination in reducing disease occurrence and AMU in farmed striped catfish aquaculture and poultry, respectively. In Colombia, an improved colostrum protocol is tested to reduce piglet diarrhea, replace routine use of medicated feed, and reduce antibiotic treatments. In addition, the projects incorporate behavior change and economic assessments.

In addition, national and international food certification schemes are evolving to include responsible antimicrobial use (AMU) practices. ICARS collaborates with Benin to establish certification of AMR in imported hatching eggs and day-old chickens. AMR's integration into food safety includes also voluntary industry actions, like discontinuing use of critical antibiotics. Recent regulatory shifts, such as the EU's ban on use of growth-promoting antibiotics and antibiotics reserved for human use in livestock and their products imported from outside the EU (January 2022), highlight growing recognition of food trade and certification in combating AMR.

In conclusion, ICARS provides a unique value proposition in LMICs to co-develop evidence-based, context-specific, cost-effective, and sustainable solutions to combat AMR and advance the implementation of National Action Plans on AMR. The unique model of ICARS is the partnerships with both ministries and researchers to support solutions informed by intervention and implementation research using multidisciplinary approaches, including insights from behavioral science and economics.

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ORAL

Emerging Food Safety Risks: Thermal Process Contaminants

Vural Gökmen

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Today, heat treatments are widely applied by the food industry in the preparation and preservation of food products and ingredients. While foods are exposed to high temperatures for the desired product features during processes such as baking, frying, roasting, sterilization and deodorization, certain chemical changes may also occur affecting quality and safety aspects of final products. With the developments in food analysis techniques, our knowledge about the mechanisms of chemical changes that occur in foods during thermal processes and their consequences that are closely related to food safety has increased significantly.

Acrylamide, furan and its derivatives, dicarbonyl compounds, advanced glycation end products, chloropropanols and their esters, and glycidyl esters, which are thought to negatively affect human health, occupy the agenda of national and global food safety authorities and the food industry as emerging food safety risks. Above-mentioned substances are called **thermal process contaminants** because the main factor causing their formation is heat. These contaminants have increased consumers' concerns about processed foods. Although the presence of such substances in heated foods has only recently been discovered, it should not be forgotten that human beings have been exposed to food safety risks caused by process contaminants for many years. On the other hand, it is understood that the food industry is not sufficiently prepared for these new food safety risks based on heat treatments. The food industry is expected to increase their efforts towards reformulation and developing alternative processing techniques to combat food safety risks caused by the thermal process contaminants.

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ORAL

The FAO/WHO Expert Consultation on Risk Assessment of Allergens: What Does it Mean for Global Allergen Management?

René Crevel

René Crevel Consulting Ltd., Mildenhall, England

The FAO/WHO Expert Consultation on Risk Assessment of Allergens, which took place between late 2020 and early 2023, was the first full Expert Consultation on food allergens since the FAO Technical meeting in November 1995. The 1995 Consultation formed the basis of much of the global allergen regulation, such as how to define priority allergens and what they should be. In the intervening 25 years much has been learnt about food allergens, how to assess the risk they pose and thereby better protect consumers with food allergies. The agenda set by Codex for the experts was correspondingly ambitious and challenging. Overall, up to 30 experts met online for a total of 105 hours, as well as a one-week face-to-face meeting. To meet the terms of reference set by Codex, the members of the Consultation proposed a comprehensive overhaul of the way allergens are managed globally, based on the most recent knowledge and understanding. This started with a review of the criteria previously used to identify global priority allergens, followed by a detailed review of the current (1995) list and consideration of potential addition of new food allergens and removal of any existing ones failing to meet criteria for inclusion. In a second series of meetings, the Consultation addressed a critical issue, which had been identified by the 1995 Consultation but could not be addressed, because of the lack of data, namely what are safe limits for allergens when unintentionally present in a product. The Consultation thus defined Reference Doses for the identified priority allergens, guided by a clear and transparent food safety objective and following a defined scientific analysis. It also thereby provided a clear mechanism whereby Reference Doses could be identified for local priority allergens. The Consultation then addressed how those Reference Doses could be used in the management of allergens, focussing on the scientific application of Precautionary Allergen Labelling. Finally, the Consultation examined whether and how Reference Doses could help to define exemptions from allergen labelling, such as those that have are possible in certain jurisdictions, such as the European Union and United States of America. This presentation aims to share the main outcomes of the Consultation's work, as well as explain the choices that were made. It will also distil the main conclusions and implications of the Expert Consultation's work.

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ORAL

Sustainable Novel Approach for Food Processing in the View of Foods Safety

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Food industry has been under pressure to increase the quality of food products with their safety, and achieving this thorough using a sustainable process has become a significant concern with the challenges of environmental-friendly food processing under the umbrella of the European Green Deal. Sustainability in food processing is based on applying non-polluting and economically efficient processes by conserving energy with the additional concern of the process safety. Besides this, food industry has been challenged by (recently) increased food safety issues (e.g., recent *Salmonella* outbreaks in peanut butter, whole shell eggs, dry onions, tahini, humous; *Listeria* cases in ice cream mixes; *Cronobacter sakazakii* in baby formulas, etc.). All these recent cases have coincided with the quote from the announcement of the world food safety day by `Food and Agriculture Organization of the United Nations` and `World Health Organization`: “Food safety: Prepare for the unexpected”.

Considering the unexpected, most of the recent food safety issues connected with the above-mentioned microorganisms emerged with the low water activity (<0.85) food products (peanut butter, chocolate, tahini, powders, baby formulas, dried fruit and vegetables, etc.) indicated the requirement of innovative approaches in processing. Even though the low moisture foods are accounted to be less susceptible to the microbial growth, the pathogen microorganisms, with their low numbers, might still survive through the shelf-life and cause significant safety concerns. *Salmonella* Spp. has been specifically linked in a numerous number of outbreaks while *Cronobacter sakazakii* shows a recent significant concern in baby formulas. A proper thermal processing is expected to provide a significant reduction in the number of the pathogenic microorganisms, but the conventional thermal processing approaches, as major pillars of the food industry, have certain disadvantages for process efficiency due to the lower thermal conductivity and thermal diffusivity of low water food products. The higher viscosity with non-Newtonian rheology features, in the case of liquid foods bring additional challenges to the processing. Therefore, in this study, novel approaches for some of the electro-heating technologies (microwave - MW, radio frequency - RF and infrared-IR) were demonstrated to reduce safety risks while still maintaining the quality with sustainable and efficient processing.

In this presentation, the effectiveness of these electro-heating approaches for process effectiveness for pasteurization of the low water activity products was demonstrated. MW, RF, and IR processing applications were focused for this purpose, and the examples for process innovation with industrial scale (experimentally validated) computational models were presented. These computational models highlighted the scale-up issues for industrial scale sustainable processing with required process design to demonstrate the application of novel

approaches to the industrial food manufacturing processes.

The objective of this presentation was to present the sustainable novel approaches for food processing in the view of recent food safety issues. For this objective, electro-heating technologies were demonstrated to replace the conventional thermal processing for sustainability. In this concept, the scale-up of the processing is expected to become a significant issue, and computational modelling-based approaches are required with the support of digitalization (e.g., artificial intelligence, machine learning, etc.) for the upcoming industry x.0.

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ORAL

Innovative Intelligent Packaging Technology for Monitoring Food Freshness and Safety

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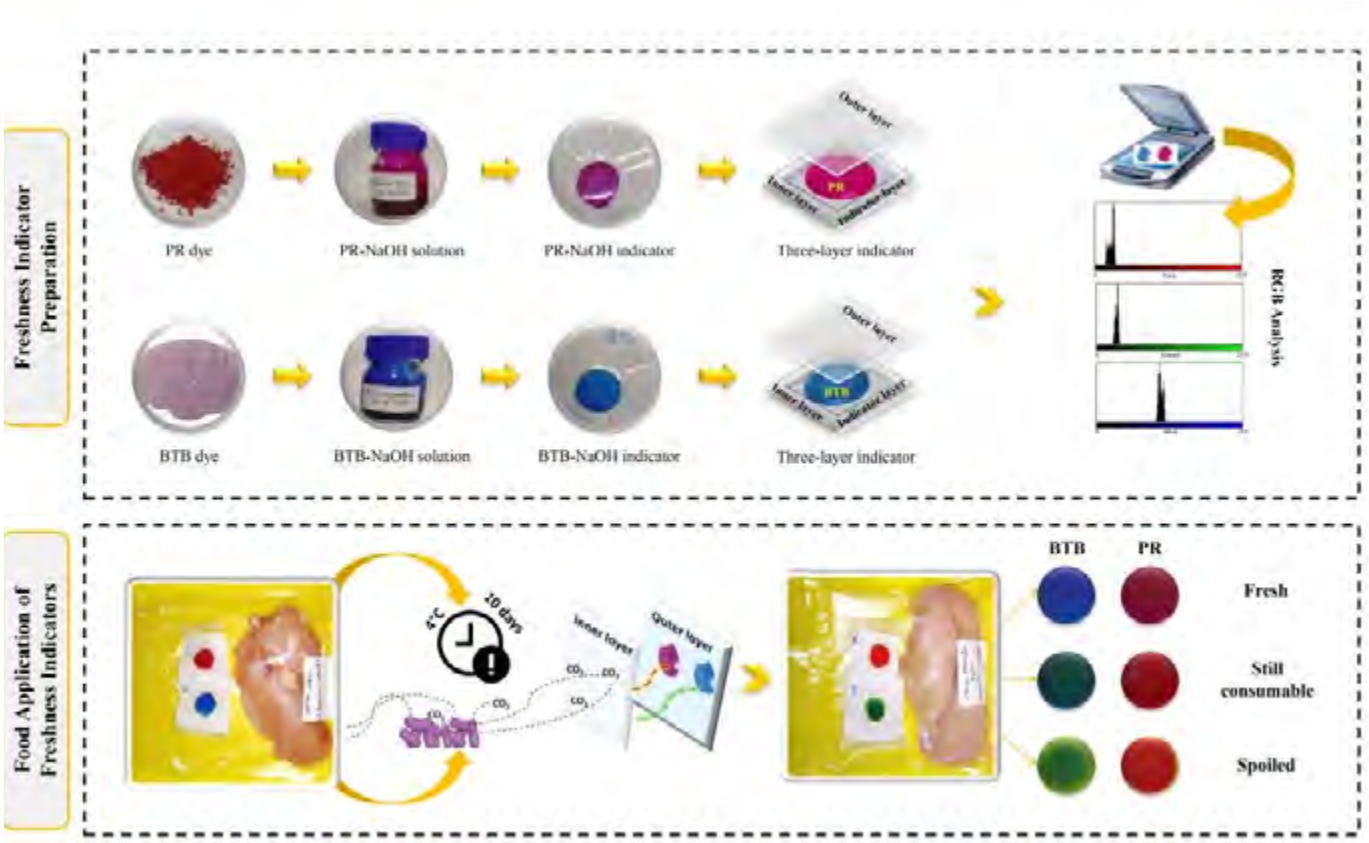
Intelligent indicators integrated into food packaging have a high potential for real-time and non-destructive monitoring of freshness/spoilage of the products within the package based on a visual color change to warn consumers. The newly developed novel three-layer intelligent indicators for monitoring chicken meat spoilage will be presented to explore this technology for its potential in real packaging practices. The freshness indicators were designed in three layers to be sensitive to CO_2 as a spoilage metabolite occurred due to microbiological spoilage of chicken meat. In the color change layer of the freshness indicators, bromothymol blue (BTB) and phenol red (PR) dyes were used at a ratio of 1% (w/w), along with a 3% (w/w) methylcellulose as a binder, 1% (w/w) polyethylene glycol as a plasticizer. The freshness indicators were laminated with low-density white polyethylene (LDPE) used in the inner layer and polyethylene terephthalate (PET) films in the outer layer. First, simulation studies were performed to monitor the color changes of the developed indicators in the presence of spoilage metabolite (CO_2 ranging from 0% to 30%). The simulation and food validation studies were conducted at 4°C for 10 days to provide real food packaging and storage conditions. The total color change values were determined using two different color measurement methods. L*, a*, and b* were measured using a colorimeter to determine total color difference (ΔE). Image J software was used to evaluate R, G, and B to determine the total color difference (ΔRGB). To test the functionality of the freshness indicators, a food validation study was conducted using chicken breast meat packaged in polyamide/polyethylene (PA/PE) under air and 100% N_2 atmospheres. During the validation study, changes in the quality parameters of the chicken breast meat were monitored using headspace gas composition, pH, total volatile basic nitrogen (TVB-N), trimethylamine (TMA) concentration with gas chromatography (GC), total mesophilic aerobic bacteria, Pseudomonas spp., and sensory evaluation. In the simulation study, a gradual color change was observed with increasing CO_2 concentration in both BTB-based and PR-based colorimetric freshness indicators. In the case of BTB-based freshness indicators, a gradual color change was observed from turquoise to dark green at CO_2 concentrations of 10-15% and from dark green to light green in the range of 15-30% CO_2. For PR-based indicators, a color change from purple to red was observed at a 5% CO_2 concentration, and from orange to yellowish-orange in the 5-30% CO_2 range. The visual color change in the PR-based indicator was insufficient to detect spoilage with the naked eye in both the simulation and food trials. However, three-stage color (dark blue-turquoise-green) change occurred in BTB-based indicators, and the color transition in the spoilage level of CO_2 (10-15% (v/v)) is supported by the physicochemical, microbiological, and sensorial properties of the chicken breast. The shelf life of chicken breast under air was limited to 4 days, while the shelf life under 100% N_2 was 6 days, supported by the visual color change of BTB indicator. The BTB-based indicators were found promising on

real packaging conditions and could be adapted to industrial scale for monitoring real-time freshness/spoilage of poultry, ensuring food safety, reducing food waste, promoting traceability and sustainability in the food industry.

Overall schematic concept



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ORAL

Decontamination of Food Packaging Films by Non-Thermal Plasma Corona Discharge: Assessment of Wet Treatment

Emine Gizem Acar, Dilan Doğanöz, Deniz Çavdar, Funda Karbancıoğlu-Güler, **Gürbüz Güneş**

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Decontamination of food packaging surface is important for preventing contamination and maintaining the quality and safety of foods. Despite the existence of some physical and chemical decontamination methods, new technologies that are cost effective, nontoxic, residue-free, and applicable to various packaging materials are of great interest in food industry, legislators and researchers. Atmospheric nonthermal plasma (NTP) is one of the potential technologies that inactivates microorganisms on packaging surfaces through formed reactive chemical species. Wetting the surfaces during the atmospheric NTP can increase the reactive species and the microbial inactivation. This study investigated the inactivation efficiency of non-thermal plasma (NTP) Corona discharge under dry and wet conditions against vegetative cells of Staphylococcus aureus, Bacillus subtilis and Candida albicans spores of Bacillus subtilis, and fungal spores of Penicillium expansum and Aspergillus niger on commonly used three polymeric packaging films. Pre-sterilized bOPP, LDPE and PET films were spot-inoculated to simulate contaminated films. The contaminated film surfaces were treated with atmospheric NTP corona discharge for various exposure times under both dry and wet conditions. The wet treatment was applied by covering the film surface with a thin layer of water during the plasma treatment. After cold plasma exposure, the viable microorganisms remained on the film surface were determined. NTP Corona discharge inactivation efficiency was determined from the difference in microbial load before and after treatment. Decontamination rates were increased significantly by wet treatment ($p<0.05$). The wet treatment caused a 1.06-log inactivation of B. subtilis spores as opposed to a 0.33-log inactivation by the dry treatment. Vegetative B. subtilis cells, which were inactivated 0.93 log in dry application on the PET surface, were inactivated 1.51 log when the surface was wetted. Plasma exposure for 1 to 3 min resulted in about 3-log inactivation of P. expansum under wet conditions while the same treatment caused up to 1-log inactivation under dry conditions. Similarly, the wet treatment for 3 min and the dry treatment for 12 min exposure caused a similar A. niger inactivation (~1.40-log). Besides, the 9-12 min dry treatments brought about 0.15 to 1.0-log inactivation, while the wet treatments caused 0.4 to 2.9-log inactivation of C. albicans for the same exposure times. The structural differences of cells affected the wet treatment efficiency. For example, fungi were more resistant than bacteria in dry treatment but they were more susceptible than Gram-positives in wet treatment. The increased inactivation efficiency of the plasma treatment under wet condition is thought to be associated with greater amounts of reactive oxidative species such as free radicals and highly oxidative molecules formed in the presence of water. The effective inactivation of microorganisms with known UV resistance such as B. subtilis and A. niger spores has shown that the Corona NTP applied under wet condition is a promising

method for decontamination of packaging surfaces. In conclusion, plasma treatments under wet conditions achieved higher microbial inactivation and would be favorable over the dry treatment. Atmospheric NTP corona discharge under wet condition has great potential in improving the decontamination of food packaging films.

ORAL

Shelf-life Extension of Refrigerated Pacific White Shrimp (*Litopenaus vannamei*) by Prior Pulse Electric Field and Vacuum Impregnation with Chitooligosaccharide-Catechin Conjugate

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Chitooligosaccharide (CHOS; β-1-4-linked d-glucosamine) is a water-soluble depolymerized chitosan and possesses antioxidant and antimicrobial properties. CHOS also possesses the reactive amino group at C-2 and hydroxyl groups at C-3 and C-6, which can favor chemical modification such as graft copolymerization of polyphenols (PPN), thus enhancing CHOS bioactivities. CHOS-PPN conjugate, especially CHOS-catechin conjugate showed enhanced antimicrobial and antioxidant bioactivities including inhibitory potential toward polyphenoloxidase, an enzyme that causes melanosis or blackening of shrimps. Therefore, CHOS-catechin conjugate was prepared and prior pulse electric field (PEF) treated Pacific white shrimp (PWS) immersed in with the aid of vacuum impregnation (VI) for shelf-life extension during storage in air at 4 ºC.Methods: For CHOS-catechin conjugate preparation, CHOS (1%, w/v) and catechin (10%, w/w of CHOS) were used for grafting via the free radical grafting method. Antimicrobial (AM) activities of CHOS-catechin conjugate were determined. Further, PWS were pretreated with PEF for 5 min at PEF intensity and number of pulses of 15 kV/cm and 800, respectively, followed by soaking in CHOS-catechin conjugate solution at different concentrations (1 and 2%, w/v) at shrimp to solution ratio of 1:5 (w/v) in combination with VI. Microbiological and chemical changes, melanosis scores, and sensory properties of treated PWS and the control were monitored during storage at 4 ºC for 15 days. Moreover, microbial diversity of PWS during storage was assessed using 16S rRNA gene Next Generation Sequencing (NGS).Results: CHOS-catechin conjugate at a concentration of 10 mg/mL showed zone inhibition toward Pseudomonas aeruginosa (12.4 mm), Vibrio parahaemolyticus (13.7 mm), Escherichia coli (9.45 mm), Listeria monocytogenes (8.9 mm), and Staphylococcus aureus (10.5 mm) more effectively than CHOS ($p<0.05$). The SEM images of tested bacteria confirmed the antimicrobial activity of CHOS-catechin conjugate, in which pores were generated and the membrane was disrupted. PWS pretreated with PEF followed by CHOS-catechin exposure at 2% (w/v) under vacuum impregnation (PWS-CC-2) yielded lower microbial loads (<106 CFU/g) than other samples up to 12 days ($p<0.05$). PWS-CC-2 possessed the lower oxidation of polyunsaturated fatty acids, which was mainly caused by free radical scavenging and antimicrobial activities of CHOS-catechin conjugate. Moreover, PWS-CC-2 possessed lower melanosis scores and higher color likeness as compared to control during storage ($p<0.05$). In addition, NGS based on the 16S rRNA gene revealed that Shewanella and Pseudomonas were dominant genera and the complete elimination of Vibrios.Discussion: The enhanced antimicrobial activity of CHOS-catechin conjugate was associated with higher total phenolic content. Its antioxidant activity was more likely due to the donation of hydrogens from CHOS at C-2 (NH2), C-3 (OH), and C-6 (OH) as well as hydroxyl groups from catechin. Catechin has 5 OH-groups, in which A and B rings possess two OH-groups each, while a dihydropyran heterocycle (the C ring) has an OH-group on carbon 3. Those are considered excellent electron donors and disrupt bacterial cell wall, which were plausibly related to higher antioxidant and antimicrobial activities of CHOS-catechin conjugate.

Moreover, the ability of EGCG to delocalize electrons might contribute to enhanced bioactivities. Microbial growth in PWS was decreased because of the antimicrobial activity of CHOS-catechin conjugate. Moreover, CHOS-catechin conjugate was linked with various amino acid residues of pro polyphenoloxidase (proPPO), including Tyr208 or Tyr209 of proPPO via van der Waals, hydrophobic interaction, and hydrogen bonding as elucidated by the molecular docking of proPPO. Tyr208 and Tyr209 regulated the activity of this enzyme. Significance: CHOS-catechin conjugate had higher antimicrobial activity than CHOS. Furthermore, the shelf-life of PWS with sensory acceptability was prolonged for at least 12 days at 4 °C.

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Effects of Using Starter Culture on Microbiological, Physicochemical and Sensory Properties of Pastırma

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Coagulase-negative staphylococci and lactic acid bacteria are two technologically important microorganism groups in pastırma production. These microorganisms, which are found spontaneously in traditional production, generally do not allow standard production and may pose risks in terms of product safety. Therefore, research on the use of starter culture in pastırma production under industrial conditions is of great importance. In this current study, it was aimed to determine the effects of the starter culture preparation containing *Latilactobacillus curvatus, Staphylococcus xylosus* and *S. carnosus* on the product properties of pastırma. In the research, sırt pastırma production with and without starter culture (control) was carried out under industrial conditions. After production, the sliced samples were packaged in a modified atmosphere (70% N_2 +30% CO_2) and stored at 4°C for 3 months. During storage (0, 30, 60, 90 days), pH, water activity, residual nitrite, thiobarbutyric acid reactive substances (TBARS), instrumental color values and microbiological properties (lactic acid bacteria, *Micrococcus/Staphylococcus* and *Enterobacteria-ceae*) of samples were determined. In addition, the samples were tested in terms of sensory properties (color, odor, taste, texture and general acceptability). As a result of the analysis, it was determined that the use of starter culture reduced the pH value, but the pH value did not fall below 5.5 in any sample during storage. The control group gave lower lactic acid bacteria count than the starter culture group. In contrast, micrococci/staphylococci showed good growth in the control group. The number of Enterobacteriaceae was found below the detectable limit (< 2 log cfu/g) in all samples. The mean water activity value was found below 0.90 in both groups. The group containing the starter culture gave lower residual nitrite values than the control group. The use of starter culture increased the a* value. While no significant difference was determined between the groups in terms of TBARS, the TBARS value increased as the storage period progressed. In sensory evaluation, the group with starter culture was evaluated with higher scores in terms of color and general acceptability compared to the control group. No statistically significant change was observed in the sensory properties of the samples during storage. As a result, it has been determined that the good growth of *L. curvatus* in the starter culture preparation (*L. curvatus, S. xylosus* and *S. carnosus*) is important for product safety, and the use of starter culture has a positive effect on the red color intensity, residual nitrite and some sensory properties of the product.

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Food Safety Sciences and Innovations for Alternative Foods: Linking Risk Assessment to Nutritional Benefits

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With the world's population projected to increase from the current 7.7 billion to 9.2 billion in 2050, food security is becoming an increasingly important global issue. Apart from the increase in population, changing consumer palate, climate change and natural resource scarcity make meeting the increased demand for food even more challenging.

The plant-based meat and alternative protein industries are taking off globally, with especially fast growth in Asia. Adequate supporting framework on the meat substitute industry is needed to ensure environmental sustainability, nutrition and food safety and understand the implications for smallholder agriculture while enhancing food supply capacity.

As not all the new crops selected for plant-based meat have been consumed in the past, technology based risk assessment would be needed for these novel foods. The risk assessment may include the following aspects: 1. Plant Food Toxicity (phenolic compounds); 2. Plant Food Allergy (oligosaccharides, proteins triggering immune response), 3. Microbial Contaminants in food processing, 4. Health impact of the novel food when consumed as intended (dietary exposure to novel food).

Despite of the limited farming land in Singapore, the city-state has launched a number of national food initiatives towards sustainable food security including from urban farming to food safety assessment to consumer buy-in of novel foods such as plant-based meat (Future Ready Food Safety Hub - FRESH, as well as Singapore Agrifood Innovation Lab – SAIL).

Globally, the shift towards sustainable food systems has sparked innovations in food sources and production systems, including cultivated meat, plant-based food products, precision fermentation, and 3D food printing.

These advancements pose regulatory challenges and opportunities, with Singapore emerging as a critical player in adopting and regulating new food technologies. My presentation explores the international landscape of new food sources and production systems, focusing on Singapore's role and regulatory approaches compared to global practices.

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Balancing Sustainability and Safety in Agricultural Water

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Agricultural water is a critical resource to grow crops for a worldwide population that is increasing. When growing fruits and vegetables that are consumed raw or with minimal processing, contamination of these crops from irrigation water of poor microbial quality is a significant health risk. Numerous outbreaks with bacterial pathogens like *Escherichia coli* O157:H7, *Salmonella enterica*, and parasites have been traced back to poor quality irrigation or agricultural water. Ensuring the microbial quality of irrigation and agricultural water is a priority. However, as climate change, population growth, and economic development strain water resources, agricultural water scarcity threatens crop production. New approaches and strategies must be implemented to utilize surface water, recycled (reclaimed) water, and rainwater to replace the use of groundwater. However, the microbial risks and appropriate mitigation steps must be in place to decrease the risk of microbial contamination. Surface water may contain bacterial, viral and parasitic pathogens that can contaminate fruit and vegetables. Surface water sources may require extensive characterization through longitudinal analysis to determine their suitability for agricultural irrigation. These characterizations can determine the most appropriate mitigation strategy to apply to decrease the risk of contamination. Concurrent in-depth characterization of recovered pathogenic or fecal indicator isolates (antibiotic resistance of pathogens or fecal indicators from these waters) can also be conducted. Similarly, recycled or reclaimed water represents an abundant and relatively consistent source of water to be used in agricultural production. However, concerns about microbial risks from these waters also exist. Several research studies have longitudinally examined these pathogens in different types of water.

During this talk the topics the surveillance of surface waters (rivers, ponds) and recycled wastewater for bacterial pathogens and fecal indicators will be addressed. As the use of recycled wastewater is considered in agricultural production, regulations in the U.S., including specific states, and from other trade will be discussed to examine their effect on the use of this resource. Ongoing research projects examining cost-effective interventions to harvest rainwater of sufficient microbial quality, along with strategies to simultaneously reduce parasitic and bacterial pathogens, will be discussed. This session will address if using more available and sustainable water resources in agricultural production can be conducted in a manner that limits or decreases the risk of microbial contamination in fruits and vegetables.

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Micro/Nanoplastics Pollution in the Environment and Human

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In this presentation, macro, micro, and nanoplastic pollution in the environment and the food chain including human will be summarized. Large-sized plastics, most of which are of terrestrial origin, break down into micro and nanoplastics, which are rapidly entering the food chain in both aquatic and terrestrial ecosystems. In recent years, the potential risks of micro and nin particular of anoplastics to human health have also become a significant concern. This presentation aims to raise awareness of the importance of plastic pollution and its impact on environmental and human health.

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The Potential for Reducing Food Waste through Shelf-Life Extension: Actionable Insights from Data Digitization

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Digital, practical, user-friendly tools generate actionable insights for the food industry to develop effective food waste reduction strategies. This study aimed to develop a methodology behind a digital food waste estimator that may be used to calculate the potential food waste reduction and the environmental and nutritional reach impact by extending the shelf life of foods. The methodology for this tool incorporates a straightforward algorithm and robust data sources. Additionally, two case studies were analyzed and discussed to demonstrate the tool's application and effectiveness.

The results from the food waste estimator revealed that by increasing the shelf life of poultry meat by 40%, waste could be reduced by 6–7%, CO_2 emission by 457–567 kg, and water usage by 656,571–814,149 L/1000 kg of product. Meanwhile, by increasing the shelf life of bread by 20%, waste can be reduced by 5–6%, CO_2 emission by 155–192 kg, and water usage by 248,000–307,520 L/1000 kg of product. This study demonstrated that the fundamental mathematical approach to and assumptions behind the food waste estimator can be effectively used to determine the potential for food waste reduction and environmental impact by extending a product's shelf life. Extending the shelf life of food may reduce environmental impact and food waste.

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Food Safety Risks in Traditional Foods

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Traditional foods are foods that reflect the local and cultural situation of a certain geographical region and are mostly produced using traditional methods. Since our country has a geography that connects different continents, hosts many cultures, and has ecological and climatic diversity, the diversity of traditional foods is very wide. As with all kinds of food, there are many different dangers in the food production chain from field/farm to fork in the production of traditional foods and pose significant threats to public health. These threats are valid for small-scale household traditional production as well as large-scale production. In general, factors that threaten food safety can be grouped into three groups: chemical, physical and biological. In particular, foodborne biological threats, with their varying levels of disease-causing ability and antimicrobial resistance potential, are gaining importance in these groups. In this context, in order to ensure consumer safety, the chain from farm/field to fork in traditional food production must be followed and recorded. It is important to inform the public on this issue. Traditional food does not always mean healthy and safe food.

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Mycotoxigenic Fungi and Mycotoxins in Dairy Products: Risks, Preventive Strategies and Analytical Approaches

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Mycotoxigenic fungi present significant economic and health risks by contaminating dairy products, including cheese and yogurt, with durable mycotoxins that withstand high temperatures. The persistence of these toxins throughout dairy processing and production stages poses a substantial threat to human health. Given the susceptibility of dairy products to fungal spoilage during production, ripening, and storage, there is an increased risk of mycotoxin formation if the involved fungal strains are mycotoxigenic. Identifying these strains involves isolating them from the product, molecular identification, and characterizing the genes responsible for mycotoxin biosynthesis. Innovative strategies to this risk include DNA barcoding for species identification, developing multi-mycotoxin detection methods with enhanced sensitivity, creating biomarkers for exposure assessment, improving predictive models for mycotoxin contamination, and understanding the correlation between empirical results and standardized methods. Furthermore, the adoption of Good Agricultural Practices (GAP), Hazard Analysis and Critical Control Points (HACCP) systems, risk analyses, along with the exploration of metabolomics and metagenomics, offers promising pathways for assessing and managing the mycotoxigenic potential of fungal strains in dairy products. In Turkey, the production and ripening of various cheeses, such as Divle Obruk, Konya Moldy, Erzurum Göğermiş, Moldy Civil, Isparta Moldy Çömlek, and Kayseri Çömlek Cheeses, involve unique fungal strains due to distinct environmental conditions. For instance, Divle Obruk cheese become contaminated with diverse fungal strains that have adapted to the particular cave environment where cheese ripening occurs. Identifying and analyzing these strains for mycotoxin biosynthesis genes are critical steps towards ensuring the safety of mold-ripened cheeses. By eliminating mycotoxigenic fungi and incorporating potential beneficial fungi, while the safety and quality of cheeses are ensured, sensory attributes are also improved through the fungal enzymatic activities. By adopting this approach, Turkish moldy cheeses would gain international recognition.

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Food Safety in Traditional Meat Products

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Traditional foods are important products that play a role in maintaining cultural heritage with their characteristic features. It is essential to protect such types of products by legal regulations and to examine the changes to be made in production from the lens of food safety. Many food products, including meat products that are marketed as "traditional" products do not reflect the characteristics of those traditional products. The application of traditional production methods in small and medium-sized enterprises is decreasing day by day and fast production methods are preferred. Although it is possible to produce reliable products by applying traditional methods in the production of sucuk, pastırma and kavurma, the production of such products must be controlled by determining food safety and process hygiene criteria. However, preserving the characteristic features of the products is also of great importance. In addition, it is thought that efforts to introduce traditional foods into industrial production, provided that their typical characteristics are preserved, can contribute to widening of product diversity as well as transferring traditional foods to future generations as a part of cultural heritage.

In the traditional production of sucuk, which is a dry fermented sausage type widely produced in Türkiye, fermentation temperatures are increased to very high levels. In these types of products, Staphylococcus aureus poses a risk for product safety. In addition, Esherichia coli O157:H7 and Listeria monocytogenes are important foodborne pathogenic microorganisms that must be kept under control. Nitrite may be used in traditional sucuk production in amounts that exceed the legal threshold levels. Since sucuk is generally consumed by barbecuing or grilling, the risk of nitrosamines in these products increases significantly and this negatively affects product safety. On the other hand, in the production of pastırma, which is classified as an intermediate moisture food, the curing process is extremely vital for the product safety. It is important to keep the temperature low until the salt and curing agents penetrate into the inner parts of the meat to prevent the growth of foodborne pathogens. S. aureus is particularly considered an important pathogen in pastırma. Since the pH value generally does not fall below 5.5 during pastırma production, other hurdle effects are important in controlling this pathogen. However, if meat with high pH value is used as raw material in the production, product safety is negatively affected due to insufficient salt diffusion and nondecreasing water activity. L. monocytogenes, S.aureus and Clostridium perfringens may pose risks in kavurma, which is an uncured-cooked meat product. Especially kavurma kept open in sales outlets pose a risk in terms of food safety. In small-scale enterprises, the desired quality characteristics of traditional meat products cannot always be achieved due to the lack of scientific and technical knowledge and fluctuations in raw material quality. It is thought that conducting comprehensive research on traditional products such as sucuk, pastırma and kavurma, provided that the product features are

preserved, will contribute significantly to the delivery of these products to a wider audience.

In fact, there are a sufficient number of hurdle effects for each traditional product. Some modifications in the production of traditional meat products are possible in the light of developments in food science and technology, provided that the characteristic features are preserved in the production process of these products. In this study, sucuk, pastırma, kavurma and some other traditional products were evaluated in terms of product safety and recommendations were made.

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Assessment of Seafood Safety in Turkey: A Mussel Case Study

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Mussels (*Mytilus galloprovincialis*), commonly known as black mussels or Mediterranean mussels, are members of the Mytilae family and are renowned for their high nutritional value and health benefits. Widely harvested along the Mediterranean, Atlantic Coast, Black Sea, Marmara Sea, and Bosphorus, mussels are rich in omega-3 polyunsaturated fatty acids, essential minerals, astaxanthin, and beta-carotene, making them an important dietary component. In recent years, there has been a surge in the production of farmed fish, crustaceans, and mussels in Turkey, with significant investments aimed at their further expansion. This trend is mirrored globally and has led to the proliferation of mussel farms across the country. Mussels are filter-feeding and their dishes prepared from mussels collected under uncontrolled conditions in their natural environment. Especially, black mussels are at risk of bacterial contamination due to environmental conditions. If mussels are not properly cleaned or processed, the presence of bacterial pathogens can endanger human health and lead to food poisoning. Therefore, despite efforts to increase food safety through farmed mussel production and improved processing practices, ensuring proper handling and processing of mussels is essential to minimize health risks for consumers. Despite the increase in farmed mussel production in recent years and the attention paid to food hygiene in the production process, mussel consumption remains a risky product in terms of food safety, although the risk of toxic metal contamination is minimized. Mussels are predominantly consumed in Turkey as fried mussels and stuffed mussels, with the shift towards using farmed mussels in most restaurants and retail markets due to the rise in aquaculture production. Despite their widespread popularity, mussel consumption comes with inherent food safety risks. Mussel dishes made from mussels harvested in uncontrolled natural environments may contain pathogens, posing potential health hazards like food poisoning. Stuffed mussels, a beloved traditional delicacy enjoyed across coastal regions of Turkey (including the Marmara, Aegean, Black Sea, and Mediterranean regions), are particularly vulnerable to these risks. Contributing factors include the use of non-fresh mussels, unhygienic production processes, and inadequate storage conditions, all of which can encourage bacterial growth and elevate the risk of foodborne illnesses. It's crucial to prioritize the quality and safety of ingredients used in stuffed mussels and to adhere to strict hygiene standards during production to mitigate these risks. Despite occasional reports of food poisoning linked to stuffed mussel consumption in Turkey, implementing rigorous quality control measures and raising consumer awareness can help minimize health risks. When consuming mussels, it's important to be mindful of these food safety considerations. Opting for mussels from reputable suppliers known for their adherence to stringent quality and hygiene standards is advisable. Additionally, thorough cooking of mussels before consumption to eliminate potential pathogens is essential. Proper storage of mussels in refrigerated conditions and timely consumption are also crucial steps to maintain their safety and quality. By staying vigilant about these factors, consumers can enjoy mussels safely and without concerns about foodborne illnesses.

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Management of Mycotoxins in Dried Fruits and Nuts

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Mycotoxin is one of the most important food safety problems in nuts and dried fruits, which have an important place in global consumption habits and are becoming more important with new generation nutrition strategies. Mycotoxins are secondary metabolite produced by filamentous fungi that have toxic effects on humans and animals. Depending on the type of mycotoxin and the dose of contact, acute as well as chronic effects (carcinogenic, teratogenic, tremorgenic, hepatotoxic, nephrotoxic and neurotoxic) are reported. Mycotoxins are produced by various fungal species, the most important and most common in food are those produced by the genera Aspergillus, Penicillium and Fusarium.

Food products can be contaminated with mycotoxins pre-and post-harvest. Contamination of food or agricultural products with toxin-producing molds is not sufficient for mycotoxin formation, favorable conditions for mycotoxin production must also be present. Factors affecting mycotoxin formation include fungal species diversity and strain variation, host plant type, age, susceptibility and health, soil characteristics, moisture content, irrigation, temperature, microbial population, presence of other toxins. Fungal growth and mycotoxin formation largely depend on the moisture content of the substrate, temperature, and relative humidity of the environment. It is not possible to control mycotoxins in agricultural products after they are formed. Most mycotoxins are chemically stable and survive food processing.

Türkiye is among the world leaders in the production of dried figs, raisins, dried apricots, hazelnuts and pistachios. Aflatoxin (AF) and Ochratoxin-A (OTA) are the main mycotoxins that cause risk for these products. Many countries have established regulations for mycotoxins to protect the health of consumers. With the European Commission revised on maximum levels for certain contaminants in food regulation (Regulation (EU) No. 2023/915) in 2023, the Turkish food codex contaminants regulation was also revised and a time period was given for the implementation of new limits for mycotoxins in some products. The limits set by these regulations for products marketed for the final consumer: AF-B1 5 µg/kg, total AF 10 µg/kg in hazelnuts; AF-B1 8 µg/kg, total AF 10 µg/kg, OTA 5 µg/kg in pistachios; AF-B1 2 µg/kg, total AF 4 µg/kg, OTA 8 µg/kg in raisins; AF-B1 6 µg/kg, total AF 10 µg/kg, OTA 8 µg/kg in dried figs. Between 01.01.2020 and 01.03.2024, a total of 380 notifications were made in the Rapid Alert System for Food and Feed (RASFF) for mycotoxin risk related to dried fruits and nuts imported from Turkey. Among the notifications, aflatoxin was reported in 191 dried figs, 89 pistachios and 11 hazelnuts. For OTA, RASFF alerts were issued in 12 raisins, 57 dried figs and 1 pistachio.

Fungal growth starts in the field and increases during harvesting and storage as long as favorable conditions for growth/mycotoxin production persist. In order to prevent product loss and to protect human health, mycotoxin risk should be kept under control starting from the field and including all subsequent steps. Mycotoxin

management strategies should be considered to suppress mycotoxin formation at all stages of production including harvesting, drying, transporting, storage and distribution. Environmental and climatic conditions play a critical role in the contamination of foods with mycotoxins. The integrated use of good agricultural practices (GAP), good manufacturing practices (GMP) and HACCP practices to prevent the contamination of mycotoxin-producing molds and mycotoxin formation in nuts and dried fruits will ensure that the risk is controlled.

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Providing Real-Time Cold Chain Traceability in Food Safety

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In global food trade, it is extremely important to maintain the quality of products and ensure food safety. Since food production consists of many different steps from field to fork, and after production, the final products must be sent to regional, national and/or international markets, depending on the customer, protecting the quality and safety of food throughout this process can become quite complex. Therefore, it is necessary to ensure traceability of each process throughout the products supply chain (SC).In cold supply chains, perishable food products require special attention as they are much more sensitive than non-perishable food products. Cold supply chain is defined as “the transportation of temperature-sensitive products through a SC with thermal and refrigerated packaging methods and logistics planning to protect the integrity of these shipments” (Luo et al., 2016). Therefore, temperature is the most important factor that must be monitored throughout the lifespan of perishable food products in order to extend their shelf life and ensure quality and safety. Since it is critical to detect problems as soon as possible, decisions should be made quickly based on accurate information (Ruiz-Garcia, Lunadei, Barreiro, & Robla, 2009).Especially in recent years, when there is no real-time (and continuous) traceability in food safety, real protection of foods cannot be ensured, spoilage or loss of quality cannot be prevented even if foods are transported by cold chain, and many foods are spoiled even though they are transported by cold chain, and this situation results in high costs. appears to cause damage. This situation has revealed the need for systems for "continuous and online tracking of real-time product traceability" in the cold supply chain, but when the current situation is examined, it has been determined that there is no domestic real-time technology in the field in question, and the requirements in the industry can be partially met with imported systems. It reveals that as a result of the systems installed not being real-time and the systems installed unconsciously not meeting the expectations, a 20% loss during transportation in frozen or fresh vegetables in cold chain transportation has become naturally acceptable.In this literature review, in line with the information mentioned above, which traceability solutions are currently available for the purpose of maintaining quality and safety in food systems have been researched and classified. The results from this review were then analyzed in detail to obtain a basis for technical solutions based on the current state of knowledge and to identify possible traceability structures in the cold chain.The aim of this study is to both analyze the problems experienced when there is no real-time traceability in cold chain transportation and some solution suggestions with real data, and to investigate different types of identification technologies used for real-time cold supply chain traceability. It is aimed to define the cold chain technologies and techniques

used, to reveal their advantages and disadvantages, and to map which system can be used in which products. Thus, a unique Decision Tree was created to select a suitable technical solution. The KDS created in this study will help the user determine the type of traceability technology and structure that best suits their products. The information obtained as a result of this literature study and the unique decision tree will shed light on the design and development of real-time domestic cold chain monitoring and management technology and systems. With the development and widespread use of these systems, food waste will be minimized and access to fresh food, which is increasingly important, will be provided safely.

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Coating Technology in Plastic Packaging and Recycling

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Food safety is the set of standards and precautions that must be followed in the production, processing, storage and consumption of food to protect human health. These standards and measures include food producers, processors, distributors and consumers. Food safety aims to minimize the risks of chemical, microbiological and physical contamination in foods and to ensure that foods to be delivered to the the consumer safely.

Plastic packaging produced in various cheap petrochemical plants from oil refineries is of very high quality and is widely used in the food industry. Plastic packaging offers a number of advantages for protecting, storing and containing food flows in the food industry. In the food industry, the use of PET (polyethylene terephthalte) packaging, which has thermoplastic properties and is completely recyclable, is common. PET (polyethylene terephthalate) bottles are commonly used for the sale of carbonated beverages, such as refillable soft drinks. However, carbonic acid found in carbonated beverages may show the barrier properties of PET. This acid can penetrate into the core of the PET bottle and reduce the filter feature of the PET bottles. This period may be further exposed during soft drinks, especially under pressure with carbonic acid. In this case, the gases inside the PET bottle can leak out and get air from outside. This may affect the quality and taste of the product, because the taste of carbonated drinks often depends on the presence of carbohydrates (CO2). However, PET bottles are often reinforced with additional coatings or technologies for CO2 barrier properties. For example, coating materials can be applied or multilayer structures can be used to provide a CO2 barrier to the inner surfaces of PET bottles. These technologies prevent CO2 leakage to preserve the quality of the beverage and increase the durability of the packaging. The coating is transparent like glass but flexible, impact and friction resistant. Additionally, it greatly reduces diffusion and extends the shelf life of beverages. However, thanks to technologies developed by the packaging industry, the CO2 barrier properties of PET bottles can be increased and the quality and freshness of the beverage can be maintained.

To improve the gas barrier feature of PET bottles used in today's industry, Coating, Multilayer, Blending and Oxygen scavenger technologies can be used alone or in combination. As a result, each technology displays different properties. Bottle coating technology is widely used in the beverage industry. Because coating materials protect the product beverage against external factors and prolong the shelf life of the product, as well as providing healthier products by reducing the risk of product taste, odor and contamination that may come from outside. Harmful wastes, which have been produced as a result of the use of fossil fuels in the production phase of plastic packaging for years, are recycled by ensuring that the product comes into contact only with glass, thanks to the coating technology, reducing natural resource depletion by ensuring the reuse of resources, saving energy and reducing the amount of waste. It can be evaluated in a wide range from the selection of

packaging materials to the establishment of recycling facilities.

In the recycling of plastic packaging, the plastic packaging that is first collected in containers is subjected to a rough screening process in the collection and sorting facility where they are brought. In this section, plastic packages are separated according to their types, converted into smaller volumes, and the products are stocked after washing and drying. After the broken particles separated according to their density (PET, PE, PVC, etc.), a second washing process is carried out with chemicals. After the rinsing and metal control processes following washing, the particles are dried, and the cleaned plastic particles come to the extruder, allowing the extruder to turn the plastic particles into granules at the end of the melting process. These resulting granules can enter production as primary raw materials. As a result, it aims to protect natural resources, reduce the amount of waste and minimize the carbon footprint by producing recyclable, renewable and environmentally friendly materials. In this way, it may be possible to produce neutral CO2 with renewable coating technology.

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ORAL

Ready to Eat Products in Flexible Packaging as an Emergency Food in Response to Natural Disasters

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In natural disasters, physical, chemical, and biological pollutants damage the area where we live and the environment where the raw materials of food are grown (air, water, soil). In addition, because usual distribution network is failed, access and storage of safe food is also inadequate. Thus, ready to eat products are a good option to reach safe food due to ease of storage, ease of consumption and rich nutritional content. As an innovation point of view, flexible retortable packaging outshines conventional metal cans due to the lower weight ana less thermal process needs resulting with higher nutritional value respectively. At that point, ready to eat products in PP bowls serve as a good option. In our research, PP bowls and multilayer foil are used as a packaging material. In this study two different foil as opaque and transparent are used with MAP application as a variable group in addition to control group, which is packed with transparent foil without MAP application. MAP is applied as a mixture of 80% N and 20% CO_2. Ready meals are prepared by cooking up to 600 °C and then cooled to room temperature before filling. Each bowl is packed as 200 g. After MAP application and sealing, products are retorted under mild thermal conditions to reach one year shelf life. During the study, accelerated and real time shelf-life study is performed in terms of humidity, macronutrients, sterility, pH, internal gas content, packaging integrity and sensory attributes. Accelerated shelf-life study is done under both 350 °C and 450 °C for 6 months, while real time shelf-life study is followed for 15 months under room conditions. At the end of the shelf-life study, it is revealed that, pH level and sterility are maintained for all groups. However, O_2 level in control group and the package with transparent film rise to higher than 1%, while the group with opaque film keeps O_2 level close to 0%. Humidity level of content is maintained better in the group with transparent foil comparing to the other groups. 5% humidity loss is measured at the end of the shelf-life study for the group with the transparent foil while others lost 15%. Additionally, at the end of the shelf-life study, sensory evaluation conducted by 25 panellists show that the group with opaque film has higher ranking comparing to the other groups as 3.6 out of 5. Especially colour ranks are far better than other groups as 4.2 out of 5. As a conclusion, ready to eat products with flexible packaging like PP bowls give reasonable shelf-life as one year to create good options under emergency conditions like natural disasters. As a further study, thermal or non-thermal preservation techniques can be studied to optimize shelf life in terms of food quality and safety. Moreover, in order to achieve better shelf-life more than 1-year in terms of quality attributes, different gas combinations and packaging materials can be evaluated.

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ORAL

Six Steps to Preventing Physical Contamination

Uğur Tuncer

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This Presentation explores different types of physical contamination that can occur in a food or beverage manufacturing facility and what manufacturers can do to mitigate contamination risks.

It sets out the dangers that physical contaminants pose to both manufacturers and consumers and examines the impact of product recalls. The Presentation explains the importance of zero contamination and highlights six ways to prevent physical contamination to help manufacturers improve safety on their production lines.

Topics Covered:

- Types of contamination
- Impact of product recalls
- Importance of zero contamination
- Six steps to preventing physical contamination
- Product inspection technologies from METTLER TOLEDO

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UV-C Light Application in Cheese Brine

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In recent years, non-thermal technologies (UV light, cold plasma, ultrasonication, pulse light, high-pressure application) have attracted attention as an alternative to heat treatment. Among these technologies in the dairy industry, the interest in ultraviolet (UV) light technology to improve food safety is increasing day by day. New developments in UV applications have shown that microbial safety can be ensured by using the lethal effect of UV not only on solid surfaces but also on liquid and fluid products. The ability to process the cheese brine with UV-C light with microbial quality equivalent to pasteurization will be beneficial in terms of both economic and sustainability. While obtaining a microbiologically safe brine, energy and operating costs will be reduced. In this study, the device named RaslysationTMPolaris/test system was used. The possibilities of UV-C application as an alternative to pasteurization of brine, which is used in feta cheese production to give salt in the vat and collected back from the vats at the end of the process and pasteurized and reused, were investigated and the effects of UV-C application on brine were examined. In RaslysationTMPolaris patented system, turbulent flow is provided to the liquid through specially designed coils, while UV-C is homogeneously applied to the entire liquid product through the coil. The UV-C source operates at 254 nm. At the first stage of the study, 3 different diameter coils (5-7-10 mm) and 3 different UV-C intensities (60%-80%-100%) were applied to determine the appropriate coil diameter and UV-C intensity. The flow rate was used as 400 l/h. The inlet temperature of the raw brine used in the study is 20 °C. Raw brine was exposed to UV-C light by passing through the device at 20 °C temperature at 60%, 80%, and 100% UV-C intensity respectively. It was observed that the temperature increase in the brine at the exit of the device increased by a maximum 1 °C after two cycles. The processed brine obtained after two cycles was subjected to microbiological and sensory analysis. In microbiological analyses, total aerobic mesophilic bacteria (TPC), Enterobacteriaceae, mold and yeast inoculation were performed. With a 7 mm coil, it was determined that the initial TPC load of 15800 cfu/ml decreased to 2 and 1.5 cfu/ml with 60% and 80% intensity UV-C application respectively, and <1 cfu/ml with 100% intensity UV-C application. While the initial Enterobacteriacea, mold, and yeast counts were 42, 12, and 24 cfu/ml respectively, they decreased to <1 cfu/ml after the %60-%80-%100 UV-C intensity applications. For sensorial control, UV-treated brine was used in pilot-scale feta cheese production. During the shelf life controls of the products, no difference was observed between the reference samples made with pasteurized brine. The study was repeated at different intensities with of 7 mm coil. Since UV-C has the potential to cause changes in sensory properties when applied at high intensity, studies were carried out at low intensities (15%-30%-50%) to minimize this effect. TPC, Enterobacteriaceae, mold, and yeast analyses were also performed

on UV-C treated brine. According to the analysis results, UV-C treatment at 30% and 50% intensity was found to be most effective in inhibiting the initial bacterial load.It was determined that UV-C application with a coil diameter of 7 mm and intensity between 40-50%, eliminated the microbial load in the cheese brine, and there was no sensory difference between the treated brine and pasteurized brine. It is thought that UV-C treatment can be used as an alternative application to pasteurization to make cheese brine microbiologically safe, and it can be evaluated in industrial-scale productions by further larger-scale studies in this field.

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ORAL

Innovative Multiplex Detection of Antibiotics in Milk: Enhancing Food Safety and Fermentation Processes

Olga Matveeva-Kolm

Unisensor, Liege, Belgium

The widespread use of antibiotics in the veterinary sector for growth promotion and disease treatment in livestock has raised significant concerns regarding food safety and human health. A notable portion of these antibiotics is excreted through the milk of dairy animals without alteration, posing potential risks to consumers. This presentation explores the detrimental effects of antibiotic residues in milk, particularly on the fermentation processes critical for cheese and yogurt production, and highlights the innovative solutions developed by Unisensor for detecting these contaminants.

Antibiotic residues in milk can adversely affect the fermentation process by inhibiting or killing the lactic acid bacteria essential for acidification and flavour development in cheese and yogurt. This disruption not only compromises the quality and safety of the final product but also facilitates the growth and selection of antibiotic-resistant bacteria, thereby further impairing product integrity. The specific impact of antibiotics on fermentation varies depending on the type of antibiotic used, dosage, duration of treatment, and the strains of lactic acid bacteria involved.

Given these challenges, it is crucial for the dairy industry to implement stringent monitoring and control measures over antibiotic use to mitigate their impact on product quality and safety. Since its establishment in 1997, Unisensor has emerged as a leader in diagnostic engineering for the agri-food and veterinary sectors, specializing in the detection of a broad range of contaminants. Our unique multiplexing approach allows for the simultaneous detection of various contaminants, including residues of veterinary drugs, toxins, and adulterants in dairy products and meats.

The Extenso platform, a cornerstone of our technological advancements, enables the detection of over 100 different antibiotics in milk. This capability is essential for ensuring the quality and safety of fermented dairy products. By leveraging such advanced diagnostic technologies, the dairy industry can better safeguard consumer health and maintain high production standards.

This presentation at the Food Safety Congress will delve into the implications of antibiotic residues for dairy fermentation processes and discuss how cutting-edge technologies like those developed by Unisensor can play a pivotal role in addressing these challenges, thus supporting the global commitment to food safety and public health.

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Discovery of Peptide Biomarkers for Meat Identification Purposes Using Proteomic Approaches

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Food adulteration is a global issue where the integrity of the food supply chain is compromised, posing serious health risks and violating religious and dietary restrictions. Most of this malpractice is intentionally adding of pork meat to beef products to make it cheaper. Despite numerous legal measures that have been taken, the fight against meat adulteration requires rigorous enforcement of food safety regulations, advanced detection methods and increased consumer awareness to ensure authenticity and safety. DNA based detection of meat type is widely accepted, however DNA is vulnerable to degradation when it is heat processed. Firstly, this research focuses on the discovery of peptide biomarkers of heat-stable proteins of pork meat for authentication purposes. The second aim is to quantify pork meat adulteration in beef using discovered pork peptide biomarkers.

Method. Certified reference material (CRM) of 100% pork and 100% beef meat were produced for analytical purposes. Initially, the meat was ground to ensure uniformity in texture and composition. Following grinding, it was autoclaved to eliminate any biological contaminants and ensure the stability of the sample. Finally, the autoclaved meat was lyophilized, transforming the meat into a dry, stable powder. This lyophilized product serves as a CRM, offering a reliable standard for analytical methods aimed at identifying and quantifying biomarkers in pork meat. The efficiency of protein extraction was investigated using various lysis buffers which aimed to identify the buffer that maximizes protein yield. Filter-aided sample preparation (FASP) technique was used to prepare tryptic peptides to remove substances that could interfere with downstream LC-MS/MS proteomic analysis. Proteome Discoverer was used to identify tryptic peptides in which the candidate biomarkers were chosen by filtering the results of whole proteomic analysis in terms of parameters such as sequence length, retention time and abundance of the peptide. A BLAST search was performed on the Uniprot database for candidate biomarker peptides to identify whether they are pork-specific or not. Then Uniprot Align tool was used to confirm these data by aligning peptide sequences of related proteins. Pork and beef CRM's were mixed to prepare 1%, 5%, and 10% pork content, and a PRM method was developed to quantify identified biomarker peptides in the mixtures. *Results*. Four lysis buffers were compared for protein extraction and peptide yield: T-PER RIPA, SDS/Tris buffer (0.5% w/v SDS in 50 mM Tris/HCl, pH 7.6), and Urea/Thiourea buffer (7 M Urea, 2 M Thiourea in 50 mM Tris, pH 8). Proteome Discoverer identified 9255,

10884, 10899 and 10376 peptide sequences respectively. Therefore, SDS/Tris Buffer was determined as the best option because of its remarkable effectiveness. Seven pork-specific biomarkers were identified belonging to the most abundant protein groups (myosin, albumin, hemoglobin, and carbonic anhydrase) in the pork meat tissue. Identified pork meat biomarkers in the beef matrix can be detected at 1% level by the PRM method.

Discussion. Our studies reveal that the authentication and quantification of meat products can be effectively accomplished through proteomic approaches, introducing a new dimension to the field. This advanced detection method plays a crucial role in ensuring the authenticity of food products.

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ORAL

Method Optimization for Detection of High Polar Plant Growth Regulators and Pesticides in Different Agricultural Commodity Matrices

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The high polar chemicals as the plant growth regulators, chlormequat and mepiquat, and the herbicides, diquat, are used widely during agricultural practices. The residues of these compounds on fresh agricultural commodities should be monitored because they cause adverse effects on reproduction and development of the mammals. The aim of this study was to validate an analytical method for the detection of these high polar compounds using inhouse method in 4 different matrices representing different groups by using LC-MS/MS. Methods: The raisin, lentil, chestnut and tomato samples without pesticides were provided by Perla Fruit Company. The validation of each compound was evaluated based on SANTE/11312/2021 Guidelines. The extraction of the compounds was conducted by using a inhouse method without PSA-clean up. In the method, 10 g of homogenized sample was weighed in 50 mL polypropylene centrifuge tube and spiked with the standard mixture of the compound to prepare matrix-matched calibration. Then, 10 mL of methanol and 0.1 molar HCl (1:1, v/v) was added to sample tube. After the tubes were shaken for 1 min vigorously, they were put in ultrasonic bath at 80ºC during 15 min. They cooled to room temperature and shaken vigorously for 1 min and centrifuged for 5 min at 3000 g. After centrifugation, the supernatant was filtered with 0.2 µm membrane filter. The final extract was diluted (1:5 ratio) in methanol. Results: The linearities (r2) of all compounds were quite confident (diquat 0.993-0.995; chlormequat 0.991-0.997; mepiquat 0.996-0.999). The LOQ values of diquat, chlormequat and mepiquat were 6.08-7.73; 6.98-9.06 and 5.66-6.79 µg kg-1, respectively. The detection limits were under their Maximum Residue Limits (10-20 µg kg-1) for all compounds. The recovery rates of the compounds for two spike levels (10 and 50 µgkg-1) were calculated between 79-114% and 92-109% for diquat; 87-103% and 104-118% for chlormequat; 86-107% and 86-104% for mepiquat, respectively. The rates did not exceed the confidential interval (70-120%) mentioned in SANTE/11312/2021 Guidelines. The highest repeatability RDSr and reproducibility RDSR values for two spike levels (10 and 50 µgkg-1) were 12.18 and 12.71%, respectively. All values were under the SANTE's limit (<20%). Discussion: The validation data of all compounds for four matrices obtained in LC-MS/MS analysis was quite reliable and

were in line with the SANTE/11312/2021 Guideline. To accurate detection and decrease health risks of these agricultural chemicals, the use of optimized and modified inhouse method in Food Control Laboratories is highly suggested.

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Recent Honey Adulteration Practices and Comprehensive Review on Commonly Used Analytical Approaches to Detect Honey Fraud

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Over the years, honey has become increasingly popular due to its unique taste and known therapeutic properties. Owing to the increasing interest in natural nutrition, the destruction of nectar sources, the gradual decline of bee populations, contrarily the growing human population, and the elevated costs of beekeeping made it impossible to fulfill the demand. Honey is the third most adulterated food product worldwide and in 2023, JRC reported that 46% of the honeys imported into the EU are suspicious of not complying with the EU directive. Counterfeit honey is becoming a global and massive problem since products threaten human health and deceive people economically. Thus, quality control and R&D activities have attracted great attention and the necessity of promising analytical methods for sensitive and accurate detection of multiple modes of adulteration is growing recently. Honey is prone to be adulterated directly or indirectly by using inexpensive sugar syrups, lower quality elements such as enzymes, and food dyes. The highly complex and dynamic nature of the honey makes adulteration identification challenging. Physicochemical assays alone are not sufficient to fully understand the authenticity. Palynological investigations are well established to report botanical origins but not satisfying in terms of adulteration identification. The most commonly used sugar syrups in honey adulteration are inverted syrups produced by inversion of beet or cane sucrose as the C3 plant sugar, syrups that of produced from liquefied starch such as high fructose corn/maize syrup (HFCS), brown (BRS), white rice syrups (WRS) or inulin based syrups (e.g. agave, manioc) [3]. Isotopic fingerprints of the C4 sugars are benefited to detecting HFCS or cane syrup utilizing the well-harmonized AOAC 998.12 method and EA-IRMS instrumentation. Enzymatically inverted sugar syrup is detected by β-Fructofuranosidase assay. Meanwhile, the LC-EA-IRMS system has been widely used and suggested to detect both C3-C4 sugar syrups simultaneously. Sorbic acid and AFGP molecules are suggested to be the reliable markers of BRS and WRS respectively and monitored via LC-MS systems. Foreign polysaccharides are typically screened by HPAEC-PAD or LC-MS systems to report starch-based syrup usage. Syrup production process-related rare sugars such as mannose, psicose, or DFA as caramelization by-products are assumed to be adulteration-linked impurities in honey. Other than syrups, exogenous alpha-amylase originating from foreign microorganisms may also be added to mask the lowered diastase level. Colorimetric enzyme assays by using multiple substrates and alternative dilute and shoot preparation combined with HPLC detection are the techniques used to figure out these enzyme residues. Caramel color dyes are used to mimic honeydew honeys and artificially darkened honeys could be identified by following the amounts of imidazoles. Besides, false declaration of the origins and mislabelling approaches especially for mimicked honeydew and monofloral honeys, ultrafiltration, or

resin processing to exclude the aged or adulterated honey markers are also present as known frauds. Other than applied techniques like FTIR and Raman spectroscopy, NMR and HR-MS are the far most efficient analysis options among the untargeted analyses recently. Higher sensitivity, improved resolution, and retrospective investigation options made them the first choice. However, the need for both local and global authentic and adulterated honey databases seems to be a major bottleneck. Varying geographical and botanical origins of honeys lead to inconsistent physical-chemical compositions and this creates a huge and dynamic sample pool which causes data misinterpretation. Honey adulteration evolved with the sole objective of deceiving laboratory tests. Current conventional techniques are not able to detect new modes of adulteration, as markers can be manipulated. As no method can uncover all adulterations, there is always a need for multi-marker and/or comprehensive non-targeted methods to tackle dynamic frauds.

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Validation of Multi-residue Analytic Method for Detection of Some Biocides in Different Agricultural Commodities

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Hypothesis: Didecyldimethylammonium chloride (DBAC) and benzalkonium chloride (BAC) are multi-use biocides that are used for surface cleaning. Since these compounds show broad spectrum activity against bacteria and fungi, they are widely used in greenhouse disinfections. These chemicals may be environmentally persistent depending on local conditions. They are highly toxic to aquatic invertebrates and moderately toxic to fish and mammalian if ingested. Additionally they display adverse effects on reproduction, development and nervous systems of mammalians. They may contaminate fresh vegetables and fruits, and European Union (EU) authorities recommend monitoring their residues on various agriculture commodities. The aim of this study was to validate an analytical method for the detection of BAC and DBAC with their C10-C18 and C8-C12 homologues using LC-MS/MS and QuECHeRS extraction in 4 different matrices (raisin, lentil, chestnut and tomato).

Methods: The raisin, lentil, chestnut and tomato samples without any chemicals were purchased by Perla Fruit Company. The extraction of the compounds on samples was performed by using a suitable kit for fresh fruit and vegetables according to AOAC 2007.01 QuEChERS method. Briefly, fifteen grams of sample were mixed vigorously for 1 min with 15 mL acetonitrile. Then, anhydrous magnesium sulphate (6 g) and sodium acetate (1.5 g) were added to the tube contents and shaken vigorously for a further 1 min. The tubes were then centrifuged at 4000 rpm for 1 min. The supernatants were carefully transferred into 15 mL falcon tubes containing anhydrous magnesium sulphate (1.2 g) and PSA (400 mg). The tubes were vortexed for 30 s and centrifuged at 4000 rpm for 1 min. The supernatants were passed through 0.2 mm membrane filters and transferred into auto-sampler vials for LC–MS/MS. The validation of each chemical was evaluated according to SANTE/11312/2021 Guidelines. Linearity was tested with six levels ranging from 2.5 to 250 mg L^{-1}. Recovery rates and precision values were calculated using the results from two analysts at five different times for two different levels (10 and 50 mg L^{-1}). 2.5 mg L^{-1} of the compounds was used for calculation of limit of quantitation (LOQ) values.

Results: The linearities of DBAC and BAC and their homologues were quite confident (r^2= 0.997-0.999) for all matrices. The LOQ values of DBAC and BAC were 2.70-3.04 and 2.61-4.51 µg kg^{-1}, respectively. The detection limits were under their Maximum Residue Limits (MRL: 50 and 100 µg kg^{-1}) for DBAC and BAC and their homologues, respectively. The recovery rates of the compounds from all matrices for two spike levels (10 and 50 µg kg^{-1}) were calculated between 93-97% and 95-100% for DBAC; 79-99% and 85-98% for BAC, respectively. The recovery percentages are found within the confidential interval (70-120%) mentioned in SANTE/11312/2021 Guidelines. The highest repeatability RDSr and reproducibility RDSR values for two spike levels (10 and 50 µg kg^{-1}) were 11.04% and %12.91, respectively. All RSD values were lower than the SANTE's limit (<20%).

Discussion: The validation data of both compounds and homologues for different matrices represented four groups obtained in LC-MS/MS analysis was compatible with the SANTE/11312/2021 Guideline. The optimized method provided fast and reliable detection of these biocides on different agricultural commodities and can be used for residue monitoring programs.

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Detection of Adulteration in Fig Seed Oil Sold in Turkish Markets using FTIR Sensors and Chemometrics

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The aim of this study is to identify the presence of adulteration in fig seed oil sold in the market. Samples were obtained from producers in the Aydın region and online sellers across Turkey to uncover any fraudulent practices through analysis. This research is crucial for ensuring consumer safety and product quality. Current analysis methods used for characterizing oils and detecting potential adulteration are time-consuming, expensive, and labor-intensive, nvolving complex sample preparations and skilled technicians. Our goal is to develop a reliable verification program for fig seed oils available in the market using Fourier-transform infrared (FT-IR) spectroscopy, which enables real-time applications.

A total of 39 oils labeled as 100% fig seed, including 9 oils purchased from local markets in Aydın and 30 oils purchased from online markets, were obtained. Additionally, 5 genuine fig seed oils were obtained from reputable manufacturers. All oils were analyzed using gas chromatography-flame ionization detector (GC-FID), and their fatty acid compositions were determined. Additionally, these oils were analyzed using Fourier-transform infrared (FTIR) spectroscopy. For this purpose, 75 µl of oil sample was placed on the crystal surface of the device, and the spectrum of each sample was recorded in the range of 4000-700 cm^{-1} wave numbers with a spectral resolution of 4 cm^{-1}. These spectra and fatty acid composition information obtained from the GC-FID device were modeled using Soft Independent Modeling of Class Analogy Algorithm (SIMCA).

Differences were observed in the fatty acid compositions of 17 out of the 39 oils (44%) purchased from the market compared to genuine fig seed oils in their GC chromatograms, and these samples were identified as adulterated samples. When the FTIR spectra of the samples were modeled using SIMCA, oils identified as adulterated with genuine fig seed oils formed different clusters. The use of the FTIR spectrometer has made this method an excellent alternative to traditional testing methods by providing ease of use. Potential gains and commercial advantages obtained from the mislabeling of fig seed oils are detrimental to the interests of both consumers and honest producers. Combining FTIR spectra with pattern recognition (SIMCA) shows promise for rapid and effective food component analysis.

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European Union One Health 2022 Zoonoses Report

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This report by the European Food Safety Authority and the European Centre for Disease Prevention and Control presents the results of the zoonoses monitoring and surveillance activities carried out in 2022 in 27 Member States (MSs), the United Kingdom (Northern Ireland) and 11 non-MSs. Key statistics on zoonoses and zoonotic agents in humans, food, animals and feed are provided and interpreted historically. In 2022, the first and second most reported zoonoses in humans were campylobacteriosis and salmonellosis, respectively. The number of cases of campylobacteriosis and salmonellosis remained stable in comparison with 2021. Nineteen MSs and the United Kingdom (Northern Ireland) achieved all the established targets in poultry populations for the reduction of *Salmonella* prevalence for the relevant serovars. *Salmonella* samples from carcases of various animal species, and samples for *Campylobacter* quantification from broiler carcases, were more frequently positive when performed by the competent authorities than when own checks were conducted. Yersiniosis was the third most reported zoonosis in humans, followed by Shiga toxin-producing *Escherichia coli* (STEC) and *Listeria monocytogenes* infections. *L. monocytogenes* and West Nile virus infections were the most severe zoonotic diseases, with the most hospitalisations and highest case fatality rates. In 2022, reporting showed an increase of more than 600% compared with 2021 in locally acquired cases of human West Nile virus infection, which is a mosquito-borne disease. In the EU, the number of reported foodborne outbreaks and cases, hospitalisations and deaths was higher in 2022 than in 2021. The number of deaths from outbreaks was the highest ever reported in the EU in the last 10 years, mainly caused by *L. monocytogenes* and to a lesser degree by *Salmonella*. *Salmonella* and in particular *S.* Enteritidis remained the most frequently reported causative agent for foodborne outbreaks. Norovirus (and other calicivirus) was the agent associated with the highest number of outbreak human cases. This report also provides updates on brucellosis, *Coxiella burnetii* (Q fever), echinococcosis, rabies, toxoplasmosis, trichinellosis, infection with *Mycobacterium tuberculosis* complex (focusing on *Mycobacterium bovis* and *Mycobacterium caprae*) and tularaemia.

Reference

EFSA and ECDC (European Food Safety Authority and European Centre for Disease Prevention and Control). (2023). The European Union One Health 2022 Zoonoses Report. *EFSA Journal*, *21*(12), e8442. https://doi.org/10.2903/j.efsa.2023.8442

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ORAL

Studies on Foodborne Zoonosis and Related Antimicrobial Resistance

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According to the Law on Veterinary Services Plant Health food and Feed numbered 5996, in order to decrease and to take control *Salmonella* agents that are significant for human health at the primary production phase 'National *Salmonella* Control Programme' has been established on 16.08.2018.

The basic approach of National *Salmonella* Control Programmes applied in the world countries, is primarily determining the Salmonella frequency in the production stage and then appyling *Salmonella* reduction programme based on the production type and the obtained data.

For this purpose, in our country Salmonella serotypes which are of public health importance in the primary production stage of poultry products are monitored and measures are taken to protect public health.

Foodborne zoonoses are also important because of the antimicrobial resistance that they can cause. It is known that antimicrobial resistance (AMR) is a global public health problem so AMR issue is tackled within the framework of the *One Health Approach*. In this regard 'National Veterinary Antibiotic Resistance Monitoring Project' has been carried out for the determination of the AMR profile in the indicator bacteria and some microorganisms significant for public health. Also electronic follow-up systems have been implemented in our country in order to monitor all stages of veterinary drugs, especially antibiotics and then vaccines from the production to use in animals. And studies in terms of usage of rational drugs or antibiotics are carried out in the framework of the *One Health Approach.*

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Not All Bacteria are Harmful; IPA Explores Considerations for Probiotics and Beyond

Solange Henoud, George Paraskevakos

IPA, Canada

In this session the IPA will outline the regulatory, technical, and scientific criteria for probiotics, clarifying the key differences and minimum requirements to qualify a micro-organism as a probiotic while distinguishing between harmful pathogens and beneficial bacteria. The presentation will highlight regulatory challenges and provisions across various countries, providing an overview of these issues. As IPA expands its scope to include prebiotics and postbiotics, among others, the discussion will delve into these new areas and what they mean for the industry.

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ORAL

Molecular Characterization of Bacillus spp. Isolated from Ambient Gnocchi and Evaluation of a Biopreservation Approach

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Bacillus spp. can be a risk for consumers and cause food spoilage. Fifty-four strains of *Bacillus* spp. were isolated from Italian ambient gnocchi in different storage conditions and formulations. The strains were identified and characterized by Whole Genome Sequencing (WGS), treated with *Thymus vulgaris* essential oil (TOE) and the effects were evaluated by the expression of some genes involved in stress response.

Method: The genomes of the 54 *Bacillus* strains, obtained by WGS, were identified and characterized by Ribosomal MLST tool (rMLST) and k-SNP3 analysis. Phylogenetic trees based on the housekeeping genes gyrB, rpoB, and tuf were also realized to confirm species identification. Genes distances were determined from alignments through the Jukes-Cantor method, while the dendrogram was obtained with the Neighbor-Joining method. After that, virulence factors, antibiotic resistance, and bacteriocin production genes were retrieved by the genomes by the Basic Local Alignment Search Tool (BLAST), to highlight potential negative or positive roles of the isolates in gnocchi. Then, two isolates of the most found species (*Bacillus cereus* 11 and *Bacillus subtilis* 58L) were exposed to *Thymus vulgaris* essential oil (TOE), to evaluate the Minimum Inhibitory Concentration (MIC). Subsequently, real-time RT-PCR SYBR green was used to investigate the expression of some genes involved in the stress mechanisms induced by sublethal concentrations of TOE at increasing exposure times.

Results: Phylogenetically, close *Bacillus* spp. strains were isolated from both ambient gnocchi and their ingredients, especially rice flour, starch, and turmeric, showing how the contamination of the raw materials is crucial for the safety and quality of the finished product. The pathogenic species *B. cereus*, *B. thuringiensis*, and *B. paranthracis* were isolated from not-spoiled gnocchi, and this finding represents a risk for consumers. The presence of virulence and antibiotic resistance genes in the genomes of these isolates confirms their pathogenic potential. In detail, one isolate of B. cereus and one of *B. thuringiensis* harbored the cescC gene, linked to the production of cereulide, a peptide which constitutes the emetic toxin of B. cereus, responsible for emetic syndrome and liver failure. Instead, *B. subtilis* was the most isolated species, also from gnocchi with evident spoilage (slime and reddish discoloration), and this demonstrates its ability to spoil gnocchi and grow even in non-permissive conditions. In fact, isolation from gnocchi with lactic acid in the formulation demonstrates the resistance of *B. subtilis* strains to low pH. Furthermore, some *B. subtilis* isolates retrieved genes for the

bacteriocin subtilin biosynthesis, revealing potential positive properties. Regarding the antimicrobial effect of TEO, MIC value was 1.25 µL/mL for B. cereus 11 and *B. subtilis* 58L. At sublethal concentrations (0.31 µL/mL and 0.63 µL/mL) TEO lengthened the lag phase of microorganisms and determined the upregulation of genes involved in mechanisms of response to stress due to exposure to the antimicrobial agent, such as repair of membrane damage, restoration of quorum sensing mechanisms, biofilm formation, and mobility (pbpF, spoA, plcR, sinR).

Discussion: Our data provide new insights on the spoilage and pathogenic potential of *Bacillus* spp. in ambient gnocchi, a product whose market penetration is increasing in Italy. In view of the elimination of preservatives, TEO provides a stressful effect, capable of triggering defense mechanisms. Therefore, these results are promising for future applications in food environments.

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Industrial Scale Radio Frequency Thawing of Frozen Bulk Chicken Meat: Evaluation of the Microbiological and Physicochemical Quality

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Research hypothesis. Radio frequency (RF) has been successfully used for thawing in the literature for specifically lab-scale studies. However, a feasibility study on industrial scale is required to demonstrate its adaptability for poultry industry. Hence, the objective hypothesis was to apply RF process for thawing of frozen bulk chicken meat in industrial scale and determine the microbiological quality in terms of food safety as compared to the conventional thawing methods.

*Method***.** Inactivation effect of RF and conventional thawing was evaluated on *Salmonella* Enteritidis and *Salmonella* Thyphimurium strains, the critical pathogens in chicken meat, through an inoculation study. The strains were inoculated on fresh chicken breast and thigh meat bulk (≈9 kg) in the range of 4-6 log cfu/g, individually. The inoculated samples were packaged in a retail dimension of 60×40×10 cm and frozen for 6 h in an air-circulated freezer (4 m/s air speed at -35 °C) until the center temperature reached to -18°C. After 36 hours of temperature equalization at -18°C, the bulk meats were thawed by RF and conventional methods. Thawing was perfomed by using a staggered through electric field RF system (10 kW, 27.12 MHz) at 17.5 cm electrode gap and a temperature-controlled incubator with circulated air set at 22±0.5°C (CA22) and 4±0.1°C (CA4) as conventional thawing methods. The temperature distribution during thawing was measured at four locations by fiber optic sensors. Thawing was completed when the lowest temperature reached to app. -1-0 °C. Upon thawing, meat samples were analyzed to determine the microbial inactivation effect of RF by counting *S.* Enteritidis and *S.* Thyphimurium numbers before freezing and after thawing. Additionally, total mesophilic aerobic bacteria (TMAB) counts were determined in non-inoculated thawed meat samples as well as physicochemical parameters.

Results. The numbers of *S.* Enteritidis were calculated to be 6.29, 5.34 and 6.30 log cfu/g before freezing and that of were 6.06, 6.21 and 6.26 log cfu/g in breast samples subjected to RF, C22 and C4 thawing, respectively. RF resulted in a significant reduction by 0.23 log units in breast meat ($p<0.05$) while none of the thawing methods did not show an inactivation effect in thigh meat on *S.* Enteritidis ($p>0.05$). On the other side, the number of *S.* Typhimurium decreased by app. 0.5 log units in thigh meat thawed by CA4 and CA22 ($p<0.05$), whereas RF did not show any effect on this strain. The counts of *S.* Typhimurium after inoculation were 4.06, 4.07 and 4.07 log cfu/g in thigh meat, which reached to 3.87, 3.62 and 3.65 log cfu/g after thawing by RF, C22 and C4, respectively. Regarding breast meat, the reduction in *S.* Typhimurium numbers, in the range of 0.06-0.26 log cfu/g, was found to be insignificant ($p<0.05$). No significant effect of thawing was determined

on the TMAB count in breast meat, although RF thawing resulted in significantly 1-log reduction in TMAB number as compared to CA4 and CA22 ($p<0.05$). When RF processing was used for thawing instead of CA4, the amount of thawing loss decreased by 3.5 and 6 times, respectively, in breast and thigh meat ($p<0.05$). Additionally, RF thawing results demonstrated that it might be novel industrial application to limit lipid oxidation, an undesirable consequence of the freeze-thaw process, and RF thawing resulted in the production of more tender meat as compared to conventional methods.

Discussion. RF thawing might be a novel approach for the poultry industry by decreasing process time, saving energy and minimizing the quality losses during thawing process. A reduction in thawing loss, TBARS value, and TMAB numbers were provided by RF thawing leading to a more tender meat.

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ORAL

BRCGS Food Safety Version 9- Review of Most Common Non Conformities

Evren Efe Kabagöz

BRCGS, Istanbul, Türkiye

BRCGS was founded in 1996 by retailers who wanted to harmonise food safety standards across the supply chain. Today it is globally recognised across both food and non-food categories and operate the most rigorous third party certification scheme of its type. BRCGS has the most rigorous schemes and the highest trained auditors giving the best results possible.

BRCGS is a market-leading global brand that helps build confidence in the supply chain. Our Global Standards for Food Safety, Packaging Materials, Storage and Distribution, Consumer Products, Agents and Brokers, Retail, Gluten Free, Plant-Based and Ethical Trading set the benchmark for good manufacturing practice, and help provide assurance to customers that your products are safe, legal and of high quality.

Food Safety Standard was revised and 9th version was issued at August 2022. The new version started to be implemented by the producers starting from February 2023. All BRCGS audit reports are uploaded on a platform named BRCGS Directory and BRCGS collects data regarding all the BRCGS audits performed. According to the data the most common nonconformities and the details of the findings can be analysed.

The presentation provides an overview of the most common major and minor non conformities raised globally and within Turkiye covering one year after February 2023. There is a seperate section which talks about tenvironmental monitoring programme findings in Turkey, covering details of the non conformities raised.

Also presentation focuses on the root cause analyses and reasons behind these findings. Guidelines and supportive technical documents to be used by sites and BRCGS Participate Platform have also been mentioned in the presentatiıon.

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IFS ESG Check-IFS Sustainibility Program

Ezgi Dedebas Ugur

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It aims to create a food system that ensures food security and nutrition for all, in a way that does not jeopardise the economic, social and environmental basis for future generations to sustain it in the same way. This means It is profitable from start to finish (economic sustainability); It provides broad-based benefits for society (social sustainability); It has a positive or neutral impact on the natural environment (environmental sustainability). A sustainable food system is at the centre of the United Nations' Sustainable Development Goals (SDGs). Adopted in 2015, the SDGs call for major transformations in agriculture and food systems to end hunger, achieve food security and improve nutrition by 2030. To realize the SDGs, the global food system needs to be reshaped to be more productive, more inclusive of poor and marginalized populations, environmentally sustainable and resilient, and able to deliver healthy and nutritious diets to all. These are complex and systemic challenges that require the combination of interconnected actions at the local, national, regional and global levels. As food safety and sustainability cannot be considered in isolation from each other, IFS has created a direct link to sustainability within organisational policy in the latest version of the IFS Food standard.

Sustainability has the potential to reduce the pressure of food production on social and natural resources while at the same time reducing commercial vulnerabilities. Combining environmental stewardship with a sound business plan while advancing social justice is an innovative yet profitable approach to streamlining business operations.

The best way to start in this new area is to integrate ESG criteria (environmental, social and governance) into the day-to-day operations of companies.

The IFS ESG Check verification tool has been published to ensure that companies are both compliant with new regulations and at the same time meet the sustainability expectations of their business partners in the supply chain. Companies included in the programme

- Embed sustainability into daily business as part of the company's corporate values.

- It is ready for the evolving legal environment related to sustainability and meets the expectations of stakeholders.

- Contributes to a more sustainable food system.

IFS ESG Check is designed as a modular system and so far consists of ESG and Carbon Footprint modules. The ESG module is the basic module that shall be implemented first. The rest of the carbon footprint and future modules are optional. The check is carried out on-site by approved auditors and combined with other IFS Audits or Assessments if desired.

The ESG Module is based on the implementation of the sustainability management system and focuses on top management commitment, integration of ESG criteria, negative impacts and mitigation methods and stakeholder communication.

The Carbon Footprint module focuses on data collection, calculation methodology, short and long term targets, mitigation and continuous improvement.

The Carbon Footprint module "looks at what is behind the final data". It does not verify the calculations.

Before the control, companies make their own self-assessments and share them with the auditor beforehand. According to this data, the auditor scores the ESG management system of the organisation and identifies areas for improvement.

The results of different modules are determined independently of each other and do not affect the outcome of IFS Audits or Global Markets Assessments. There is no final result of Pass or Fail. According to the final result, it is levelled as "Advanced", "Intermediate", Beginner" on a progress scale and the aim is to target improvement.

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Food Loss & Waste Reduction and Third-Party Certification to achieve SDGs

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Our planet faces a significant challenge with the projected population reaching 10 billion by 2050, while persistent hunger affects millions. Shockingly, one-third of all food produced is lost or wasted across the supply chain, an amount that could feed 2 billion people. The drivers behind this crisis are complex, including inefficient practices, limited infrastructure, and biological and environmental factors, compounded by indirect drivers such as inadequate training and governance issues. In response, as a member of the UN Global Compact committed to SDG 12 (Responsible Consumption and Production), we recognize the urgency to address this issue. Specifically, SDG 12.3 targets halving food loss and waste by 2030, aligning with our mission to contribute to the Zero Hunger Goal (SDG 2) and various other SDGs. As the Certification Programme Owner, Foundation FSSC, we have integrated food loss and waste requirements into Version 6, aiming to minimize food loss, maximize human food production, and reduce environmental impact while preparing organizations for evolving legislation on food waste reduction. Our approach employs a "Target, Measure, Act" strategy, setting ambitious goals, meticulously measuring progress, and implementing effective measures to combat food waste. With 35,000 certified food manufacturers and F&B organizations, we have the potential to significantly contribute to achieving SDG 12.3 and scaling up global efforts to reduce food waste, thereby creating a better future for all.

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Why did GFSI - EHEDG Need to Cooperate?

Hein Timmerman

European Hygienic Engineering and Design Grup (EHEDG), The Netherlands

EHEDG, the European Hygienic Engineering and Design group is a leading source of hygienic design and engineering expertise, with a global reach and enhances food safety and quality across the whole industry. The goal of EHEDG is to raise awareness of hygienic design and engineering, develop guidance and solutions, provide a platform to promote our expertise and facilitate networking across the world.

In a recent EFSA publication of 19 January 2024, it is clearly concluded that common risk factors for persistence in the food and feed processing environment (FFPE) are inadequate zoning and hygiene barriers; lack of hygienic design of equipment and machines; and inadequate cleaning and disinfection. EHEDG has an inventory of over 50 documents addressing 10 focus areas, to better serve the food and hygienic design market in a time of rapid industrial and technological changes.

The Global Food Safety Initiative (GFSI) had dedicated 2 specific technical scopes on hygienic design (HD): the JI : for Suppliers of Food Building and Processing Equipment to incorporate HD in business processes and the JII : for Food Producers to incorporate HD into existing GFSI scope. EHEDG has published a white paper on these scopes to provide substantial practical insights, as well as e new guideline N°58 on Hygienic Design Risk Management that will be published in the coming month, and offers dedicated training programmes to support a full integration of HD within a food safety culture.

POSTER SESSION

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POSTER 01

Determination of Ochratoxin-A Producer *Aspergillus* section *Nigri* Strains

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Ochratoxin A (OTA) biosynthesis occurs due to contamination of agrifoods with fungi. To comply with the legal limits specified in the Codex Alimentarius, analytically pure OTA standards are required to conduct routine food analyses. Therefore, the replacement of high-cost imported standards with those produced from domestic resources is crucial. In this context, the OTA production capacities of 73 Aspergillus sec. Nigri strains from the TUBITAK MRC Culture Collection and Mycology Laboratory isolates were investigated and those identified as naturally high OTA-producers were selected to optimize and lead further purification studies. In order to determine OTA production capacities, a spore suspension was prepared from the 7-day culture of the isolates in PDA medium with water including %0.05 Tween 80. The spore load for each strain was adjusted to 1-5x105 spores/mL, and to examine toxin production, 100 µL was inoculated into the centers of petri dishes containing YES agar and CYA agar and incubated at 26ºC for 7 days. YES and CYA were used for A. carbonarius isolates, while only YES medium was used for A. niger agg. and A. japonicus isolates. After the incubation, the samples were weighed, placed in stomacher bags, and homogenized with 100 mL methanol:water (70:30, v:v) extraction solvent for 30 minutes. Extracts were filtered, passed through a 0.45 µm PTFE membrane filter, and vialled. OTA content in the medium was quantified by High-Performance Liquid Chromatography equipped with a UV detector (HPLC-UV). Each experiment was run in duplicate. %20.5 of the strains screened could not produce OTA under the optimized conditions determined based on the literature. In terms of YES medium, %62.0 produced OTA in the range of 0-500 ng/g, %1.7 in the range of 500-1000 ng/g, %20.6 in the range of 1000-10.000 ng/g. A. carbonarius strains known to be ochratoxigenic in CYA, %46.4 produced OTA in the range of 0-500 ng/g, %21.4 in the range of 500-1000 ng/g, %32.1 in the range of 1000-10.000 ng/g. The portion of strains that can biosynthesize more than 10.000 ng/g OTA is %15.5. It was found that 16 strains of A. carbonarius produced higher amounts of OTA in CYA than in YES medium. OTA possesses nephrotoxic, immunosuppressive, teratogenic, and carcinogenic properties, and was listed as a Group 2B human carcinogen by the International Agency for Research on Cancer (IARC) in 1993. Considering the inter- and intra-species genetic differences, the extent to which the toxin production of ochratoxigenic isolates, which are frequently encountered as OTA producers in a wide range of commodities such as cereals and cereal-derived products, spices, dried fruits, coffee, and wine can be increased due to the optimization of extrinsic factors, has been the subject of many research due to stated direct threat to public

health. Hence, stated that the majority of Aspergillus section Nigri isolated from agricultural products can produce very high amounts of OTA under optimum conditions. The dataset obtained confirmed that is reached national fungal resources that we can use as input for the production of analytically pure standards, which are the other stages of the project. The study revealed that posses of sufficient fungal resources in our country to produce our own valid standards instead of imported standards used in OTA analysis. In addition, as climate change becomes devastating on global food systems, it is indispensable that OTA-contaminated foods will continue to be a food safety problem in the coming years. Therefore, no doubt that increases the need of more sustainable analysis performance. Supported by TUBITAK 1007 program, project no 119G001.

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POSTER 02

Implementation of an Automation System for Enhancing Food Safety Traceability

Gamze Elmas Çetin, Feyza Karabulut

Yörükoğlu Süt ve Ürünleri San. Tic. A.Ş., Antalya, Türkiye

Food traceability, one of the fundamental tools of food safety, aims to trace products and processes backward to identify the source of problems and establish necessary information systems for crisis management mechanisms. Traceability provided through electronic-based information systems and technologies is more effective than traditional systems, allowing products to be tracked throughout the supply chain, thereby enhancing food safety by quickly identifying any adverse conditions that may arise during this process.

Various activities were carried out in this project to ensure the effectiveness and feasibility of the food traceability system. Specifically designed office and mobile software were developed to support the food traceability system. These software applications are used to monitor production processes, ensure product traceability, and record data. Modern development tools such as Microsoft Visual Studio were used in the development phase of the software. Production processes were closely monitored and recorded in detail, with each stage and potential problems documented. The office software was developed on the ASP.NET MVC 5 platform and operates on the .NET Framework 4.6.1, while the mobile application was developed for the Android 5.1 (Lollipop) operating system. Special attention was paid to ensuring that the software is easy to use, fast, and reliable, and necessary tests were conducted accordingly. Additionally, the server systems where the software would be used were identified, and security measures were implemented. Thus, the necessary software infrastructure for the food traceability system was prepared and tested robustly, ensuring its effective and secure operation.

The results obtained within the scope of the project encompass significant advancements and successes in food traceability. Firstly, traceability has been ensured throughout all processes from production to the end consumer. The transformation of each product from raw material to finished goods has been closely monitored and recorded, enabling any problems related to a product to be quickly identified. Furthermore, with the development of office and mobile software, full integration into the product traceability system has been achieved. Through the use of these software applications, every step of the processes from production to sales points can be tracked and intervened as necessary.

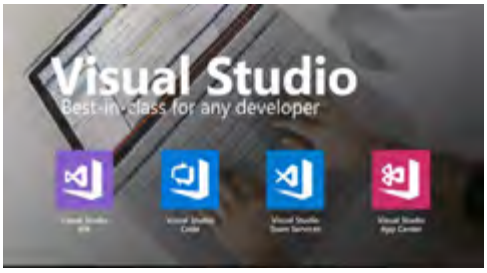
Database structuring and testing are also crucial steps. Thus, data integrity has been ensured, and the reliability of the data has been increased. Moreover, rapid reporting and easy management capabilities have been obtained. These features allow businesses to manage product traceability more effectively, particularly concerning rapid action in any adverse situations.

In conclusion, through the efforts made in the project, an effective and sustainable solution has been developed

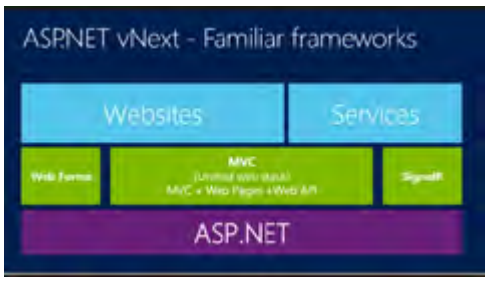
for the food traceability system. Alongside the development of office and mobile software, the database has been structured and tested. As a result, product traceability has been ensured from production to the end consumer, and data integrity has been maintained. Additionally, rapid reporting and easy management capabilities have been achieved, enabling swift crisis management actions.

The developed traceability system provides stakeholders in the food industry with reliable product tracking and crisis management capabilities, offering recommendations and forecasts through automatic reporting. The automatic reporting system greatly facilitates production planning, shipment planning, and sales planning by providing recommendations and forecasts to all departments. With this system, healthy communication between departments is ensured, and product traceability is maintained through a single platform.

Visual Studio



ASP.NET



Microsoft IIS

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POSTER 03

The Proper Utilization of Scientific Data in Food Safety Communication- Madensuyu.org

Tuğba Şimşek, **Murat İntepe**, İrem Uysal

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The correct information regarding food safety should rely on reliable sources. It should also provide consumers with accurate information about mineral-rich and nutritious mineral water. Although Turkey has rich resources of mineral water, consumption rates are quite low. The health effects of mineral water are not well understood. Increasing awareness of these health effects will positively influence consumption. To test these hypotheses, the level of understanding of information provided to consumers through a website, the perception of accuracy, and attitudes towards mineral water are measured. The research aims to evaluate the impact of information shared on our existing website, madensuyu.org, on consumers and how the proper use of scientific data in food safety communication affects consumers' knowledge and attitudes. In order to provide consumers with accurate and real information about mineral water, information about consumers and mineral water is shared on the existing website. Before sharing this information, a literature review is conducted, which includes studies evaluating the components of mineral water, its effects on health, and consumers' knowledge levels regarding mineral water. The information on the designed website is based on scientific data such as mineral water components, production process, health benefits, and consumption recommendations, providing valuable data that the general consumer population can understand and that the target audience can find answers to their questions. These data cover a series of food safety measures determined by agricultural and food safety principles. The results obtained from the studies conducted on the website demonstrate the vital importance of providing consumers with reliable information. In particular, providing correct, reliable, and understandable information about mineral water successfully promotes conscious consumption practices. This involves emphasizing the various benefits of mineral water based on scientific data. Reviews show that the content is enriched with strong scientific sources supporting the positive effects of mineral water on health. Providing consumers with correct and reliable answers to their directed questions enhances the quality of the information provided by the site. Additionally, providing consumers with the necessary basic information for conscious consumption enables the use of mineral water in a healthy and safe manner. In this regard, increasing awareness of food safety plays a significant role in protecting consumers' health. Sharing transparent information about mineral water production and consumption processes instills confidence in consumers about the reliability of the product. Emphasizing compliance with food safety standards encourages consumers to take necessary precautions to protect their health. In this context, by emphasizing standardization, quality control, and appropriate production practices, it scientifically demonstrates the safety of mineral water consumption. In conclusion, this review emphasizes that communication based on scientific principles, transparency in food safety, and providing solid answers to consumer questions enable products like mineral water to be consumed consciously. Such websites contribute to consumers making healthy lifestyle choices with accurate and reliable information. Our country has significant resources in terms of mineral water. However, despite its many health effects, mineral water is

mostly consumed by the public for stomach ailments. This situation stems from a lack of information about the health effects of mineral water. As consumers' knowledge about the content of mineral water and its effects on human health increases, the importance of mineral water consumption will be better understood, leading to increased consumption.

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POSTER 04

Effect of Different Cooking Temperatures and Times Used in the Production of Probiotic Chicken Nuggets on the Survival of Probiotics with Spores

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Probiotic products are generally known as foods that have undergone fermentation and have not been subjected to heat treatment during the production process. In this study, it is aimed to develop an innovative product, therefore the survival of Bacillus coagulans GBI-30 6086 (BC30), which has heat-resistant spores and added to the nugget dough, will be investigated in chicken nuggets that are subjected to cooking process during the production.

Since bacterial spores can be resistant to heat, they have the possibility of surviving cooking processes. In this study, selected Bacillus coagulans GBI-30, 6086 spores were added to the nugget dough and subjected to cooking process after the application of liquid and solid coating. The cooking process was applied in the fryer at 170 °C for 20 seconds and in the oven at 95 °C (1st group) or 105 °C (2nd group) at 50% humidity, respectively. Different cooking times were applied to each group of nugget samples that were pre-cooked at 95 °C or 105 °C. The nuggets were cooked in two groups and cooked for different periods of time, such as 8, 9 or 10 minutes. Since the produced nuggets were subjected to a second cooking at home, second cooking process were also applied at 180 °C for 6 minutes. After the second cooking process, serial dilutions were made from 25 g samples and inoculated on Plate Count Agar (PCA) medium by spread plate method. Petri dishes were incubated at 35 °C for 48-72 hours. The study was repeated 2 times.

0.1% lyophilized culture was added to the nugget dough and the cooking processes were carried out. In the nugget production, the central temperature of the product at the exit of the oven was determined to be approximately 80 °C. In the second cooking, the central temperature was determined to be approximately 60 °C. In this study which was conducted for the purpose of probiotic nugget production, no growth was observed in the probiotic-free nuggets used for control after the second cooking. After cooking for different cooking times at 95 °C and 105 °C, approximately 6 log probiotic Bacillus coagulans GBI-30, 6086 was detected. These results showed that probiotic spore forming bacteria can be used in foods, such as heat-treated nugget samples. It has been understood that it may be possible to consume heat-treated probiotic products in order to protect the digestive system and indirectly food safety and public health, especially in conditions where nutrition is negatively affected due to natural disasters and war, or in lifestyles where fast-food consumption is adopted.

With this study, a heat-treated probiotic product other than dairy products or fermented products was successfully developed. New products of this type are needed to ensure the safety of the microbiota in the digestive systems of individuals living under different stress conditions and developing eating disorders as a result of unforeseen sudden changes.

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POSTER 05

Sustainable Food Safety

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A food system is a broad concept that includes all elements of a society's nutrition, such as growing, harvesting, processing, packaging, transportation, marketing, consumption and waste disposal. A food system operates within and is influenced by social, political, economic and environmental contexts. Food systems are basically divided into conventional (traditional) or alternative food systems. When describing food systems, the term "traditional" is used as a comparison in the sense of continuing with known functions throughout society. For example, it is also known that the amount of pesticides used in agriculture in the traditional system causes health problems, including cancer and many diseases. Pesticides also cause soil, air and water pollution and lead to the extinction of non-target organisms. At the same time, the pesticide problem is still one of the issues that our country suffers the most from in the RAFSS system. Today, GlobalGAP and organic production are mentioned for sustainability in agricultureThe internationally accepted definition of food safety dates back to the World Food Summit in 1996. This definition: "Food safety must have adequate, safe and affordable access that meets nutritional needs and food preferences for an active and healthy life." This definition reveals that we need to examine food safety in four dimensions:•Availability of food,•Accessibility (economic and physical),•Usage and•Stability of these three dimensionsGFSI approved systems ensure that food safety can be proven on an international basis, and the most prominent of these is the IFS Food Safety System, which is widely used in European Union countries. Apart from this, other GFSI approved standards are also used today as evidence of food safety.The United Nations Food and Agriculture Organization defines the sustainable food system as follows: "A sustainable food system is a system that will ensure food safety and nutrition for future generations, while at the same time not compromising the economic, social and environmental foundations. According to data from the Food and Agriculture Organization of the United Nations (FAO), the world population is expected to be 9.7 billion by 2050, and global food production must increase by approximately 70% to feed this population. This shows that the current food system is not sustainable and that innovative solutions must be found to ensure sustainability in food as quickly as possible.Food sustainability is a system in which social, economic and environmental dimensions are taken into account in the process from food production to consumption. This means:•Provides broad-based benefit for society (social sustainability)oFood safetyoSustainable nutritionoDiscreet tradingoEmployment, education and equality of opportunityo Reducing west•Has a positive or neutral impact on the natural environment (environmental sustainability)oReducing carbon footprint and water footprintoEfficient use of resourcesoCircular economy (packaging waste, reuse and recycling)oProtection of ecosystems (biodiversity and sustainable resource use)•It is profitable (economic sustainability)oSectoral and economic developmentoCollaboration with stakeholdersoDevelopment of

international tradeoInvestment, research and innovationIn the report prepared by the European Commission in 2011 titled "Sustainable Food Production and Consumption in a World with Limited Resources"; The interconnections of various biological, social and economic factors within the framework of sustainable food systems are mentioned. According to this:•Food production volume, method and type can negatively affect biodiversity and global climate by causing high amounts of natural resource use and environmental pollution.•In most cases, water and energy problems arise not because of insufficiency of natural resources, but because of incorrect and inefficient use.•Changes in climate and decline in biodiversity are factors that influence each other.•With economic development, the demand for foodstuffs increases, which becomes one of the main reasons for famine.Challenges in achieving sustainability goals in food:•Urbanization and faulty agricultural practices•Climate Change and drought•Deterioration of the ecosystem•Biofuel production•It appears as price instability.Keywords: food safety, sustainability, GlobalGAP, IFS, GFSI

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POSTER 06

Sustainability Dimensions of Preservative-Free Production: Process Parameters, Shelf Life Extension, and Life Cycle Analysis

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Food preservatives are natural or synthetic chemicals added to foods or drugs to delay spoilage caused by microbial growth or unwanted chemical changes. When preservatives are used in higher amounts than recommended, they can exhibit toxic effects. Today, beverage trends are moving towards more natural, simplified products that can have positive effects on human health. Thus, the ability to produce without preservatives has become possible with pasteurization systems. The importance of preservative-free production methods for sustainability is significant. This approach contributes to the protection of natural resources and human health by reducing environmental impacts. Not using chemical preservatives carries four major benefits for sustainability: Reduction of Environmental Impacts, Preservation of Human Health, Enhancement of Food Safety, and Sustainable Use of Natural Resources. The production and use of chemical preservatives can lead to environmental pollution and biodiversity loss. The production process of these chemicals often involves intensive energy usage, negatively affecting energy efficiency. On the other hand, preservative-free production methods can help conserve natural resources and reduce environmental impacts. The addition of chemical preservatives to beverages can have negative effects on human health in the medium and long term. Consumption of these chemicals can lead to health problems or exacerbate existing health issues. In contrast, preservative-free production methods serve the third Sustainable Development Goal, "Good Health and Well-being," by protecting human health and contributing to a sustainable consumption model. Another effect of using chemical preservatives is their contribution to extending the shelf life of food products. However, the handicaps they create in terms of human health significantly threaten food safety. Preservative-free production allows products to be preserved using natural methods, extending shelf life naturally and contributing to food safety. The use of chemical preservatives can also lead to overexploitation or damage to some natural resources. Additionally, the extraction of raw materials required for their production can negatively impact natural ecosystems. In contrast, preservative-free production methods encourage the more sustainable use of natural resources. For these reasons, Kızılay Beverages opts for the Tunnel Pasteurization system to produce more natural and healthy beverages without using preservative chemicals. The Tunnel Pasteurization system ensures the removal of microbiological effects from the beverage and supports a sustainable production process by providing energy efficiency. This system involves gradually raising the beverage to a high temperature and then gradually cooling it, killing harmful microorganisms and helping extend the product's shelf life. Thus, it becomes possible to produce without preservatives while ensuring that the products are suitable for human health and safer. In conclusion, not using chemical preservatives in products is crucial for sustainability. This approach contributes to reducing environmental impacts, preserving human health, enhancing food safety, and promoting the sustainable use of natural resources. Therefore, adopting preservative-free production methods is a significant step towards transitioning to a more sustainable consumption and production model.

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POSTER 07

Polypropylene Packaging's Hot Filling Strength: Carbon Footprint, and Performance Evaluation

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Since the 19th century, the increase in industrialization has led to a parallel increase in the production of packaged foods. On the other hand, the management of packaging waste has become a separate issue. Research in this field has brought forth a series of proposals aimed at solving waste problems. The most important suggestion in this regard is the concept of circular economy. Circular economy is a sustainable model that minimizes waste by efficiently using resources. The main perspective of this model, the 4-R rule, encompasses the principles of "Reduce," "Reuse," "Recycle," and "Recover." Accordingly, "Reduce" aims to minimize consumption and waste generation, while "Reuse" supports extending the lifespan of products and materials for different purposes. "Recycle" involves making materials reusable, while "Recover" facilitates energy generation from waste. These principles aim to extend product lifespan starting from packaging design, reduce waste, and use resources more effectively.

Food safety refers to a scientific system cycle encompassing the processing, preparation, storage, and presentation of foods to control biological, physical, and chemical factors. Safe food is food that has been rendered fit for consumption by eliminating any form of spoilage or contamination. Basic human needs such as nutrition and healthy living are possible through the principle of food safety. Foodborne illnesses have adverse effects on human health in both developed and developing countries. In this context, packaging plays a crucial role in delivering safe food to consumers. Generally, packaging is a material in various forms that facilitates the protection, transportation, and storage of products under clean and reliable conditions. Packaging is classified as primary, secondary, or tertiary based on its purpose of use. Primary packaging, which directly interacts with food, is essential for ensuring the safe preservation of food throughout its shelf life. Primary packaging serves as the most important barrier against external factors. Therefore, the correct selection of packaging material and design is crucial for ensuring food safety during the process of delivering food to consumers.

Due to the production process requirements, the filling of the product into packaging for melted cheese production necessitates hot filling. In the dairy industry, the use of Polystyrene (PS) and Polypropylene (PP) packaging, which are thermoformable materials, is quite common for products requiring hot filling. PS is low-density, lightweight, and rigid, easily shapeable at high temperatures. PP, on the other hand, is flexible, durable, and resistant to chemicals. It is often used in hot-fill products because it is stable to temperature and resistant to deformation. The aim of this study is to evaluate the strength of 300g PS and PP packaging materials used in cream cheese packaging filled at 75°C and to assess the transition to PP packaging material, which offers advantages in terms of carbon footprint. In this context, a test design was conducted with one control and two experimental groups. PS containers with a 10mm top gap made of PS material were used as the control

group. For the experimental groups, containers with two different top gaps (8mm and 5mm) were obtained to observe deformation and determine the packaging volume closest to the standard. Cream cheese filling was performed with hot filling process in 100 containers from each experimental group. The vacuum formation in the containers was evaluated after cooling. Vacuum formation was observed in 8mm PP containers while no problem was observed in 5mm PP containers. In the next stage of the study, a transport test was conducted with 100 containers. As no deformation was observed in PP containers, a production trial was planned. The same experiments were repeated with 9000 PP containers and the products were subjected to stress and shelf life tests based on the positive results obtained. As a result, 5mm top gap PP containers successfully completed transport and shelf life tests similar to 10mm top gap PS containers. As a result of these experiments, the transition to PP packaging material reduced the carbon footprint of packaging by 28.8%, decreasing from 66.6 g CO_2 to 47.4 g CO_2. Consequently, the carbon footprint was significantly reduced.

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POSTER 08

Alternative Food Source: Single Cell Proteins

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One of the biggest problems faced today is to provide food and nutrition in a sustainable manner to the ever-increasing number of the world's population. Protein is one of the most important nutrients needed in daily life. Animal protein production has negative effects on factors such as environment, cost, energy and time. Therefore, people have started to look for alternative protein sources. One of the sustainable protein sources is single cell proteins (THP). They are products formed after the production and drying of microbial cells such as blue-green algae, bacteria, yeast and fungi in large quantities in culture systems for use in human or animal nutrition. Large-sized single cell production requires many basic engineering processes. THP production: It includes the stages of preparing the nutrient medium containing the appropriate carbon source, preventing undesirable contamination, producing the desired microorganism, and completing the harvesting process by separating it from the biomass. These microorganisms can be grown using inexpensive substrates such as agricultural waste and even human/animal waste.

The use of THP dates back to ancient times and its potential value is known. Yeasts were used in wine and bread around 2500 BC. It is known that the Aztecs ate freshwater algae collected from Lake Chad in Africa. I. And II. It was added to the food of soldiers as a protein supplement during the World Wars. The amount of protein in 100 grams of different foods is 20.20 grams in beef, 3.40 grams in milk, and 12.53 grams in eggs. 100 g produced by microorganisms. The protein amount of micro protein is 11.25 grams, which is enough to meet 10% of the world's population. In addition to its high nutritional values, THP also has many advantages. Its advantages are that it multiplies rapidly, can be produced throughout the year, can be produced in large quantities in a small area, and contains different beneficial substances as well as protein. Its disadvantages are: complex production time, harvesting and purification difficulties, incomplete amino acid profile, consumer perception and acceptance, allergic potential, high nucleic acid content.

The industries where it is used are animal feed and nutrition, food additives, industrial processes, nutritional supplements, medical applications, cosmetics and personal care products. Most THP products are used as animal feed and therefore safety requirements for animal consumption must be met. Regulatory approval for protein production for human consumption is a longer and more expensive process.

Customer perception, high nucleic acid content and possible allergic effects are factors that limit the use of THPs as food. However, these and similar factors can be eliminated with developing technology. THP is not a new idea, but there are very few studies and literature on these subjects. Studies should continue rapidly to expand the consumption of THPs, which are attractive in terms of sustainability, to societies. While developed countries have access to protein sources, it causes serious health problems in developing countries. Healthy and balanced nutrition can be achieved by using THPs in animal and human nutrition.

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POSTER 09

Effects of Antibiotic Resistance on Food Safety

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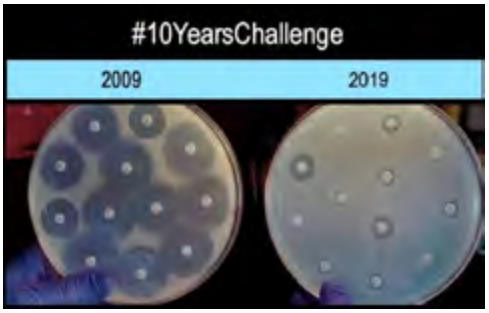
Misuse of antimicrobials for human consumption and their use for non-therapeutic purposes in the breeding of nutrition valuable animals is an important factor causing the emergence of antimicrobial resistance globally. Worldwide, antimicrobial agents from all classes of clinically important drugs have been introduced into agriculture as feed additives. Additionally, modern food animal production models, where large numbers of animals are kept in households or farms, create opportunities for extensive host-to-host transfers. Crowding, inadequate shelter and unsanitary conditions facilitate the spread of infectious diseases among both humans and animals. Taking precautions for these problems is possible with a multidisciplinary approach; It is considered that good production practices, preventive antibiotic applications and curative antibiotic applications can be achieved by being under the control of Veterinarians and therefore public institutions, and by careful waste and sewage management of farms, especially where animals with food value are raised. As a result, reducing the use of antimicrobials through rational use in all sectors with the One Health approach and then slowing down the spread of resistance will help us take more concrete steps towards antimicrobial resistance, which will be a much more important problem in the future.

Antibiotic Resistance



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POSTER 10

Investigation of Different Drying Methods for Preservation and Identification of Bioactive Compounds from Peels of 4 Varieties of Sweet Potatoes

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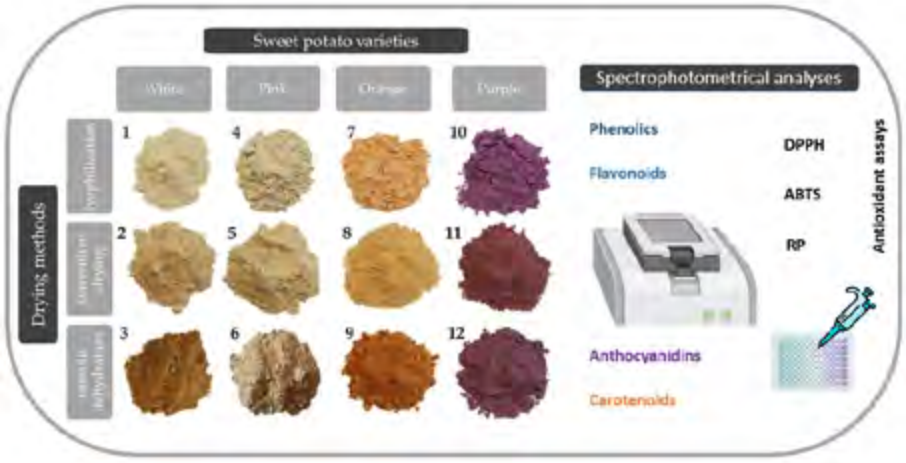
Ipomoea batatas is commonly referred to as sweet potato. It ranks eighth among all food crops and produces approximately 131 million tons annually. It is largely used in the food sector, generating plenty of non-consumable waste, with vast potential. The use of drying methods in preservation of perishable food waste is valuable for asset food security. Peels of 4 different-colored sweet potatoes were separated (yellow, pink, orange, and purple) and dried using three different methods (lyophilization, osmotic dehydration, and convective drying). All dried material was homogenized as powder and stored in the fridge for further analysis. Ultrasound extraction (ultrasonic bath) of bioactive content was performed using 36:63 acetone: ethanol mixture for 30 minutes, following centrifuge and supernatant separation. Spectrophotometrical analyses were used to investigate present bioactive compounds and antioxidant activity (DPPH, ABTS, and reducing power activity. In all samples total phenolic and flavonoid content was measured, while carotenoids were determined in orange and anthocyanins in purple sweet potato peels. Interestingly, peels of sweet potatoes, as agro-waste material still proved to be a relevant source of bioactive compounds, and all four species had a significant scavenging activity against investigated free radicals. The highest phenolics had purple I. batatas ranging from 453.13-515.58 mg/100 mg, followed by orange I. batatas (200.73- 251.35 mg/100 mg). Total flavonoids followed the same trend. Similarly, antioxidant assays showed the highest power of purple samples, which is connected to their anthocyanins content (124.16-229.58 mg/100g). The strongest scavenging activity for purple samples was shown against DPPH radical, and more specifically for the lyophilized sample (6287.45 μM TE/100g). For white, pink, and orange samples, the strongest activity was presented against ABTS radical, and for osmotically dehydrated samples, 2470.89, 1664.45, and 2016.57 μM TE/100g, respectively. The best drying method depends on the type of sweet potato peel. Anthocyanins-rich purple potato showcased the strongest bioactivity after lyophilization, while other samples varied between osmotic dehydration and convective drying. This is an important finding since these methods are less costly and energy efficient.All three drying methods secured valuable amounts of bioactive components while helping preserve food waste from spoilage. The obtained results could be used to determine compatible drying methods for needed agro-waste, showcasing its potential use.

Investigation of different drying methods for preservation and identification of bioactive compounds from peels of 4 varieties of sweet potatoes



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POSTER 11

Genomic Analysis of a *Listeria monocytogenes* Strain in Response to Stress Conditions: Preliminary Results

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Listeria monocytogenes is a Gram positive, facultative intracellular, and cold tolerant pathogen that is of concern in ready-to-eat (RTE) foods. It causes listeriosis, a severe invasive disease that can be fatal in individuals with a compromised immune system, including the elderly, pregnant women, and their newborns. *L. monocytogenes* exhibits resilience under diverse environmental conditions. A research framework that evaluates the resilience of this pathogen could help prevention measures.

L. monocytogenes has a crucial impact on the safety of RTE foods because it can grow under refrigeration and resist technological stresses, such as at low/high pH, high salt concentrations and modified atmosphere. According to the Commission Regulation N0 2073/2005, the levels of *L. monocytogenes* in foods not intended for infants and for special medical purposes and not representing an optimal substrate for its growth shall not exceed 100 CFU/g. In this study, a genomic approach, combined with immunoproteomics and bioinformatics, was carried out to assess the expression levels of genes responsible for the virulence biomarkers expressed by a L. monocytogenes 1/2 strain involved in a listeriosis outbreak in the Marche region (Italy), grown under adverse environmental conditions in terms of temperature (12°C and 37°C), pH (7.0), and salt concentrations (0.5% and 7%). In addition, a strain grown at optimal condition served as baseline. Quantitative reverse transcription PCR (qPCR) assays were developed to quantify the relative expression of a panel of 6 target genes (imo0132, imo0699, imo0723, imo1053, imo2679, trxB) involved in the stress response. 16SrRNA was included as housekeeping gene target.

The gene expression levels of lmo0699 gene, which encodes the Flagellar Motor switch protein (FliM), known for regulating flagella formation and motility of the strain, increased at 12°C, whereas at the same temperature but under acidic and osmotic stress conditions the gene expression was inhibited. Lmo0723, which encodes the methyl-accepting chemotaxis protein, identified in the motility and morphology of the microorganism, exhibited high similar expression patterns across all experimental conditions. Other txrB, lmo2679 and lmo0132 genes, associated with detecting environmental hurdles and initiating appropriate cellular responses,

exhibited low expression, comparable in all conditions.

The application of genomic studies could help classify and characterize *L. monocytogenes* strains to understand and investigate their physiological behaviour, especially in the perspective of outbreak investigations and surveillance strategies.

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POSTER 12

Improving the Quality and Safety of Gluten-Free Sourdoughs and Breads

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Production of gluten-free bread with good quality is usually associated with the use of various food additives and/or selected starter cultures with the aim to compensate the lack of gluten and to improve the viscoelastic properties of the dough and the safety of the obtained products. Our study aimed to obtain non-gluten bread and sourdoughs from non-gluten flours with applying single cultures of lactic acid bacteria (LAB) - *Pediococcus acidilactici*, *Pediococcus pentosaceus* and *Enteroccocus durans*.

Teff, rice corn and sorghum flours were used in this study - all obtained by laboratory grain milling. Compressed yeast, guar gum (E412), xanthan gum (E415) and carboxymethyl cellulose (E466) were also used as raw materials. Teff flour was used to prepare a separate sourdough with each LAB strain. Equal weights of flour and sterile water were mixed to obtain a dough yield (DY) of 280. Each starter culture was added to a batch of teff dough at an inoculum amount of 5 log CFU/g of dough to ferment the sourdoughs. Active acidity, total titratable acidity and LAB viable cell counts were analysed for each sourdough. The non-gluten flour base was composed of teff flour, rice flour, corn flour and sorghum flour, mixed with yeast, salt and water for bread preparation. Different combinations of xanthan, guar gum and carboxymethyl cellulose and different ratios to the non-gluten flour base were tested in order to select the formulation of the non-gluten bread for further experiments with sourdough addition. After selecting the most appropriate dough variant, test gluten-free breads with sourdoughs from the listed strains and control bread with baker's yeast were prepared. The rheological properties of the doughs were assessed. After baking, the main quality parameters of the obtained non-gluten breads were evaluated.

The use of sourdoughs was explored to obtain non-gluten breads with good quality characteristics. Since lactic acid bacteria have significant effect on ensuring the safety of the fermented products, this approach brings the benefit of obtaining safe non-gluten bread with prolonged shelf-life. Our results showed that adding xanthan gum (0.6 %), guar gum (1.0 %) and carboxymethyl cellulose (1.0 %) to the gluten-free (GF) dough significantly improved its structural and baking properties. The tested LAB strains reached 108 cfu/g in teff flour and produced sourdoughs with a pleasant lactic aroma. The sourdough-fermented doughs were softer and more elastic compared to the control dough, and yielded reduced baking loss. Strain *Enterococcus durans* provided the best baking characteristics of the GF dough, and the highest softness of the GFB during storage. Strain *Pediococcus pentosaceus* had the most pronounced positive effect on aroma, taste and aftertaste. During 72-h storage, sourdough-leavened breads were found to remain softer than the yeast-leavened sample. A significant effect of strain specificity was also found, and strain Enteroccocus durans 09B374 (ED) provided

the highest softness of the non-gluten bread in terms of total and plastic deformation, while strains Pediococcus acidilactici 02P108 (PA), *Pediococcus pentosaceus* 12R2187 (PP) had a pronounced positive effect on elastic deformation.Discussion:The present study explored the possibility to apply sourdough technology to develop non-gluten bread with improved nutritional and technological characteristics by the addition of lactic acid bacteria in the form of sourdough. The results obtained indicate that the selected combination of non-gluten flours and additives was adequate for obtaining a non-gluten bread with good quality characteristics, and the application of sourdoughs in the non-gluten flour matrix is a successful approach for gluten-free bread development. Strain specificity is significant for dough rheology and the baking characteristics and it is, therefore, important to perform a careful starter culture selection.

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POSTER 13

Unlocking Valuable Compounds from Horned Melon Agro-Waste: Cloud Point Extraction Enhanced by Microwave and Ultrasound Techniques

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Cloud point extraction (CPE) offers a promising method for isolating bioactive compounds from agricultural by-products. This study investigates the application of CPE to extract valuable components from the non-consumable parts of horned melon. The research aims to enhance the utilization of these waste materials in various industries. CPE was conducted using a modified method of Motikar et al. (2020). Horned melon peel powder, water, and Tween 80 were added in a 20 mL conical flask with a 1:50 solid-to-liquid ratio (w/v), surfactant concentration was 10% (w/v) and the pH of the solution was 3. Ultrasound CPE was performed in an ultrasound bath at a temperature of 60 ° C and frequency of 40 kHz with a constant power of 140W for 30 min, while microwave CPE was conducted at a microwave power of 600 W for 60 seconds. The obtained liquid extract was centrifuged at 10000 rpm for 10 min and the supernatant was separated. The supernatant was mixed with the salt (NaCl) at concentrations of 16% (w/v). Further, the mixture was kept in the water bath at a temperature of 45°C for 1 hour, followed by centrifugation to accomplish phase separation. Microwave extraction and ultrasound extraction were performed following the same process conditions of ultrasound-assisted CPE. The liquid extract was collected by separating solids by centrifugation at 4000 rpm for 10 min. The extracts were evaluated by three methods: total phenolic content, total carotenoids, and antioxidant potential. This study showcases the impact of different treatments on the total phenolic content (TPC), total carotenoid content (TC), and antioxidant activity (AA) of the horned melon samples. Ultrasound-assisted CPE significantly enhances the total phenolic content to 345.56 mg GAE/100g dw, a notable increase from ultrasound extraction alone (255.37 mg GAE/100g dw). Moreover, ultrasound-assisted CPE demonstrates remarkable antioxidant activity of 956.82 µmol TE/100 g dw, surpassing ultrasound extraction (865.63 µmol TE/100 g dw). In addition, the total carotenoid content is elevated in ultrasound-assisted CPE (3.96 mg β-carotene/100g dw) compared to ultrasound extraction (2.68 mg β-carotene/100g dw). Microwave-assisted CPE emerges as another effective technique, with TPC reaching 427.77 mg GAE/100g dw and AA at 974.79 µmol TE/100 g dw, along with a notable TC of 1.97 mg β-carotene/100g dw. Microwave extraction alone exhibits a promising TPC of 338.97 mg GAE/100g dw, although its AA is slightly lower compared to microwave-assisted CPE.This study underscores the importance of innovative extraction methods, particularly ultrasound and microwave-assisted CPE, in maximizing the bioactive compound content and antioxidant activity of the sample, with potential implications for various industries. Further research could focus on optimizing parameters to enhance the efficiency and sustainability of these extraction techniques.

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POSTER 14

Research of Effects of Different Packaging Barrier Properties on Quality and Shelf Life of Various Different Various Different Foodstuffs

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In this project, three packaging materials having different O2 permeability were used to investigate the effects of this differentiation on quality and shelf life of dry powder soups and mealmakers. These three packaging are supplied from different suppliers and defining as Existing (Pack-1), Supplier 1 (Pack-2) and Supplier 2 (Pack-3) in this project. Packed products are stored in high test temperature (+35^{O} C) and in ambient temperature (average +25^{O}C), and control samples are stored in -15^{O}C for up to 12 months. Package headspace gas analysis, general appearance, humidity and colour level are periodically conducted on products, and their results are evaluated and assessed. The purpose of this study is to investigate the effect of oxygen permeability level of 3 different films, having high barrier properties ranged from 1.3 to 17.1 gas transmission rate (GTR), in the high barrier category on the quality of dry powder products.

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POSTER 15

Determination of *in vitro* Anticarcinogenic Activity of Probiotic Fermented Sour Cherry Beverages

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In parallel with the advancing technological developments and increasing consumer awareness, elevated number of studies have been focused on determination of the suitability of fruit and vegetable matrices as carriers of probiotic cultures and lactic acid in recent years. In this study, sour cherry juice supplemented with sugar was lacto-fermented using 3 different probiotic strains (*Lactiplantibacillus plantarum* strain XL963, LP; *Limosilactobacillus fermentum* strain W8, LF; and *Lactiplantibacillus pentosus* strain ML10, LPN) and their mixture at 30 °C for 20h fermentation period. Then the fermented sour cherry juice samples stored at 4 °C for 28 days. Anticarcinogenic activity of the lactofermented probiotic fruit juice samples were analyzed against MCF-7 cells, a commonly used human breast cancer cell line, using XTT test. In general, sour cherry-based lacto-fermented beverages showed varying anticarcinogenic activity (≈13 % lower) against MCF-7 cell lines depending on the fruit juice concentration. At the beginning of storage, a 87% of cell viability was observed in the LPN fermented sample (containing 12% of saccharose) in the case of the highest concentration (100 µL/mL), followed by LF, LP and Mix fermented ones, respectively. At this concentration, lacto-fermented samples showed higher ($P<0.05$) anticarcinogenity compared to non-fermented control samples. At 28th day of the storage, anticarcinogenic activity decreased as compared to the those of beginning and the cell viability increased. Overall, this study showed that although an increase in *in vitro* anticarcinogenic activity of sour cherry beverage by probiotic fermentation was observed, activity of all the lacto-fermented beverage samples was limited.

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POSTER 16

Metal Levels, Fatty Acid and Vitamins in Commercially Available Canned Fish on the Bulgarian Market. Benefit-Risk Ratio Intake.

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Seafood is an important source of high quality animal protein, very rich in omega-3 long-chain polyunsaturated fatty acids (Prato et al., 2020) and bioactive compounds such as carotenoids (Tan et al., 2022) and vitamins. An alternative way to introduce seafood in the common diet is canning, which are more popular and well consumed in the developed countries since it is convenient, ready-to-eat and affordable (Kosker et al, 2023). The aim of this study was to determine: 1) the concentration of some elements (Cd, Pb , Al, Cr, Mn, Fe, Ni, Cu, Zn), fatty acid composition and fat soluble vitamin, antioxidant pigments and cholesterol content of canned fish purchased from the Bulgarian grocery market; 2) the impact of canned fishes on human health assessed by commonly used risk index based on the maximum concentration of element that could be reached via consumption of canned fishes and 3) the benefit-risk ratio for human health based on trace elements and n-3 LC-PUFAs contents in canned fishes.

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POSTER 17

Microbial Risks in Terms of Food Safety in the Non-Alcoholic Beverage Industry

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Food safety is an important issue that affects all people around the world. Many countries around the world have become aware of food safety and have established legal obligations and food safety systems. According to FAO's definition, food safety; it is a set of measures taken to eliminate physical, chemical, biological and all kinds of damages that may occur in foods. In the context of food safety, a hazard can be any substance/agent associated with food that has the potential to cause harm when consumed. As global demands for microbial food safety increase, new threats continue to be identified. Soft drinks are considered safe due to their content, but the problems they may cause are a matter of debate. Approximately 32 cases of foodborne outbreaks due to consumption of inadequately sterilized fruit juice have been documented since 1922.Soft drinks: They are carbonated or still drinks containing sugar/artificial sweeteners, acidity regulators, flavors, colorants and preservatives. Contamination of raw materials with many microorganisms during production and low hygiene quality in the production facility cause product deterioration. Spoilage is a metabolic process by which beverages become undesirable or unacceptable for human consumption due to changes in sensory properties. For beverages to spoil directly, microbial growth must reach the limit of 105 to 106 cfu/ml. The type and rate of microbial spoilage depend on the composition of nutrients in the soft drink. The CO2 it contains, the addition of acidity regulators and the presence of preservatives are the most important factors in preventing microbial growth. Due to these features, while some microorganisms do not pose a risk in soft drinks, microorganisms that are tolerant to acidic environments and CO2 can remain alive and pose a risk. The proliferation of highly tolerant microflora causes spoilage in products. In the soft drink industry, spoilage is caused by yeasts, lactic acid bacteria and acetic acid bacteria, molds, Alicylobacillus and pathogenic bacteria.Yeasts have the ability to grow in high sugar concentration and low water activity. Fermentative and oxidative yeasts are resistant to acidic pHs and high CO2 concentrations. Molds are another spoilage agent classified as aerobic, heat sensitive and resistant, able to grow at low pH and high sugar concentration. Molds can contaminate drinks with the spores and mycelial fragments they form. They cause moldy and stale taste in the product. Mycotoxins, which are metabolites formed by some molds, have been defined as carcinogenic in different groups by IARC.LAB is responsible for CO2 loss and astringent taste, while some species produce diacetyl, which gives butter and its odor. The proliferation of AAB in soft drinks causes taste changes, packaging swelling, cloudiness or precipitation. ACB is a spore-forming bacterium that can survive pasteurization, causing spoilage in heat-treated fruit-based beverages. The distortion it creates is difficult to detect. It does not cause any visible changes such as gas during growth, so deterioration in retail products is not noticed. It is usually recognized by the specific smell caused by the production of guaiacol. Sediment, turbidity and discoloration are rare defects. Pathogenic

microorganisms have been found to exist in soft drinks as a result of poor hygiene. No spoilage associated with pathogenic bacteria has been reported in commercially available soft drinks in developed countries. Enteric group pathogens are not microorganisms that cause common spoilage. Soft drinks are generally considered safe and do not cause any foodborne illnesses. However, it is not possible to completely prevent this situation. The most common method to ensure food safety, extend shelf life and neutralize microorganisms is heat treatment. However, alternative new protective methods are being tried to prevent losses of organoleptic properties and improve microbial quality.

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POSTER 18

Effect of Post-Harvest Imazalil Treatment on Quality Attributes of Moroccan Pomegranate Variety "Sefri Ouled Abdellah" During Cold Storage

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Pomegranate (*Punica granatum* L.) has received special attention from fruit growers and consumers around the world due to its diverse functionality and famous nutritional benefit in the human diet. Harvested pomegranate fruit is highly susceptible to high weight loss and deterioration in technological quality and nutritional components during postharvest handling and storage. Cold storage is one of the best common methods of conservation technologies performed to extend its availability in the market. This leads to myriad problems of this method is that low temperature causes deterioration of quality and nutritional values in pomegranate fruit. The ultimate aim is to find a new way to effectively maintain fruit quality during cold storage. Thus, the effects of treatment based on Imazalil on their technological quality (Weight loss, color attributes (L*, a*, b*, C and h°), pH, titratable acidity and total soluble solids), and nutritional components (total anthocyanins contents (TAC), and total phenolics contents (TPC)) in Pomegranate fruits of the variety 'Sefri Ouled Abdellah' collected from the Béni Mellal region and immediately stored at 4°C for 120 days. Fresh untreated Pomegranates showed high general quality deterioration in weight loss (0% to 13, 57 %), color changes, titrable acidity (0, 19 g/100 ml to 0, 12 g/100 ml), and increase in total soluble solids (3, 97% to 4, 47%) during cold storage. The Treatment based on Imazalil was more effective in delaying the changes and losses in bioactive components when compared with those in control. The total polyphenols for the control fruits are degraded during storage from 290.10 mg EAG/100 ml to 92.94 mg EAG/100 ml but for the treated fruits the polyphenol content at the end of storage is 100.95 mg EAG/100 ml. This experiment adds to a growing corpus of research showing treatment based on Imazalil is effective in prolonging the technological quality and nutritional components of pomegranate in postharvest during cold storage. Our data suggest that we still have a long way to find the best treatments and storage conditions for pomegranate fruit.

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POSTER 19

Evaluation of Dietary Chronic Exposure to Certain Preservative Food Additives

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Dietary exposure levels of additives is essential to comprehend the long-term effects in humans. It has been found that there are a limited number of comprehensive dietary exposure studies involving humans in Türkiye. This study aims to evaluate chronic dietary exposure to some preservative food additives (benzoate, sorbate, nitrite, nitrate) in young adults aged 19-45 and compare exposure levels with acceptable daily intake.

This research is designed as a cross-sectional observational. A general survey form was applied to the participants to evaluate their demographic characteristics and dietary habits. Semi-quantitative processed food frequency questionnaire designed by the researcher was used. This questionnaire is based on the NOVA food classification, aiming to evaluate processed food consumption over the last year to ascertain the intake levels of preservative food additives (benzoate, sorbate, nitrite, nitrate). Firstly, a semi-quantitative processed food frequency questionnaire determined to the daily consumption amount of processed foods containing preservative food additives. Afterward, the amount of preservatives in the processed foods was calculated using the maximum permitted use levels (MPL) in the Turkish Food Codex Food Additives Regulation. The dietary exposure to preservative food additives was obtained by multiplying the daily consumption amount of foods containing the relevant additives and the maximum permissible use level of additives. Individuals' daily additive intakes calculated per body weight were compared with the acceptable daily intake set by the European Food Safety Authority to evaluate whether there was a risk of exceeding the acceptable daily intake value of the relevant additive.

A total of 200 individuals, 151 women (%75,5) and 49 men (%24,5), participated in the study. The average age of the participants is 27.01 ±8.21 years. According to data obtained from the processed food frequency questionnaire, average daily intakes of benzoate, sorbate, nitrite, and nitrate were calculated as 0.18 ± 0.21 mg/kg, 1.44 ± 1.38 mg/kg, 0.03 ± 0.04 mg/kg and 0.0019 ± 0.009 mg/kg, respectively. Dietary exposure to sorbate and nitrite in men at the 95th percentile are found as 182.5% and 186.5% of ADI; for women, it was found as 150.5% and 163.2% of ADI at the 95th percentile, respectively. In all individuals, the meeting rate of ADI for benzoate and nitrate intake at the 95th percentile was below 50%; for sorbate and nitrite intake were found to be 153.6% and 161.3%, respectively. These results showed that the sorbate and nitrite exposure of the highest consumers (P95) for both genders exceeds the ADI, greatly. Sorbate intake exceeds the ADI in 11.5% of individuals and nitrite intake in 15.5% of individuals. Dietary benzoate and nitrate intake were

below the ADI in all participants. It also was found that as the contribution to total energy intake of fourth group of the NOVA classification increases, the intake level of benzoate ($r=0.237$; $p<0,05$), sorbate ($r=0.530$; $p<0,05$), nitrite also increase ($r =0.306$; $p<0.05$). Conclusion: Although the ratio of individuals exceeding the preservative food additives intake amounts was low, increasing the frequency and amount of consumption of ultra-processed foods brings the risk of exposure to preservative additives. Further research is required involving calculation of the dietary exposure to food additives to conduct their risk assessment.

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POSTER 20

Machinery Technologies Development Towards Food Safety

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Implementation of prerequisite programs and hygienic infrastructure conditions play a decisive role in ensuring and maintaining food safety. It is known that there are sources of danger that create food safety risks as a general situation in the production of food products. Preventive approaches that control microbial, chemical and physical hazard sources in direct or indirect contact are important. The global trend in the food industry relates to minimal processing and preservation of food. Good practice and engineering approaches in hygienic design guide manufacturers in the development of food processing systems that prevent food contamination by microorganisms, particles and chemicals (Lelieveld et al., 2016). Hygienic design requires defining rules that allow the correct development of food processing systems. Knowledge in this field will certainly help designers and engineers in developing hygienically compatible systems (Musiari et al., 2024). This study aims to collect engineering information regarding hygienic design conditions in the manufacturing of machinery and equipment technologies used in food processing processes and to provide input for good manufacturing practices.

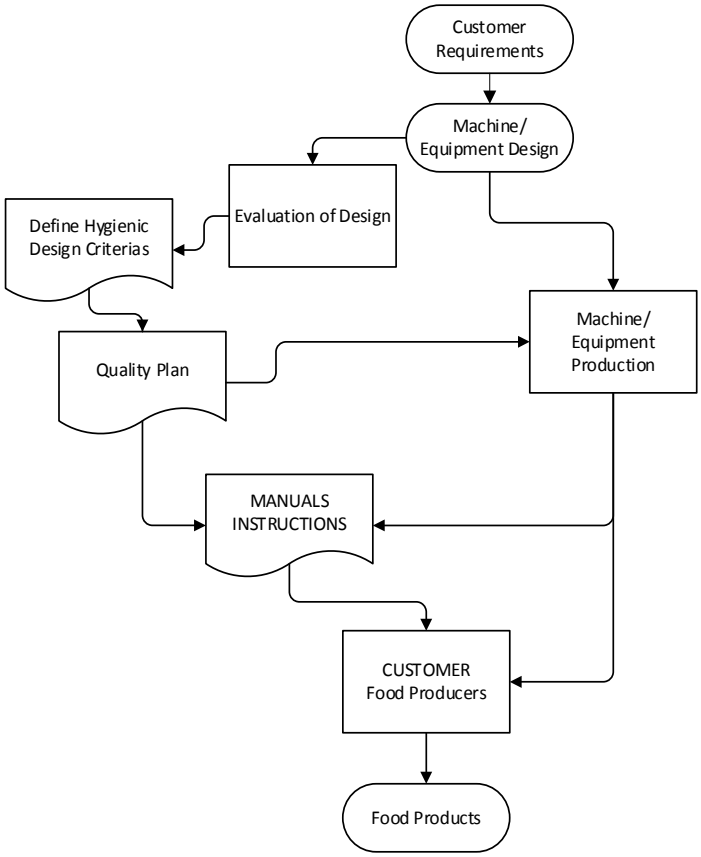
The machinery industry is characterized by precision engineering and complex production processes. FMEA is defined as a proactive tool to systematically identify potential failure modes, evaluate their consequences, and prioritize corrective actions (Dev et al., 2018). By integrating the FMEA technique into the quality control framework in the manufacturing of food machinery and equipment, product quality can be increased and food safety risks can be reduced by establishing risk communication with the food manufacturer. In this context, a quality management process has been designed for the purpose of developing food machinery and equipment in accordance with hygienic design requirements.

The quality management process within the scope of Product Realization begins with the design activity for the demands and needs of the food manufacturer. A competent multidisciplinary team evaluates the design and contributes to the quality plan after determining the hygienic design criteria. Quality control is carried out during the application stages of manufacturing techniques such as cold forming, machining, welded manufacturing, leveling and polishing in machinery and equipment production, taking into account the relevant hygienic design criteria. The findings obtained up to this stage provide guidelines for food producers who will use the machine to ensure food safety in production. Identifying hygienic design problems during the manufacturing process will provide input to the design development activity and provide the information and communication necessary for the food manufacturer to maintain safe food production.

After the global food safety initiative published its hygienic design benchmarking requirements, certification programs began to adopt these requirements in their certification systems and the entire food industry realized

that they had to come to terms with hygiene requirements. It is known that hygienic design is now an integral part of food safety management. It is important to initiate risk communication with stakeholders in the supply chain with this integrative approach and to create input for studies in this field.

The application of the presented method also provides sustainable food safety and a life cycle approach, as well as a reduction in the carbon footprint of food producers, as a means of reducing maintenance operations and other costs required for cleaning and sanitation of machinery/equipment.



References

Dev, K., Gurukula, S., Vishwavidyalaya, K., Srivastava, S., & Kangri Vishwavidyalaya, G. (2018). Failure Mode and Effect Analysis (FMEA) Implementation: A Literature Review.

https://www.researchgate.net/publication/333209894

EHEDG Doc. 9, 1993. https://www.ehedg.org/guidelines-working-groups/guidelines/guidelines.

EHEDG White Paper on GFSI Hygienic Design Scopes JI & JII, 2022. https://www.ehedg.org/guidelines-working-groups/guidelines/guidelines/detail/white-paper-1-test

Holah, J., Campden, C., 2000. Food Processing Equipment Design and Cleanability, Flair Flow Europe Technical Manual F-FE 377A/00. Teagasc. The National Food Centre, Dublin.

Lelieveld, H.L.M., Holah, J.T., Napper, D., 2014. Hygiene in Food Processing: Principles and Practice, second ed. Elsevier Science, United Kingdom.

Lelieveld, H., Holah, J., Gabric, D., 2016. Handbook of Hygiene Control in the Food Industry. Woodhead Publishing, Cambridge.

Musiari, F., Moroni, F., Pirondi, A., & Favi, C. (2024). Towards computer-aided hygienic design: Definition of a knowledge-based system for food processing equipment. Journal of Food Engineering, 363. https://doi.org/10.1016/j.jfoodeng.2023.111776

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POSTER 21

UHT Sterilisation Technology in Viscous Food Products

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The world population increases and the sustainability of adequate nutrition and protein resources becomes important. Process technologies that prevent waste and ensure food safety in consumers' access to food resources need to be developed (Sha & Xiong, 2020). Heat treatment is applied in the food industry to prevent microbial growth and/or harmful enzymes to ensure food safety during the targeted shelf life of the final product. In response to the difficulties encountered in industrial application due to the functional structure of proteins, heat treatment technologies are used as the most common method (Wang & Zhao, 2023). Ultra high temperature (UHT) sterilization; It is a continuous sterilization process that operates for a few seconds at temperatures above 130°C (140-150°C). The disadvantage of UHT temperature regimes is that they cause undesirable reactions such as color, loss of nutrients and reduced process efficiency. Although the current industrial uses of UHT technology are quite diverse, it is known that the most common application is in dairy products. Within the framework of this study, sterilization technology and application areas developed to be applied to viscous products are discussed. UHT sterilization finds a wide range of applications, such as processing of vegetables and fruits at the semi-products (tomatoes, strawberries), sterile fruit juices, soy milks and baby foods, puddings, sauces and other products.

UHT technique can be performed indirectly in plate and pipe systems and directly by injection and infusion methods at industrial applications. Although the heat treatment norm required for UHT is 1 second at 135°C, it can be stretched to upper limits according to the microbial contamination profile, including spore form, depending on the food raw material and supply chain conditions (Guo et al., 2024). Compared to indirect tube or plate heating methods, direct steam injection heating can heat the sample much faster, so the structure of the protein can be shaped in the desired direction. Recent research indicates that direct steam injection heating is becoming widespread for processing dairy and plant-based proteins (Safavi Nic et al., 2020).

Developed by Kromel direct contact steam injection (DCSI) technology contributes a nozzle-shaped steam injector was designed to reach sterilization temperatures. In the pre-preparation unit, the product, which has the desired structural properties, is continuously flowed through the pipeline and compared with the steam in the mixing chamber, reaching the desired temperature, and after the specified time, it is cooled until it reaches the desired dry matter level in the cooling cycle.

UHT technique with direct steam injection is used in the production of cream cheese in Turkey (Doruk, 2018). The developed UHT technology finds the opportunity to be used in this field, and its applications continue in industrial mass production. Mixing saturated steam into the product provides the temperature required for UHT with a sudden increase in temperature. The product prepared in the pre-cooking unit is sent from the

balance tank to the steam injectors with the help of a spiral pump, and the product flow rate and pressure and steam pressure are adjusted in combination. Product flow is ensured in this way for the UHT line, which is a continuous process. The product coming from the line with the help of a spiral pump is directly compared in the steam injectors with the steam passing through a 1 micron special steam filter with a line pressure of 6 bars. Meanwhile, the product temperature rises to 144±2°C and is kept at this temperature for 2-4 seconds. With the developed technology, UHT sterilization can be achieved with a net product loading capacity of 1000 kg/h, consuming 12.5 kW electricity, 120 kg/h (8-10 bar) steam and 50 lt/min (6-8 bar) air. In this technology, a steam injection system, which involves critical engineering work, is designed to inject steam homogeneously into the product. In UHT sterilization, cream cheese heated to 142°C is placed under vacuum in the rapid cooling tank until it reaches a sufficient cooling temperature; It is cooled to 70-80 °C and ready for aseptic filling.

There are many different examples of application areas of direct heat treatment technology, such as sterilization in liquid baby food and reducing the effects of the Maillard reaction. In examples from the dairy sector; Effects such as sterilization, colloidal stability, denaturation control, optimization of rennet coagulation ability, reduction of Maillard reactions, and improvement of physical stability are applied. Application examples of direct heat treatment technology in vegetable protein-based thick foods; improvement of solubility, foaming and emulsion properties in soy protein, reduction of odor content in soy milk, elimination of undesirable aroma and trypsin inhibitor activity in plant-based soy milk, improvement of emulsion quality in pea-rice protein blends, reduction of Ochratoxin A in oat-based baby cereal, pineapple juice It can find wide application areas such as sterilization (Wang & Zhao, 2023).

In the field of sustainability of protein sources, the negative effects of the production and consumption of animal proteins on the environment and climate, together with the changing of consumer's nutritional habits, increase the importance of plant protein sources. In recent years, a significant increase in the consumption of plant-based meat alternatives and milk substitutes has been observed with the increase in research on alternative plant proteins (Sha & Xiong, 2020).

There are studies that model adsorption and desorption kinetics and other reaction dynamics such as mass, momentum and heat transfer as a function of Reynolds number, in the application of heat treatment at the desired level and in the formation of layers in the structural change of proteins under the effect of heat treatment. In foods where Direct Steam Injection UHT Sterilization technology will be applied, effective production and cleaning processes can be planned by using these models (Safavi Nic et al., 2020).

In the direct heating technology developed within the scope of the project, steam is injected into the atmosphere under 4-5 bar pressure in a closed environment to apply heat treatment to the product at 140 degrees. The environment where steam injection is applied to the product is designed as a pressurized pipe. In traditional production, since the pasteurization temperature (80°C) is close to the filling temperature (72°C), there is no need for very intense cooling. In the new system, since the sterilization temperature is (142°C), faster and more effective heating and cooling is needed. Heating was achieved by providing steam, and cooling was achieved by evaporating water from the product in a special tank under vacuum. In this way, water changes phase everywhere in the product and cools down by taking the necessary phase change enthalpy. Mechanical tests of the system, the prototype of which was developed and the automation of which was completed in line with the targets determined within the scope of the project, and product trials were carried out on cream cheese

as a model food. Developing UHT sterilization technology on new generation model foods and expanding its usage area will benefit sustainability in the supply chain.

UHT sterilization technology is used to produce healthy and reliable products with a consistent structure, long shelf life, containing high amounts of animal protein, especially needed for security forces (military areas), primarily for consumption in regions where there is no cold chain (Africa, Middle East, Asia, etc.) was developed for the purpose of production. In disaster management, where access to safe food is of critical importance, expanding the use of this sterilization technology and being prepared for disaster situations by carrying out product R&D studies will also prevent losses.

References

Doruk, 2008. Farklı proses tekniklerinin eritme peyniri yapımında ürün kalitesi üzerine etkilerinin belirlenmesi. Yüksek Lisans Tezi. Gıda Mühendisliği A.B.D., Fen Bilimleri Enstitüsü, Namık Kemal Üniversitesi.

Guo, M., Wang, Y., Wang, P., Luo, J., Qian, W., Li, H., Wang, M., Yang, J., & Ren, F. (2024). Multiscale structure analysis reveals changes in the structure of casein micelles treated with direct-steam-infusion UHT. *Food Hydrocolloids*, *153*. https://doi.org/10.1016/j.foodhyd.2024.110033

Safavi Nic, S. S., Buist, K. A., Verdurmen, R. E. M., & Kuipers, J. A. M. (2020). Dynamic model to predict heat-induced protein denaturation and fouling in a Direct Contact Steam Condensation process. *Chemical Engineering Science: X*, *8*. https://doi.org/10.1016/j.cesx.2020.100075

Sha, L., & Xiong, Y. L. (2020). Plant protein-based alternatives of reconstructed meat: Science, technology, and challenges. In *Trends in Food Science and Technology* (Vol. 102, pp. 51–61). Elsevier Ltd. https://doi.org/10.1016/j.tifs.2020.05.022

Wang, X., & Zhao, Z. (2023). A mini-review about direct steam heating and its application in dairy and plant protein processing. In *Food Chemistry* (Vol. 408). Elsevier Ltd. https://doi.org/10.1016/j.foodchem.2022.135233

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POSTER 22

Influence of Mold Spore Level on the Bread Shelf Life Containing Fermented Wheat Flour Preservation System

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Clean label preservation is top of mind for bakeries across the world as consumer demand better bread with simpler label declarations. The aim of the study was to evaluate the anti-microbial efficacy of Upgrade W2 in white bread formulation against various molds inoculated at various concentrations.

Three different white breads were prepared containing either 0 % (Control), 0.9% or 1.8% Upgrade W2 on flour weight. Each loaf was inoculated with one of the following common bakery molds: *Aspergillus niger*, *Cladosporium cladosporioides*, *Penicillium roqueforti*, *P. commune* or *P. brevicompactum*. The molds were surface spot inoculated with either a 3, 4 or 5 log conidia inoculation per spot. The breads were incubated at 20 °C and visual molding was monitored daily for 30 days.

Control treatment spoiled within 5 or 6 days of incubation, regardless of inoculum dosage or species. At 0.9% Upgrade W2, *A. niger* outgrowth was apparent after 20, 19 or 12 days for the 3 log, 4 log, and 5 log inoculation levels, respectively. For *C. cladosporioides* this effect was not observed as both the 3 log and 5 log inoculation levels spoiled after 15 days at 0.9% Upgrade W2. For *Penicillium roqueforti* the inoculum concentration did not have an impact on the shelf life, even at the 1.8% Upgrade W2 dosage, while for other strains (e.g. *Penicillium commune* or *Cladosporium cladosporioides*) the shelf life was significantly reduced at increased inoculum level.

This study outlines the efficacy of fermented wheat flour (Upgrade W2) to increase the shelf-life of white bread.

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POSTER 23

Control of Spoilage Bacteria in Plant-Based Meat Analogue with Cultured Sugar and Vinegar Systems

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Plant-based meat continues to trend globally in demand as a meat substitute. Health is a main driver to consumers, making clean-label ingredients desirable. To evaluate the antimicrobial efficacy of fermentate, vinegar (BV), and organic acids on plant-based chicken (PBC) analogue.

In study 1, PBC was produced with three different formulations: (i) 0.75% vinegar for positive control (PC), (ii) 0.75% vinegar and 1% fermentate A and (iii) 0.75% vinegar and 2% fermentate B. In study 2, PBC was produced with five different formulations: (i) PC with no antimicrobial, (ii) 2.25% BV and fermentate B, (iii-v) 2.25% BV and fermentate B with 0.1, 0.2, and 0.4% organic acids, respectively. Each formulation was inoculated with a cocktail (~3 $\log_{10}$ CFU/g) of *Lactococcus lactis*, *L. lactis*, *Enterococcus lactis*, *Aerococcus* sp., and *Carnobacterium maltaromaticum*, then homogenized and stored at 4°C and 7°C. Sample homogenate was plated in duplicate onto deMan, Rogosa, Sharpe for enumeration lactic acid bacteria (incubated anaerobically) until spoilage level achieved (~7 $\log_{10}$ CFU/g). Data was analyzed using one-way ANNOVA ($P<0.05$).

In study 1, at 4°C all treatments formulated with either vinegar and fermentate A or fermentate B significantly ($P<0.05$) controlled growth up to 59 days storage compared to PC which grew until ~5 $\log_{10}$ CFU/g. On day-59, the 0.75% vinegar and 2% fermentate B treatment exhibited fewer populations (~1.85 $\log_{10}$ CFU/g). At 7°C, 0.75% vinegar and 2% fermentate B treatment was the most effective with an additional 7 days of shelf-life over PC (spoilage at day-12). In study 2, formulation with 0.4% organic acids (treatment v) at both temperatures was most effective (54 days of shelf-life) compared to PC which showed spoilage at day-13 (4°C) and day-5 (7°C).

This study demonstrates clean-label fermentate and vinegar-based solutions are effective against spoilage bacteria in plant-based chicken.

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POSTER 24

Calcium-Based Vinegar Powder as an Effective Anti-Fungal Preservation System for Cream Cheese

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Fungal spoilage is a major concern for dairy products such as cheese, cream cheese, and yoghurts. First, because the production and shipping of products that eventually end up spoiling have major impact on the environment. On top, molds can produce mycotoxins, so fungal spoilage is not only of concern economically but could also pose a food safety risk. To combat food spoilage, manufacturers add in preservatives such as potassium sorbate, but this is considered unfavorable from a consumer perspective.

The aim of the study was to evaluate the anti-microbial efficacy of calcium-based vinegar powder in comparison to potassium sorbate in commercially available cream cheese.

Four different treatments of full-fat cream cheese were prepared: cream cheese containing no preservative, 0.075 % potassium sorbate, 0.5 % or 1.0 % calcium-based vinegar (CBV). For each treatment, six samples of 50 g each were prepared and were left to spoil without inoculation. All samples were incubated at 10 °C. In addition, four identical treatments were tested in a low-fat cream cheese as well. Once a week all samples were exposed to the laboratory environment for an hour, mimicking open shelf life. Samples were observed daily until mold growth appeared.

Uninoculated full fat cheese sample with 0.075 % sorbate spoiled after 57 days, whereas 1.0 % of CBV did not spoil for 51 days, compared to a control that spoiled within 12 days. The 0.075 % sorbate and 1.0 % CBV samples of uninoculated low-fat cream cheeses showed similar results, as they did not spoil for 57 days and 48 days, respectively.

The results of this study demonstrate the added benefit of a CBV-based preservation system in dairy based products, such as cream cheese. It provides

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POSTER 25

Developing Scientific Methods for Bread Shelf Life Studies for Shelf Life Extension Using Fermentate Solution

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Shelf life extension is top of mind for many bakeries, to maintain bread quality throughout supply chain and to minimize food waste. Preservation solutions need to be validated for shelf life before being implemented. Implementing a preservation solution requires validated shelf life studies.

To develop and assess different shelf life protocols and inoculation methods for bread shelf life estimation using a fermentation based preservation system.

Loaves of standard white bread were prepared with either no preservatives, or with varying levels of Upgrade CR33 (1.8-2.1%). Bread dough was adjusted to target a final bread pH of 5.2. Regular shelf life and spot inoculation testing were compared. For regular shelf life testing, uninoculated breads were used. For spot inoculation, standardized mold spore suspensions of *Penicillium roqueforti, Aspergillus niger, Cladosporium cladosporoides* were pipetted throughout the bread surface. All breads were placed in clear bags and stored at 25°C, monitoring daily for visible mold growth.

Non-inoculated breads showed high variability in data, with many variables never showing visible mold before factors such as staling impacted results. Spot inoculation method showed consistent results, with negative control breads molding consistently by 5-7 days. Upgrade CR33 showed shelf life extension of +83% and +100% at 1.8% and 2.1%, respectively, compared to no-preservatives treatment which gave 6 days of shelf life.

These results highlight the importance of inoculated studies for accurate validation of a preservation solution and substantiates the preservation efficacy of Upgrade CR33 solution.

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POSTER 26

Efficacy of Conventional and Clean Label Preservation Systems Against Mold and Yeast Growth in Herb-Butter

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To meet the sustainability development goals, food waste reduction has been top-of-mind of food companies as it has beneficial impact on all aspects of the food supply chain. Herb-butter is impacted by growth of yeast and molds and a preservation system is required to extend its shelf life.

In this study we evaluated the efficacy of conventional (sodium acetate) and clean label (smoke system – Cloud SC100 & Lemon buffered vinegar system – Nourishield® 5000L) preservation systems against mold and yeast outgrowth in herb-butter.

Herb-butter was prepared with either 0.4 % sodium acetate, 0.1 % Cloud SC100 or 1 % Nourishield® 5000L and a control. To assess the efficacy against mold growth, 10 replicates were stored at 4 °C and 20 °C and incubated until visible mold growth occurred. In addition, an inoculated study was conducted in triplicate. Each treatment was inoculated with 3 log conidia per sample of *Penicillium roqueforti, P. commune, P. brevicompactum* and *Aspergillus niger.* To assess the native yeast population, non-inoculated herb-butter was incubated at 10 °C for 70 days and samples where regularly plated on YM agar to determine the colony count.

For the uninoculated herb-butters, the control showed mold spoilage after 15 days, samples with 0.1% Cloud SC100 after 18 days, while 1% Nourishield® 5000L and 0.4% sodium acetate did not show any spoilage within 40 days. The inoculated mold samples all spoiled within 7 days, regardless of the preservation system employed. Furthermore, we found that native yeast growth was inhibited by adding sodium acetate.

This study outlines the efficacy of conventional and clean label preservation systems to enhance shelf life of herb-butter.

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Antilisterial Capacity of Organic Salt Acids in Low Sodium Frankfurters

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Due to both supply chain, and nutritional labelling, potassium-based solutions are preferred antimicrobials compared to their sodium counterparts. In this study, potassium acetate/diacetate-blend was evaluated for antimicrobial efficacy against *L. monocytogenes* on frankfurters.

To assess the antilisterial effects of potassium lactate, sodium acetate and potassium acetate/diacetate (Provian K) in frankfurters stored at 4 and 7 C for 120 days.

A total of 2000 hot dogs of different treatment formulations (0.25-0.75% Provian K, 0.06-0.16% sodium acetate and 1.17-3.25% potassium lactate) and control (no antimicrobials) were inoculated with a five-strain cocktail of *L. monocytogenes*. Packaged were massaged to disperse vacuum packaged and stored at 4 and 7°C. At each sampling, duplicate packages of frankfurters were homogenized using a stomacher and plated onto Modified Oxford medium for enumeration. Failure of antilisterial capacity was assessed at 2 log CFU/g outgrowth, and treatment performance was compared using one-way ANOVA ($p<0.05$). The enumeration data was fitted to modified Gompertz model to calculate the lag time (day) and maximum growth rate (μmax; log/day) for each treatment.

Inoculation level of 2.5 log CFU/g of *L. monocytogenes* was achieved on day 0 for all the treatments. The control treatment exhibited fastest outgrowth (>2 log CFU/g) of *L. monocytogenes* by 21 days and 3 days of storage at 4°C and 7°C, respectively. The 0.75% Provian K treatment significantly ($p<0.05$) controlled *L. monocytogenes* outgrowth (<2 log CFU/g) > 63 days and 7 days of storage at 4°C and 7°C, respectively. At 4°C, Provian K exhibited highest lag time and slowest μmax of (20 day; 0.05 log/day) compared to control (9 day; 0.13 log/day) while at 7°C, Provian K and sodium acetate treatments exhibited significantly ($p<0.05$) reduced μmax compared to control and potassium lactate treatments.

Potassium acetates/diacetates can be used as highly effective alternatives to classic lactate based *Listeria* interventions.

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POSTER 28

The Effect of Organic Acid Based Antimicrobials on Controlling *Listeria monocytogenes* Outgrowth in Smoked Salmon at Retail Simulated Refrigerated Storage Conditions

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Listeria monocytogenes is a threat for ready-to-eat food products like smoked salmon, with multiple recalls after outbreaks of listeriosis in recent years (Lachmann *et al*., 2022).

This research shows *Listeria monocytogenes* inhibition in commercial cold smoked salmon products with addition of acetates and lactate during temperature abused storage of 28 days.

Six different treatments of smoked salmon were prepared: control (no preservative), 0.61% sodium acetate, 0.61% Provian K, 0.61% Provian N and 1.63% sodium lactate 60%. The slices were inoculated with a cocktail of 3 *L. monocytogenes* strains at 2-3 log (CFU/g). The inoculated smoked salmon slices were vacuum-packed and stored at a consecutive temperature profile of 7 days at 2°C, then 12 days at 7°C and finally 9 days at 9°C, representing the storage period during production, retail and at the consumer. Samples were plated in triplicate on PALCAM agar (*Listeria* counts) at regular time points during storage. At t=0 and after 28 days spoilage organisms were isolated from all treatments.

Two log (CFU/g) outgrowth of *L. monocytogenes* was observed in the control treatment after 28 days. Addition of 1.63% sodium lactate (60% w/w) resulted in 0.9±0.2 log (CFU/g) outgrowth. All acetate-based preservatives showed significantly better antimicrobial performance ($P<0.05$) compared to sodium lactate, with outgrowth of 0-0.3 log±0.3 (CFU/g) after 28 days. Furthermore, isolation of spoilage organisms of each treatment after 28 days showed that different preservatives target different microorganisms with a shift towards mainly lactic acid bacteria in treatments containing acetates compared to a more diverse spoilage flora in the control and lactate samples.

The results of this study demonstrate the superior performance of acetate based antimicrobial solutions to control outgrowth of *L. monocytogenes* in smoked salmon at abusive temperatures storage conditions, and thereby assuring food safety of smoked salmon.

References

Lachmann, R., Halbedel, S., Lüth, S., Holzer, A., Adler, M., Pietzka, A., & Wilking, H. (2022). Invasive listeriosis outbreaks and salmon products: a genomic, epidemiological study. *Emerging Microbes & Infections*, 1-30.

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POSTER 29

Evaluating Low Sodium Organic Acid Salts against *Lactobacillus sakei* for the Shelf Life Extension of Frankfurters

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Consumer and regulatory pressure for low sodium options illicit the need for potassium-based antimicrobials. Highly effective potassium based acetic acid salts would be a viable alternative for meat applications.

To evaluate the efficacy of sodium and potassium based organic acid salts against *L. sakei* in frankfurters at 2, 4, 7°C for up to 120 days incubation.

Frankfurters (1300 per treatment) of eight organic acid treatments (0.25-0.75% Provian K, 0.06-0.16% sodium acetate and 1.17-3.25% potassium lactate) and control (no antimicrobials) were inoculated with 2-3 $\log_{10}$ CFU/g *L. sakei*, vacuum packaged and stored at 2, 4, 7°C for up to 120 days. During sampling, duplicates of sample homogenate were plated onto deMan, Rogosa, Sharpe agar for enumeration. Spoilage threshold was set at 6 log CFU/g, and treatment performance was compared using one-way ANOVA ($P < 0.05$). Primary modeling was used to model growth and estimate day of microbial spoilage.

Inoculation level of 2.5 log CFU/g of *L. sakei* was achieved on day 0 for all treatments. Overall, 3.25% potassium lactate and 0.75% Provian K were very similar in their antimicrobial performance. Control treatments showed fastest outgrowth of *L. sakei* at all temperatures, reaching 6 $\log_{10}$ CFU/g on 34, 24 and 10 days storage at 2, 4 and 7 °C, respectively. Provian K (0.75%) showed significantly enhanced shelf life compared to control ($P \leq 0.0032$) at these storage temperatures, imparting 14, 11 and 2 days shelf life extension at 2, 4 and 7 °C, respectively.

Provian K exhibited superior antimicrobial efficacy against *L. sakei* in processed meat at a 3 to 5 times lower use level compared to potassium lactate-based preservatives, providing meat processors with cost-efficient solutions.

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POSTER 30

Examination of Different Starch Usage in Sausage Products

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In the poultry sector, raw starch is used at a rate of 90%. It is expected that structurally beneficial effects will be achieved with commonly used starch types in processed emulsified products in the sector. Research on the types of starch commonly used in the poultry sector could be an important step towards improving product quality.These properties include gelation, adhesiveness, water-binding capacity, moisture retention, stabilization, and viscosity enhancement. The use of raw potato, corn, wheat starches, and modified wheat starch has been evaluated in sausage products to determine the appropriate type of starch. The parameters of elasticity, texture, slicability, chewability, and cooking loss of the sausage products were evaluated in terms of starches. As a preliminary study, viscosity measurements of starches were performed, and the effects of starch source and modification were compared. Taking into account factors such as particle sizes of starch types, product caliber, baking program, formulation of other components, starch type, and gelation temperature, the formulation of sausage products was carried out by the Lezita R&D Center. This study aimed to bring an innovative approach to starch usage in the poultry sector to improve product quality. The findings obtained will bring differentiation to the sector and lead to products of better quality. In preliminary studies, viscosity measurements were conducted based on temperature and waiting time (3 days), and the results showed parallelism with the evaluation of the final product. As an outcome of the study, statistically significant differences were observed among samples in terms of hardness, gumminess, and sliceability, with the most suitable results observed in natural potato starch and the least suitable results observed in corn starch ($p=0.05$). A synergistic effect was observed with the combined use of modified wheat and raw potato starch. No significant difference was observed in cooking loss and sliceability ($p=0.05$).

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POSTER 31

Pınar Et Food Safety Culture

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Purpose. Assessing, improving, and sustaining our current food safety culture

What was done to achieve the purpose?. The goals were set

- ✓ A survey was created for the employees.
- ✓ A training presentation was prepared, and training sessions were organized.
- ✓ Announcements were made via posters, emails, and notice boards.

How was it done?. A survey tailored to the needs was prepared, and the collected survey results were compiled into a report for necessary actions to be taken

During face-to-face training sessions, staff members were informed and feedback was collected.

Announcement of top management support, sharing of policies and objectives. Active participation of employees was ensured through a poster competition.

"The Power of Ideas" Poster Competition. With the poster competition we organized, we supported the creativity and team spirit of employees working with a focus on food safety. We provided participants with the opportunity to visually express their perspectives on Pinar Meat Food Safety Culture. Employees who participated and those who achieved top rankings were rewarded.

Conclusion. With all these efforts, we strengthened the food safety culture in our workplace. Thus, by increasing the awareness level of employees, we ensured the implementation of food safety standards more effectively and continuously improved them.