International Conference on

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40th 한국식품위생안전성학회 정기학술대회

The Science of Food Safety :
Bridging Research and Application

November 19(Wed) - 21(Fri), 2025

Haevichi Hotel & Resort Jeju

■주최 사단법인 한국식품위생안전성학회

■후원 식품의약품안전처, 식품의약품안전평가원, KFRI 한국식품연구원, KAHAS Korea Agency of HACCP Accreditation and Services, 식품안전정보원 NATIONAL FOOD SAFETY INFORMATION SERVICE, 한국식품산업협회 Korea Food Industry Association, 한국식품과학연구원 Korea Advanced Food Research Institute, 한국소비자원 Korea Consumer Agency, ThermoFisher SCIENTIFIC, NEOGEN, Sanigen, BIOMERIEUX, hygiena, 고마바이오텍(주), Maeil, LAS Life is Art of Science, 부경대학교 PUKYONG NATIONAL UNIVERSITY, 경북대학교 KYUNGPOOK NATIONAL UNIVERSITY, 이화여자대학교 EWHA WOMANS UNIVERSITY, 시스템헬스융합전공 SYstem Health & Engineering, KOFST 한국과학기술단체총연합회

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Invitation

한국식품위생안전성학회 회원 여러분 안녕하십니까?

빠르게 변화하는 사회와 기술 환경 속에서 회원 여러분과 가정에 항상 건강과 행복이 함께하시기를 진심으로 기원합니다. 우리 사회는 여전히 다양한 예측 불가능한 도전에 직면하고 있으며, 식품 산업과 안전성 분야 역시 새로운 과제와 기회를 맞이하고 있습니다. 한국식품위생안전성학회는 이러한 변화 속에서 학계, 정부, 산업계 전문가들이 함께 모여 미래 식품안전의 비전을 논의할 수 있는 장을 마련하고자 합니다.

다가오는 2025년 11월 19일부터 21일까지 3일간, 아름다운 섬 제주 해비치 호텔&리조트에서 제40회 정기학술대회가 개최됩니다. 이번 학술대회의 주제는 “The Science of Food Safety: Bridging Research and Applicaiton”입니다. 총 29개의 세션과 기기 전시, Young Scientist 세션, 대학원생 구두 발표 등으로 구성되며, 최신 연구 성과와 지식을 공유하고, 국내외 식품 안전 정책 및 기술의 미래 방향을 제시하는 소중한 기회가 될 것입니다.

특히 Plenary Session에서는 식품안전의 새로운 비전을 함께 모색합니다. 먼저, 본 학회 전회장이셨으며 현재 한림원 원장이신 정진호원장님이 과학과 사회 융합을 통한 식품안전의 미래를 강연하십니다. 강원대학교 오덕환교수님은 미생물 기반 식품안전 및 건강증진 전략을 발표하십니다. 그리고 한국식품안전관리인증원 한상배원장님은 식품안전문화의 중요성과 확산방안에 대한 강연을 해주실 예정입니다.

아울러 이번 학술대회를 후원해 주신 식품의약품안전처, 식품의약품안전평가원, 한국식품연구원, 한국식품안전관리인증원, 식품안전정보원, 한국식품산업협회를 비롯한 여러 기관과 네오젠코리아, ㈜세니젠, ㈜비오메리으코리아, 써모 피셔 사이언티픽 코리아, 하이지에나 등 많은 기업들께 깊이 감사드립니다. 지속적인 관심과 후원이 학회의 성장과 발전에 큰 힘이 되고 있습니다.

끝으로, 바쁜 일정에도 불구하고 귀중한 연구 결과를 발표하고 토론에 참여해 주신 연자님들과 좌장님, 그리고 학술대회 준비에 헌신해 주신 모든 관계자 여러분께 진심으로 감사의 말씀을 드립니다. 회원 여러분의 많은 관심과 적극적인 참여를 부탁드리며, 이번 제 40회 정기학술대회가 식품위생안전성 분야의 새로운 도약을 이끄는 장이 되기를 기대합니다.

감사합니다.

2025년 11월 19일

(사)한국식품위생안전성학회 회장 **오 세 욱**

Congratulatory Message

안녕하십니까? 식품의약품안전처장 오유경입니다.

제40회 식품위생안전성학회 정기학술대회 개최를 축하드립니다.

※ (주제) The Science of Food Safety: Bridging Research and Application

학술대회를 준비해 주신 오세욱 회장님, 관계자분들께 감사드리며, 식품안전에 기여하신 공로로 수상하시는 여러분께도 축하드립니다.

식품안전은 국민 건강의 기초이며, 식품산업의 신뢰와 경쟁력을 떠받치는 핵심 버팀목입니다.

식품위생안전성학회는 지난 40여년간 전문성과 축적된 연구 성과를 바탕으로, 실험실의 과학적 이론을 식품안전 현장에 실천 가능한 응용기술로 연결하는 가교 역할을 충실히 해 오셨습니다.

최근에는 인공지능, 사물인터넷, 빅데이터 등 첨단 기술이 식품안전 분야에도 빠르게 도입되고 있습니다.

식품의약품안전처 역시 수입식품 전자심사 SAFE-i24, AI 기반 위해예측시스템, 푸드 QR시스템 등을 통해 활용해 나가고 있습니다.

첨단기술을 정책과 연결하여 보다 효율적이고 사각지대 없는 식품안전망을 확립하는 것은 우리 국민의 더 건강한 삶을 구현하고 K-푸드의 글로벌 경쟁력을 높일 수 있을 것이라 기대됩니다.

이번 학술대회를 통해 식품안전의 과학적 연구와 현장 적용을 연결하고, 지속가능한 식품산업의 미래를 함께 모색하는 뜻깊은 장이 되기를 바랍니다.

감사합니다.

2025년 11월 19일

식품의약품안전처장 **오 유 경**

Congratulatory Message

존경하는 한국식품위생안전성학회 회원 여러분,

그리고 세계 각국에서 오신 식품안전 분야의 전문가 여러분, 안녕하십니까.

제40회 정기학술대회 및 국제학술대회가 “The Science of Food Safety: Bridging Research and Application”이라는 대주제 아래 이렇게 뜻깊게 개최된 것을 진심으로 축하드립니다. 또한, 학회 40주년이라는 역사적 이정표를 함께 기념하게 되어 개인적으로도 무척 뜻깊게 생각합니다.

제가 회장직을 수행한 지도 벌써 15년이라는 시간이 흘렀습니다. 그동안 학회는 학문적 내실과 사회적 책임을 동시에 품은 기관으로 성장해 왔으며, 오늘 이 자리에서 이러한 발전의 결과를 함께 나눌 수 있어 큰 감명을 받습니다.

다가올 50주년, 100주년에는 학회가 대한민국 식품안전의 최전선에서 과학과 정책, 국민 삶을 연결하는 핵심 축이 되기를 진심으로 기대합니다.

현재 저는 한국과학기술한림원(KAST)의 원장으로서, 과학기술의 사회적 책임과 국가적 전략에 대해 더욱 깊은 고민을 하고 있습니다. 식품안전은 단순한 규제의 문제가 아니라, 과학기술을 기반으로 한 국민 건강, 산업 경쟁력, 지속가능한 생태계를 지켜내는 종합적 과제입니다.

특히 위기 대응력과 신뢰 회복의 시대를 맞은 지금, 여러분의 연구와 제언은 식품안전 정책과 국가 전략의 과학적 근거가 됩니다.

오늘 이 자리를 통해 발표되고 토론될 새로운 기술, 규제과학, 리스크 평가 모델은 과학과 행정, 소비자와 산업 간의 신뢰를 복원하는 기반이 될 것이며, 이는 곧 학회가 수행해 온 ‘과학의 사회적 책무’의 연장선상이라 생각합니다.

끝으로, 이번 학술대회를 준비해주신 오세욱 회장님을 비롯한 임원진과 조직위원회, 그리고 함께해 주신 모든 국내외 연사 여러분께 깊은 감사의 말씀을 드립니다.

여러분의 연구와 실천이 국민 생활의 안전과 국가 과학기술의 신뢰를 높이는 데 더욱 크게 기여하길 바라며, 학회의 지속적 성장과 모든 참석자 여러분의 건승을 기원합니다.

감사합니다.

2025년 11월 19일

한국과학기술한림원 원장 **정 진 호**

Congratulatory Message

안녕하십니까, 농촌진흥청장 이승돈입니다.

존경하는 한국식품위생안전성학회 오세욱 회장님을 비롯한 임원진과 회원 여러분, 그리고 귀빈 여러분.

오늘 제40회 한국식품위생안전성학회 정기학술대회 개최를 진심으로 축하드리며, 이 뜻깊은 자리에 영상으로나마 축하 인사를 드리게 되어 매우 기쁘게 생각합니다.

이번 학술대회는 “식품안전의 과학: 연구와 현장의 연결”이라는 의미 있는 주제로 개최됩니다. 연구실의 과학적 성과가 현장에서 실질적 가치로 구현될 때, 비로소 국민이 안심할 수 있는 먹거리 환경이 완성된다는 점에서 오늘날 식품안전이 나아가야 할 방향을 잘 제시하고 있습니다.

최근 기후변화, 신종 병원체 출현, 글로벌 공급망 변화 등으로 식품안전 환경은 더욱 복잡해지고 있습니다. 이러한 위기 앞에서 과학기술에 기반한 예방적 관리체계 구축은 선택이 아닌 필수가 되었습니다.

농촌진흥청은 농장에서 식탁까지 이어지는 全 과정의 안전관리 강화를 위해, 농산물과 농업환경의 생물적 위해요소 진단 및 제어기술 개발, 관련 제도·기준에 대한 과학적인 근거 마련에 노력하고 있으며, 국민 여러분이 믿고 안심할 수 있는 안전한 식탁을 만드는 데 최선을 다하고 있습니다.

한국식품위생안전성학회는 지난 40년간 학문적 깊이와 현장 적용성을 겸비한 연구로 우리나라의 식품안전 분야를 선도해 왔습니다. 이번 학술대회가 그 간의 성과를 공유하고, 새로운 비전과 협력의 장을 여는 뜻깊은 자리가 되기를 기대합니다.

다시 한번 학술대회 개최를 축하드리며, 참석하신 모든 분들의 건강과 학회의 무궁한 발전을 기원합니다.

감사합니다.

2025년 11월 19일

농촌진흥청장 **이 승 돈**

Academic Conference Organizing Committee

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조 직 위 원	방우석	영남대 식품영양학과 교수

CONTENTS

Day 3

DAY 1 2025. 11. 19 (WED)

Plenary Lecture 1

Diamond Hall A — Chair: Sang-Do Ha / Chung-Ang University

15:30~16:10	Strategic Science in a Shifting Era: National R&D, Innovation Priorities, and the Expanding Frontier of Food Safety [Jin-Ho Chung / Korea Academy of Science and Technology (KAST)]

Session 1 Safety Management of Hazardous Contaminants in Home Meal Replacements
- 식품별 유해오염물질 오염도 조사 사업('26~'27) 사업설명회 개최-

Crystal Hall B — Chair: Sung-Kwan Park / Ministry of Food and Drug Safety

16:20~16:45	Analytical Investigation of Hazardous Substances in Foods for Standard Re-evaluation [Hyun Suk Oh / Ministry of Food and Drug Safety]
16:45~17:10	Home Meal Replacements in the Global Foodscape: Trends and Safety Challenges [Minchul Kang / Pulmuone Co., Ltd.]
17:10~17:35	Analysis of Free 3-MCPD, 3-MCPD Esters, and Glycidyl Esters in Home Meal Replacements [Young-Suk Kim / Ewha Womans University]
17:35~18:00	Dietary Exposure and Risk Assessment of Hazardous Contents in Home Meal Replacement Products [Seok-Hee Lee / Dongguk University]

■ 식품의약품안전처 유해물질기준과

Session 2 Rapid and Accurate Analysis Solutions for Food Safety

Crystal Hall C — Chair: Hyeon Gyu Lee / Hanyang University

16:20~16:50	Allergen Risk Management and Analysis Solutions [Younghun Choi / KOMABIOTECH]
16:50~17:25	From Enrichment to PCR: Simplifying the Workflow for Food Safety Labs [Edmond Roquigny / Goldstandard Diagnostics]
17:25~18:00	Goldstandard Diagnostics' Diagnostic Solutions for Rapid and Accurate Detection of Mycotoxins in Food [Sangdon Moon / KOMABIOTECH]

■ 고마바이오텍

Session 3	Value-Added Food Safety: Science-Driven Strategies for Quality, Innovation, and Global Competitiveness

Crystal Hall D — Chair: Hee-Seok Lee / Chung-Ang University

16:20~16:45	Smart and Sustainable Green Extraction, Materialization, and Hygiene Management of Agro-Fishery by-Products using Electromagnetic Energy [Daeung Yu / Changwon National University]
16:45~17:10	Upcycling of Jeju Agricultural By-Products for the Development of Functional Food Ingredients [Ki-Bae Hong / Jeju National University]
17:10~17:35	Food Safety and Global Competitiveness: K-Value Food Strategies to Address Shifting Regulatory Paradigms [Chulwoo Jeong / Samyang Foods]
17:35~18:00	Case Study on Digital-Based Automated Inspection and Management System for Strengthening Food Safety in Cross-Border E-Commerce Foods [Geun Hwi Bae / National Food Safety Information Service]

■ 식품안전정보원

Session 4	Next-Generation Risk Assessment in Food: Opportunities and Challenges for Regulatory Science

Crystal Hall E — Chair: Hyeyoung Lee / National Institute of Food And Drug Safety Evaluation

16:20~16:40	Global Trends in Next-Generation Risk Assessment for Food: Regulatory Perspectives and Future Directions [Hyang Sook Chun / Chung-Ang University]
16:40~17:00	Weight of Evidence Determination of Points of Departure: from Data to Decision [Joohee Jung / Duksung Women's University]
17:00~17:20	Developments and Limitations of *In Vitro-In Silico*-Based Toxicity Prediction [Kyunghee Ji / Yongin University]
17:20~17:40	A New Paradigm of Risk Communication: Implications for Food Risk Management and Assessment [Hye-Jin Paek / Hanyang University]
17:40~18:00	Panel Discussion: Regulators, Academia, and Industry

■ 식품의약품안전평가원 식품위해평가과

Session 5	The Importance of Food Safety Management and Environmental Monitoring for the Sustainable Growth of the Food Industry

Diamond Hall A — Chair: Joon Goo Lee / Seoul National University of Science and Technology

16:20~16:50	Risk-Based Environmental Monitoring Requirements of GFSI Scheme and U.S. FDA [Wonjun Oh / DNV Business Assurance Korea]
16:50~17:25	The Importance and Policy Needs of Environmental Monitoring for Foodborne Pathogens in Food Safety [Tae Jin Cho / Korea University]
17:25~18:00	Management Strategies and Implications for *Salmonella* Control from Laying Hen Farms in the United States, the European Union, Japan, and South Korea [Jin San Moon / Animal and Plant Quarantine Agency]

■ 네오젠코리아

DAY 2 2025. 11. 20 (THU)

Plenary Lecture 2

Diamond Hall A — Chair: Kun-Ho Seo / Konkuk University

09:30~10:10	Microbial Approaches to Food Safety and Health Promotion [Deog Hwan Oh / Future F Biotech Co., Ltd.]

Session 6 Genomic Approaches in the Analysis of Food-Associated Microorganisms: Current Trends and Techniques

Crystal Hall A — Chair: Insun Joo / National Institute of Food And Drug Safety Evaluation

10:20~10:45	Application of Next-Generation Sequencing (NGS) in Investigating Food-Borne Pathogens and Outbreaks by the MFDS [Yonghoon Kim / National Institute of Food And Drug Safety Evaluation]
10:45~11:10	Development of an NGS Panel for the Detection and Identification of Food-Borne Pathogens at the MFDS [Min Jung Lee / National Institute of Food And Drug Safety Evaluation]
11:10~11:35	Uncovering Contamination Pathways in Food Systems through Metagenomic Analysis of Environmental and Food-Associated Microbiota [Tae Jin Cho / Korea University]
11:35~12:00	Transcriptomic Approach for Understanding *Salmonella* Behavior in Food Production [Hyunjin Yoon / Ajou University]

■ 식품의약품안전평가원 미생물과

Session 7 Predictive and Preventive Approaches for Emerging Microbial Hazards in Food

Crystal Hall B — Chair: Hyun Jung Kim, Min-Cheol Lim / Korea Food Research Institute

10:20~10:45	Multi-Omics Insights into Food Safety: Current Advances and Future Challenges [Si Hong Park / Oregon State University]
10:45~11:10	Machine Learning Approaches for Predicting *Listeria monocytogenes* Growth Across Various Protein-Based Ready-to-Eat Food Products [Hyun Jung Kim / Korea Food Research Institute]
11:10~11:35	Pattern-Guided Microbial Behavior Analysis: Accelerating Foodborne Pathogen Identification Using Wrinkled Surfaces [Min-Cheol Lim / Korea Food Research Institute]
11:35~12:00	Emerging Strategies for Inactivation of Foodborne Viruses in the Food Processing Environments [Sangha Han / Chung-Ang University]

■ 한국식품연구원 안전유통연구단

Session 8	Smart Choices in Health Functional Foods: Awareness, Safety and Responsibility

Crystal Hall C — Chair: Joonbae Hong / Korea Consumer Agency

10:20~10:50	Consumer Awareness Survey for Providing Accurate Information on Health Functional Foods [Nyeong-Seo Park / Korea Consumer Agency]
10:50~11:25	Management and Policies for Health Functional Foods [Min Sik Kim / Ministry of Food and Drug Safety]
11:25~12:00	Overview of Consumer Centered Management (CCM) at Korea Ginseng Corporation (KGC) for Enhancing Consumer Trust [Saeng Gi Yoo / Korea Ginseng Corporation]

■ 한국소비자원

Session 9	A Change in the Diagnostic Paradigm of Hazardous Microorganisms in the Food Industry

Crystal Hall D — Chair: Min-Suk Kong / Seoul National University of Science and Technology

10:20~10:50	Rapid Detection and Application of Sanitary Indicators and Food Poisoning Bacteria Using Chromogenic Technology-Based Dry Media [Nobuyoshi Sato / Kikkoman Biochemifa Company]
10:50~11:25	Food Poisoning Bacteria/Virus Analysis Using Real Time qPCR, Increase Utilization of Vegan/Halal/Allergen Analyses [Hyunwook Kim / Sanigen]
11:25~12:00	Development of a Novel Next-Generation Sequencing (NGS) Panel Method for *Salmonella* and *Escherichia coli* Serogrouping [Ju-Hoon Lee / Seoul National University]

■ 세니젠

Session 10	Global Trends and Scientific Evaluation of Food Additive Safety Management

Crystal Hall E — Chair: Mi Ra Kim / Ministry of Food and Drug Safety

10:20~10:50	Current Status of Food Additive Regulatory Systems and Analytical Method Improvements in Korea [Kwang-Won Lee / Korea University]
10:50~11:25	Evaluation and Analysis of Sweetener Intake Levels in Korea [Young-Jun Kim / Seoul National University of Science and Technology]
11:25~12:00	Policies on the Safety Management of Food Additives in Major Countries: Domestic and International Perspectives [Jihyun Lee / Seoul National University]

■ 식품의약품안전평가원 첨가물포장과

Session 11 GMO Safety: Scientific Validation and Societal & Industrial Value

Diamond Hall A — Chair: BoKyung Moon / Chung-Ang University

10:20~10:50	Current Status and Prospects of Biotech Crops for Sustainable Society in the Face of Climate Crisis [Sang-Soo Kwak / UST]
10:50~11:25	GMO Safety: Evidence, Standards, and Trust [Hae-Yeong Kim / Kyung Hee University]
11:25~12:00	GMO Issues and Regulations in Food Industry [Sang-Do Ha / Chung-Ang University]

■ 한국식품산업협회

Session 12 Beyond Compliance: Shaping the Future of Food Safety Culture

Crystal Hall A — Chair: Sun Hee Park / Maeil Dairies Co., Ltd.

13:30~13:55	Building a Strong Food Safety Culture: Insights from USFDA Perspectives and Global Best Practices [Eric Stevens / Hygiena]
13:55~14:20	Advancing Food Safety Culture: Measurement Tools and Applications [Seung Yong Cho / National Food Safety Information Service]
14:20~14:45	Time-Synchronized Large-Scale Process Analytics for Real-Time Anomaly Detection in Food Manufacturing [Sangoh Kim / Food Engineering, Dankook University]
14:45~15:10	Rebuilding Trust through Food Safety Culture: Lessons from Maeil Dairies [Sangwoo Cho / Maeil Dairies Co., Ltd.]

■ 매일유업

Session 13 MPs Safety Management in Food

Crystal Hall B — Chair: Moon-Ik Chang / National Institute of Food And Drug Safety Evaluation

13:30~13:50	Overview of MPs in Food Safety [Jung Eun Lee / National Institute of Food & Drug Safety Evaluation]
13:50~14:10	Development and Validation of Analytical Methods for Microplastics in Food [Minyoung Chae / CESCO]
14:10~14:30	Pretreatment Strategies and Py-GC/MS Approaches for MPs Analysis in Food Matrices [Young-Min Kim / Daegu University]
14:30~14:50	Optimization of MPs Analysis Techniques in Food - Case Studies on Salt and Honey [Hyoyoung Lee / KOTITI Testing & Research Institute]
14:50~15:10	Onsite SERS Detection of Microplastics Using 3D Plasmonic Paper [Ho Sang Jung / Korea University]

■ 식품의약품안전평가원 신종유해물질과

Session 14 Regulatory Science and Technological Advances in Cell-Based Food

Crystal Hall C — Chair: Mi-Kyung Park / Kyungpook National University

13:30~13:55	Regulatory Developments on the Safety Assessment of Cell-Based Foods in Korea [Hyung Wook Chung / Ministry of Food and Drug Safety]
13:55~14:20	Tissue Engineering and Cultivated Meat [Wonil Han / TissenBioFarm]
14:20~14:45	Exploring Functional Materials as Culture Media Substitutes for Enhanced Cell-Based Food Production [Jun-Hyun Oh / Sangmyung University]
14:45~15:10	Biomaterials Bridging Cells and Food: Hybrid Scaffold Research for Sustainable Cell-Based Food [Sohyeon Park / Kyungpook National University]

■ 경북대학교

Session 15 Strengthen Food Safety through Digital Innovation and Global Regulatory Science

Crystal Hall D — Chair: Sang-Do Ha / Chung-Ang University

13:30~14:00	One Health and Global Food Safety Strategies [Yongho Park / Seoul National University]
14:00~14:35	Tackling Pathogens' Persistence with Smart Monitoring and Digital Power [Daniele Sohier / Hygiena]
14:35~15:10	Harnessing the Power of Hygiena Diagnostics toward Building a Safer Food [Emily Tay / Hygiena]

■ Hygiena

Session 16 Progressive MassARRAY Solutions for Enhanced Food Safety

Crystal Hall E — Chair: Dae-Ok Kim / Kyung Hee University

13:30~13:55	LAS Introduction [Ohyung Kwon / LAS]
13:55~14:20	Fundamental Principles of the MassARRAY® System [Sooyoung Choi / LAS]
14:20~14:45	MassArray Technology : Exploring the Potential of MassArray in Various Food Safety Applications [Hyunhee Seo / LAS]
14:45~15:10	Rapid Detection System for Foodborne Pathogens Using MassARRAY [Unji Kim / Kookmin University]

■ LAS

Session 17 Research on Safety Management Technology for the Sustainable Future Food Industry

Diamond Hall A Chair: Jin Hwan Hong / Korea Agency of HACCP Accreditation and Services

13:30~14:00	A study on the Improvement of HACCP Management for the Safe Manufacturing of Liquid Egg Products [Chan Wook Son / Korea Agency of HACCP Accreditation and Services]
14:00~14:35	A Study on Developing Food Safety Management Guidelines for Major Non-Conforming Processes in the Korean HACCP System [Younseo Park / Korea Agency of HACCP Accreditation and Services]
14:35~15:10	Enhancing Accessibility of OLHA (On-Line Hazard Analysis) System [Seonyeong Choi / Korea Agency of HACCP Accreditation and Services]

■ 한국식품안전관리인증원

Session 18 Management of Veterinary Drugs in Livestocks and Fishery Products

Crystal Hall A Chair: Jae-Eun Mun / Ministry of Food and Drug Safety

15:30~15:55	Enhancement of Domestic Seafood Safety Management [Mi Ran Jang / Ministry of Food and Drug Safety]
15:55~16:20	Management of Veterinary Drugs in Livestocks and Fishery Products [Gui-Hyun Jang / Ministry of Food and Drug Safety]
16:20~16:45	Comprehensive Residue Survey in Minor Animal-Source Foods: Method Fitness and Risk Context [Yongho Shin / Dong-A University]
16:45~17:10	Preparation and Stability Assessment of Meat Certified Reference Materials for Accurate Determination of Veterinary Drugs [Seok-Won Hyung / Korea Research Institute of Standards and Science (KRISS)]

■ 식품의약품안전평가원 잔류물질과

Session 19 Blue Food Auction House 3.0 Model: A Digital Platform for Hygienic and Quality Seafood Distribution

Crystal Hall B Chair: Seul-Ki Park / Korea Food Research Institute

15:30~15:50	Establishing Grading and Quality Standards for Major Seafood [Du-Min Jo / National Marine Biodiversity Institute of Korea]
15:50~16:10	Microbiological Risk Assessment of Automated Processes in Fish Auction Markets for Seafood Safety [Jeeyeon Lee / Dong-Eui University]
16:10~16:30	Monitoring Physicochemical and Volatile Changes of Laver (*Pyropia* spp.) for Quality and Safety Management [Gi-Un Seong / Korea Food Research Institute]
16:30~16:50	Deep Learning-Based Video Analysis for Seafood Freshness Grading and Defective Product Classification [Inhoon Jang / Hankyong National University]
16:50~17:10	Blue Food Auction House 3.0 Model: Past, Present, and Future of Seafood Auction House [Young-In Jung / Sea-Life Science Lab Co., Ltd.]

■ 한국식품연구원 스마트제조사업단

Session 20 Food Safety Perspectives on Pathogen Investigation and Heat-Resistant Mold Management

Crystal Hall C Chair: Deog Hwan Oh / Kangwon Institute of Inclusive Technology (KIIT)

15:30~15:55	Proactive Environmental Pathogen Management in Dairy Manufacturing: Integrating FDA cGMP EPM Principles with Advanced Molecular Tools [Sangwoo Cho / Maeil Dairies Co.,Ltd]
15:55~16:20	GENE-UP® TYPER: Rapid qPCR Strain Typing for Foodborne Pathogen Root Cause Analysis [Bomi Park / bioMerieux KOREA]
16:20~16:45	Fungi Contamination and Food Safety [Joonbae Hong / Korea Consumer Agency (KCA)]
16:45~17:10	Mold Control in Ambient-Distributed Pie Products [Jeawook Kang / ORION]

■ 비오메리으코리아

Session 21 National Strategy for Advancing Food Nutrient Information System

Crystal Hall D Chair: Soonho Lee / National Institute of Food and Drug Safety Evaluation

15:30~15:55	Policy Applications of the Korean Food and Nutrient Database [Soon-Kyu Lee / Ministry of Food and Drug Safety]
15:55~16:20	Food Nutrition Labeling in Korea [Eunjin Park / Ministry of Food and Drug Safety]
16:20~16:45	Strategy for the Advancement of the Korean Food and Nutrient Database [You-Gyoung Park / National Institute of Food and Drug Safety Evaluation]
16:45~17:10	Development of Korean Food Composition Database and Its Application [Youngmin Choi / Rural Development Administration]

■ 식품의약품안전평가원 영양기능연구과

Session 22 The Study about Non-Regulated Hazardous Mycotoxins

Crystal Hall E Chair: Jin Sook Kim / Ministry of Food and Drug Safety

15:30~15:55	Investigation into the Causes of a Food Poisoning Outbreak Resulting from Red Yeast Rice [Tomoya Yoshinari / National Institute of Health Sciences]
15:55~16:20	"The Known Unknowns": Understanding and Addressing the Risk of Modified Mycotoxins in Food Safety [Hyang Sook Chun / Chung-Ang University]
16:20~16:45	Occurrence of Non-Regulated Mycotoxins and Their Producing Fungi in Crops [Ja Yeong Jang / National Institute of Agricultural Sciences]
16:45~17:10	Development of Analytical method of Non-Regulated Mycotoxins for Proactive Management of Food Safety [Young Woon Kang / Ministry of Food and Drug Safety]

■ 식품의약품안전처 곰팡이독소연구회

Session 23	Rapid Detection of Foodborne Pathogens Using High-Sensitivity Diagnostic Techniques

Diamond Hall A — Chair: Kun-Ho Seo / Konkuk University

15:30~15:55	Technological Progress in the Aspect of qPCR Applied to Food Pathogen Testing: When Technology Meets Food Industry's Needs [Sandra Freville / Thermo Fisher Scientific]
15:55~16:20	Introduction to Various Applications of Digital PCR and NGS Based Genetic Analysis for Food Safety and Research [Keun-Joon Park / Thermo Fisher Scientific]
16:20~16:45	Stable Isotope Ratio Analysis for Tracing Geographical Origin and Authenticity of Food and Beverages [Hyeongseok Song / Thermo Fisher Scientific]
16:45~17:10	Quality Control Automation Along the Laboratory Workflow [Jooyeon Han / Thermo Fisher Scientific]

■ 써모피셔사이언티픽코리아

DAY 3 2025. 11. 21 (FRI)

Plenary Lecture 3

Diamond Hall A — Chair: Young-Mok Kim / Pukyong National University

09:30~10:10	Food Safety Culture [Sang Bae Han / Korea Agency of HACCP Accreditation and Services]

Session 24 Young Scientist Presentation Ⅰ Foodborne Toxins and Health Effects

Crystal Hall A — Chair: Sunae Kim / Ewha Womans University

10:20~10:50	Comprehensive Omics Insights into Mesaconitine Toxicity from *Aconitum* Plants in Zebrafish [Eunyoung Park / Seoul National University]
10:50~11:25	Foodborne Nitrite-Producing Bacteria as Hidden Contributors to Infant Methemoglobinemia [Sun Min Park / Korea University]
11:25~12:00	Cognitive and Behavioral Impairments by Methylglyoxal-Induced Hippocampal Dysfunction [Seong-Min Hong / Gyeongsang National University]

■ 한국식품위생안전성학회

Session 25 Young Scientist Presentation Ⅱ Advanced Technologies for Food Safety

Crystal Hall E — Chair: Yoonjee Chang / Kookmin University

10:20~10:50	Germination and Subsequent Inactivation of Bacterial Endospores Using Pulsed Ohmic Heating [Eun-Rae Cho / Gangneung-Wonju National University]
10:50~11:25	Next-Generation Food Processing Technologies Based on Superheated Steam and Cold Plasma [Soo-Hwan Kim / The Catholic University of Korea]
11:25~12:00	Characterization of Biofilm Formation and Development of Rapid Detection Methods for Foodborne Pathogens [Unji Kim / Kookmin University]

■ 한국식품위생안전성학회

Session 26 Development and Safety of Future Foods Based on Blue Foods

Crystal Hall C Chair: Dong Hyun Kim / Kyungpook National University

10:20~10:45	Advancing Fermented Blue Foods: Microbial Strategies for Quality, Safety, and Functional Potential [Du-Min Jo / National Marine Biodiversity Institute of Korea]
10:45~11:10	Eco-Friendly Protein Extraction and Characterization from *Chlorella pyrenoidosa* using Microbial Enzymes and Fermentation [Kyung-Jin Cho / Korea Food Research Institute]
11:10~11:35	Alginic Acid, a Functional Dietary Ingredient Derived from *Ecklonia maxima* Stipe, Attenuates the Pro-Inflammatory Responses on Particulate Matter-Induced Lung Macrophages [Hyun-Soo Kim / Gyeongsang National University]
11:35~12:00	Targeting Foodborne Pathogens: Integrating Natural and Synthetic Molecules for Safer Foods [Fazlurrahman Khan / Pukyong National University]

■ 국립부경대학교

Session 27 The Future of Functional Food Safety: Predictive, Integrated, and AI Big Data-Empowered

Crystal Hall D Chair: Hee-Seok Lee / Chung-Ang University

10:20~10:45	The Necessity of Predictive Systems for Functional Ingredient Safety: A Data-Centric Approach [Kwang Suk Ko / Ewha Womans University]
10:45~11:10	A Review of System-Based Approach for Evaluating the Satefy of Multiple Dietary Supplement Uses [Seungyoun Jung / Ewha Womans University]
11:10~11:35	Developing a Data-Driven Algorithm to Predict Risks of Combined Use of Health Functional Ingredients [Seok-Hee Lee / Dongguk University]
11:35~12:00	Development of an Integrated Predictive Algorithm for Safety Assessment of Functional Ingredient Intake Based on the Cross-Nutrient Database (CNDB) [Ga-Hee Shin / Insilicogen, Inc & D.iF, Inc]

■ 이화여자대학교

Session 28 Emerging Insights into Pathogenic Microbes and Host Responses

Crystal Hall B Chair: Hyun-Gyun Yuk / Chung-Ang University

10:20~10:50	Recent Perspectives on Gut Microbiome Responses to Pathogenic Viral Infections and Recovery [Soohwan Suh / Konyang University]
10:50~11:25	Extrahepatic Manifestation of Hepatitis E Virus: New Insights from a Miniature Pig Model and the Development of Next-Generation Infection Systems [Soontag Jung / Chung-Ang University]
11:25~12:00	Genomic and Phenotypic Characterization of Gram-Negative Bacteria from Fresh Vegetables [Gyu-Sung Cho / Max Rubner-Institut]

■ 한국식품위생안전성학회

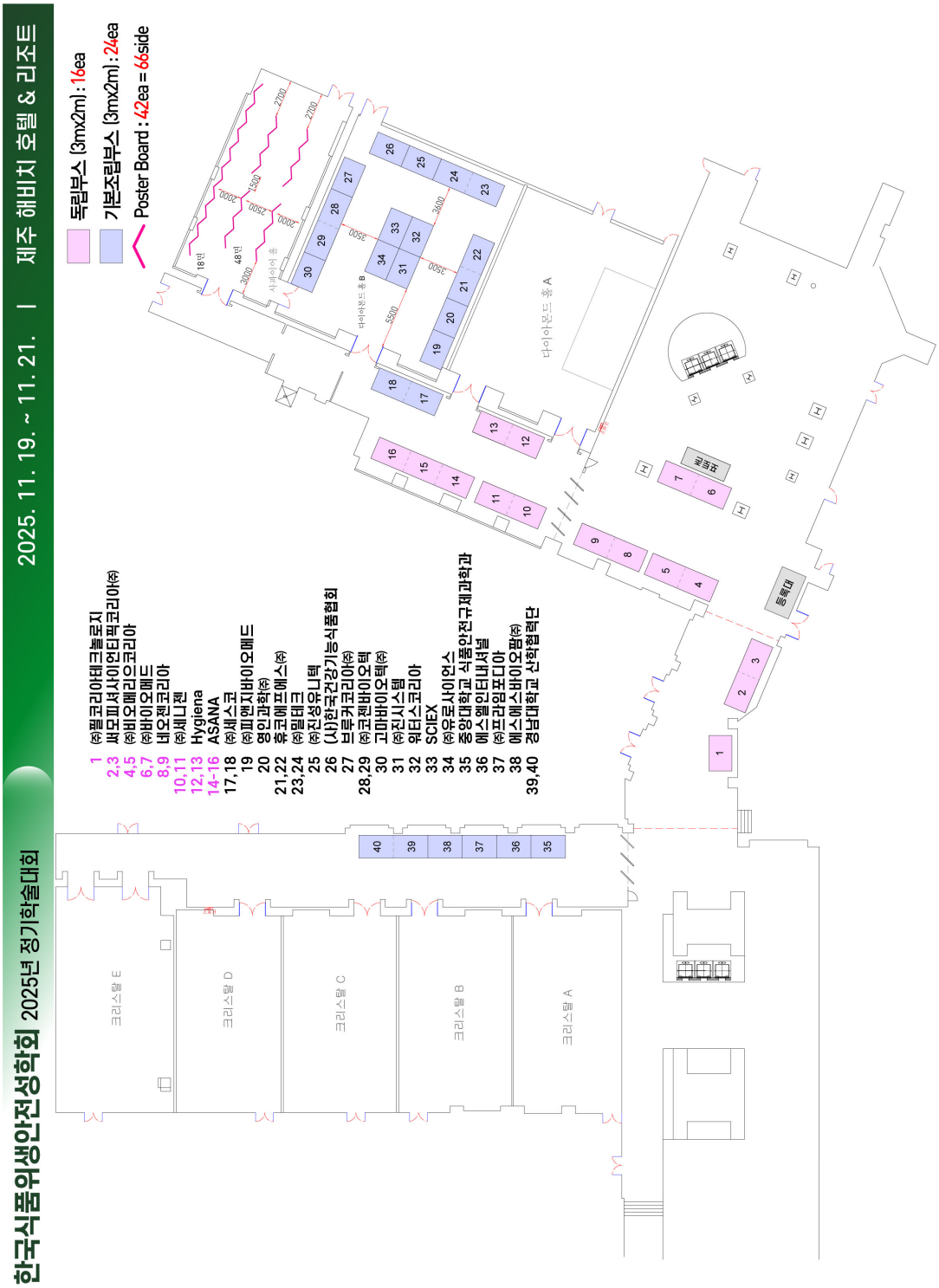
Session 29	Use-by-Date Labeling System and Food Safety

Diamond Hall A Chair: Jung-Nyun Kim / Korea Advanced Food Research Institute

10:20~10:45	Policy Directions for Food Use-by Date Labeling System [Gui-Im Moon / Ministry of Food and Drug Safety]
10:45~11:10	Study on the Establishment of Reference Values for the Use-by Date of Various Foods [Jae-Wook Shin / Korea Advanced Food Research Institute]
11:10~11:35	Scientific Basis and Methodology for Establishing Use-by Dates [Sang-Do Ha / Chung-Ang University]
11:35~12:00	Changes in Consumer Perception of the Use-by Date Labeling System [Sohyun Baek / Korea National Council of Consumer Organizations]

■ 한국식품과학연구원

Exhibition Floor Plan



40th 한국식품위생안전성학회 정기학술대회

International Conference on

Food Safety and 40th KoSFoS Annual Meeting

Plenary Lecture 1

The Science of Food Safety :
Bridging Research and Application

Plenary Lecture 1

Strategic science in a shifting era: National R&D, innovation priorities, and the expanding frontier of food safety

Jin-Ho Chung

Korea Academy of Science and Technology

Korea's national science and technology (S&T) landscape is undergoing a fundamental transition. As the global competition for innovation intensifies-with AI, biotechnology, and health security at the forefront-our ability to secure long-term research capacity, strategic talent pipelines, and cross-sector coordination is being tested.

From my perspective as President of the Korean Academy of Science and Technology (KAST), this keynote outlines how Korea must recalibrate its research ecosystem: balancing top-down strategic investment with bottom-up creativity, reinforcing basic science while integrating cutting-edge platforms, and enhancing the coherence between education, research, and industrial application. The emphasis must be on "anticipatory science"-not just responding to crises but preemptively designing scientific systems for resilience and trust.

Within this strategic realignment, food safety stands out as a critical testbed. As dietary systems become more complex-spanning global supply chains, biotechnology-enhanced production, and evolving consumer demands-ensuring food safety is no longer a matter of narrow regulation. It requires integrated R&D across molecular biology, environmental monitoring, materials safety, and digital traceability systems. Korea's expertise in life sciences, combined with its national R&D infrastructure, offers an opportunity to lead in this multidimensional challenge.

Ultimately, food safety exemplifies what modern science must become: evidence-based, interdisciplinary, and forward-looking-anchored in research, but relevant to both policy and daily life.

40th 한국식품위생안전성학회 정기학술대회

International Conference on
Food Safety and 40th KoSFoS Annual Meeting

Session 1

Safety Management of Hazardous Contaminants in Home Meal Replacements

The Science of Food Safety :
Bridging Research and Application

Session 1-1

Analytical investigation of hazardous substances in foods for standard re-evaluation

Hyun Suk Oh*, Ji Young Kim, Yumi Jo, Se Jong Park, Sung Kwan Park

Residues and Contaminants Standard Division, Food Standard, Ministry of Food and Drug Safety, Cheongju, Korea

As dietary patterns in Korea have become increasingly diverse, the consumption of processed foods, dining-out meals, and institutional catering has continued to rise, while the frequency of home cooking has also increased. These changes may elevate potential exposure to hazardous contaminants generated during food manufacturing, processing, and cooking, highlighting the need for scientific evaluation and systematic management of contamination levels in foods.

In this study, contamination levels of 19 hazardous (heavy metals, mycotoxins and other hazardous chemical contaminants) substances were analyzed in approximately 30,000 samples, including agricultural products, livestock, seafood, and home meal replacement (HMR) products, reflecting current food consumption trends. Human exposure assessment and re-evaluation of existing regulatory limits were also conducted for relevant substances.

The results indicated variability in contamination levels across different processing stages, suggesting the need for re-establishing rational standards based on food type and exposure characteristics.

This study provides fundamental data for risk-based management of hazardous contaminants in foods and contributes to the development of sustainable regulatory frameworks considering changes in dietary habits and climate.

Keywords: Hazardous contaminants, Human exposure assessment, Standard re-evaluation, Food hygiene, Dietary pattern

Session 1-2

Home meal replacements in the global foodscape: Trends and safety challenges

Min Chul Kang*

Global Regulatory Center, Pulmuone Technology Institute, Pulmuone Co., Ltd.

Home Meal Replacements (HMRs) have emerged as a central feature of the global foodscape, reflecting diverse changes in dietary patterns, lifestyles, and consumer expectations. In addition, it is evident that the preferred characteristics and forms of HMRs vary across global markets depending on cultural contexts. The rapid growth of the HMR industry is driven by the dual demand for convenience and balanced nutrition, positioning these products as a vital alternative to traditional cooking and dining. However, this expansion has also introduced food safety challenges that require closer examination. Key issues include the complexity of ingredient sourcing, the need to maintain cold-chain stability during storage and distribution, and the inconsistencies among national and international regulatory frameworks. Furthermore, the introduction of novel ingredients and the diversification of HMR formats, ranging from chilled and frozen ready meals to innovative meal kits, presents additional challenges related to microbiological safety, labeling accuracy, and allergen declaration. This study reviews global trends of the HMR industry, identifies emerging safety concerns, and examines how regulatory innovations can be mobilized to address them. Building on this analysis, this research emphasizes the importance of proactive risk management and collaborative approaches across academic, industrial, and governmental sectors to ensure that HMRs continue to grow as safe, sustainable, and reliable components of the modern foodscape.

Session 1-3

Analysis of free 3-MCPD, 3-MCPD esters, and glycidyl esters in home meal replacements

Somin Jung[1], Beom Jin Lim[2], Kwang-Won Lee[2*], Young-Suk Kim[1*]

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[2]*Department of Biotechnology, Korea University, Seoul, 02841, Korea*

3-Monochloropropanediol (MCPD) esters and glycidyl esters (GE) as well as free 3-MCPD are the process contaminants found in diverse processed foods. Both 3-MCPD esters and GE can be formed by frying and baking, although they are mainly generated during the refining process, in particular, deodorization step, of vegetable oils. The free form MCPD is determined as a by-product during the manufacturing of hydrolyzed vegetable proteins (HVPs) and soy sauces using concentrated hydrochloric acid and high temperature. The free form MCPD and glycidol are released from their parent esters by lipase during digestion and show carcinogenicity and genotoxic carcinogenicity, respectively.

Nowadays, the consumption of home meal replacements (HMRs) are steadily increasing mainly due to their convenient preparations. However, little data on the contents of free 3-MCPD, 3-MCPD esters, and glycidyl esters in HMRs is available, although some of them have the main sources, such as HVPs, soy sauces, and vegetable oils, of those toxic compounds. In addition, there has been no study on the change in their contents after preparation and cooking of HMRs. In this study, we investigated the contents and change of free 3-MCPD, 3-MCPD esters, and glycidyl esters in HMRs both before and after cooking. GC-MS analyses after a derivatization using heptafluorobutyric anhydride and phenylboronic acid, respectively, for free 3-MCPD, and both 3-MCPD esters and glycidyl esters were applied after the validation of each methods.

Session 1-4

Dietary exposure and risk assessment of hazardous contents in home meal replacement products

Seok-Hee Lee[1*], Hee-Seok Lee[2]

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The growing demand for Home Meal Replacement (HMR) products in South Korea, driven by lifestyle changes such as the rise of single-person households and an aging population, has intensified the need for systematic safety evaluation. Although HMR products are produced from regulated ingredients, their increased consumption raises potential concerns regarding exposure to hazardous substances formed or introduced during manufacturing, packaging, or storage processes.

This study estimated dietary exposure and evaluated potential health risks associated with hazardous contents in HMR products by integrating available data from the Korea National Health and Nutrition Examination Survey (KNHANES) with national contaminant monitoring results. However, estimating HMR-specific intake within KNHANES was highly limited due to the lack of clearly defined food-type categories. For items where consumption data could not be derived, a poundage-based estimation approach was used as a complementary indicator to approximate exposure levels.

Despite these data limitations, the overall risk levels for all monitored hazards in HMR products were found to be very low. This study emphasizes the importance of developing a better dietary survey system to capture real consumption patterns of HMR products and to improve the reliability of future risk assessments.

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Session 2

Rapid and Accurate Analysis Solutions for Food Safety

The Science of Food Safety :
Bridging Research and Application

Session 2-1

Allergen risk management and analysis solutions

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Food allergy is an immunological disorder that can cause a variety of reactions, from mild gastrointestinal symptoms to severe anaphylaxis. Its prevalence is increasing worldwide. Accurate diagnosis of food-derived allergens is essential for patients to avoid allergies and develop appropriate treatment plans.

Consequently, demand is growing for platform-based diagnostic solutions that can enhance diagnostic accuracy and improve testing efficiency.

Goldstandard Diagnostics offers a diverse portfolio of technologies for food allergy diagnosis, offering integrated solutions that enable rapid and accurate diagnosis in clinical and food safety settings.

ELISA kits enable sensitive and quantitative detection of various food allergens, and integration with the BOLT fully automated ELISA system maximizes testing efficiency and result reproducibility.

PCR kits detect allergen genetic material in food with high sensitivity, making them ideal for qualitative and quantitative analysis for food safety management.

Lateral Flow (immunochromatography) kits can be used for point-of-care (PoC) rapid diagnostics, dramatically increasing testing accessibility.

Goldstandard Diagnostics possesses a diagnostic platform encompassing everything from laboratory-based, high-precision analysis to point-of-care diagnostics, offering flexible solutions tailored to each user's needs. This session will introduce the characteristics and application examples of each diagnostic technology and share their potential for practical use in clinical and industrial settings.

Session 2-2

From enrichment to PCR: Simplifying the workflow for food safety labs

Edmond Roquigny

Gold Standard Diagnostics 61 Science Park Road, #05-03/08 The Galen, Singapore Science Park II Singapore 117525

Gold Standard Diagnostics presents BACGene GO, a revolutionary solution designed to streamline food pathogen testing workflows. With over 30 years of molecular biology expertise, the company offers a full portfolio of rapid diagnostic kits, instruments, for food, feed, environmental, Animal health and clinical markets.

The BACGene GO simplifies pathogen detection-particularly *Salmonella* spp. and *Listeria* spp./*monocytogenes*-through a 2-step real-time PCR workflow. This includes ready-to-use lysis and PCR plates, minimizing manual handling and reducing contamination risks. The kits are validated across major PCR cyclers ensuring broad compatibility and easy implementation in your laboratory.

BACGene GO delivers next-day results, significantly improving turnaround time (TAT). This enables faster production release, better resource planning, and reduced operational costs. The workflow is designed for flexibility, allowing labs to optimize sample processing schedules.

The kits are AFNOR NF and AOAC VALIDATION certified, confirming their equivalence to ISO reference methods. Validation includes matrix studies, interlaboratory trials, and robustness assessments-ensuring high sensitivity, specificity, and reliability.

Gold Standard Diagnostics supports full pathogen workflows, from enrichment using BAC_Gro™ media to automated analysis via PURE software. Results for Salmonella are available in under 18 hours, enabling faster production release and improved operational efficiency.

With a global footprint and commitment to innovation, Gold Standard Diagnostics empowers laboratories to meet regulatory standards while enhancing efficiency and accuracy in food safety testing.

Session 2-3

Goldstandard Diagnostics' diagnostic solutions for rapid and accurate detection of mycotoxins in food

Sangdon Moon

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Mycotoxins are a major contaminant attracting global attention in food and feed safety, significantly impacting consumer health and the food industry as a whole. Goldstandard Diagnostics has developed innovative diagnostic kits capable of rapidly and accurately detecting mycotoxins in food, effectively addressing the needs of the domestic and international food safety markets. This presentation will introduce the technical features and application examples of its kits targeting various mycotoxins, including aflatoxin, ochratoxin A, deoxynivalenol (DON), and zearalenone.

Based on ELISA and lateral flow platforms, our diagnostic kits feature high sensitivity, high specificity, and a user-friendly design, making them ideal for rapid testing and quality control in the food industry. Notably, their rapid analysis time and simple preprocessing significantly enhance testing efficiency. Furthermore, their global quality certifications have earned them recognition in the international market for their reliability.

Goldstandard Diagnostics' mycotoxin diagnostic kit is expected to be an effective solution for not only complying with HACCP, GMP, and MFDS standards, but also strengthening food companies' safety management capabilities. Through this presentation, we aim to share the product's key benefits and potential applications, and explore potential collaborations with domestic food safety professionals.

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Session 3

Value-Added Food Safety: Science-Driven Strategies for Quality, Innovation, and Global Competitiveness

The Science of Food Safety :
Bridging Research and Application

Session 3-1

Smart and sustainable green extraction, materialization, and hygiene management of agro-fishery by-products using electromagnetic energy

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This study developed an eco-friendly platform integrating green extraction, functional materialization, and non-thermal electromagnetic sterilization to enhance the quality, functionality, and value of agro-fishery by-products. These resources often require advanced approaches to maintain stability and functional properties during processing and storage. Using combined green extraction (CGE) technologies-such as microwave-assisted, supercritical fluid, ultrasound-assisted, and high-pressure processes-bioactive compounds inherent in agro-fishery by-products were effectively concentrated. High-performance liquid chromatography and response surface methodology confirmed that CGE significantly improved the recovery and antioxidant capacity of functional constituents. *In vitro* and *in situ* evaluations demonstrated enhanced stability and retention of these functional properties. To ensure long-term stability and processability, the extracts were spray-dried or fluidized-bed dried, resulting in powders with improved dispersibility and maintained bioactivity. For microbial safety, cold plasma and selective UV-LED sterilization were applied, providing effective surface decontamination while preserving the functional characteristics of the materials. This integrated approach presents a sustainable strategy for the high-value utilization of agro-fishery by-products, enabling the recovery of natural functional compounds, development of value-added ingredients, and clean-label preservation. It offers a promising technological solution for extending shelf life, supporting eco-friendly food production, and fostering circular bioresource use.

Session 3-2

Upcycling of Jeju agricultural by-products for the development of functional food ingredients

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Citrus unshiu pericarpium (CUP), the dried peel of *C. unshiu* fruit, is a rich source of the flavonoids naringenin and hesperetin, which act as phytoestrogens through their binding to estrogen receptors (ERs). This study aimed to establish a value-added utilization strategy for CUP, an agro-industrial by-product, by applying enzymatic hydrolysis and lactic acid fermentation to enhance its bioactive potential, and to further investigate the sleep-promoting effects of immature CUP (ICUP) compared with related materials using *Drosophila melanogaster* as an in vivo model. The binding affinities of CUP extracts toward ERα and ERβ were evaluated using a bioluminescence resonance energy transfer assay, and transcriptional activation of estrogen-responsive genes was assessed in receptor-expressing cells. Enzymatic treatment significantly enhanced the liberation of naringin and hesperidin, whereas lactic acid fermentation facilitated their conversion to naringenin and hesperetin. Consequently, the enzymatically treated and fermented CUP extract exhibited 1.5-2.0-fold higher binding and dimerization activities toward ERα and ERβ than untreated controls, indicating improved phytoestrogenic functionality. In the *Drosophila*, dietary supplementation with 4% ICUP markedly reduced nocturnal movement and sleep fragmentation while increasing total sleep time, showing a stronger sleep-promoting effect than fermented ICUP or mature CUP. These behavioral improvements were accompanied by elevated mRNA expression of GABA receptor subunits and antioxidant enzymes. Collectively, the findings suggest that ICUP and enzymatically processed CUP possess enhanced estrogenic and neuromodulatory activities, supporting their potential as functional food ingredients for non-pharmacological management of menopausal symptoms and sleep disorders.

Session 3-3

Food safety and global competitiveness: K-value food strategies to address shifting regulatory paradigms

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The global food regulatory environment is undergoing a rapid transition from traditional specification-based conformity assessments to a new paradigm grounded in scientific studies and risk evaluations. While these shifts are often justified under the banner of protecting public health, in practice they frequently manifest as new non-tariff barriers, creating substantial challenges for food companies seeking access to international markets. A notable example is the case in Denmark, where Korean spicy ramen products were subject to recall based on total capsaicin content assessments. This incident highlights how risk evaluation outcomes, beyond existing standards and specifications, can be directly applied to trade restrictions.

In addition, new front-of-package labeling (FOPL) schemes are being introduced and expanded worldwide. Mandatory systems are spreading across North America, Europe, Asia, and the Middle East, while certain U.S. states, such as Texas and Louisiana, have enacted laws requiring warning statements or QR code disclosures for products containing artificial colors or additives. Although these measures aim to enhance consumer awareness, they also compel exporters to address labeling compliance from the product formulation stage, creating further barriers to trade.

Furthermore, the European Union has established strict regulations for emerging contaminants such as mineral oil hydrocarbons (MOH), 3-MCPD esters (3-MCPDE), and glycidyl esters (GE)-standards not currently applied in Korea. Recent non-compliance cases involving instant noodle products underscore the potential risks Korean exporters may face in overseas markets.

For K-Value Food to strengthen its global competitiveness, it is imperative to combine product innovation with proactive adaptation to evolving regulatory environments and to pursue international regulatory harmonization. This presentation will review recent regulatory trends and case studies, and will discuss key strategies for the Korean food industry to prepare for sustainable global expansion.

Session 3-4

Case study on digital-based automated inspection and management system for strengthening food safety in cross-border e-commerce foods

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The rapid expansion of cross-border e-commerce has led to a growing number of food safety concerns, including labeling violations and the presence of hazardous substances. These issues highlight the urgent need for an efficient and accurate inspection system. Traditional manual-based methods have shown limitations, particularly in handling small-quantity, multi-variety imported foods purchased directly by consumers. In this study, we present a case of digital transformation in food safety management, focusing on the development and implementation of eight automation programs by the National Food Safety Information Service (NFSI). The programs include automated labeling inspection, image comparison and recognition, API-based data conversion, and a legal alert system. These tools have collectively reduced inspection time by approximately 30-50%, while significantly lowering human errors in repetitive tasks. In 2025, NFSI procured and inspected 5,000 cross-border e-commerce food items, among which 646 cases (12.9%) were identified as non-compliant due to hazardous substances or labeling issues. Immediate actions, including customs blocking, online sales suspension, and consumer alerts, were taken to minimize public exposure. This digital-based management approach goes beyond administrative efficiency, achieving tangible outcomes in early detection and proactive prevention of hazardous foods. The findings suggest that this model can serve as a scientific foundation for future digital strategies in food hygiene and safety, with the potential for international applicability in the rapidly evolving global food distribution environment.

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Session 4

Next-Generation Risk Assessment in Food: Opportunities and Challenges for Regulatory Science

The Science of Food Safety :
Bridging Research and Application

Session 4-1

Global trends in next-generation risk assessment for food: Regulatory perspectives and future directions

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Traditional animal-based testing is increasingly misaligned with ethical expectations, timelines, costs, and human relevance. Next-generation risk assessment (NGRA) addresses these limitations by integrating New Approach Methodologies (NAMs) that combine omics-enabled assays, physiologically based kinetic (PBK) modeling, in vitro-to-in vivo extrapolation (IVIVE), organ-on-chip systems, and artificial intelligence (AI)-driven quantitative structure-activity relationship (QSAR) and machine learning (ML) tools. Major regulators-including the United States Environmental Protection Agency (US EPA), the European Food Safety Authority (EFSA), Health Canada, and the Food Safety Commission of Japan (FSCJ)-are operationalizing NAMs within food-safety decision frameworks, signaling a durable, global shift. This presentation synthesizes international NGRA implementation and reports findings from a multi-sector stakeholder survey in Korea (n = 874) spanning academia, industry, government, and research institutes. Priority needs include AI-powered exposure models, high-throughput screening pipelines, and population-specific sensitivity assessment, alongside critical gaps in validation standards, data interoperability, regulatory acceptance pathways, and workforce capability. Building on these findings, we propose a phased roadmap for Korea's food regulatory science: (1) establish domestic NAMs reference capabilities, digital infrastructure, and curated data standards; (2) conduct regulator-anchored pilot case studies to define performance metrics, acceptance criteria, and uncertainty documentation; (3) scale through international collaboration and harmonization with the Asia Pacific Consortium for Regulatory Assessment (APCRA) and the Organization for Economic Co-operation and Development (OECD); and (4) embed governance, training, and key performance indicators (KPIs) to sustain adoption and continuous improvement. Once finalized, the framework will provide a policy-ready basis for aligning Korea's food-safety assessments with global norms while meeting national priorities-supporting more human-relevant, transparent, and resource-efficient decision-making in line with NGRA.

Session 4-2

Weight of evidence determination of points of departure: From data to decision

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Humans are routinely exposed to a variety of chemicals, both through intentional use and incidental contact in their daily lives. Estimating threshold value below which such exposures are not expected to elicit adverse health effects provides a fundamental basis for chemical regulation. Health-based guidance values (HBGVs) represent essential reference points in toxicological risk assessment, nevertheless, deriving these values through comprehensive animal studies or human investigations for every substance is severely contained and often unfeasible. To address these limitations, various new approach methodologies (NAMs), including omics technologies and quantitative structure-activity relationship (QSAR) models, have been developed to generate mechanistic and predictive data. In this study, we present a weight-of-evidence (WoE) framework to integrate heterogenous data sources and evaluate both qualitative and quantitative aspects of the derivation of point of departure (PoD). The proposed framework emphasizes the transparent evaluation of both data quality and consistency, combining experimental results with computational predictions. By linking data generation to regulatory decisions, this approach strengthens the reliability of PoD determination and provides a practical foundation for establishing HBGVs in data-limited contexts.

Session 4-3

Developments and limitations of *in vitro-in silico*-based toxicity prediction

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The number of synthesized chemicals has rapidly increased over the past decade, yet toxicity information for many compounds remains limited. With the global trend toward reducing animal testing, leveraging toxicity big data and deep learning offers a promising approach to screen potential toxicants. This study aimed to identify potential chemicals associated with reproductive and estrogen receptor (ER)-mediated toxicities in 1,135 cleaning products and 886 laundry products. Chemicals contained in these products were listed from publicly available databases. Potential reproductive and ER-mediated toxicants were identified using the European Union Classification, Labeling and Packaging (CLP) system and the ToxCast database, respectively. For chemicals absent from ToxCast, ER activity was predicted using deep learning models. Among 783 listed chemicals, 53 were identified as potential reproductive toxicants and 310 as potential ER-mediated toxicants. Of the 473 chemicals not tested in ToxCast assays, deep learning models predicted 42 chemicals with potential ER-mediated toxicity. Ultimately, 13 chemicals were identified as potentially causing reproductive toxicity via ER interactions. This study demonstrates a screening method integrating *in vivo*, *in vitro*, and *in silico* data to identify chemicals with potential reproductive and ER-mediated toxicities. However, limitations remain, including incomplete coverage of toxicity databases, variability in deep learning model predictions, and the need for experimental validation to confirm predicted outcomes. Despite these limitations, *in vitro-in silico* models represent a valuable tool for prioritizing chemicals for further toxicological assessment.

Session 4-4

A new paradigm for risk communication: Implications for food risk management and assessment

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Food safety governance faces increasingly complex risks arising from globalized supply chains, emerging food technologies, and digital infodemics. Risk communication has evolved from an expert-centered, assessment-driven model toward a more collaborative and participatory approach. Yet in practice, cooperation among diverse stakeholders remains limited, understanding of public-centered communication strategies is insufficient, and adaptation to digital and AI-driven environments is slow. Even the IRGC (International Risk Governance Council) Framework, while pioneering integration of risk assessment, management, and communication, remains largely institutional and has not fully incorporated the transformations brought by the digital era.

This invited talk introduces a new paradigm of risk communication that positions communication as a core component of food safety governance rather than a supplementary function. The proposed framework emphasizes transparency, stakeholder participation, and explainable risk while integrating advances in artificial intelligence (AI) for early hazard detection, supply-chain traceability, and personalized risk communication.

Recent international initiatives such as the EU's Transparency Regulation, EFSA's crisis communication guide, WHO's RCCE-IM framework, and Codex emergency guidelines exemplify this global transition toward open and participatory risk governance. AI further offers new opportunities for tailoring messages, managing infodemics, and processing complex data in real time, though challenges such as algorithmic bias, privacy risks, and trust erosion remain. Ultimately, this paradigm envisions food risk governance as an adaptive infrastructure linking science, society, and technology to manage uncertainty with speed, precision, and accountability.

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Session 5

The Importance of Food Safety Management and Environmental Monitoring for the Sustainable Growth of the Food Industry

The Science of Food Safety :
Bridging Research and Application

Session 5-1

Risk-based environmental monitoring requirements of GFSI scheme and U.S. FDA

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The Environmental Monitoring Program (EMP) is recognized as a critical preventive tool for controlling potential pathogen contamination in food manufacturing environments. Its importance has been reinforced in recent years under the Global Food Safety Initiative (GFSI) certification schemes, where international standards explicitly require a risk-based approach to monitoring environmental hazards. Rather than adopting fixed sampling schedules, organizations are expected to design EMPs proportionate to their risk profiles, considering product characteristics (e.g., ready-to-eat vs. heat-treated), processing stages, facility zoning, and historical data. This presentation reviews key EMP requirements across major GFSI-benchmarked schemes, particularly FSSC 22000 and BRCGS, highlighting commonalities in zone-based sampling, pathogen and indicator testing, and corrective action protocols, while contrasting differences in documentation depth and regulatory alignment. Reference will also be made to the U.S. FDA's Investigations Operations Manual (IOM), which provides detailed guidance on environmental sampling for pathogens such as Listeria monocytogenes and Salmonella, underscoring how regulatory expectations reinforce the risk-based philosophy. Drawing on case studies from Korean food companies, practical aspects of EMP design and operation will be discussed, including site mapping, frequency adjustment based on risk prioritization, statistical trend analysis, and integration with sanitation validation. Beyond compliance, EMP data can serve as an early-warning system that drives preventive actions and resource allocation. The findings emphasize that EMP should not be regarded merely as a certification requirement, but as a strategic risk management tool. When implemented effectively, it enhances food safety culture, reduces recall likelihood, and builds resilience in line with both certification schemes and regulatory expectations.

Session 5-2

The importance and policy needs of environmental monitoring for foodborne pathogens in food safety

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Environmental monitoring programs (EMPs) have become critical tools in advancing food safety worldwide, offering direct insight into microbial contaminant dynamics within food manufacturing environments. Recent trends highlight a shift from mere end-product testing to proactive detection of hidden pathogens, including biofilm-forming bacteria, and persistent contamination in hard-to-clean facility zones. By systematically analyzing surfaces, equipment interfaces, and environmental niches, EMPs enable rapid identification of contamination sources and support targeted corrective actions, reducing the risk of foodborne outbreaks and recalls. Internationally, major regulatory agencies now require robust EMP implementation, with practices tailored to risk zones within facilities and integrated with HACCP-based systems. Contemporary EMPs increasingly emphasize rapid detection methods (such as PCR and culture-based techniques), digital data analytics, and predictive modeling to strengthen hazard identification, trend analysis, and continuous improvement processes. Korea has strengthened food safety by expanding risk-focused management, actively adopting global advances in rapid detection and regulatory innovation. By comparing international and Korean strategies, this presentation underscores the transformative power of EMPs-not only for uncovering previously undetectable contamination but also for empowering the industry to proactively minimize foodborne hazards. Strengthening policy support for adaptive, technology-enabled EMPs will be essential to enhance consumer safety and prepare for future food system challenges.

Session 5-3

Management strategies and implications for *Salmonella* control from laying hen farms in the United States, the European Union, Japan, and South Korea

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Salmonella infection through contaminated eggs from laying hen farms poses a major threat to food safety and public health. Therefore, effective *Salmonella* control on farms is essential. Based on this background, this study was investigated the management strategies for *Salmonella* control and compared its application in the United States, the European Union, Japan, and South Korea. The USDA and FDA enforce the 'Egg Safe Rule,' which mandates environmental sampling for managing *Salmonella* Enteritidis on laying hen farms in 1989. This regulation requires periodic testing of various environmental matrices, including feed, feces, water, and dust, to check for *Salmonella* contamination. A positive result necessitates further testing, cleaning & disinfection vaccination and rodent & pest control. The EU's '*Salmonella* Control Program' provides unified *Salmonella* management guidelines for all member states in 2003. This program emphasizes environmental sampling as a key management tool for laying hen farms. Specifically, it monitors for *Salmonella* contamination through fecal samples and focuses on *S*. Enteritidis & *S*. Typhimurium. Farms that test positive for *Salmonella* may face restriction on egg sales or be required to heat treat their eggs. Japan manages egg safety through its 'Food Safety Basic Act' and related regulations in 2002. Laying hen farms conduct their own hygiene management and *Salmonella* testing operating an environmental monitoring system that primarily detects *Salmonella* spp. in litter, feces, and dust. In Japan, farm-level self-management is combined with government oversight, with a strong emphasis on the farms' responsibility to provide safe eggs to consumers. South Korea's Ministry of Food and Drug Safety and the ministry of Agriculture, Food and Rural Affairs have implemented the HACCP system, which includes environmental sampling. Farms conduct regular inspection of environmental samples, such as feces and dust, to monitor for *Salmonella* spp. in 2008. A positive result leads to an on-sited investigation and corrective actions, including enhanced disinfection and stricter hygiene controls. This study demonstrated that there is a slight difference in the environmental and eggs sampling methods, protocols, target serotype, and enforcement measures for *Salmonella* management strategies from four regions. Nevertheless, environmental testing is highlights as a key strategy for *Salmonella* control from laying hen farms in each region.

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Plenary Lecture 2

The Science of Food Safety :
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Plenary Lecture 2

Microbial approaches to food safety and health promotion

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The ultimate purpose of food safety is not merely to eliminate contamination and hazards, but to protect and promote human health. This presentation highlights the intrinsic interrelationship between food safety and health promotion from a microbial perspective. Microorganisms in food are recognized not only as potential hazards but also as valuable biological resources that can provide health benefits to humans.

Pathogenic microbes pose major risks to foodborne illness and public health, thus necessitating advanced control strategies based on microbial ecology, natural antimicrobials, and biocontrol systems. Conversely, beneficial microorganisms-such as probiotics, postbiotics, and fermentation-derived metabolites-play a pivotal role in enhancing food functionality and supporting physiological health. These microbes and their bioactive compounds contribute to improved nutrient bioavailability, modulation of gut microbiota, immune regulation, and metabolic balance. Through such mechanisms, microbial utilization in foods can transform the concept of food safety from passive risk prevention into active health promotion.

Accordingly, this presentation focuses on two main aspects: microbial control and microbial utilization-introducing recent research trends and technological applications for producing foods that harmonize safety and functionality. Through this perspective, it emphasizes that microbiological approaches serve not only as measures for preventing food contamination but also as essential scientific strategies for maintaining overall human health and preventing disease.

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Session 6

Genomic Approaches in the Analysis of Food-Associated Microorganisms: Current Trends and Techniques

The Science of Food Safety :
Bridging Research and Application

Session 6-1

Application of next-generation sequencing (NGS) in investigating food-borne pathogens and outbreaks by the MFDS

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Advances in Next Generation Sequencing (NGS) technology have made it an economically viable alternative to conventional typing methods for outbreak investigations and public health surveillance. Whole genome sequencing provides more detailed and precise data for identifying outbreaks compared to the current standard technique, pulsed-field gel electrophoresis (PFGE). We compared PFGE band patterns with next-generation sequencing-based single nucleotide polymorphism (SNP) patterns for isolates from foodborne outbreaks in South Korea. The SNP patterns showed higher discriminatory ability than PFGE patterns. In addition, comparative genomics using whole genome sequencing (WGS) data has provided insights into the genomic characteristics of pathogenic bacteria, including potential virulence determinants and horizontal gene transfer. Currently, we are developing an NGS-based gene panel for simultaneous detecting additional virulence genes of foodborne pathogens in food and environmental samples. Furthermore, the Ministry of Food and Drug Safety (MFDS) has established the National Genome Information Network for Foodborne Pathogens (NGIN-F, URL: https://nginf.nifds.go.kr), which includes various genomic data analysis programs. Consequently, it is clear that the next-generation sequencing approaches will have a significant impact on food safety, quality control, and microbiology.

Session 6-2

Development of an NGS panel for the detection and identification of food-borne pathogens at the MFDS

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Next-Generation Sequencing (NGS) has emerged as a revolutionary tool in foodborne pathogen analysis and outbreak investigation due to its high-resolution genomic data and enhanced tracing capabilities. The MFDS developed three core NGS panels to enhance genomic surveillance of foodborne pathogens. First, a 17-Pathogen Multiplex Panel was created for the simultaneous detection of key bacterial pathogens by targeting their specific virulence and marker genes. Second, a Serotyping Panel was designed for the serotype determination of *E. coli* and *Salmonella*. Third, a Norovirus WGS Panel was established to enable rapid whole-genome sequencing (WGS) for viral outbreak tracing. All panels involved rigorous design, PCR optimization, and could be applied across multiple sequencing platforms, including the Illumina MiSeq, Thermo S5, and Oxford Nanopore. The development of these three NGS panels by MFDS significantly advances food safety monitoring. These tools shift pathogen surveillance to a rapid, genomic approach, which improves outbreak investigation efficiency and enhances public health protection against foodborne threats.

Session 6-3

Uncovering contamination pathways in food systems through metagenomic analysis of environmental and food-associated microbiota

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Metagenomic analysis has revolutionized the detection and tracking of pathogenic microorganisms and microbial communities in complex food and environmental systems. The advances in source tracking methodologies that integrate high-throughput sequencing with Bayesian and machine learning models such as Source Tracker, FEAST, and emerging deep learning tools provide comprehensive capabilities for tracing contamination sources in complex microbiomes. Recent studies demonstrate how metagenomics enables precise identification and quantification of contamination sources in processing environments, revealing microbial contamination pathways and their relative contributions to food safety risks. Comparative analyses highlight shared principles in global and Korean practices, including reliance on metagenomic datasets, microbial community profiling, and bioinformatics pipelines, while also noting specific innovations such as genome-to-source association tools like Source App and transfer learning-based context-aware models. These advancements support faster, more accurate, and context-specific source attribution than traditional culture-based or marker gene approaches. Drawing on these insights, we propose tailored strategies for leveraging metagenomic source tracking within Korea's food safety management systems. Emphasis is placed on integrating multi-omics data, enhancing microbial source libraries with local strain repositories, and applying AI-driven predictive models to improve monitoring and intervention frameworks. Modern analytical tools enable the construction of resilient food safety systems that can effectively mitigate contamination risks amid evolving challenges. This synthesis of current research and regional practices aims to inform future developments in food safety science and guide policy decisions for contamination control using cutting-edge microbiome technologies.

Session 6-4

Transcriptomic approach for understanding *Salmonella* behavior in food production

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Salmonella enterica is a primary foodborne pathogen causing gastroenteritis called salmonellosis, which is generally self-limiting in healthy humans, but may be fatal and can lead to bacteremia and systemic infections in young children, the elderly, and immunocompromised individuals. *Salmonella* encounters a myriad of hostile environments before its transmission to humans mainly through contaminated foods and water. During its evolution into a pathogen, *Salmonella* has acquired diverse genetic elements required for surviving in these conditions and fine-tunes the expression of these genetic repertoire for its better fitness under a given environment. The goal of this study is to understand how *Salmonella* orchestrates the myriad of genes associated with resistance and virulence in response to hostile stressors in food-processing environments. Transcriptomic analysis provides a comprehensive understanding of the mechanisms used by *Salmonella* to adapt to the hostile environments such as sanitizer treatments and innutritious foods. Poultry, beef, and vegetables, raw or undercooked eggs and egg-related products have been identified as the most important source of foodborne *Salmonella* outbreaks. Transcriptomic analysis was applied to the high-risk foods contaminated with *Salmonella* and differentially expressed genes (DEGs) were determined. DEGs, up- or down-regulated in response to food environments, may play important roles for *Salmonella* to adapt to these food conditions. Besides, a variety of sanitizing processes using UV light, sodium hypochlorite, and quaternary ammonium compound, are introduced to inactivate *Salmonella* in the food processing environments. Therefore, *Salmonella* transcriptomic profiles were also analyzed under these sanitizing processes. Regarding food safety, it is important to understand the mechanisms underlying *Salmonella* resistance to stressful conditions and to explore measures to control the activity of resistance-inducing factors. We observed that the genes associated with resistance and virulence were differentially regulated in response to foods and sanitizing agents. Transcriptomics data accumulation may suggest how *Salmonella* orchestrates resistance and virulence and promotes its fitness under the unfavorable environments.

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Session 7

Predictive and Preventive Approaches for Emerging Microbial Hazards in Food

The Science of Food Safety :
Bridging Research and Application

Session 7-1

Multi-omics insights into food safety: Current advances and future challenges

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Food safety is an essential component of public health and sustainable food systems; however, it is threatened by the emergence of novel pathogens and increasing antimicrobial resistance. Multi-omics-based research, encompassing metagenomics, transcriptomics, proteomics, and metabolomics, has facilitated the development of research methodologies capable of detecting, characterizing, and predicting potential food safety risks. The integration of multi-omics approaches facilitates the acquisition of a comprehensive systems-level understanding of microbial community dynamics, host-pathogen interactions, and biochemical pathways occurring from farm to fork. Metagenomics enables rapid identification of pathogenic and spoilage microbes, as well as the surveillance of antimicrobial resistance genes in complex ecosystems. Transcriptomic and proteomic profiling reveal gene expression and protein-level responses to environmental stressors, providing holistic insights into microbial survival and virulence mechanisms. Furthermore, metabolomics uncovers microbial physiology, metabolic pathways, pathogenesis, stress responses, and novel bioactive compounds. Collectively, multi-omics integration facilitates the development of predictive models for food safety and quality monitoring, risk assessment, and traceability. Despite the potential of multi-omics approach to revolutionize food safety and quality, several challenges persist in data standardization, integration of analytical platforms, and translation of omics data into regulatory and industrial practices. The substantial volume of high-dimensional data requires the utilization of advanced bioinformatics tools, artificial intelligence, and machine learning algorithms to facilitate the efficient processing of data. In conclusion, bridging the gap between current innovations and future challenges implements the transition toward a safer, transparent, and sustainable food ecosystem.

Session 7-2

Machine learning approaches for predicting *Listeria monocytogenes* growth across various protein-based ready-to-eat food products

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Quantitative microbial risk assessment relies on predictive modeling to evaluate foodborne pathogen risk under diverse environmental and product-specific variables, yet traditional mathematical models face limitations when accommodating the complex matrix effects of various foods. These matrix effects can significantly influence both the survival and growth of foodborne pathogens including *Listeria monocytogenes* in food. Machine learning (ML) has recently emerged as a promising alternative in predictive microbiology, enabling more accurate modeling of microbial growth and survival under diverse and complex food environments. In this study, a comprehensive metadata set of protein-based ready-to-eat (RTE) products was constructed, and the *L. monocytogenes* were enumerated under defined storage conditions. Multiple machine learning algorithms were trained and evaluated on this dataset to demonstrate that ML can overcome the limitations of traditional predictive models, showing applicability to diverse food categories. The performance of the developed machine learning-based *Listeria* growth estimation models was cross-validated using the k-fold method. Machine learning models obtained in this study provided accurate and scalable predictions for *L. monocytogenes* growth in diverse protein-based RTE foods. This machine learning-based prediction model can serve as a practical tool for food industry safety management and regulatory oversight, facilitating more proactive and effective control of *Listeria* risks in protein-based RTE foods.

Session 7-3

Pattern-guided microbial behavior analysis: Accelerating foodborne pathogen identification using wrinkled surfaces

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Recent advancements in the field of microstructured surfaces have facilitated novel insights into the dynamics of microbial motion and growth in confined environments. In this study, we explored a pattern-guided approach for rapid visualization and discrimination of foodborne pathogens using engineered wrinkled polydimethylsiloxane (PDMS) surfaces. In the context of our prior research on parallel concentric wrinkle formation, we have demonstrated that minor variations in surface geometry elicit discrete microbial responses, encompassing attachment, motility, and colony morphology. When subjected to controlled wrinkle dimensions, Gram-positive and Gram-negative bacteria demonstrated differential alignment and proliferation behaviors, indicating that topographical cues can serve as a physical discriminator for bacterial identification. Time-lapse imaging and microcolony analysis revealed that wrinkle-guided microenvironments suppress overgrowth while enhancing species-specific motility patterns. Furthermore, the integration of image-based pattern analysis with basic statistical modeling enabled the differentiation of bacterial species without the need for molecular labeling. This pattern-responsive methodology provides a rapid, label-free framework for evaluating microbial activity and potential contamination on food-contact materials. The proposed approach signifies a progression in the development of micro-topography-assisted pathogen sensing platforms, thereby integrating the domains of material surface engineering and predictive food safety monitoring.

Session 7-4

Emerging strategies for inactivation of foodborne viruses in the food processing environments

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Foodborne viral contamination has become an increasing concern for both public health and the food industry, as enteric viruses are recognized as major causes of nonbacterial acute gastroenteritis. Human norovirus (HuNoV) and hepatitis A virus (HAV) are the leading pathogens associated with foodborne outbreaks, while astrovirus, Aichi virus, sapovirus, and human rotavirus have also been implicated. Although severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is mainly transmitted via respiratory routes, its persistence on food and packaging materials highlights the importance of comprehensive viral control measures throughout the food chain. Traditional inactivation strategies-including chemical (e.g., chlorine, ethanol, organic acids), physical (e.g., heat, high hydrostatic pressure, UV-C, ionizing radiation, cold plasma) approaches-have been widely applied in the food industry. However, limitations such as chemical residues or adverse effects on food quality have prompted the exploration of alternative, sustainable solutions. Therefore, biological (e.g., plant extracts, essential oils, lactic acid bacteria metabolites) approaches have been attempted to reduce foodborne viruses in the food industry. This presentation provides an overview of the persistence and transmission mechanisms of key foodborne viruses, compares the efficacy and limitations of conventional disinfection methods, and introduces emerging nonthermal and biologically based technologies that can effectively inactivate viruses while maintaining product quality. In addition, recent research employing various inactivation techniques-including chemical, physical, and biological methods-aimed at reducing foodborne viral contamination will also be presented. These insights aim to support the development of integrated, science-based interventions for safer and more sustainable food processing environments.

Keywords: foodborne viruses; viral inactivation; nonthermal technology; biological control; sustainable food safety

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Session 8

Smart Choices in Health Functional Foods: Awareness, Safety and Responsibility

The Science of Food Safety :
Bridging Research and Application

Session 8-1

Consumer awareness survey for providing accurate information on health functional foods

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In modern society, health functional foods have become essential for maintaining and enhancing health, and the market for these products in Korea is growing rapidly. However, this growth has led to an increase in side effects, posing potential health risks to consumers. This study was performed to identify issues in the perception, purchase, and consumption processes of functional health foods among 2,000 adults aged 20-69 years residing in five metropolitan areas: Seoul and its surrounding metropolitan areas. The survey was conducted online, and data were analyzed using SPSS software. The main findings revealed that 68.9% of respondents reported consuming health functional foods, with immune function enhancement cited as the most common reason for their use. Additionally, consumers purchased health functional foods primarily through online channels, with family and friends, TV programs, and social networking sites as major sources of information. However, 21.2% of respondents reported side effects, raising concerns about the safety of these products. This study emphasizes the importance of consumer education and information provision. Systematic education and information dissemination are necessary for proper selection and consumption of health functional foods. These efforts may contribute to the sustainable development of the health functional foods market and help ensure consumer protection.

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Session 9

A Change in the Diagnostic Paradigm of Hazardous Microorganisms in the Food Industry

The Science of Food Safety :
Bridging Research and Application

Session 9-1

Rapid detection and application of hygiene indicator bacteria and foodborne pathogens using chromogenic technology-based dry media

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Today, public awareness regarding food safety and security continues to rise, and regulations concerning food safety in the food industry are becoming increasingly stringent. In particular, as foodborne illnesses draw significant public attention, microbiological testing is growing in importance. Consequently, the number of tests and the workload placed on laboratory staff are also increasing.

Easy Plate, a prepared film media for microbiological testing, helps address the growing demand for food testing by enabling faster workflows and reducing operator burden. It contributes to enhancing food safety through improved efficiency and reliability in microbial testing.

Time-saving

- With no need for media preparation or autoclaving, Easy Plate is ready to use straight from the package, reducing preparation time.
- With no need for dilution, overlay techniques, or special equipment, Easy Plate helps shorten handling time.
- Easy Plate's stackable design greatly reduces the operational space required.

Easy operation

- Simply open the cover film, drop the sample, and close the film, making inoculation quick and easy.
- The chromogenic indicator allows for easy differentiation of colonies.
- Automatic colony counting is possible using the dedicated Colony Counting System for Easy Plate.

High accuracy

- Demonstrates a high correlation with conventional testing methods.
- Certified by AOAC PTM, MicroVal, and NordVal.

Reduction of environmental impact

- With approximately 1/20th the volume of a traditional petri dish, Easy Plate significantly reduces waste.

Session 9-2

Food poisoning bacteria/virus analysis using real-time qPCR, increase utilization of vegan/halal/allergen analyses

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Since the Covid-19 outbreak, there has been a heightened emphasis on food safety measures due to increased awareness of the health risks associated with contaminated food. Nevertheless, the number of food poisoning cases and patients is increasing every year. This trend is the same for global. As a result, the demand for food safety inspections continues to increase.

However, in Korea, food poisoning-related microbial testing methods rely on traditional media methods. The media method is time-consuming and labor-intensive. In the meantime, various rapid testing methods have been developed, of which the real-time PCR method is a simple and sensitive alternative to the traditional medium method. Real-time PCR can use genetic analysis to determine the presence of substances (e.g., food poisoning bacteria, viruses, etc.) in the sample. And this method can be effectively used in analysis of vegan and halal. These analyses should be performed based on accurate DNA extraction. If you use the real-time PCR method that can check the results faster than before, it is a good way to increase the reliability of food safety test results.

Session 9-3

Development of a novel next-generation sequencing (NGS) panel method for *Salmonella* and *Escheirhica coli* serogrouping

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Foodborne outbreaks caused by diverse serotypes of *Salmonella* and *Escherichia coli* remain a major public health concern worldwide. Accurate serogrouping is essential for effective surveillance and prevention of such outbreaks. However, conventional serotyping methods based on antigen-antibody agglutination are time-consuming, labor-intensive, and often limited by low accuracy and reagent availability. To overcome these challenges, we developed a novel next-generation sequencing (NGS) panel for rapid and precise serogrouping of *Salmonella* and *E. coli* without the need for culture-based antigen analysis. For *Salmonella*, serotype-specific gene sequences encoding O-, H1-, and H2-antigens were curated from the SeqSero and NCBI databases, and a reference database was constructed. A total of 50 *Salmonella* serotypes were used for validation, achieving 100% serogrouping accuracy on both Illumina and Nanopore platforms. The NGS panel successfully distinguished multiple serotypes within a single sample and demonstrated robust performance in various food matrices (chicken, eggshell, and lettuce). Cross-validation across five institutions further confirmed its reproducibility and applicability. Similarly, for *E. coli*, serotype-specific gene sequences encoding O- and H-antigens were curated from the SerotypeFinder 2.0 and NCBI databases, and a corresponding reference database was constructed. A total of 72 *E. coli* serotypes were validated, achieving 100% serogrouping accuracy across both sequencing platforms and accurately identified multiple serotypes in spiked food matrices (ground beef, milk, and lettuce). This study establishes a rapid, culture-independent NGS panel method for simultaneous serogrouping of *Salmonella* and *E. coli*, providing a robust and efficient serogrouping method for food safety monitoring. This research was supported by a grant (23194MFDS016) from the Ministry of Food and Drug Safety, Republic of Korea (2024).

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Session 10

Global Trends and Scientific Evaluation of Food Additive Safety Management

The Science of Food Safety :
Bridging Research and Application

Session 10-1

Current status of food additive regulatory systems and analytical method improvements in Korea

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Korea's food additive management system, based on the Food Sanitation Act and operated by the Ministry of Food and Drug Safety (MFDS), has evolved toward a science-driven and internationally harmonized framework. As of 2024, about 650 additives (≈ 450 synthetic, 200 natural) are regulated under a Positive List System ensuring pre-market safety assessment and strict post-market surveillance. Recent advances include modernization of analytical methods such as HPLC-DAD for simultaneous preservative analysis and LC-MS/MS for synthetic dyes, improving sensitivity tenfold and reducing analysis time by 75%. Natural additive authentication has been strengthened through isotopic ratio mass spectrometry, DNA barcoding, and HPLC fingerprinting, while rapid on-site screening using ELISA and electrochemical biosensors enhances monitoring efficiency. Method validation now follows AOAC and ISO/IEC 17025 standards, ensuring accuracy and reproducibility across laboratories. In addition, high-resolution mass spectrometry, chemometrics, and AI-based data analytics are being adopted for non-targeted screening and predictive risk assessment. Future directions emphasize proactive evaluation of novel additives (e.g., nanomaterials, fermentation-derived compounds), digitalized surveillance, and expanded global collaboration through the 2025 CODEX Committee on Food Additives hosted in Korea. Collectively, these initiatives advance analytical reliability, regulatory transparency, and international competitiveness, supporting a safer and more trusted K-Food ecosystem.

Session 10-2

Evaluation and analysis of sweetener intake levels in Korea

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This study aimed to investigate the regulatory status, analytical methodologies, and dietary exposure of artificial sweeteners to support risk assessment and safety management in Korea. First, a comprehensive literature review was conducted on major international standards-including those of the United States, the European Union, Japan, and CODEX-focusing on the physicochemical properties, toxicological data, and Acceptable Daily Intake (ADI) values of commonly used sweeteners. In addition, current specifications, regulatory frameworks, and analytical methods for sweetener determination were systematically examined, along with global consumption trends and exposure assessment studies.

Moreover, a nationwide monitoring survey was carried out to measure the levels of four artificial sweeteners-aspartame, acesulfame potassium, saccharin sodium, and sucralose-in commercially distributed foods, including imported products. A total of 1,321 samples were collected from 19 food categories in which sweeteners are commonly used, prioritizing products marketed as "zero-sugar." Analytical methods for simultaneous determination were validated, and inter-laboratory cross-validation was performed using LC/DAD and LC-MS/MS to ensure reliability.

Dietary exposure to each sweetener was estimated for the general population and by age groups, including both average and high consumers. Exposure levels were then compared with ADI values and international data to assess potential health risks and evaluate national dietary intake trends. The findings of this study provide scientific evidence for the safety evaluation and regulatory refinement of artificial sweeteners in Korea, contributing to the development of data-driven risk management strategies.

Session 10-3

Policies on the safety management of food additives in major countries: Domestic and international perspectives

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Food additives are essential for maintaining food quality and safety; however, regulatory frameworks differ significantly among countries, influencing global trade and public health. Among these additives, synthetic food colorants are widely used to enhance visual quality and consumer acceptance because of their cost efficiency and stability, but they have raised safety concerns related to potential carcinogenicity and allergic reactions. Consequently, many countries have strengthened their safety management systems and re-evaluated the use of these compounds. This presentation summarizes and compares the regulatory frameworks of synthetic food colorants in major regions, including Korea, the United States, the European Union, Australia and New Zealand, China, and Japan. The presentation will also discuss toxicological aspects of synthetic food colorants and differences in analytical methods used across these regions. The findings highlight the need for harmonized international standards and improved analytical techniques for detecting synthetic food colorants in complex food matrices. Further studies are needed to clarify the toxicity of processing byproducts and to assess the cumulative and synergistic effects of multiple colorants. The results of this work aim to contribute to enhancing food additive safety management and supporting evidence-based policy decisions.

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Session 11

GMO Safety: Scientific Validation and Societal & Industrial Value

The Science of Food Safety :
Bridging Research and Application

Session 11-1

Current status and prospects of biotech crops for sustainable society in the face of climate crisis

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The world population is likely to exceed 9.7 billion by 2050 according to estimates from UN-FAO. If we continue consuming energy and food at the present rates, our requirements in 2050 will exceed current needs by more than 3.5-fold and 1.7-fold, respectively. Climate change also increasingly limits our ability to feed the growing population. Agricultural production is extremely vulnerable to climate change; thus, the potential effects of climate change have life-threatening implications for the global population. The aging society is another global issue, as an older population requires an abundant supply of healthy foods. To cope with the global crises of food, nutrition, and energy supply, new eco-friendly industrial crop varieties are urgently needed to ensure a sustainable future. It is imperative that we pay attention to marginal lands such as semi-arid, high-salinity, and contaminated areas for sustainable agriculture. Plant biotechnology can be used as a tool to maximize plant productivity by introducing stress tolerance and metabolic genes in existing crop cultivars. The grain self-support rate including feed in Korea is approximately 20% to severely threaten national food security in the future. Genetically modified crops (GM crops, biotech crops) such as an herbicide-tolerant GM soybean and Bt-tolerant GM maize have been commercially cultivated since 1996. So far there is no report regarding the negative effect of commercially cultivated GM crops on health and environment problems. GM crops on the health and environment safety are strictly regulating by UN-Convention on Biological Diversion. The market of biotech crops is approximately 45% of the global seed market, indicating that biotech crop is a global mega-trend. In the presentation, the current status and prospect of biotech crop will be introduced in terms of food security in Korea.

Session 11-2

GMO safety: Evidence, standards, and trust

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The safety of GM foods has been the subject of ongoing debate in Korea since 2001, when GM soybeans and GM corn were first imported. To ensure safe management, Korea's Safety Review Committee for GM Foods evaluates whether conventional foods and GM foods are equivalent based on the principle of substantial equivalence-an international standard established by the Codex Alimentarius Commission. This review confirms the absence of safety concerns, and only GM foods approved through this process may be imported and distributed. Globally, authoritative bodies such as the WHO, FAO, and the U.S. National Academy of Sciences (NAS) have concluded-based on decades of accumulated research-that GMO foods are safe. Notably, in 2016, the NAS analyzed approximately 900 studies and datasets published over 20 years and found no evidence that GMOs are harmful to health. That same year, 107 Nobel laureates stated in a public declaration that no adverse health effects on humans or animals have been confirmed from the consumption of GMOs to date. GMOs are already deeply integrated into our food supply and across industries. Their safety is supported by scientific verification, and oversight is strictly managed according to international standards. What is needed now is rational, evidence-based discussion and transparent communication to build public trust. When scientific safety and consumer confidence go hand in hand, we can move beyond controversy and secure a healthy, sustainable food future.

Session 11-3

GMO issues and regulations in food industry

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Recently, the first surgical operation to transplant a genetically recombinant GMO pig kidney into a brain-dead person was successfully performed. The vaccine, which is playing a crucial role in humanity's fight against COVID-19, is also being mass-produced in a short period of time by transferring the spike protein gene from the coronavirus surface into a safe microorganism using GMO technology. GMO technology, which is being widely utilized in the life-threatening medical field, has yet to receive a transplant or refuse treatment. However, in Korea, GMOs in food are particularly stingy and negative, leading to a debate over full labeling regulations that has persisted for years. Realistically, GMOs cannot be avoided in processed foods, and completely consuming zero GMOs is impossible. Considering the reasons, first, in absolute terms, non-GMOs are impossible to secure globally compared to GMOs. Furthermore, even for non-GMO raw materials or processed foods, the technology and systems to determine whether they are completely GMO-free are inadequate. If GMO raw materials are supplied as non-GMO overseas, such as from China, there is a lack of institutional mechanisms to trace and manage the origin and sanction violations. Furthermore, it is difficult to guarantee the non-GMO status of each food product imported from countries with varying GMO labeling regulations due to the distribution structure. Our government's regulations, which discourage GMOs due to vague anxiety about genetic modification, could paradoxically lead to our tables being filled with non-GMO foods from China, which are difficult to verify. Second, given the unscientific and negative social perception of GMOs, the public opinion that implementing a full labeling system will likely lead consumers to avoid GMO foods in restaurants and supermarkets cannot be overlooked. For regular restaurants to prepare and serve non-GMO dishes, securing non-GMO ingredients is not only difficult, but also expensive, leading to a price increase of at least 20%. If the Korean food industry, which relies on imports for approximately 70% of its food ingredients, is unaccounted for, and a rapid introduction of non-GMO ingredients is triggered to avoid the full labeling system, the resulting costs will be even greater. This will further accelerate the decline in dining out consumption due to the pandemic, dealing a devastating blow to small restaurant businesses already on the brink. Finally, the GMO management system must be harmonized to ensure fairness across countries in the global era and tailored to domestic socioeconomic realities. Furthermore, a positive approach is needed to secure key national industries and technologies that will lead the nation's future. Rather than fostering negative consumer perceptions through strict regulations, it is time for open discussion to recognize biotechnology (BT), a key component of the global battle to secure new future technologies, and to support citizens in fully benefiting from its benefits. The U.S. Department of Agriculture has also announced that, starting in 2022, it will replace the term “genetically modified food,” or GMO, with terms such as “BE (Bioengineered) food”. Going forward, GMOs are likely to be perceived not as genetic modification, but as safe, future-oriented biotechnology, known as biofoods. While major advanced countries have already accepted GMOs as part of their everyday life sciences, if our government were to introduce regulations that require the use of terms with negative connotations, it would inevitably face criticism for being an outdated, desk-bound administrative measure.

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Session 12

Beyond Compliance: Shaping the Future of Food Safety Culture

The Science of Food Safety :
Bridging Research and Application

Session 12-1

Building a strong food safety culture: Insights from US FDA, USDA, and global best practices

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Developing a strong food safety culture is now recognized globally as essential for preventing contamination and protecting public health. The U.S. Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA) emphasize that safe food depends not only on technology but also on people: leadership, communication, and accountability at every level. Both agencies promote risk-based preventive systems and continuous improvement to embed food safety as a shared organizational responsibility.

This presentation shares lessons from U.S. regulatory perspectives and global best practices such as Codex Alimentarius, ISO 22000:2018, and GFSI and BRCGS standards. It explores practical approaches to assess and strengthen culture through leadership engagement, hygiene verification, and real-time data analytics. Participants will gain strategies to transform food safety from a compliance obligation into a proactive company-wide value-driving consistency, transparency, and trust across supply chains in both domestic and international markets.

Session 12-2

Advancing food safety culture: Measurement tools and applications

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Ensuring the production of safe food requires not only the hardware components of food hygiene and safety management-such as management systems, facilities, and equipment-but also software factors, including management commitment, employee engagement, education and training, and a shared understanding of food safety. These aspects are collectively referred to as food safety culture, which integrates the concepts of a food safety management system and a food safety climate. Food safety culture represents the combination of human and material factors necessary for the production of safe and hygienic food, and reflects an organizational culture in which all members voluntarily act in a hygienic and safety-conscious manner. To improve a company's food safety culture, it is essential to define what constitutes a desirable culture and to describe it through key dimensions such as leadership and vision, workplace environment, employee knowledge and behavior, data collection and evaluation, and relationships with regulatory authorities. Food safety culture has increasingly been incorporated as an element of compliance assessment in food safety management systems. For example, in countries such as Australia, regulatory agencies provide checklists and guidelines that allow food manufacturers to self-assess and enhance their food safety culture. This study introduces key factors for evaluating food safety culture through a literature review and investigates how these factors influence the overall performance of food safety practices.

Session 12-3

Time-synchronized large-scale process analytics for real-time anomaly detection in food manufacturing

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Reliable early detection of process anomalies in food manufacturing requires two foundations: high-quality, large-scale process data and a consistent timebase across devices. In this study, approximately 400 GB of multi-source process data were analyzed using a custom software toolchain to identify and explain production issues observed on the shop floor. During root-cause analysis, it was found that several controllers operating on an isolated intranet exhibited unsynchronized clocks, resulting in timestamp misalignment across logs and hindering event correlation and causal inference. To address this, an on-premises Network Time Protocol (NTP) architecture was designed and deployed, deriving reference time from GPS and maintaining continuity via an LTE Cat-M1 backhaul. Through this approach, stable time synchronization for controllers and data loggers was achieved without general internet access, thereby restoring cross-system timestamp consistency and enabling precise sequence-of-events analysis. A pipeline-ingestion, cleansing, time alignment, feature engineering, and anomaly mining-was implemented to surface bottlenecks and abnormal patterns revealed by the corrected timelines. Finally, a service roadmap is outlined that leverages the now-accurate time series to train AI models for real-time monitoring and decision support, enabling immediate alerts on process deviations and supporting proactive control. Observability and traceability in food processes are improved, providing a practical pathway from offline diagnostics to online, AI-assisted anomaly detection.

Session 12-4

Rebuilding trust through food safety culture: Lessons from maeil dairies

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In recent years, Maeil Dairy has faced several quality challenges that revealed the limitations of system-based food safety management and underscored the importance of organizational transparency and accountability. To ensure sustainable improvement, the company established an Independent Quality & Safety Assurance Committee composed of external experts, thereby integrating third-party perspectives into its food safety governance. This independent oversight strengthened credibility and accelerated innovation by ensuring objectivity, openness, and trust across the organization.

In parallel, Maeil Dairy implemented a structured *Food Safety Culture Framework* emphasizing behavioral engagement, transparent communication, and leadership-driven commitment. Initiatives such as open reporting campaigns, monthly safety newsletters, and leadership-led site dialogues have reinforced ownership and safety awareness among employees. As a result, voluntary risk reporting has increased, audit nonconformities have decreased, and a culture of proactive communication has become established. This presentation shares the lessons learned from Maeil Dairy's transformation-demonstrating how third-party assurance and culture-based leadership can rebuild trust, enhance organizational resilience, and elevate food safety excellence across the dairy industry.

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Session 13

MPs Safety Management in Food

The Science of Food Safety :
Bridging Research and Application

Session 13-1

Overview of MPs in food safety

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Plastic is widely used in our lives such as packages, clothing, tires and degraded into smaller particles known as microplastics (MPs). MPs are generally defined as synthetic plastic polymer particles of < 5 mm. With the increasing use of plastics, MPs have become a global issue about environment and human health. They can enter into the human body through multiple exposure ways including air, soil, marine, fresh water, food packings, and food. Despite their widespread presence, scientific evidence is insufficient to determine the risk of MPs to human health. Because the definition and analysis of MPs has not yet been standardized globally, many previous studies used various instruments, analysis methods, validation methods, and sizes of MPs. Since 2017, the Ministry of Food and Drug Safety has been studying about MPs in food, utensils, containers, packages, and the risk of MPs in human bodies. Especially, food matrices consisted of carbohydrate, protein, lipid, and many food additives are highly complex, so it is very difficult to develop a pretreatment method for each food categories. We have optimized the pretreatment protocols, validated analytical methods, and established the standard operating procedure (SOP) of three food products. In this session, we aim to present the progress and results of our projects on MPs in food.

Session 13-2

Development and validation of analytical methods for microplastics in food

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Recent studies have reported that microplastics, generated from plastic pollution, are being exposed not only to marine ecosystems but also to humans through food consumption. Although microplastics have been detected in various food products, establishing a standardized analytical method for their quantitative analysis is essential. Accordingly, this study aimed to develop a sample preparation and instrumental analysis method capable of accurately detecting and analyzing microplastics in various foods, and to scientifically verify its validity. For seafood products such as canned foods and frozen seafood, we developed a sample preparation method by establishing the optimal conditions for organic matter digestion based on potassium hydroxide, interference removal strategies, and optimal sample amount conditions. Instrumental analysis methods were established using Fourier-transform infrared spectroscopy (FT-IR) and Raman spectroscopy combined with microscopy. The validity of the analytical methods was evaluated through recovery experiments of major microplastic target substances (PP, PE, PS), achieving an average recovery rate of over 70% with excellent reproducibility. This study presents a reliable analytical method for microplastic analysis in food, which is expected to be utilized as a standard testing procedure for future regulatory criteria establishment and risk assessment research.

Session 13-3

Pretreatment strategies and Py-GC/MS approaches for microplastic analysis in food matrices

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The increasing use of plastics has led to microplastic contamination not only in various environmental media but also in foods and food-related containers and packaging. Consequently, intensive efforts are being made worldwide to develop analytical methods for qualitative and quantitative detection as well as to conduct prevalence studies. Microplastics are generally defined as synthetic plastics smaller than 5 mm. Since processed foods contain diverse components such as proteins, carbohydrates, and lipids, effective removal of the food matrix requires the application of combined pretreatment techniques tailored to the characteristics of these major constituents. Furthermore, filtration procedures after pretreatment must be optimized to maximize recovery efficiency of microplastics. For instrumental analysis, spectroscopic methods such as FT-IR and Raman microscope are widely employed to identify particle size and number, while Py-GC/MS enables quantitative determination of the mass of microplastics by polymer type. In this study, we applied recently developed pretreatment protocols and instrumental techniques to processed foods and present the analytical results to share insights with the scientific community.

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Session 13-4

Optimization of microplastic analysis in food matrices - Case studies on salt and honey

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Microplastics have emerged as a critical issue for food safety and human health; however, standardized quantitative methods for different food matrices are still under development. This study aimed to optimize pretreatment procedures for microplastic analysis using salt and honey as representative food matrices.

For salt, a drying step was introduced to eliminate weight errors caused by moisture, and the appropriate sample amount was established through evaluation of detection trends. In addition, the efficiency of organic matter removal at varying hydrogen peroxide concentrations was assessed, resulting in an improved analytical protocol. These optimizations reduced analysis time while maintaining representativeness and reproducibility, ultimately enhancing analytical accuracy.

Honey, characterized by high viscosity and sugar content, presents challenges for particle separation. To overcome this, a solvent was selected based on compositional analysis, and hydrogen peroxide treatment was applied to effectively remove organic matter. Verification using reference materials confirmed that the honey matrix could be decomposed without damaging microplastics.

This study demonstrates the need for matrix-specific optimization of microplastic analysis methods. The case studies on salt and honey provide a foundation for the standardization of food microplastic monitoring and will contribute to future international inter-laboratory validation efforts.

Session 13-5

Onsite SERS detection of microplastics using 3D plasmonic paper

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Microplastics (MPs) are emerging contaminants found in water, food, and the atmosphere, posing serious environmental and health risks due to their toxic, carcinogenic, and endocrine-disrupting properties. Despite significant research efforts, onsite and facile detection of MPs remains challenging because of the need for complex pretreatment and expensive instrumentation. Here, we propose a paper-based 3D plasmonic gold nanopocket (3D-PGNP) nanoarchitecture as a dual-function platform for MP filtration and surface-enhanced Raman scattering (SERS) detection. The 3D-PGNP is fabricated through a simple solution-based method on a cellulose acetate substrate and integrated into a syringe filter device for direct analysis. When MP-containing solutions pass through the device, MPs are captured within the porous plasmonic matrix, where interfacial and volumetric hotspots amplify Raman signals without the need for sample pretreatment. Finite-difference time-domain (FDTD) simulations confirm strong electromagnetic field enhancement at the MP-3D-PGNP interface. Using a portable Raman spectrometer, SERS mapping images are acquired and processed with a logistic regression-based machine learning (ML) model to digitally classify MP-positive regions. The developed SERS-ML approach enables accurate identification and quantification of various MP types, including polystyrene (PS) and polyethylene (PE), both in mixed solutions and in real water samples such as tap, river, and seawater. This hybrid 3D-PGNP-syringe-ML platform provides a cost-effective, sensitive, and field-deployable solution for MP monitoring. Moreover, it can be extended to the detection of other micro- to submicrometer-sized hazardous materials, including bacteria, viruses, and fungi, thereby offering a promising route toward next-generation environmental and biomedical sensing.

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Session 14

Regulatory Science and Technological Advances in Cell-Based Food

The Science of Food Safety :
Bridging Research and Application

Session 14-1

Regulatory developments on the safety assessment of cell-based foods in Korea

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Cell-based foods, produced through the culturing of cells isolated from animals, have emerged as a novel food utilizing new food technologies. Following the first regulatory approval in Singapore in 2020, several companies have received approvals in Australia, Israel, New Zealand, and the United States of America. Although many countries are still in the early stage of establishing regulatory frameworks, Republic of Korea has taken proactive measures to build a foundation for the safety management of cell-based foods. In 2023, The Ministry of Food and Drug Safety (MFDS) revised the 'Enforcement Rule of the Food Sanitation Act' to include cell-based foods as subjects of approval for novel foods. Furthermore, the MFDS updated the 'Standards for Recognition of Temporary Standards and Specifications for Foods' specifying detailed procedures and submission requirements, and published practical guidelines for companies in 2024. The MFDS evaluates the entire production process and the quality and safety of the final product, from cell origin and cell line establishment to cell culture and harvesting, in accordance with these regulations. At the International level, the Food and Agriculture Organization (FAO) and the Codex Alimentarius Commission (CAC) are leading efforts to harmonize global guidance on cell-based foods. Recognizing the need for further discussion, the Codex Committee on Food Additives (CCFA) launched an electronic working group to develop a guideline for food safety assessment of cell culture media components in cell-based food production, chaired by Singapore and co-chaired by Korea, China, Saudi Arabia in 2025. In addition to such international cooperation, the MFDS will continue to research to improve the safety assessment framework in order to ensure the safety of cell-based foods.

Session 14-2

Tissue engineering and cultivated meat

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Research on cultivated meat is evolving toward advanced tissue engineering approaches that integrate biological science with food technology. As the field moves beyond simple cell culture, the challenge lies in reproducing the structure, texture, and composition of real meat through the coordinated use of cells, scaffolds, and culture media. Understanding the cellular organization of muscle and fat, together with their microarchitecture, provides the foundation for designing edible tissues with authentic sensory and nutritional qualities. Approaches for developing edible artificial tissues beyond the cellular level are a central focus in achieving these goals. Tissue engineering provides the conceptual basis for constructing edible tissues, while biofabrication serves as its practical implementation. Current research adapts biomedical fabrication methods to organize cells, scaffolds, and media into coherent three-dimensional constructs. Although this transfer has proven effective in reproducing basic tissue features, it remains constrained by the unique requirements of edibility, cost efficiency, and large-scale production. Developing a tissue engineering framework specifically suited to cultivated meat, translating biological precision into food grade materials and scalable processes, is therefore essential. Within this evolving context, biomimicry serves as a guiding design philosophy for creating architectures that emulate natural muscle and fat while maintaining cell viability and desirable texture. Key considerations include sustaining viable tissue structures, achieving appealing sensory properties, and enabling scalable production. Advancing cultivated meat through tissue engineering principles will be critical to its transition from experimental research to a practical and widely accepted food solution.

Session 14-3

Exploring functional materials as culture media substitutes for enhanced cell-based food production

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As the demand for cell-based foods continues to expand, the development of efficient and functional medium additives has become essential to ensure optimal cell growth, culture stability, and economic feasibility. The efficacy of cell-based foods is greatly dependent on the growth media which raises ethical and cost issues. This presentation reviews the current research on exploring potential functional materials to substitute high-cost ingredients such as fetal bovine serum (FBS) in the cell culture media. In addition, this presentation introduces a current study aimed to enhance the bioactivity of sustainable food-derived functional materials and optimize their concentrations in the medium to improve cell culture efficiency. Twelve functional materials were evaluated through antioxidant activities and cell viability to screen potential candidates for supporting cell culture. Among these, silk peptide extracted from the silkworm (*Bombyx mori*) cocoon was selected as the most promising material. The antioxidant activities, protein structures, and functional properties of silkworm cocoon and silk peptide were analyzed to evaluate their suitability for processing in the culture medium. The suitability of silk peptide as a medium composition was verified through a series of cell-based assays, including seeding efficiency, cell viability, live/dead cell imaging, and quantitative CCK-8 analysis. These assays were conducted using various concentrations of silk peptide and FBS, with silkworm cocoon as a comparison group. Silk peptide significantly enhanced cell attachment and growth efficiency compared to the control, and 100 μg/mL of silk peptide in the culture medium demonstrated excellent biocompatibility and nutritional contribution. Overall, these findings highlight the potential of silk peptide as an advanced functional material that promotes efficient and reliable cell growth, providing a practical foundation for the economically sustainable production and scalability of cell-based foods.

Session 14-4

Biomaterials bridging cells and food: Hybrid scaffold research for sustainable cell-based foods

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Cell-based foods are emerging as a sustainable solution to address the world's rising protein demand while alleviating the environmental burden of conventional livestock production. The realization of this next-generation food requires not only viable animal cells but also edible scaffolds, authentic flavor and texture, balanced nutrition, and commercial scalability. Achieving these multifaceted goals demands the convergence of cell biology, materials science, and food engineering. Within this framework, the scaffold plays a pivotal role by providing a three-dimensional environment that supports cell growth, nutrient transport, and ultimately meat quality. This study presents the development of diverse, food-grade scaffolds through a polymer-based platform designed to operate from the nanoscale to the macroscale, realized in the form of microparticles and nano-coatings with a focus on material-cell interactions. First, gelatin microspheres (GMS) were engineered as micro-scale scaffolds, where structural tuning enabled multifunctionality and supported the formation of muscle cell sheet-based cultured food. Second, textured soy protein was functionalized with an edible coating to produce hybrid scaffolds, resulting in plant-animal composite cultured meat with enhanced adhesion and sensory properties. Third, rice grains were modified with food-safe coatings, resulting in stable and biocompatible scaffolds whose granular architecture guided the organized growth of bovine muscle and fat cells. Collectively, these scaffold strategies highlight how polymer platforms can unite structure, nutrition, and sensory quality to advance cultured meat. The comparative evaluation of these approaches highlights their potential for scalability and consumer acceptance, providing valuable insights into the future development of sustainable cell-based foods.

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Session 15

Strengthen Food Safety through Digital Innovation and Global Regulatory Science

The Science of Food Safety :
Bridging Research and Application

Session 15-1

One health and global food safety strategies

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Food safety is a multifaceted public health issue that involves human, animal, and environmental health. The *One Health* concept provides an integrated framework to address these interlinked risks. This study explores global regulatory trends and One Health-based diagnostic innovations to propose effective strategies for Korea's food safety policy and practice.

There is a growing need for stronger collaboration among the WHO, FAO, and WOAH (formerly OIE) to realize the *One Health* framework through the tripartite agreement. Sharing responsibilities and coordinating global activities at the human-animal-ecosystem interface are essential. The Global Early Warning and Response System (GLEWS) exemplifies this collaboration by combining the alert and response mechanisms of WHO, FAO, and WOAH to support the prediction, prevention, and control of animal disease threats and foodborne zoonoses.

Internationally, food safety governance has evolved toward integration and transparency, as seen in advanced countries such as the United States, Japan, the EU, France and New Zealand. These systems operate under unified and risk-based frameworks. In contrast, Korea's food safety responsibilities remain divided between the Ministry of Agriculture, Food and Rural Affairs (MAFRA) and the Ministry of Food and Drug Safety (MFDS), limiting inter-sectoral coordination.

To strengthen Korea's capacity, this study proposes three strategies: (1) Institutional Integration through inter-ministerial data linkage; (2) Diagnostic Intelligence using NGS, LAMP, and metagenomic early-warning tools; and (3) Global Collaboration by aligning with GLEWS and other international initiatives. These approaches will promote a science-based, transparent, and integrated One Health system enhancing national and global food safety resilience.

Session 15-2

Tackling pathogens' persistence with smart monitoring and digital power

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The presentation explores how smart monitoring and digital technologies can strengthen food safety by tackling pathogen persistence in production environments. Persistent bacterial strains, often responsible for food recalls, arise from poor hygienic design, ineffective cleaning, cross-contamination, and zoning failures.

A structured 5-point control plan emphasizes prevention, sanitation, cross-contamination control, and verification through environmental monitoring. Key standards like GFSI Benchmarking 2024 highlight the need for risk-based, traceable, and regularly reviewed programs.

The presentation introduces zoning concepts, rapid response strategies to positive samples, and early warning systems using tools such as ATP, microbial indicator and pathogen testing.

It also identifies common compliance gaps and showcases how digital, paperless solutions can enhance sanitation, data management, and traceability. Integrating digital tools enables real-time insights, trend analysis, and faster corrective actions, turning monitoring data into proactive control measures.

Ultimately, smart environmental monitoring combines structure, early detection, and data-driven decision-making to improve hygiene efficiency, reduce contamination risks, and protect both consumers and brands.

Session 15-3

Harnessing the power of hygiena diagnostics toward building a safer food

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The presentation explores how leveraging advanced technologies such ATP based monitoring systems, real-time PCR-based foodborne pathogen and spoilage organism detection assays to ensure precise and reliable monitoring of hygiene in production lines and processing areas. When coupled with sophisticated data management system like the SureTrend® digital platform, it enables data integration and analysis from multiple sources and facilities, creating a bird's eye view of a mapped out manufacturing environment, helping to identify critical areas and mitigate risks through traceability and real time trend analysis. This type of approach of coupling smart monitoring and digital technologies identifies the most high-risk parts of the food manufacturing process and allows companies to focus resources accordingly.

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Session 16

Progressive MassARRAY Solutions for Enhanced Food Safety

The Science of Food Safety :
Bridging Research and Application

Session 16-2

Fundamental principles of the MassARRAY® system

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Multiplex assays allow for the simultaneous detection of multiple targets within a single reaction, offering significant advantages in reducing sample volume and experimental time while streamlining workflows. Among platforms for multiplex genome analysis, the MassARRAY® system by Agena Bioscience stands out for its reliability and economic efficiency.

The system employs matrix-assisted laser desorption/ionization-time of flight (MALDI-TOF) mass spectrometry to achieve precise detection of DNA molecules. Genetic variants of interest are amplified through end-point PCR under universal cycling conditions and are subsequently distinguished by their individual molecular masses, eliminating the need for fluorescence or additional labeling steps. The integrated software package generates comprehensive reports in standardized formats, thereby reducing complex bioinformatics requirements and conserving resources. The MassARRAY system enables the analysis of 10s-100s genetic markers per sample from as little as 10 ng of nucleic acid, with the capacity to detect up to 4,800-19,200 genetic variants in a single run.

The system enables the detection of single nucleotide polymorphisms (SNPs), insertions, deletions, translocations, copy number variations, and methylation markers, facilitating applications across pharmacogenomics, oncology, hereditary genetics, sample integrity verification, infectious disease research, agricultural genomics, animal health, and food safety assessment.

In this session, we will provide a comprehensive overview of the fundamental principles, technological methodologies, and chemical foundations of the MassARRAY platform.

Session 16-3

MassArray technology: Exploring the potential of MassArray in various food safety applications

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The MassARRAY® system by Agena Bioscience utilizes MALDI-TOF (Matrix-Assisted Laser Desorption Ionization-Time of Flight) mass spectrometry technology to deliver faster and more accurate results compared to conventional genetic analysis methods. The system enables simultaneous analysis of up to 50 markers from a single DNA sample, and with its automated dispensing technology, DNA assay mixtures are efficiently spotted onto a SpectroCHIP®. This allows for high-throughput analysis of up to 768 samples, generating data for up to 38,400 genetic markers in a single run.

One of the key advantages of the MassARRAY system is its flexibility in target design, which allows researchers to customize panels according to specific study goals. In the field of food safety, it has been applied to the detection of foodborne pathogens, identification of harmful intestinal microbes in livestock through fecal samples, GMO screening, and SNP analysis for origin authentication. Beyond food safety, the system also demonstrates high performance in diverse areas such as mutation analysis, pharmacogenomics, DNA methylation studies, variant profiling, and sample verification, making it an essential tool in both research and diagnostic settings where precision is critical.

This presentation will explore the diverse applications of the MassARRAY system and discuss its potential future roles and directions in the field of food safety.

Session 16-4

Rapid detection system for foodborne pathogens using MassARRAY

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Culture-based methods remain the gold standard for the detection of foodborne pathogens. However, these methods are labor-intensive, time-consuming, and poorly suited for high-throughput applications. To overcome these limitations, molecular diagnostic tools such as real-time PCR have been implemented as complementary standard methods. Nevertheless, the concurrent detection of multiple pathogens remains technically challenging, often impeding timely interventions in food safety management systems. This limitation can delay critical responses in food safety management, increasing the risk of contamination going undetected in foods. Therefore, in this study, we developed and validated a matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) for the rapid, multiplex identification of major foodborne pathogens. Specific primers and single-based extension probes were designed using AGENA ASSAY DESIGN SUITE v3.0, and their target specificity was confirmed through NCBI BLAST analysis. The resulting mass-to-charge (m/z) spectra enabled unambiguous discrimination of amplicons with high analytical precision. The developed assay achieved a limit of detection of 10^2-10^3 CFU/mL in pure cultures and exhibited comparable analytical sensitivity to conventional real-time PCR. Notably, the MassARRAY-MALDI-TOF system enables high-throughput, cost-efficient, and accurate detection of multiple pathogens within a few hours. These findings demonstrate the potential of this platform as a robust alternative for molecular diagnostic tools. It offers substantial improvements in efficiency, throughput, and diagnostic accuracy for foodborne pathogen monitoring across clinical, industrial, and regulatory domains.

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Session 17

Research on Safety Management Technology for the Sustainable Future Food Industry

The Science of Food Safety :
Bridging Research and Application

Session 17-1

A Study on the improvement of HACCP management for the safe manufacturing of liquid egg products

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Recently, food safety incidents related to food poisoning by *Salmonella* in foods using liquid egg products (whole egg liquid, liquid egg yolk, liquid egg white) have been continuously raised. This study examined hygiene indicator bacteria (general bacterial count, coliforms) and foodborne pathogens (*salmonella* spp.) in the manufacturing process and environment in order to suggest safety management measures for each major process of liquid egg manufacturers. In the liquid egg manufacturing process, sorting, washing, drying, cracking eggs, removing foreign materials, cooling, pasteurizing, storage, and transportation were identified as major management processes. Especially in the washing process, the changes in sodium hypochlorite concentration and washing effectiveness according to the usage time of the raw material egg washing water (containing sodium hypochlorite) were evaluated. As a result, it was confirmed that the concentration of sodium hypochlorite (200 ppm at first) in washing water decreased to 100 ppm after 30 minutes under conditions of repeated raw material egg addition. In the case of the washing effect, a reduction effect in the general bacterial count on the eggshell was observed when using the washing water for the first time and 1 hour. However, when the same washing water was used for 2 hours, the general bacterial count rather increased. Moreover, an increase in general bacterial count was observed in the washing water used for 2 hours. Additionally, according to the validation results of the manufacturing environments, *Salmonella* spp. was detected in the egg cracking machine and transfer line after the production ends. However after washing and sterilizing them with sodium hypochlorite disinfectant, the results confirmed negative. In conclusion, in the washing process, the sodium hypochlorite concentration shall be maintained at a fixed level at all times, and an appropriate replacement cycle for washing water shall be set and managed to prevent microbiological contamination. In addition, facilities such as egg cracking machine and transfer line shall be disinfected using sodium hypochlorite disinfectant after washing to prevent cross-contamination.

Session 17-2

A study on developing food safety management guidelines for major non-conforming processes in the Korean HACCP system

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The World Meteorological Organization (WMO) recently projected that the global temperature will rise by 1.5°C above pre-industrial levels before 2040. Such continuous climatic changes are expected to exert a profound influence on food safety and dietary patterns. A 1°C increase in average temperature is associated with approximately a 5.3% rise in reported foodborne illness cases and a 6.2% increase in the number of patients. In July 2025, the national average temperature in Korea reached 27.1°C, which was 2.5°C higher than the historical norm, thereby amplifying the risk of microbial proliferation and the emergence of novel hazards such as mutated foodborne pathogens and viruses.

Meanwhile, food safety incidents continue to occur annually. The main contributing factors include deficiencies in raw material hygiene management, insufficient critical control poins (CCP) during manufacturing and inadequate cleaning in workplaces and production facilities. Cross-contamination by biological hazards has been identified as a leading cause of microbial contamination. In particular, recent food safety incidents involving foodborne pathogens in widely consumed food categories highlight the urgent need for institutional improvements in food safety management.

This study aims to re-evaluate the current Korean HACCP system, which has been implemented since December 1995 without substantial revisions to CCP management criteria. By analyzing biological hazards across representative food categories frequently consumed by the public and reassessing the adequacy of validation practices for CCP critical limits, this study proposes scientific and rational strategies to strengthen Korea's food safety management. Collectively, these strategies contribute to establishing a science-based and resilient HACCP system capable of proactively responding to evolving food safety challenges in the future.

Session 17-3

Enhancing accessibility of OLHA (on-line hazard analysis) system

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'Hazard Analysis' is the first principle among the 7 principles and 12 steps of HACCP. It is a systematic process of collecting and evaluating information to determine whether hazards and the conditions that may give rise to them exist and may affect the safety of food products, and it is a mandatory procedure for all companies applying HACCP. To alleviate the difficulties faced by HACCP-certified establishments in preparing hazard analyses and the financial burden of inspections, the Korea Agency of HACCP Accreditation and Services (KAHAS) has developed and provides the 'OLHA (On-line Hazard Analysis)' system free of charge, utilizing public data. The OLHA system delivers information through three main components: (1) Hazard Analysis, (2) Food Standards and Specifications, and (3) My OLHA. The 'hazard Analysis' section provides analysis information for 220 food raw materials and food products, including hazard identification criteria and risk assessment data used to evaluate the likelihood of occurrence. The 'Food Standards and Specifications' section contains official standards and specifications for 862 food raw materials and food products. The 'My OLHA' section supports the preparation of Product Description linked to Product Manufacturing Report and provides customized food safety information for individual businesses. This system will continue to be upgraded, with plan to add process-specific hazard analysis information next year, as well as continuously incorporating components of all 12 HACCP steps, including the CCP decision tree and HACCP plan, etc. The ultimately goal is to evolve OLHA into a comprehensive, one-stop HACCP support system.

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Session 18

Management of Veterinary Drugs in Livestocks and Fishery Products

The Science of Food Safety :
Bridging Research and Application

Session 18-1

Enhancement of domestic seafood safety management

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In Korea, total seafood production reached 3.61 million tons in 2024, representing a 2.2% decrease from the previous year. Nevertheless, the proportion of aquaculture-based production has continued to rise, accounting for approximately 62.3% of the national total. Because aquaculture products inherently involve the use of veterinary drugs and antibiotics, systematic monitoring and management of residue levels are essential to ensure food safety.

Per-capita seafood consumption in Korea was 63.3 kg in 2022, a figure that far exceeds the global average of 19.9 kg, underscoring the country's strong dependence on aquatic food resources and the growing public demand for safety assurance. At the same time, the aquaculture industry faces increasing antibiotic usage, diversification of farming environments, and rapid shifts in distribution and consumption patterns driven by the expansion of non-face-to-face online trade. These complex changes present new challenges that cannot be fully addressed by conventional management systems. To strengthen seafood safety, the Ministry of Food and Drug Safety (MFDS) has established four on-site seafood testing centers and is implementing an integrated safety-management system spanning production, distribution, and consumption. Given that risk prevention at the production stage is crucial, the MFDS, in collaboration with the Ministry of Oceans and Fisheries (MOF), is reinforcing its role as a national control tower for seafood safety. These efforts highlight the urgent need to develop scientifically grounded and policy-oriented management strategies that can effectively respond to the evolving production, distribution, and consumption environments of Korea's seafood industry.

Session 18-2

Management of veterinary drugs in livestock and fishery products

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The consumption of livestock and fishery products has been increasing annually as they are major sources of nutrients that are essential in the human diet, such as proteins and minerals. Increasing consumption of livestock and fishery products, the usage of veterinary antibiotics is increasing as well. This consumption can adversely affect human health, and such consumption over a long period of time can also cause increased antibiotic resistance. With the increase in public attention to food safety, regulation of veterinary drugs used in animal food production has been imposed in nearly every country. To ensure food safety in Korea, the Ministry of Food and Drug Safety (MFDS) has implemented the positive list system (PLS) for veterinary drugs since 2024. Five major livestock and one fishery product were initially subjected to PLS, and in the absence of established Korean maximum residue limits (MRL), a uniform level of 0.01 mg/kg was applied. In parallel, research has been conducted to support the second-phase expansion of PLS to cover minor species. To enhance food safety, the National Institute of Food and Drug Safety (NIFDS) has improved analytical methods for veterinary drugs to enhance quantitative performance and accuracy in accordance with guidelines. Additional efforts include the development of rapid detection kits and the establishment of microbiological acceptable daily intake (mADI) based on Korean intestinal microflora. These initiatives are expected to strengthen food safety management and protect public health.

Session 18-3

Comprehensive residue survey in minor animal-source foods: Method fitness and risk context

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Minor animal-source foods have been increasingly incorporated into Korean diets, yet systematic residue surveillance and analytical method guidance have been comparatively underdeveloped. To address this gap, a comprehensive residue survey was planned for minor animal-source foods in Korea, and method fitness was evaluated alongside monitoring. Representative matrices-sheep/goat, duck, quail eggs, edible insects, and frogs-were selected on the basis of consumption, production/import trends, and matrix characteristics. Analytical scope covers multi-class pesticides (LC-MS/MS and GC-MS/MS lists totaling 200+ actives) alongside veterinary drugs and prohibited substances defined in the national code. For routine testing, official single- and multi-residue Food Code methods were applied by commodity class. For analytes that could not be reliably measured in representative matrices-arsanilic acid and salbutamol-new procedures were developed using QuPPe-type extraction for highly polar analytes and HPLC separation on pentafluorophenyl (PFP) stationary phases, and intra- and inter-laboratory verification was conducted. In the applicability review across representative species, method performance met the Ministry's acceptance criteria for quantitation limits, linearity, and accuracy/precision in most cases. Monitoring was implemented on 100 samples spanning honey, duck, goat, sheep, horse, quail egg, deer, rabbit, turkey, goose, frog, snail, mealworm larvae, rhinoceros/flower chafer larvae, and softshell turtle, reflecting offline and online procurement proportional to market availability. Residues detected in any sample were subjected to risk assessment using the framework defined for hazard identification, toxicological reference values, and exposure estimation tailored to minor animal-source foods. Collectively, an implementable surveillance design was established and method fitness for minor species was demonstrated, with dedicated solutions provided for highly polar or otherwise intractable analytes.

Session 18-4

Preparation and stability assessment of meat certified reference materials for accurate determination of veterinary drugs

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Accurate determination of residual veterinary drugs is essential for establishing Maximum Residue Limit (MRL)-based regulations and for ensuring food safety. Certified reference materials (CRMs) play a crucial role in maintaining measurement traceability and providing a reliable basis for validating analytical methods. In this presentation, the overall process and key considerations involved in the preparation and stability monitoring of meat-based CRMs developed for the determination of veterinary drugs are described. The CRM preparation involves several well-controlled processing steps, including freeze-drying, pulverization, spiking of target analytes, filtration, homogenization, and bottling under controlled and reproducible conditions. Stability monitoring is another crucial step, conducted under various temperature and time conditions to simulate transportation, field use, and both short- and long-term storage. As case studies, examples of CRM preparation using chicken and beef matrices will be introduced. The chicken CRMs were developed for the analysis of ciprofloxacin and enrofloxacin, whereas the beef CRMs, characterized by a higher fat content, were prepared for the determination of ofloxacin and sulfadiazine. The analytical values of the target compounds were obtained using ultra-high performance liquid chromatography-isotope dilution tandem mass spectrometry, ensuring high accuracy and traceability. These efforts contribute to establishing reliable reference systems that support consistent monitoring of veterinary drug residues in food.

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Session 19

Blue Food Auction House 3.0 Model: A Digital Platform for Hygienic and Quality Seafood Distribution

The Science of Food Safety :
Bridging Research and Application

Session 19-1

Establishing grading and quality standards for major seafood

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Consumer awareness of food quality has been increasing rapidly, driven by a rising demand for safe and reliable food. In line with this trend, there is a growing need to develop a scientifically standardized system for the objective assessment and grading of seafood quality. Seafood shows considerable variation in nutritional composition and overall quality depending on factors such as the catching season, habitat conditions, and individual differences. Additionally, it is especially susceptible to quality deterioration during production and distribution. Therefore, both nutritional and freshness indicators must be considered to develop a comprehensive and reliable quality grading system. This study aimed to establish scientifically based quality indicators and grading criteria for major seafood. Nutritional components were analyzed across different catching seasons and sizes. Correlation analyses between size and nutritional composition were performed to develop a quality index. Furthermore, regression and correlation analyses between freshness-related parameters and RGB color values were conducted to create a freshness index. These two indices were combined to propose a seafood quality grading model that enables objective and comprehensive evaluation. The proposed quality indicators provide a foundation for standardized quality assessments and digital quality management systems in the seafood industry. This result is expected to enhance consumer confidence and improve distribution efficiency, ultimately contributing to the development of a scientific and objective seafood distribution system.

Session 19-2

Microbiological risk assessment of automated processes in fish auction markets for seafood safety

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Fish auction markets in Korea have traditionally faced challenges in ensuring microbiological safety due to the continued use of wooden fish boxes and the reliance on manual handling processes such as sorting. These conditions not only threaten the quality of seafood but also increase the risk of microbial contamination through frequent human contact. Wooden boxes are prone to contamination and are difficult to clean and dry, indicating a need for improvement in auction handling systems. This study conducted a microbiological risk assessment of two commonly consumed fish species, mackerel (*Scomber japonicus*) and croaker (*Larimichthys polyactis*), to evaluate the effectiveness of automated and improved auction processes designed to minimize human contact. Using the @RISK software, we modeled the behavior of pathogenic *Escherichia coli* and compared contamination levels between conventional and improved fish auction environments. Predictive models for pathogenic *E. coli* in mackerel and croaker were developed, and cross-contamination from wooden boxes as well as time-temperature profiles during handling steps in fish auctions were analyzed. The risk assessment simulation integrates all preceding datasets, including consumption data, dose-response models, and other relevant parameters, to comprehensively evaluate species-specific microbial risks. Based on these findings, the modernization of fish auction markets could potentially mitigate microbial risks and enhance the overall safety and international reputation of Korean seafood, while enabling the verification of freshness and supporting the establishment of effective management control points.

Session 19-3

Monitoring physicochemical and volatile changes of laver (*Pyropia* spp.) for quality and safety management

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Laver (*Pyropia* spp.) is one of Korea's most important marine products, widely consumed for its nutritional benefits and cultural significance. Despite the industrial scale of its production, systematic studies on the physicochemical and volatile changes that occur during commercial processing remain limited. This study aimed to monitor the quality- and safety-related variations in laver throughout four key manufacturing stages: seawater storage, rinsing, aging/blending and drying. The physicochemical properties and volatile compounds were analyzed to evaluate the process-dependent trends in nutritional and sensory quality. Free amino acid profiling revealed a consistent increase in the total amino acid content from Step 1 to Step 4, with remarkable enrichment of glutamic acid, alanine, γ-aminobutyric acid (GABA), and phenylalanine. These amino acids are associated with umami and sweet taste development, indicating that the drying process contributes significantly to flavor enhancement. Multivariate statistical analysis successfully differentiated the processing stages based on both amino acid and volatile compound patterns, demonstrating that biochemical and aroma characteristics evolve distinctly across steps. Volatile profiling showed a clear transition from light alcoholic compounds, such as acetaldehyde and furan, in the early stages to thermally derived odorants, including propanoic acid, cis-3-hexenol, and (1-methylethyl)benzene, during drying. The formation of high-molecular-weight volatiles in the final stage suggests their potential use as thermal process markers for monitoring manufacturing stability. Overall, these findings provide a scientific foundation for establishing quality and safety management strategies for laver manufacturing. This process-resolved approach highlights key indicators that can be applied to improve product quality, flavor consistency, and process traceability in the seaweed industry. This research was supported by the Korea Institute of Marine Science & Technology Promotion (KIMST) through grants RS-2021-KS211539, funded by the Ministry of Oceans and Fisheries.

Session 19-4

Deep learning-based image analysis for seafood freshness grading and defective product classification

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This study presents a deep learning-based visual recognition approach for automating seafood quality assessment at fish auction markets. Conventional grading in seafood distribution primarily relies on human sensory inspection, which depends on subjective judgment and inconsistent visual evaluation. Such sensory-based assessment lacks objective and reproducible standards, especially for fresh products such as *Scomber* (mackerel). To overcome these limitations, we developed an artificial intelligence system that enables real-time, non-destructive, and quantitative evaluation of mackerel quality indicators. The proposed method integrates three key functions within a unified object detection framework:

(1) freshness classification into acceptable and unacceptable categories,
(2) estimation of fish size and weight using oriented bounding boxes (OBB), and
(3) inter-species discrimination including spotted mackerel (Scomber).

A total of 994 images were collected from real auction sites under various illumination and background conditions to construct the dataset. The YOLOv8 model was fine-tuned and optimized for multi-task inference through ONNX and TensorRT conversion for efficient deployment. The model achieved a freshness classification accuracy of 90%, and a size/weight estimation error within ±5%. Furthermore, the system demonstrated a real-time inference speed of approximately five fish per second (5 FPS) on an NVIDIA RTX-class GPU. These results verify that the proposed method provides an efficient and objective alternative to conventional sensory evaluation, offering a scalable foundation for automated seafood grading and standardization in fish auction environments. The study contributes to the advancement of AI-driven food quality assessment, enabling intelligent automation for sustainable seafood distribution.

Session 19-5

Blue food auction house 3.0 model: Past, present, and future of seafood auction house

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This study aims to overcome the long-standing inefficiencies of Korea's seafood auction markets (wholesale fish markets), which have operated under non-standardized and manually managed systems for decades. To achieve this, a comprehensive standardization framework for fresh seafood distribution was developed, focusing on data standardization, electronic auction systems, and advanced hygiene management.

Historically, approximately 220 fish auction markets across Korea have each used different formats for recording species names, sizes, units, and conditions. This resulted in low data consistency and made it difficult to utilize the existing "Bada-ro System" (the National Federation of Fisheries Cooperatives' transaction platform) for policy or distribution analysis. Furthermore, insufficient hygiene standards and outdated facilities have limited both the quality of seafood and the efficiency of distribution.

To address these challenges, the Korea Food Research Institute (KFRI) led a consortium of 13 participating institutions, including SeaLife Science Lab, and achieved the following key outcomes:

Standardized ERP input system: Designed a unified ERP framework that integrates auction market codes, product conditions, species, and size specifications into a single standardized data structure. Electronic auction platform: Introduced a tablet-based auction system to replace manual bidding, enabling real-time synchronization of auction results with the ERP system, thereby improving transaction transparency and efficiency. Standardization of species codes: Established a consistent and internationally compatible classification system that can be linked with the national agri-fishery product codes and other distribution databases.

Establishment of hygiene management standards (SOP & SSOP): Defined standardized procedures for preventing cross-contamination, regulating worker movement and attire, and specifying cleaning and sanitation protocols. Implementation of smart equipment technologies: Field-tested advanced technologies, including AI-based automatic grading systems, ice slurry cooling systems, and smart fish containers equipped with traceability sensors.

As a result, the data reliability and policy applicability of auction market information were significantly enhanced, and the auction processing speed improved dramatically compared to conventional methods. Based on these achievements, the newly developed "Fish Auction Market 3.0 Model" is expected to evolve into a nationwide integrated data network supporting AI-driven supply and demand forecasting for seafood.

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Session 20

Food Safety Perspectives on Pathogen Investigation and Heat-Resistant Mold Management

The Science of Food Safety :
Bridging Research and Application

Session 20-1

Proactive environmental pathogen management in dairy manufacturing: Integrating FDA cGMP EPM principles with advanced molecular tools

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Microbial contamination in dairy processing environments remains one of the most critical challenges to food safety and brand integrity. Traditional quality systems have relied heavily on end-product testing; however, the modern approach emphasizes proactive management of the production environment where pathogens can survive and spread. This presentation introduces Maeil Dairies' practical implementation of an Environmental Pathogen Management (EPM) program based on FDA cGMP regulations (21 CFR Part 117, Subpart B). The program integrates risk-based zoning, hygienic design verification, and routine environmental mapping to detect potential contamination before it reaches products. To strengthen root cause investigation, GeneUp® molecular diagnostics and metagenomic sequencing techniques were applied for microbial source identification and community profiling. These advanced molecular tools allow comprehensive monitoring of microbial dynamics within processing environments, enabling early detection of contamination routes and pathogenic species. By combining behavioral hygiene practices, regulatory principles, and data-driven molecular diagnostics, Maeil Dairies aims to establish a proactive and sustainable food safety culture that ensures both product integrity and consumer trust.

Session 20-2

GENE-UP® TYPER: Rapid qPCR strain typing for foodborne pathogen root cause analysis

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Foodborne pathogens pose a severe threat to global public health, inflicting substantial economic and reputational damage on food production facilities. Pathogens such as *Salmonella*, *E. coli* and *Listeria monocytogenes* (LMO) can persist in environments for years following contamination, demanding precise root cause analysis beyond simple screening. However, conventional high-resolution strain typing methods, including PFGE, MLST, and WGS, have inherent limitations such as the need for specialized personnel, prolonged analysis times and high costs, hindering their routine application in the food industry.

To overcome this technological gap, bioMérieux has developed GENE-UP® TYPER, an innovative qPCR-based probabilistic strain typing solution tailored for the food industry. This method provides results from target pure cultures in just 1 hour. It utilizes 16 specific genetic marker profiles and a data model-driven algorithm to predict a strain's phylogenetic position within a core genome-based tree of over 30,000 reference LMO strains, assigning it to a specific cluster. This approach offers rapid, efficient, and high-resolution analytical results without requiring highly specialized personnel.

In conclusion, GENE-UP® TYPER significantly enhances the speed and efficiency of pathogen root cause analysis in the food industry. This method enables the early identification of persistent contamination sources or emerging strains, allowing companies to swiftly identify contamination events, implement effective mitigation strategies, strengthen food safety, and ultimately contribute to a substantial reduction in the risk of large-scale recalls.

Session 20-3

Fungi contamination and food safety

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An integrated strategy for the ‘three major threats of mold’ to food safety is necessary. Recently, the incidence of general foreign matter mold in food contamination claims is occurring. This immediately induces consumer aversion and causes a decline in brand credibility. More serious are the hidden threats, such as mycotoxins and heat-resistant molds. Mycotoxins are secondary metabolites produced by fungi like *Aspergillus*, possessing severe toxicity, including aflatoxin (Group 1 carcinogen) and ochratoxin A. Since this toxin is a chemical substance, it is not destroyed by high-temperature sterilization. Based on paper analysis, toxins are widely detected in high-risk raw materials like nuts, making scientific inspection at the point of raw material entry the only defense line. Toxins subject consumers to chronic fear regarding long-term health risks. Next, heat-resistant molds (*Byssochlamys*, *Talaromyces* spp.) survive low-temperature pasteurization processes of 80~90°C in the form of ascospores. They primarily cause decay (jellification) in acidic foods like juice and jam, creating a ‘trust gap’ with the ‘perfectly sterile’ state that consumers expect from ‘sterilized’ products. Heat-resistant spores continuously enter the manufacturing environment via routes like cooling water lines. An integrated strategy is essential to address these three threats and restore consumer trust. Key strategies include strengthening the raw material toxin management system (implementing selection technology), maximizing spore elimination in the manufacturing process (applying F_0 value and environmental control), securing transparency for brand credibility (publishing safety assurance reports), and ethically improving the claims response manual. Ultimately, mold contamination management is not merely regulatory compliance but a core investment that protects a company's viability and long-term brand value. Managing not only visible threats but also hidden ones is the key to success for the future food industry.

Session 20-4

Mold control in ambient-distributed pie products

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Recent climate change, characterized by rising temperature and humidity, has made microbial control in food increasingly challenging. Under these changing conditions, pie products distributed at ambient temperature require a certain level of moisture to maintain a soft texture, which simultaneously increases the potential for mold growth.

The molds that cause problems in pie products belong to heat-resistant species that can survive baking and other heat treatments. Among these, xerophilic molds (such as *Aspergillus glaucus* and related species) which can grow within a water activity (A_w) range of 0.69-0.81, serve as the primary risk factor for most pie products. In this study, a mold control strategy was established based on an A_w threshold of 0.72. When A_w is below 0.72, microbial count control in raw materials and processing stages is sufficient. However, when Aw exceeds 0.72, additional inhibitory measures are required to prevent mold germination. Effective inhibition was achieved through ethanol treatment or the addition of preservatives such as sorbic acid and propionic acid, which successfully suppressed mold growth during distribution.

This presentation introduces the characteristics and analytical methods of xerophilic molds in ambient pie products and shares product-specific control practices. The findings are expected to serve as fundamental data for establishing mold safety management strategies under the evolving climatic environment.

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Session 21

National Strategy for Advancing Food Nutrient Information System

The Science of Food Safety :
Bridging Research and Application

Session 21-1

Policy applications of the Korean food and nutrient database (KFNDB)

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The Korean Food and Nutrient Database (KFNDB) is a comprehensive national system that provides reliable information on foods and their nutrient composition. It plays a central role in nutrition labeling policy, public health research, and chronic disease prevention. With the increasing demand for personalized nutrition and healthier eating habits, accurate and standardized nutrient data have become essential for scientific and practical applications. To meet these needs, the Ministry of Food and Drug Safety (MFDS), in collaboration with the Ministry of Agriculture, Food and Rural Affairs and the Ministry of Oceans and Fisheries, has collected, integrated, and standardized food and nutrient data from diverse sources. All datasets adhere to international standards for food classification and nutrient measurement, ensuring data consistency and global comparability. Currently, the KFNDB includes information on more than 180,000 food items, encompassing agricultural, livestock, marine, processed, and ready-to-eat foods. The database is freely available through the Korea public data portal and is widely used in public meal management systems, dietary assessment tools, and personalized nutrition applications. Moving forward, the KFNDB aims to further improve the accuracy, reliability, and scope of its data to reflect evolving dietary patterns and the rapidly changing food market. In particular, the database will expand its coverage to include imported foods and health functional foods, thereby strengthening its role as a key evidence-based resource supporting nutrition policy, research, and consumer health.

Session 21-2

Food nutrition labeling in Korea

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The nutrition labeling system is a regulatory framework that manages nutritional information labels on food products based on standardized criteria. It aims to provide consumers with accurate nutritional information to help them to select foods appropriate for their health conditions, while also encouraging the food industry to improve product quality and competitiveness. The Korean nutrition labeling system began in 1994 with an initial mandate for nutrition labels on foods for special purposes, food supplements, and foods with nutrient content claims. Over subsequent years, its scope was gradually expanded to include almost all processed foods, except for those with low labeling necessity, with implementation phased according to the business size. In 2006, the mandatory labeling nutrients were expanded from five - energy, carbohydrates, protein, fat, and sodium - to nine by adding sugars, trans fat, saturated fat, and cholesterol, in recognition of their importance to public health. In 2016, the labeling unit was revised from ‘serving size’ to ‘intake’ to enhance clarity and consumer understanding. As the ‘serving size’ set by manufacturers often differed from the amount actually consumed depending on packaging and characteristics of products, the ‘reference amounts for one serving’ value was established based on the market surveys. Nutrient content is primarily displayed per ‘total content (package)’ and may also be displayed per 'unit content, 100 g (mL), or ‘reference amounts for one serving’, alongside the percentage contribution to the ‘one-day nutritional standard’. The one-time intake and the one-day nutritional standard are updated and revised based on scientific evidence, such as the Korea National Health and Nutrition Examination Survey and the Dietary Reference Intakes for Koreans. The Korea nutritional labeling system, including labeling items and methods, nutrient content claims, and precautions, will be made to reflect consumer needs, industry demands, and international standards, contributing to improved public health communication and alignment with global nutrition labeling practices.

Session 21-3

Strategy for the advancement of the Korean food and nutrient database

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Food composition information serves as an essential foundation for nutrition policy, dietary assessment, and public health research. To ensure the reliability and comprehensiveness of such data, systematic production and management at the national level are critical. In Korea, the Rural Development Administration (RDA) is responsible for establishing and maintaining the National Standard Food Composition Table for raw and agricultural foods, while the Ministry of Food and Drug Safety (MFDS) manages the Korean Food and Nutrient Database (KFNDB) for processed and prepared foods. The National Institute of Food and Drug Safety Evaluation (NIFDS) contributes to the development and advancement of the MFDS database through research on analytical methods and monitoring of nutrient contents in foods. The analytical methods continuously established or improved by the NIFDS are incorporated into the Korean Food Code through revisions and updates, thereby strengthening the scientific basis for food composition data. Nutrient monitoring has been conducted in phases: analysis of frequently consumed foods from 2009 to 2021, current analysis of processed foods and estimation of missing values of the KFNDB from 2024 to 2027. Future research will focus on the analysis of food composition that reflect the total diet of Koreans, ensuring a more comprehensive understanding of actual dietary intake. In addition, the NIFDS plans to develop AI-based prediction models to estimate nutrient compositions more efficiently and accurately. These efforts will further enhance the completeness and applicability of the national food composition database, supporting evidence-based nutritional policies and consumer health management. This research was conducted with the budget (24191MFDS066) of Ministry of Food and Drug Safety in 2025.

Session 21-4

Development of Korean food composition database and its application

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The development of Korean National Standard Food Composition Database (KFCD) is outlined, originating from a simple “Food Composition Table” in 1970 by Rural Development Administration. This foundational resource has matured over decades into an essential tool for national food policy, public health surveys, and dietary education. Since the 9th revision in 2017, the establishment of the National Food Analysis System (NFAS) marked a critical inflection point, significantly enhancing data quality and quantity through standardized sample procurement, validated multi-laboratory analysis, and rigorous verification against international guidelines. This systematic approach resulted in annual updates covering over 130 nutrient components. The latest 10.3 revision was released in April, 2025 in which contains data on 3,330 food items and up to 130 food nutrients for the excel database files. To secure the KFCD's role in the rapidly evolving FoodTech sector and precision nutrition, several key strategies for future advancement are proposed. These include improving FAIR (Findability, Accessibility, Interoperability, and Reusability) compliance, increasing the granularity of data for micronutrients and functional constituents, and establishing a near-real-time data update pipeline. Furthermore, development of differentiated user interfaces for consumers, researchers, and industry stakeholders is necessary. Targeted investment in interoperability, machine accessibility, and metadata depth will transform the KFDC into a globally competitive, high-value data asset for next-generation applications.

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Session 22

The Study about Non-regulated Hazardous Mycotoxins

The Science of Food Safety :
Bridging Research and Application

Session 22-1

Investigation into the causes of a food poisoning outbreak resulting from red yeast rice

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In March 2024, health problems, including renal dysfunction, fatigue, and urinary abnormalities, were publicized in Japan as a result of the intake of red yeast rice (RYR) supplement tablets. RYR, called 'Beni-Koji' in Japan, is a fermented product used as a food or food additive in East Asian countries. *Monascus pilosus*, a red pigment-producing fungus, was used to prepare the tablets. Approximately 2,700 people received medical care by the end of March 2025, and approximately 560 required hospitalization. To identify the causes of the food poisoning, the manufacturer of Beni-Koji conducted a nontargeted analysis and found an unexpected compound, puberulic acid (PA), in tablets that caused food poisoning. Because proximal tubule degeneration and necrosis were observed in the kidneys of rats treated with PA, PA contamination in the Beni-Koji tablets was considered to be the cause of the food poisoning. We conducted an on-site investigation at the Beni-Koji production factory to determine the cause of PA contamination of the tablets. *Penicillium*-like strains were isolated from wiped samples and were cultured on solid rice medium to confirm the production of PA. PA was detected in the culture extract from some strains. Both molecular phylogenetic analysis and morphological observation revealed that the PA-producing strains were all *Penicillium adametzioides*. To understand the route through which *P. adametzioides* contaminated Beni-Koji and produced PA, coculture experiments with *M. pilosus* and *P. adametzioides* were performed. In some co-culture conditions, *P. adametzioides* grew on rice medium with *M. pilosus* and produced PA. These results suggest that PA-producing *P. adametzioides* inhabited the Beni-Koji production factory and accidently contaminated the culture of *M. pilosus.* Consequently, the tablets contaminated with PA were manufactured and caused the food poisoning outbreak.

Session 22-2

"The known unknowns": Understanding and addressing the risk of modified mycotoxins in food safety

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Modified mycotoxins-formed via plant, fungal or animal metabolism or during food processing-co-occur with their parent toxins and may revert to parent forms in the gastrointestinal tract. They therefore represent a surveillance blind spot with direct implications for exposure assessment. This presentation critically reviews the 2015-2025 literature on modified mycotoxins-covering occurrence, analytical methods, toxicology, and risk assessment-and translates these insights into a practical agenda for food-safety management. Evidence mapping shows sustained focus on field mycotoxins such as zearalenone and deoxynivalenol and their conjugates, but comparatively limited work on processing- or matrix-bound products and only sporadic integration of parent and modified forms in exposure or risk frameworks. Public datasets are especially thin in Korea, where no national survey or routine monitoring of modified forms has been reported.

To address these gaps, we established a single-run LC-MS/MS workflow with solid-phase extraction clean-up for simultaneous quantification of 37 targets in foods. The panel includes regulated mycotoxins (aflatoxins, ochratoxin A, fumonisins, deoxynivalenol, zearalenone), nonregulated toxins (nivalenol, T-2/HT-2), and major Phase I/II and processing-derived forms. Ongoing work includes synthesis of noncommercial reference standards and high-resolution, non-targeted screening to flag novel or under-reported conjugates.

The talk will (i) summarize global research signals and methodological bottlenecks, (ii) share initial analytical findings and lessons for fit-for-purpose monitoring, and (iii) outline a Korea-focused roadmap: harmonized LC-MS/MS methods, access to reference materials and interlaboratory comparisons, prioritized food matrices, and linkage of occurrence with human-relevant evidence to support proportionate, context-specific risk assessment. Together, these steps make the "known unknowns" of modified mycotoxins tractable for regulatory science and practical control.

Session 22-3

Occurrence of non-regulated mycotoxins and their producing fungi in crops

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Non-regulated mycotoxins are attracting significant attention due to their potential toxicological risks, despite the absence of established regulatory limits. This study investigated the occurrence of non-regulated mycotoxins-beauverisin, enniatins, ustiloxin A, T-2/HT-2 toxins and nivalenol-and their producing fungi in various susceptible crops distributed in Korea, including ginger, ginseng, rice and other cereals. Beauvericin and enniatins were frequently detected in ginger samples, and their levels were influenced by storage temperature and relative humidity. Fresh ginseng showed a high incidence of fungal contamination, with isolated fungi confirmed as potential mycotoxin producers. In rice, ustiloxin A was identified at high levels in false smut-infected grains compared to healthy ones. Additionally, cereals such as barley, wheat, millet, sorghum, and adlay exhibited natural contamination with T-2, HT-2 and nivalenol, though the incidence varied by crop and year. Fungal community analysis revealed different dominant fungal species among various grain crops, suggesting that host preference may influence mycotoxin occurrence patterns. These results highlight the need to monitor non-regulated mycotoxins in diverse crops to better understand their food safety implications. Our findings provide a scientific basis for future risk assessment and management strategies regarding non-regulated mycotoxins.

Session 22-4

Development of analytical method of non-regulated mycotoxins for proactive management of food safety

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Korea has established standards and specifications for the management of 11 types of mycotoxins, including five types of aflatoxins, ochratoxin A, two types of fumonisins, deoxynivalenol, zearalenone, and patulin. However, due to climate change and the diversification of imported foods, the potential for the occurrence and exposure to unregulated mycotoxins is increasing. In response, the Ministry of Food and Drug Safety (MFDS) has been continuously developing analytical methods for unregulated mycotoxins-such as phomopsin, sterigmatocystin, and trichothecenes including T-2 and HT-2 toxins-in order to assess the need for their regulation and to proactively prevent food poisoning incidents. The developed analytical methods have been validated in accordance with the procedures recommended by the CODEX, and all relevant CODEX guidelines have been met.

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Session 23

Rapid Detection of Foodborne Pathogens Using High-Sensitivity Diagnostic Techniques

The Science of Food Safety :
Bridging Research and Application

Session 23-1

Technological progress in the aspect of qPCR applied to food pathogen testing: When technology meets food industry's needs

Sandra Fréville

Thermo Fisher Scientific, France

When it comes to pathogen testing, food industries need to implement a robust and effective HACCP plan to protect their brand and consumers. But, at the same time, they need to answer to global supply chain challenges and pressure and need to rely on robust, precise, and simple analytical tools and methods to free batches as soon as possible.

Implementation of alternative validated methods following the ISO 16140-2 has open doors to more efficient and reliable testing solutions, with shorter time to results in comparison to traditional reference methods, like molecular q-PCR based technologies.

Molecular technologies, and specifically q-PCR based ones, have definitively evolved a lot during the last decades. Passing from complicated and expensive methods to very simple and cost-effective workflows. But how to select the best alternative validated method for your food testing lab? What is the method which will provide you with the best ration between quality of the results, ease of use and price per sample?

Thermo Fisher Scientific has developed a portfolio of molecular alternative validated methods to support industrials in their daily challenges and to provide a flexible and evolutive solution to streamline lab workflows. In this presentation, Sandra Fréville, Regional Tactical Manager in the Microbiology division, will provide an overview of qPCR technologies characteristics available on the market and will highlight the importance of selecting the most suitable depending on your laboratory activity, characteristics and requirements, to ensure robustness of food pathogen results without compromising in efficiency or productivity.

Session 23-2

Introduction to various applications of digital PCR and NGS based genetic analysis for food safety and research

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Throughout the COVID-19 pandemic, the usefulness of Whole Genome Sequencing (WGS) using NGS (Next-Generation Sequencing) for COVID-19 virus (SARS-CoV-2) has been proven, enabling comparisons between samples and detailed epidemiological investigations, and tracking phylogenetic changes driven by viral evolution. This technological advancement also holds significant potential for research and testing in the field of food safety. It allows us to determine in detail whether all infected individuals were infected with the exact same pathogen, whether the pathogen in samples like food and in patients is identical, and what mutations the pathogen undergoes and what lineages emerge during ongoing outbreaks. For example, the Ministry of Food and Drug Safety (MFDS) already has developed the Ion Torrent NGS panel for WGS of norovirus. This panel is particularly advantageous as it can be used on the fully automated Ion Torrent Genexus NGS system, eliminating the need for specialized NGS technical expertise or experience. Furthermore, the recently introduced digital PCR (Absolute Q dPCR system) offers greater convenience and faster application than conventional droplet digital PCR (ddPCR) for detecting low-concentration DNA and analyzing food and environmental samples containing high levels of PCR inhibitors. These technologies are expected to play a crucial role in future research and responses related to ensuring food hygiene and safety.

Session 23-3

Stable isotope ratio analysis for tracing geographical origin and authenticity of food and beverages

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In the modern food industry, verifying the authenticity and geographical origin of food has become essential for building consumer trust, protecting the integrity of the industry, and fulfilling corporate social responsibility. As global food trade expands and production methods diversify, scientific verification techniques are more critical than ever to ensure the consumer's right to know and secure market transparency. Among these, Isotope Ratio Mass Spectrometry (IRMS) is gaining significant attention as a highly reliable analytical method. Stable isotopes (C, N, S, O, H) contain unique information about specific geographical and ecological environments, much like a ‘fingerprint’, based on their physicochemical properties. These differences in isotopic composition are systematically passed along the food chain, fully reflecting not only key environmental factors such as local climate, geological characteristics, and agricultural practices, but also the unique properties of the source materials. Therefore, stable isotope analysis is utilized as a powerful tool to determine origin and authenticity based on scientific evidence within complex food supply chains. This presentation aims to explain the fundamental principles for interpreting these stable isotope fingerprints in food and to introduce various applications, such as determining the geographical origin of agricultural products, authenticating food products, distinguishing between production methods, and tracing contaminants and specific additives. Ultimately, this scientific approach will provide the core data necessary to protect the brand value of food products and to establish a sustainable food supply chain built on consumer trust.

Session 23-4

Quality control automation along the laboratory workflow

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Modern laboratories are under increasing pressure to deliver accurate and reproducible results while managing higher sample, limited resources, and stricter regulatory requirements. Quality control (QC) is a critical element in ensuring reliability across workflows, yet traditional manual approaches remain inefficient and inconsistent. Manual QC often leads to variability between operators, fragmented documentation, and limited data traceability, creating significant challenges for laboratories striving to maintain data integrity and meet compliance standards. These obstacles highlight the need for a more systematic and integrated approach to QC.

To address these needs, Thermo Fisher Scientific provides a portfolio of solutions that enable the automation of quality control steps tailored to each user's workflow. By embedding QC into laboratory processes in a flexible and adaptable way, laboratories can systematically monitor critical points, minimize operator-dependent errors, and reinforce data consistency and reliability. Because these solutions are designed to complement rather than disrupt existing practices, they can be implemented without compromising established processes, while enhancing overall laboratory performance.

This presentation will demonstrate how quality control automation can improve reproducibility, increase efficiency, and support the development of a research environment grounded in trust and compliance. Beyond supplying instruments, Thermo Fisher Scientific provides training, technical support, and workflow expertise to help laboratories overcome daily challenges and achieve robust, trustworthy outcomes.

Good reception.

Thank you.

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Plenary Lecture 3

The Science of Food Safety :
Bridging Research and Application

Plenary Lecture 3

Food safety culture

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The food industry has evolved alongside societal development, with clear improvements in awareness of food safety and hygiene. In the past, many food-related accidents were caused by ignorance, but today, both consumers and producers take food safety seriously and actively manage it. Nevertheless, unpredictable risks such as nuclear accidents, poor hygiene practices in neighboring countries, and intentional food contamination remain. This makes it essential to establish a strong food safety culture within organizations.

Food safety culture goes beyond merely following regulations-it means embedding food safety as a core organizational value and having employees internalize it in their daily decisions and behaviors. It encourages a shared sense of responsibility across departments and ensures that safety practices are consistently applied.

Five key components shape this culture. First, a clear vision and mission must integrate food safety as a company value and be effectively communicated through leadership. Second, every employee should actively engage through education, communication, and recognition. Third, maintaining consistency requires well-defined roles, performance indicators, and accessible documentation. Fourth, adaptability allows swift response to crises and changes through structured planning and training. Lastly, risk awareness involves understanding potential hazards and continuously reviewing and improving practices to prevent incidents.

Management plays a central role in creating and promoting food safety culture, while employees must recognize their responsibilities and put them into practice. When food safety culture is deeply rooted, it leads to fewer accidents, better productivity and quality, higher customer satisfaction, and increased employee pride

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Session 24

Young Scientist Presentation Ⅰ

Foodborne Toxins and Health Effects

The Science of Food Safety :
Bridging Research and Application

Session 24-1

Comprehensive omics insights into mesaconitine toxicity from *Aconitum* plants in zebrafish

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Aconitum species have been widely used for thousands of years across Asia and North America, primarily in traditional Chinese medicine, where their rootstocks are commonly included in herbal formulations. Mesaconitine is a major benzoyl diterpenoid alkaloid in *Aconitum* roots, but its potential toxic effects on metabolism are unknown. This study investigated the effects of mesaconitine exposure in zebrafish through an integrative analysis of metabolomic and proteomic data. Three zebrafish groups (n = 6 each) were exposed to mesaconitine at 0 μg/L (Control), 8 μg/L (Low), or 80 μg/L (High) for 48 hours. We observed significant alterations in both protein and metabolite levels following mesaconitine exposure. The results revealed 135 differentially expressed proteins, with 63 upregulated and 72 downregulated, alongside 57 differentially expressed metabolites. The analysis also revealed significant changes in key metabolic pathways, including glycerophospholipid metabolism, alanine, aspartate, glutamate metabolism, and arginine biosynthesis indicating disruptions in lipid and amino acid metabolism. Proteomic analysis showed disruptions in oxidative phosphorylation, the tricarboxylic acid (TCA) cycle, and respiratory electron transport, indicating a broad impact on energy metabolism. The combined metabolomic and proteomic data suggested coordinated changes in metabolic pathways and energy balance. Integrative metabolomic and proteomic changes induced by mesaconitine exposure, suggesting a coordinated reprogramming of metabolic pathways and energy homeostasis. This study provides a detailed molecular understanding of the complex metabolic and proteomic alterations in zebrafish following mesaconitine exposure and offers valuable insights into the mechanisms of toxicity induced by this compound.

Session 24-2

Foodborne nitrite-producing bacteria as hidden contributors to infant methemoglobinemia

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Infant methemoglobinemia has been linked to dietary nitrate and nitrite intake, yet the mechanism of nitrate-to-nitrite conversion in infants remains unclear. While the infant gut microbiome has been considered, its limited nitrate-reducing activity and weak inhibitory barriers suggest a role of extrinsic foodborne bacteria. This study investigated the contribution of nitrite-producing bacteria (NPBs) from foods to nitrate reduction in the infant digestive system. A total of 320 food samples, including raw weaning food ingredients and processed baby foods, were screened, yielding 520 NPB isolates. NPB prevalence was higher in raw ingredients (71.9%) than in processed foods (34.4%). *Bacillota* dominated overall, with *Pseudomonadota* prevailing in nitrate-rich vegetables (i.e., beetroot, spinach, lettuce). Among 323 vegetable-derived isolates, *Pseudomonadota* displayed the highest survival (>50%) under simulated infant digestive stresses. Fourteen “high-risk” strains, including *Pantoea*, *Enterobacter*, and *Klebsiella*, exceeded nitrite conversion thresholds linked to acceptable daily intake (ADI). Notably, a *Pantoea agglomerans* strain demonstrated excessive nitrite production and adherence to intestinal surfaces. Simulated gastrointestinal models representing four infant postnatal age periods (0-1, 1-3, 3-6, 6-12 months) confirmed that NPBs inoculated to food matrix produced nitrite of ≥ADI levels in all models. Although the Infant C model (6-12 months) showed higher transient nitrite concentrations in few cases, the duration above ADI was shorter than in younger models, indicating that the risk varies depending on infant age. Overall, this study provides quantitative evidence that foodborne NPBs can survive infant digestion, proliferate, and generate excessive nitrite, highlighting their potential role in dietary-induced infant methemoglobinemia.

Session 24-3

Cognitive and behavioral impairments by methylglyoxal-induced hippocampal dysfunction

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Depression and memory impairment are common neurodegenerative conditions strongly associated with diabetes, in which methylglyoxal (MGO) accumulation from hyperglycemia and gut dysbiosis acts as a key pathogenic factor. We demonstrate that MGO exposure induces depression-like behavior and cognitive deficits in mice, accompanied by tryptophan (Trp) depletion, reduced serotonin, epinephrine, and dopamine, and neuronal loss in hippocampal regions. MGO downregulated TPH1 and TPH2, impaired neuronal outgrowth, and promoted tau phosphorylation, APP and oAβ accumulation, and disruption of the BDNF/NGF-TrkB axis. In parallel, excessive ROS activated MAPKs and NF-κB, causing redox imbalance and neuroinflammatory responses with Iba-1, IL-6, and TNF-α elevation. Importantly, Trp supplementation ameliorated these effects, restoring neurotransmitter levels and reducing behavioral deficits, oxidative stress, inflammation, and tau pathology. These results establish a novel *in vivo* model of MGO-induced neurodegeneration and suggest that Trp supplementation may serve as a therapeutic strategy for diabetes-associated depression and memory dysfunction.

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Session 25

Young Scientist Presentation II

Advanced Technologies for Food Safety

The Science of Food Safety :
Bridging Research and Application

Session 25-1

Germination and subsequent inactivation of bacterial endospores using pulsed ohmic heating

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Bacterial endospores exhibit substantial resistance to physical, chemical, and biological stresses, posing a persistent challenge to food safety. In particular, *Bacillus cereus* spores can survive various sterilization or pasteurization processes and later germinate during distribution. This presentation introduces an effective strategy using pulsed ohmic heating (POH) that comprises germination and subsequent inactivation. To verify the superior performance of POH for endospore inactivation, POH or conventional heating (CH) in a first heating stage were applied to induce activation and germination of *B. cereus* endospores, thereby reducing their heat resistance. A second heating stage at up to 100°C performed for lethal inactivation of *B. cereus* spores. Under identical treatment temperature and time, POH accelerated activation and germination of *B. cereus* spores compared with CH due to the combined action of electric field and current in addition to heat. Furthermore, damage to the exosporium was also observed after POH treatment, which facilitated greater lethal effect during the subsequent heating step. As a result, the novel strategy based on POH achieved significantly higher inactivation of endospores than CH while reducing processing temperature and time. This reduction in treatment temperature and time lowers the risk of quality loss and supports better preservation of sensory and nutritional attributes. Thus, this presentation suggests that POH based germination and subsequent inactivation strategy represents a practical and promising technique for endospore control in heat sensitive foods, enabling microbial safety.

Session 25-2

Next-generation food processing technologies based on superheated steam and cold plasma

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The growing demand for safe and high-quality foods has accelerated research into non-thermal and hybrid sterilization technologies that overcome the limitations of conventional treatments. Superheated steam (SHS) and cold plasma represent two promising approaches that can be tailored for diverse applications, ranging from surface decontamination of fresh produce to the modification of functional food materials. SHS offers rapid and uniform heat transfer, enabling effective inactivation of foodborne pathogens such as *Escherichia coli* O157:H7, *Salmonella enterica*, and *Listeria monocytogenes* on seed surfaces while simultaneously enhancing physiological traits, including germination and salinity tolerance. However, residual microbial recovery highlights the need for synergistic combinations with complementary technologies. Cold plasma and its derivatives, such as plasma-activated solutions, provide strong bactericidal activity by generating reactive oxygen and chlorine species, disrupting cell membranes, and impairing DNA integrity. These treatments are also effective against resistant forms, including biofilms and spores, and can be optimized through salinity modulation or mild heating. Integration of SHS with cold plasma offers the potential to unify the advantages of high-enthalpy steam penetration with reactive species chemistry, yielding improved microbial inactivation while minimizing thermal damage and harmful by-product formation. Moreover, these technologies may be extended beyond microbial control to support material innovation and the production of high-quality ready-to-eat meals. Collectively, SHS and cold plasma establish a versatile platform for advancing food safety, extending shelf life, and improving product functionality, paving the way for pilot-scale applications and industrial adoption.

Session 25-3

Characterization of biofilm formation and development of rapid detection methods for foodborne pathogens

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Foodborne pathogens pose a serious threat to public health and cause substantial economic losses worldwide. Although many studies have focused primarily on the planktonic state of foodborne pathogens, more than 60% of foodborne outbreaks are associated with biofilms. Therefore, controlling foodborne pathogens requires a comprehensive approach that considers both planktonic and biofilm-associated states. This study aimed to achieve integrated control of foodborne pathogens by controlling both planktonic cells and biofilms. A tHDA-CRISPR/Cas12a-based rapid detection platform was established for the planktonic state, enabling highly specific and visual identification of foodborne pathogens within a short time. In parallel, biofilms formed by major foodborne pathogens exhibited enhanced survival under various environmental conditions. Exposure to sublethal concentrations of antimicrobial agents promoted adaptation, accompanied by increased EPS production and upregulation of stress-related genes. Additionally, cross-contamination experiments further revealed that surface-to-food contact resulted in greater transfer of biofilm cells than fluid-mediated exposure, emphasizing the risk of persistent contamination. Overall, this study provided the foundation for comprehensive control of foodborne pathogens by integrating rapid detection in the planktonic state with adaptive biofilm control, thereby contributing to the advancement of public health and food safety management.

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Session 26

Development and Safety of Future Foods Based on Blue Foods

The Science of Food Safety :
Bridging Research and Application

Session 26-1

Advancing fermented blue foods: Microbial strategies for quality, safety, and functional potential

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Blue foods are important for the development of the sustainable food system. Domestic consumption of blue foods has rapidly expanded in various forms, such as raw fish, processed seafood products, and functional foods. Among these, fermented seafood such as *Jeotgal* and *Sikhae* represent popular blue foods noted for their unique flavor and traditional value. However, most traditional fermented seafood still relies on spontaneous fermentation, which often causes microbial community instability, product inconsistency, and quality degradation during distribution. To address these issues, this study aimed to improve the fermentation stability and quality of *Sikhae* by applying a starter. Lactic acid bacteria isolated from *Sikhae* were screened for potential as a starter, and changes in physicochemical, microbiological, and sensory properties during fermentation were assessed. The addition of the starter accelerated acid production and lowered pH in the early fermentation stage, thereby suppressing spoilage microorganisms. Moreover, the dominance of *Leuconostoc* spp. contributed to the stabilization of the microbial community. Also, sensory evaluation, total volatile basic nitrogen analysis, and electronic tongue measurements confirmed improvements in flavor and umami characteristics. These findings propose a microbial strategy for stabilizing and industrializing fermented seafood using lactic acid bacteria, demonstrating the potential of a fermented blue food model that improves both quality and fermentation stability.

Session 26-2

Eco-friendly protein extraction and characterization from *Chlorella pyrenoidosa* using microbial enzymes and fermentation

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Sustainable protein sources are urgently required to address global challenges such as population growth, climate change, and resource depletion. *Chlorella pyrenoidosa*, which contains approximately 60% protein on a dry matter basis, represents a promising alternative, yet conventional extraction approaches often low extraction yield, cause nutritional loss, and impair sensory quality. To overcome these limitations, we developed eco-friendly strategies using microbial protease hydrolysis and *Bacillus*-driven fermentation for protein extraction from *C. pyrenoidosa*. Response surface methodology - Box-Behnken design (R^2 = 0.9270) showed optimal microbial protease treatment conditions at 45.6℃, pH 9.1, and 49.9 min, yielding 40.70 ± 1.48% protein with increased essential amino acids, low-molecular-weight peptides, and improved antioxidant activity. To enhance extraction, 22 *Bacillus* strains were screened from *Jeotgal*, with *Bacillus amyloliquefaciens* MU2 selected for high protease activity, cell wall disruption verified by BIO-TEM. Optimization of MU2 fermentation conditions (R^2 = 0.9864) identified 26.6 h, 33.8℃, and 2.7% inoculation rate as optimal, producing significantly higher levels of essential/free amino acids, extensive peptide depolymerization, elevated phenolics, enhanced antioxidant capacity, and reduced off-flavor, with sensory tests indicating improved umami perception. Semi-pilot scale trials further increased protein content and demonstrated industrial feasibility. Overall, this work establishes an innovative microbial enzyme and fermentation strategy for sustainable protein extraction from *C. pyrenoidosa*, contributing to the advancement of alternative protein production while enhancing both economic viability and environmental sustainability.

Session 26-3

Alginic acid, a functional dietary ingredient derived from *Ecklonia maxima* stipe, attenuates the pro-inflammatory responses on particulate matter-induced lung macrophages

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Alginate is a prominent food component extensively employed in developing functional food items and a dietary supplement with significant anti-inflammatory potential. Globally, rising air pollution by particulate matter (PM) has become a significant threat to humans, causing collateral lung tissue damage by inflammation. Therefore, the present study aimed to evaluate the anti-inflammatory potential of alginate isolated from *Ecklonia maxima* stipes (EMSA) against lung inflammation due to PM exposure. Initial results from cell viability, nitric oxide, prostagalandin E-2, and pro-inflammatory cytokine production assays showed that EMSA has potential anti-inflammatory potential of EMSA through inflammatory signaling pathways, further confirmed by *in vivo* results and inductively coupled plasma-optical emission spectrometry. Therefore, EMSA can produce low-cost and high-quality alginate for several fields, such as functional foods using *E. maxima* stipes, a natural source such as functional foods, pharmaceuticals, and nutraceuticals.

Session 26-4

Targeting foodborne pathogens: Integrating natural and synthetic molecules for safer foods

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Biofilm generation by foodborne pathogens is a major concern in the food industry, jeopardizing food safety and public health. These microbial aggregations, entrenched in extracellular polymeric compounds, are more resistant to antimicrobial treatments, cleaning methods, and environmental conditions. Conventional disinfection alone is insufficient, demanding novel technologies and procedures that incorporate several control mechanisms. Beyond standard antibiotics, researchers have investigated several synthetic and natural options for controlling foodborne infections. Several natural compounds derived from marine sources, bacteria, fungi, plants, and animals have been identified as having antimicrobial, antibiofilm, and anti-virulence activities against foodborne diseases. Natural molecules such as phytochemicals, essential oils, polyphenols, and antimicrobial peptides exhibit broad-spectrum antimicrobial activity through a variety of mechanisms, including disruption of cell walls and membranes, interference with genetic replication, inhibition of biofilm formation, and disruption of quorum sensing. Green-synthesized nanoparticles (NPs) have emerged as viable antibacterial agents due to their biocompatibility, low cost, and environmental sustainability. Various biological sources, including plants, algae, bacteria, fungi, and marine organisms, serve as reducing agents for NP synthesis, offering advantages over chemical techniques. These biogenic NPs have considerable antibiofilm and antivirulence properties, allowing them to enter biofilm matrices and disrupt cell-to-cell communication processes successfully. These natural, synthetic, and bioinspired NPs provide sustainable alternatives to conventional antimicrobials, addressing the growing issue of antimicrobial resistance.

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Session 27

The Future of Functional Food Safety: Predictive, Integrated, and AI Big Data-Empowered

The Science of Food Safety :
Bridging Research and Application

Session 27-1

The necessity of predictive systems for functional ingredient safety: A data-centric approach

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The growing public interest in health has led to increased consumption of health functional foods and other functional products, resulting in a rising prevalence of overlapping and concurrent intake. In particular, as Korean society rapidly enters an aging era, the use of medications for chronic diseases has also increased, raising new safety concerns regarding the concurrent consumption of health functional foods and pharmaceuticals. Reliable prediction of such safety issues requires an integrated connection among data on ingredient composition, intake amounts, and toxicological and safety information for each component.

However, the current data management systems are fragmented across different governmental agencies, and the data are collected in non-standardized formats. Consequently, even identical ingredients are often managed differently, making interlinking and harmonization difficult. Furthermore, the collected datasets are stored in formats that are inefficient for analysis and utilization, necessitating additional refinement and curation processes. Considering the virtually infinite combinations of ingredients that may be co-ingested, the conventional safety assessment approaches, which are based on individual evaluations, have inherent limitations in predicting combinatorial safety risks.

Therefore, it is essential to standardize and systematize the safety evaluation data for individual ingredients and to develop algorithms capable of effectively integrating and analyzing diverse safety information to predict potential interactions arising from concurrent intake. To achieve this, efficient data collection, standardization, management, and inter-agency connectivity must be established.

In the era of big data and artificial intelligence (AI)-driven predictive modeling, it is imperative to build a cross-ministerial, standardized, and organically linked data management system for health functional foods. Establishing such an integrated data infrastructure and advancing AI-based predictive algorithms for combinatorial safety evaluation will contribute to the creation of a safer consumption environment for health functional foods, functional products, and pharmaceuticals.

Session 27-2

A review of system-based approach for evaluating the safety of multiple dietary supplement uses

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Dietary supplements (DS), encompassing formulations that deliver concentrated sources of vitamins, minerals, amino acids, and other bioactive compounds, are increasingly utilized with the aim of enhancing physiological function, disease prevention, and healthy aging. With the growing prevalence of concurrent or multi-supplement use, concerns have intensified regarding cumulative exposure, potential exceedance of tolerable upper intake levels, and complex nutrient-nutrient or nutrient-drug interactions. In nutrition science, system-based approaches have recently emerged as integrative digital frameworks that link multiple databases-such as food composition, biomarker, and supplement use data-to enable individualized evaluation of dietary intake. While these tools have improved precision in assessing nutrient adequacy and deficiency, their application to quantifying nutrient intake derived specifically from DS and to evaluating the potential risks of excessive or overlapping exposures remains limited. This review summarizes existing system-based approaches relevant to supplement-derived intake assessment, outlining their methodological scope, advantages, and current limitations in addressing the safety implications of multiple DS use. Building upon these gaps, we introduce a conceptual framework that extends current system-based tools beyond adequacy-focused evaluation toward integrated safety profiling. Our proposed model incorporates multi-supplement exposure data, detailed nutrient composition of DS products, and linkage to national nutrition and health databases to generate personalized feedback on total nutrient exposure and potential excess risk. By harmonizing individual-level supplement intake information with population-based reference standards, the framework aims to deliver dynamic, user-specific evaluation and evidence-informed guidance for safer and more balanced supplement consumption.

Session 27-3

Developing a data-driven algorithm to predict risks of combined use of health functional ingredients

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This study aims to develop a data-driven system that predicts potential safety risks associated with the combined intake of health functional foods, thereby supporting their safer and more evidence-based use. To achieve this, we compiled and integrated data on toxicological profiles, ADME characteristics, and toxicogenomic and toxicoproteomic information for each functional ingredient to construct a comprehensive safety database. A consumer survey was conducted to identify commonly co-consumed ingredient combinations.

Based on this integrated dataset, we developed an algorithm capable of predicting potential safety concerns arising from combined intake by modeling pairwise interactions between ingredients. To validate the algorithm, a systematic literature review was performed on frequently co-consumed ingredient pairs, confirming the plausibility of the model's predictions. Adverse event reports and experimental findings identified during the validation phase are currently being incorporated into the algorithm through weighted data integration for refinement.

This study provides a foundation for a more precise and data-driven approach to predicting and managing potential safety risks associated with the concomitant use of health functional ingredients.

Session 27-4

Development of an integrated predictive algorithm for safety assessment of functional ingredient intake based on the cross-nutrient database (CNDB)

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The concurrent intake of dietary supplements and pharmaceuticals has increased substantially, raising concerns regarding safety risks from overlapping and combined intake. To address these challenges, we established the Cross-Nutrient Database (CNDB), a Neo4j-based graph database integrating ingredient-level information from pharmaceuticals, dietary supplements, general foods, and fortified functional products. Standardization was achieved through the Unified Ingredient Identifier (UII) framework, enabling consistent cross-referencing of ingredient data.

On this foundation, we developed predictive algorithms for dual safety assessment. The overlapping intake algorithm quantifies cumulative exposure by applying Minimum Habitual Intake (MHI)-based imputation and calculating hazard quotients (HQs) relative to established upper intake levels (ULs). The co-administration algorithm evaluates risks from concurrent ingestion of different ingredients by generating ingredient combinations and applying a rule-based scoring system that integrates toxicological evidence, ADME data, CTD associations, and literature reports, while accounting for biological mechanisms such as absorption competition and synergistic toxicity.

A case analysis of a 30-year-old male consuming four dietary supplements demonstrated the applicability of the system. Overlapping intake analysis showed that EPA and DHA intake was below the recommended range and classified as safe. In contrast, co-administration analysis revealed ADME findings, CTD disease associations, gene targets, and literature evidence, which were collectively categorized as a potential risk level.

Overall, the CNDB-based predictive algorithms offer a robust and scalable framework for safety assessment. The system provides personalized guidance for consumers, population-level insights for policymakers, and evidence-based decision support for industry and researchers, thereby bridging product innovation, regulatory oversight, and consumer protection.

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Session 28

Emerging Insights into Pathogenic Microbes and Host Responses

The Science of Food Safety :
Bridging Research and Application

Session 28-1

Recent perspectives on gut microbiome responses to pathogenic viral infections and recovery

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Enteric viral infections, particularly norovirus and rotavirus, represent major global health challenges responsible for approximately one-fifth of diarrheal illnesses worldwide. This study synthesizes current understanding of gut microbiome responses to pathogenic viral infections, examining taxonomic and functional changes, diversity patterns, and recovery trajectories across multiple research cohorts. Comparative analysis reveals consistent disruption patterns during acute gastroenteritis, characterized by depletion of beneficial commensals and expansion of potentially pathogenic taxa, though responses vary by age and infection severity. Our longitudinal cohort study of five infants in León, Nicaragua demonstrated that norovirus infection caused significant microbiome disruption with *Gammaproteobacteria* dominance, particularly *Pseudomonas* species, increased alpha diversity, and reduced carbohydrate metabolism and glycan biosynthesis genes. Recovery to pre-infection composition occurred with a median of 58 days, demonstrating microbiome resilience. Cross-study comparisons highlight age-dependent differences, with adult microbiomes showing variable disruption patterns while infant microbiomes consistently exhibit more dramatic but recoverable changes. These findings have important implications for developing targeted probiotic therapies and optimizing oral vaccine timing.

Session 28-2

Extrahepatic manifestation of Hepatitis E virus: New Insights from a miniature pig model and the development of next-generation infection systems

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The global prevalence of Hepatitis E virus (HEV) infection presents a significant public health challenge, yet the absence of efficient infection models has impeded the development of effective treatments and vaccines. We previously established a miniature pig model to investigate HEV pathogenesis and discovered that the virus is widely distributed in various organs beyond the liver. Our key finding was the direct link between HEV infection and the induction of necroptosis in the pancreas, which provides a novel mechanistic explanation for HEV-induced pancreatitis. This discovery highlights the importance of extra-hepatic manifestations and lays the groundwork for more comprehensive HEV research. Building upon these critical insights, our ongoing research is focused on developing next-generation infection systems. We aim to identify the essential entry receptor for HEV, a key step in creating more physiologically relevant and efficient models. Building on this, we performed bioinformatics analysis of transcriptomes from HEV-susceptible and non-susceptible cell lines, identifying seven strong candidates for the essential entry receptor. The future direction of this research involves validating these candidates and using them to develop new, highly efficient *in vitro* and *in vivo* models. These models will serve as powerful tools to further elucidate the pathogenesis of HEV.

Session 28-3

Genomic and phenotypic characterization of Gram-negative bacteria from fresh vegetables

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Fresh produce can harbor Gram-negative bacteria with diverse antimicrobial resistance (AMR). In this study, 41 isolates were recovered from 35 retail samples (tomato, napa cabbage, cabbage, radish, carrot) collected across five provinces (Feb-Jun 2023). All isolates were purified on Eosin Methylene Blue and Pseudomonas Isolation Agar, phenotyped (KOH test, oxidase, catalase; API 32E/20NE), and whole-genome sequenced (Nanopore). De novo assemblies were quality-checked and annotated; taxonomic placement used core-genome phylogeny, fastANI, and dDDH. AMR/virulence genes and plasmid replicons were screened with curated databases; phenotypic susceptibility followed CLSI M100 disc diffusion.

All isolates were accurately identified at the genus levels: *Enterobacter* (n=12), *Serratia* (n=12), *Pseudomonas* (n=9), *Citrobacter* (n=4), *Erwinia* (n=3), *Pantoea* (n=1). AMR genes, profiled using the Staramr pipeline, were mainly detected in *Enterobacterales: Serratia* commonly carried *aac*(6')-Ic, *bla*SST-1, *oqx*B, *tet*(41); *Enterobacter* harbored *bla*ACT variants and *bla*CMG; *Citrobacter* carried *bla*CMY. No ESBL genes were detected. Eleven isolates harbored plasmid replicons (e.g., IncFII/FIB, IncN, IncR, Col-type, pKPC-CAV1321). *Pseudomonas* lacked acquired AMR genes in this study. Phenotypically, all isolates were susceptible to gentamicin and ciprofloxacin; resistance to ampicillin (97.6%) and cefoxitin (73.2%) was frequent. Tetracycline resistance aligned variably with *tet* genes. Genome-based analyses identified 34 of 41 isolates at the species level; others remained unclassified.

These findings highlight produce-associated *Enterobacterales* as important AMR reservoirs and support continued, seasonally broad genomic surveillance along the produce supply chain.

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Session 29

Use-by-Date Labeling System and Food Safety

The Science of Food Safety :
Bridging Research and Application

Session 29-1

Policy directions for the stable implementation of the use-by date system

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Since the introduction of the expiration date labeling system in 1985, it has served as a key regulatory framework for maintaining food safety and distribution order in Korea. However, the expiration date system, which is focused on the period during which products may be sold rather than the actual safe consumption period, has been criticized for causing consumer confusion and unnecessary food waste. In response to international developments-including the deletion of the expiration date definition by the Codex Alimentarius Commission (CODEX) in 2018 and the global transition of many OECD countries to the consumer-oriented use-by date system-Korea began efforts to introduce a similar framework. The Ministry of Food and Drug Safety (MFDS) established a legal foundation for the new system through the 2021 amendment of the 'Act on Labeling and Advertising of Foods', etc., and fully implemented the use-by date labeling system on January 1, 2023. To facilitate a smooth transition, the MFDS introduced a compliance grace period to alleviate industry's burden, developed and published reference values for use-by dates, and promoted the system through education, communication, and public outreach initiatives. Following implementation, consumer awareness of the use-by date increased markedly from 34.5% to 88.5%, accompanied by growing recognition that understanding the safe consumption period contributes to both food safety and waste reduction. The food industry also expressed positive expectations regarding export competitiveness and inventory management efficiency, although concerns remain over potential sales declines and increased consumer complaints. This study analyzes domestic and international policy trends related to the use-by date system, examines the scientific and policy validity of reference values, and conducts experiments on frequently consumed food categories to propose provisional use-by dates. The results are being shared continuously through the MFDS website to enhance scientific support and promote the stable and effective implementation of the use-by date system in Korea.

Session 29-2

Study on the establishment of reference values for the use-by-date of various foods

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In response to the full transition from the expiration date labeling system to the use-by date labeling system in 2023, a research project has been conducted since 2022 to minimize confusion among food manufacturers. This study aims to scientifically establish reference values for use-by dates by calculating new dates for over 200 food categories and 2,000 food items, and to make these results publicly available for practical use by the food industry. The establishment process involves collecting relevant data to determine safety factors, selecting appropriate quality and safety indicators, and setting corresponding quality safety thresholds. The use-by date is then calculated by applying safety factors to the quality safety limit period derived from storage tests. Quality and safety indicators vary depending on the characteristics of raw materials, manufacturing processes, product properties, and distribution conditions. Additionally, factors such as the manufacturing environment, raw material condition, and hygiene management level also influence the final use-by date. Data have been collected for 207 categories and approximately 2,700 items, and reference values for 175 categories and 1,450 items have been made publicly available. By the completion of the study, reference values for 200 categories and 2,000 items are expected to be published. Through the scientific establishment and public disclosure of use-by date reference values, this research aims to support food business operators and contribute to the advancement of the food industry.

Session 29-3

Scientific basis and experimental methodology for establishing use-by-dates

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From January 1 of 2023, the Ministry of Food and Drug Safety (MFDA) introduced the 'use-by-date (consumption period)', which is the period during which food can be consumed or consumed, instead of the 'expiration date', which is the period during which products can be sold. The Ministry of Food and Drug Safety is carrying out a project to set the expiration date of about 2,000 items of 200 food types in the food code from 2022 to 2025. According to the 'Consumption Date Setting Report by Food Type (December 1, 2022)', which includes reference values for consumption dates of 23 food types and 80 items in the first year, tofu has an increased shelf life of 23 days (use by date) from 17 days (Shelf life). Ham increased from 38 to 57 days, and fermented milk from 18 to 32 days. In addition, processed milk 16 days → 24 days, sweets 45 days → 81 days, fruit and vegetable beverages 11 days → 20 days, fruit and vegetable juices 20 days → 35 days, fish cake 29 days → 42 days, baby food for infants 30 days → 46 days, lactic acid bacteria beverages 18 day → 26th, etc. The existing quality safety indicators used to set the use by date (Shelf life) include many unnecessary tests and sometimes missing essential test items. In addition, instead of setting the expiration date for each type, practical test items should be selected considering the characteristics of each food (pH, Aw, packaging type, sterilization/sterilization, etc.) even for the same type. Physicochemical indicators include moisture content, pH, ethanol, moisture in non-fat matter, milk fat, acidity, salt, total nitrogen, crude protein, crude fat, acid value, TBA, antioxidants, preservatives, volatile base nitrogen, sulfur dioxide, acetic acid, 10-hydrogen hydroxy-2-decenoic acid, etc., and microbiological indicators include number of bacteria, coliform group, colon bacillus, number of fungi, food poisoning bacteria (toxic type), appearance (mold, drip, sediment, caking, separation state, color, appearance, etc.), We plan to rationally improve the experimental items for setting the expiration date that have been carried out so far by examining off-flavor and texture (physical properties, viscosity, surface cracks, surface dryness, etc.).

Session 29-4

Changes in consumer perception of the use-by date labeling system

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The purpose of this study was to investigate consumer awareness of food expiration dates and changes in food consumption patterns following the implementation of the expiration date labeling system in South Korea, thereby assessing the policy's effectiveness. Prior to the system's introduction in 2022, only 14.4% of consumers were aware of the transition to use-by dates. However, awareness gradually increased to 72.3% in 2023, 88.8% in 2024, and 90.9% in 2025. Regarding satisfaction with the current labeling system, 72.1% of respondents reported being satisfied, and 77.9% noted that the system clarified the edible period compared to shelf-life labels, making food management more convenient. The study found a positive correlation between satisfaction with the system and perceived convenience, indicating that the policy has improved consumer behavior recognition. When evaluating household food waste due to expired products post-implementation, 46.7% of consumers reported a reduction, while 46.2% observed no change. To achieve tangible reductions in food waste, efforts must focus on purchasing appropriate quantities, proper storage, and consuming items within their use periods.

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Oral Presentation List

The Science of Food Safety :
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OP1-01 Insights into the genomic traits, antibiogram profiling and biofilm dynamics of *Vibrio parahaemolyticus* and *Vibrio vulnificus*: Implications for seafood safety

Nigar Sultana Meghla[1,2,3], Soo-Jin Jung[1,2], Syeda Roufun Nesa[1,2], Md Furkanur Rahaman Mizan[1,2], Iksoon Kang[4], Sang-Do Ha[1,2*]

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[3]*Department of Microbiology, Jashore University of Science and Technology, Jashore-7408, Bangladesh*
[4]*Department of Animal Science, California Polytechnic State University, San Luis Obispo, CA 93407, USA*

OP1-02 Predictive modeling of coliform growth in chicken breast using statistical and machine learning approaches

Yejin Kim[1,2], Hae In Yong[2*], Heeyoung Lee[1*]

[1]*Food Standard Research Center, Korea Food Research Institute, Wanju, Korea*
[2]*Department of Animal Science and Biotechnology, Chungnam National University, Daejeon, Korea*

OP1-03 Influence of kitchen environment and risk perception on job satisfaction and commitment among institutional foodservice workers

Suejung Hur, Jisoo Lee, Chin-A Lee, Sunny Ham*

Department of Food & Nutrition, Yonsei University, Seoul, Korea

OP1-04 The effects of meal safety perception and online information use on national food safety evaluation among adolescents: The moderating role of food safety concern

Hee Sun Park, Seon Yeong Baek, Sunny Ham*

Department of Food & Nutrition, Yonsei University, Seoul 03722, Korea

OP1-05 Evaluation of *Staphylococcus aureus* biofilm formation and cross-contamination in a milk processing environment

Se Bin Im, Se-Wook Oh*

Department of Food and Nutrition, Kookmin University, Seoul 02707, Korea

OP1-06 Developments and limitations of *in vitro-in silico*-based toxicity prediction models

Kyunghee Ji*

Department of Health, Environment and Safety, Yongin University, Yongin 17092, Korea

OP1-07 The prevalence and microbial growth of high-risk foodborne pathogens associated with agricultural products during the years 2020-2024: A review

Soo Jin Kong, Ki Sun Yoon*

Department of Food and Nutrition, Kyung Hee University, Seoul, Korea

OP1-08 Physicochemical and microbial dynamics of Kimchi and predictive modeling of *Yersinia enterocolitica* in cabbage kimchi

Subin Jang[1,2], Yejin Kim[1], Chang-Hwan Jeong[1], Jong-Chan Kim[1], Heeyoung Lee[1,2*]

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OP2-01 Simultaneous concentration of foodborne pathogens using tetraethylenepentamine-coated magnetic nanoparticles with filtration

So-Hyeon Ji, Se-wook Oh*

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OP2-02 Quality control model for predicting spiciness and sweetness in spicy sauce using rapid, non-destructive, eco-friendly NIR

Dahui Kim[1], Choong-In Yun[2], Young-Jun Kim[1,2*]

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OP2-03 Development and optimization of UHPLC-MS/MS method for highly sensitive simultaneous quantification of eight sugar alcohols

Ji-Eun Kang[1], Choong-In Yun[2], Young-Jun Kim[1,2*]

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OP2-04 Microbiological analysis and hyperspectral imaging combined with artificial intelligence for non-destructive detection of defective red pepper powders

Ju Young Lim[1,2], Sung Gi Min[1], Ki Sun Yoon[2], Ji-Young Choi[1*]

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OP2-05 Development of propagation strategy and characterization of phage vB_LmoP_KFSLM4 infecting *Listeria monocytogenes*

Jeong-Ah Yun[1,2], Su-Hyeon Kim[1], Seung-Wan Cho[1,2], Mi-Kyung Park[1,2*]

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OP3-01 Single-person households' dietary behaviors and food waste typologies

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OP3-02 Labeling systems and consumer educational approaches for the safe use of foods for special medical purposes

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OP4-01 Comparative studies of colorimetric and laser-speckle thermography from lateral flow assay for food safety applications

Jully Blackshaire[1], Brianna Corman[2], Valery Patsekin[2], Bartek Rajwa[3], J. Paul Robinson[2,4], Euiwon Bae[1*]

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OP4-02 Biofilm formation and analysis of EPS architecture comprising polysaccharides and lipids by *Pseudomonas aeruginosa* and *Escherichia coli* on food processing surfaces

Shirin Akter[1,3], Md. Ashikur Rahman[1,3], Md. Ashrafudoulla[4], Hwayoung Lee[1,3], Lee Gaeul[2,3], Sang-Do Ha[1,2,3*]

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OP4-03 Temporal and comparative analysis of biofilm formation by *Escherichia coli*, *Salmonella* Typhimurium and *Pseudomonas aeruginosa* using CLSM and biomass quantification

Md Anamul Hasan Chowdhury[1,3], Chowdhury Sanat Anjum Reem[1,3], Md. Ashikur Rahman[1,3], Shirin Akter[1,3], Md. Ashrafudoulla Ashrafudoulla[4], Sang-Do Ha[1,2,3*]

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OP4-04 Novel *Yersinia enterocolitica* O3-specific bacteriophages isolated from the environment: Biofilm inhibition on food-contact surfaces and promising applications for cold-chain food safety

Harim Lee[1,3], Soo-Jin Jung[1,3], Chaeryeong Oh[2,3], Sang-Do Ha[1,2,3*]

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OP4-05 Effects of freeze-thaw conditions on single- and dual-species biofilms of *Listeria monocytogenes* and *Pseudomonas aeruginosa* on stainless steel surfaces

Yoon-Mi Ji, Se-Wook Oh*

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OP4-06 Induction of viable but non-culturable *Salmonella* using sodium hypochlorite and their resuscitation through antioxidant-mediated strategy

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OP4-07 AI-assisted genome-informed qPCR platform for rapid on-site detection of mastitis pathogens to enhance dairy food safety

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OP5-01 Green synthesis of silver nanoparticles using *Bacillus rugosus* HH2 supernatant with broad-spectrum antibacterial properties

Ju-Hong Kang[1], Geum-Jae Jeong[1], Hyo-Jin Kim[2], Na-Gyeong Lee[1], Yong-Mog Kim[1*]

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OP5-02 Phenyllactic acid inactivates *Cronobacter sakazakii* through cell membrane destruction, biofilm retardation, and altered gene expression

Meidistria Tandi Rapak[1,4], Soo-Jin Jung[3], Ashrafudoulla Md[5], Ashikur Rahman Md[2], Sang-Do Ha[1,2,3*]

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OP5-03 Korean food safety research trends and thematic evolution (2015-2024): Comparing before and after COVID-19

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OP5-04 Effects of thermo-focused ultrasound treatment on microbial inactivation and physicochemical properties of green tea latte

Rina Yu, Prabhathma Yasasvi Rathnayake , So Eun Yeo, Chemin Nam, Hyun Uk Cho, Seohyeon Jeon, Hae In Yong*

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OP5-05 Biosurfactant from *Bacillus velezensis* DG5714: Isolation, extraction, characterization, and evaluation of its potential as a natural emulsifier

Do-Kyun Kim[1], Geum-Jae Jeong[1], Eun-Byeol Jo[2], Jung-Min Lee[1], Young-Mog Kim[1*]

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OP5-06 Natural phlorotannins against *Pseudomonas aeruginosa* virulence: Multi-target inhibition and molecular insights for safe therapeutics

Abirami Karthikeyan[1], Aqib Javaid[2], Nazia Tabassum[3,4], Young-Mog Kim[3,4,5], Tae-Hee Kim[3,4], Won-Kyo Jung[3,4,6], Fazlurrahman Khan[2,3,4,7,8*]

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OP5-07 Beta-lactamase genes in lactic acid bacteria: Genomic, structural, and functional insights into a hidden reservoir of antimicrobial resistance

Aqib Javaid[1], Nazia Tabassum[2,3], Abirami Karthikeyan[4], Young-Mog Kim[2,3,5], Fazlurrahman Khan[1,2,3,6,7*]

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OP5-08 Comprehensive genomic and functional characterization of kimchi-derived lactic acid bacteria *Weissella cibaria* and *Weissella confusa*

Md. Ashikur Rahman[1], Hyunhee Hong[4], Md. Ashrafudoulla[5], Shirin Akter[1,3], Alina Ghimire[2,3], Si Hong Park[4], Sang-Do Ha[1,2,3*]

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OP5-09 Influence of dietary sugars on *Streptococcus mutans* biofilm formation and the inhibitory potential of quercetin

Syeda Roufun Nesa[1,2], Md Furkanur Rahaman Mizan[1,2], Nigar Sultana Meghla[1,2], Hyobin Lee[1,2], Kyung A Chun[3], Sang-Do Ha[1,2*]

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OP5-10 Appraisal of cinnamon leaf oil for controlling *Salmonella* Typhimurium biofilms on chicken and food contact surfaces

Chowdhury Sanat Anjum Reem[1,3], Md Anamul Hasan Chowdhury[1,3], Md. Ashikur Rahman[1,3], Sang-Do Ha[1,2,3*]

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OP5-11 Targeting foodborne pathogens: Integrating natural and synthetic molecules for safer foods

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OP5-12 Smartphone-based colorimetric biosensor platform for food safety: Detection of residual antibiotics via microbial metabolism

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OP5-13 **Enhanced microbiological assay for highly sensitive and accurate detection of antibiotic residues in livestock products and eggs**

Seong-Hyeon Park, Jun-Hyeok Ham, Hae-Yeong Kim*
Department of Food Science and Biotechnology, Kyung Hee University, Yongin 17104, Korea

OP5-14 **Development of a pH-responsive pectin-chitosan bilayer carvacrol nanoemulsion for improved shrimp preservation**

Yu-Ri Choi, Se-Wook Oh*
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OP5-15 **Development of an edible antimicrobial coating containing bacteriophage YEPA1 to control *Salmonella* contamination in foods**

Eunchai Suh, Minsuk Kong*
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OP5-16 **Evaluation of critical control point effectiveness and improvement HACCP plan for bakery products manufacturing process**

Hyunjung Jung, Jungbeom Kim*
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OP5-17 **Antimicrobial, anti-biofilm, and anti-inflammatory activities of Korean Red Ginseng extract and lactic acid bacteria against oral pathogens**

Eun-Ah Jung, Hojin Choi, So-Yeon Kwon, San-Yi Kim, Soo-Ah Lee, Jiyoon Wi, Jaewoong Lim, Kun-Ho Seo*
Center for One health Department of Veterinary Public Health, College of Veterinary Medicine, Konkuk University, Seoul 05029, Korea

OP5-18 **Optimization of generating groundwater sterilization reactive species using cold plasma through response surface methodology**

Kyeonghwan Hwang[1], Changheon Lee[2], Sumin Kim[1], Daeung Yu[1,2*]
[1]*Department of Food and Nutrition, Changwon National University, Changwon, Korea*
[2]*Interdisciplinary Program in Senior Human-Ecology, Major in Food and Nutrition, Changwon National University, Changwon, Korea*

OP5-19 **Genomic epidemiology of livestock-associated methicillin-resistant *Staphylococcus aureus* in Korean pig farms: Clonal expansion of CC398 and emergence of a novel lineage**

Hyeonwoo Cho, Kun Taek Park*
Department of Biological sciences, Inje University, Gimhae, Korea

OP5-20 **Rapid dissemination of pESI-carrying *Salmonella* Infantis in Korea: Insights into probable zoonotic transmission under a One Health framework**

Yeona Kim, Kun Taek Park*
Department of Digital Anti-aging and Healthcare, Inje University, Gimhae, Korea

OP5-21 **Isolation and characterization of a novel *Yersinia enterocolitica* phage INFJ1 with biocontrol potential in food matrices**

Seongshin Jo, Minsuk Kong*, Dokyung Han
Department of Food Science and Biotechnology, SeoulTech, Seoul, Korea

OP6-01 **Seasonal variation of tetrodotoxin and analogues in Korean pufferfish (*Takifugu pardalis*) and risk assessment of dietary exposure in Korean population**

Bong Ki Park[1], Hyunjun Lee[2], Chang-Sun Choi[3], Nobuhisa Kajino[4], Kwang-Sik Choi[4], Wan-Ok Lee[4], Jihyun Lee[1,5*]
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OP1-01

Insights into the genomic traits, antibiogram profiling and biofilm dynamics of *Vibrio parahaemolyticus* and *Vibrio vulnificus*: Implications for seafood safety

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Although the global seafood consumption patterns differ by choice and availability, seafood inevitably contributes to a substantial amount of daily protein intake. However, seafoods and its associated contact surfaces can be associated with pathogenic bacterial hazards including *Vibrio* species. *Vibrio parahaemolyticus* and *Vibrio vulnificus* are major seafood-borne pathogens affecting public health and trade. This study investigated their virulence, genetic diversity, antibiotic resistance, and biofilm-forming ability on seafood surfaces. Virulence genes were detected by PCR, genetic relatedness were assessed via REP-PCR, and antimicrobial resistance profiled using disk diffusion, revealing high multidrug resistance. Biofilm formation was quantified by microtiter plate assay and visualized with CLSM and FE-SEM, confirming strong adhesion and mature biofilm structures. Results showed *V. parahaemolyticus* and *V. vulnificus* predominating and forming two genetically distinct clusters. Additional analyses included quorum-sensing (Autoinducer-2 activity), hydrophobicity, exopolysaccharide production, and motility (swimming, swarming, twitching), all of which correlated with virulence in each species. The persistence of multidrug-resistant, strong biofilm-producing (high biofilm formation indexed) virulent Vibrio strains highlights the urgent need for ongoing monitoring and targeted control measures to ensure seafood safety.

OP1-02

Predictive modeling of coliform growth in chicken breast using statistical and machine learning approaches

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This study aimed to predict the growth of coliforms in chicken breast using both statistical and machine learning models and to compare their performances. A mixture of five coliforms strains was inoculated into chicken breast products at an initial level of 2-3 log CFU/g. The samples were vacuum-packed and stored at 4, 7, 10, 15, 25, and 35°C. The Baranyi model was fitted to the growth data to estimate the lag phase duration (LPD; h) and maximum specific growth (μmax; log CFU/g/h). The μmax increased with temperature, from 0.020 at 10°C to 0.637 at 35°C, while the LPD value decreased from 50.26 h at 10°C to 1.99 h at 35°C. No growth was observed at 4°C and 7°C. The kinetic parameters were fitted to secondary models as functions of temperature. Secondary models had good performance, with R^2 values of 0.999 for μmax and 0.986 for LPD. Validation at 13, 20, and 30°C confirmed the reliability of the statistical models, with RMSE ranging from 0.128 to 0.477 and R^2 values from 0.964 to 0.998. In addition, Af and Bf were 1.02 ± 0.05 and 1.04 ± 0.05, respectively, indicating the overall high performance of the statistical model. Dynamic models were also developed for low (4-15°C), high (15-30°C), and total (4-30°C) temperature ranges. Their predictive performance was good across all cases, with R^2 values greater than 0.985. In addition, a machine learning model was developed. In addition, a machine learning model was developed and compared with the statistical models based on RMSE, Af, and Bf. This study provides insights into the applicability of different modeling approaches for microbial growth prediction in chicken breast products, contributing to predictive microbiology and food safety management.

OP1-03

Influence of kitchen environment and risk perception on job satisfaction and commitment among institutional foodservice workers

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The institutional foodservice industry in Korea employs a large workforce but faces ongoing challenges, such as poor kitchen environments and chronic labor shortages. Institutional foodservice workers are often exposed to hazards, including burns, heat stress, musculoskeletal disorders, and chemical risks. Industrial accidents among school foodservice workers increased by more than 50% between 2021 and 2023. Although these risks have grown, improvements in working conditions have been slow, leading to higher turnover and difficulties in hiring skilled workers. This study examined how kitchen environment and risk perception affect job satisfaction and job commitment among institutional foodservice workers. A survey was conducted with 284 workers in Seoul and Gyeonggi Province during the second week of September 2024. The data were analyzed using frequency analysis, exploratory factor analysis, correlation analysis, and hierarchical regression. The results showed that a better kitchen environment significantly improved both job satisfaction and job commitment. Moreover, risk perception moderated the effects of kitchen environment on job satisfaction and job commitment: when workers perceived more workplace hazards, the positive effects of kitchen environment on job satisfaction and job commitment were weakened. This demonstrates that risks perceived by workers can reduce the benefits of improved physical conditions, highlighting the need to improve both working conditions and psychological safety. This study is important in both academia and industry. It is the first study to test the relationships between kitchen environment, risk perception, job satisfaction, and job commitment using empirical data. Academically, it contributes to research on foodservice management and occupational health. Practically, it highlights the urgent need for systematic risk assessment and management in institutional foodservice kitchens. As Korea advances toward developed-nation status, establishing healthy and safe working environments in institutional kitchens will be a crucial step toward meeting international standards.

OP1-04

The effects of meal safety perception and online information use on national food safety evaluation among adolescents: The moderating role of food safety concern

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The purpose of this study was to identify the factors influencing adolescents' national food safety evaluation by examining the relationships among consumer perceptions, online information use, and national food safety evaluation, as well as the moderating effect of food safety concern. This study used secondary data from the 2024 Consumer Behavior Survey for Food (CBSF) conducted by the Korea Rural Economic Institute (KREI). The survey was conducted from May 13 to August 4, 2024. A total of 588 responses from adolescent consumers aged 13 to 18 were used for the final analysis. Complex sample linear regression analysis was performed using SPSS 29.0 for Windows. The findings of the study were as follows: Online information use has a significantly negative effect on national food safety evaluation ($p < .01$), and this effect was attenuated when the level of food safety concern was high ($p < .01$). In addition, the interaction between street food safety perception and food safety concern was significant ($p < .05$), suggesting that adolescents with high food safety concern are more sensitive to the risks of street food and thus tended to evaluate national food safety more conservatively. The finding that online information use negatively influenced national food safety evaluation distinguishes this study from previous research. It indicates that mere expansion of information accessibility does not necessarily yield positive effects, but rather may reinforce anxiety and negative perceptions.

OP1-05

Evaluation of *Staphylococcus aureus* biofilm formation and cross-contamination in a milk processing environment

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Staphylococcus aureus is a major foodborne pathogen frequently associated with milk products. In milk processing, stainless steel surfaces provide conducive sites for biofilm formation, and these biofilms can spread via cross-contamination, posing a significant threat to product safety. This study evaluated *S. aureus* biofilm formation and cross-contamination potential in different media and contact by simulating milk processing environments. *S. aureus* biofilms formed on stainless steel surfaces in ultra-high temperature (UHT) milk, tryptone soy broth (TSB; nutrient-rich medium) and phosphate-buffered saline (PBS; nutrient-deficient medium). Cross-contamination was assessed by transference after immersing in liquid media (UHT milk and PBS) and by contacting with solid packaging surfaces including glass, polyethylene (PE), and polyethylene terephthalate (PET). Biofilms were scraped with a cell scraper to recover sessile cells. Biofilm biomass was 8.643 ± 0.368 log CFU/cm^2 in TSB, 7.592 ± 0.210 log CFU/cm^2 in UHT milk, and 6.903 ± 0.172 log CFU/cm^2 in PBS. Biofilm biomass was highest in TSB, but EPS content was highest in UHT milk with carbohydrates 41.87 ± 2.69 μg/mL and proteins 14.03 ± 1.45 μg/mL. Cross-contamination transfer rates were highest in biofilms formed in milk, which correlated with the lowest observed cell hydrophobicity (23.146 ± 1.117%). These results highlight the risk of cross-contamination with S. aureus biofilm in milk, which poses a safety risk to food products.

OP1-06

Developments and limitations of *in vitro-in silico*-based toxicity prediction models

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The number of synthesized chemicals has rapidly increased over the past decade, yet toxicity information for many compounds remains limited. With the global trend toward reducing animal testing, leveraging toxicity big data and deep learning offers a promising approach to screen potential toxicants. This study aimed to identify potential chemicals associated with reproductive and estrogen receptor (ER)-mediated toxicities in 1,135 cleaning products and 886 laundry products. Chemicals contained in these products were listed from publicly available databases. Potential reproductive and ER-mediated toxicants were identified using the European Union Classification, Labeling and Packaging (CLP) system and the ToxCast database, respectively. For chemicals absent from ToxCast, ER activity was predicted using deep learning models. Among 783 listed chemicals, 53 were identified as potential reproductive toxicants and 310 as potential ER-mediated toxicants. Of the 473 chemicals not tested in ToxCast assays, deep learning models predicted 42 chemicals with potential ER-mediated toxicity. Ultimately, 13 chemicals were identified as potentially causing reproductive toxicity via ER interactions. This study demonstrates a screening method integrating *in vivo*, *in vitro*, and *in silico* data to identify chemicals with potential reproductive and ER-mediated toxicities. However, limitations remain, including incomplete coverage of toxicity databases, variability in deep learning model predictions, and the need for experimental validation to confirm predicted outcomes. Despite these limitations, in vitro-in silico models represent a valuable tool for prioritizing chemicals for further toxicological assessment.

OP1-07

The prevalence and microbial growth of high-risk foodborne pathogens associated with agricultural products during the years 2020-2024: A review

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Microbiological risks associated with fresh produce present significant challenges to food safety. This study systematically reviews relevant literature published between 2020 and 2024 to quantify the prevalence and growth kinetics of high-risk pathogens-namely, *Escherichia coli*, *Salmonella* spp., and *Listeria* spp., in agricultural products. A total of 101 studies, selected from an initial pool of 7,125 papers, were analyzed, and their data were standardized and consolidated into 568 pathogen-commodity pairs, containing raw, minimally processed, and ready-to-eat (RTE) products. Results indicated a substantial degree of contamination in raw products, with prevalence rates of 36.3% for *E. coli* and 14.4% for *Salmonella* spp. in leafy greens, and 11.2% for *Listeria* spp. in fruits. Among minimally processed products, the highest prevalence of *Listeria* spp. was observed in leafy greens (10.3%). Additionally, significant bacterial growth exceeding 2 log CFU/g was reported in RTE leafy greens stored at 8°C. While the overall prevalence of pathogens in RTE products was low, notably, Salmonella spp. contamination reached 32.9% in RTE salads composed of leafy greens, highlighting potential post-processing risks. Furthermore, the highest observed growth rate of Salmonella spp. in iceberg lettuce ranged from 0.2 to 0.283 log CFU/h at temperatures between 10°C and 25°C, based on the analysis of 568 pathogen-commodity pairs included in this work. This study establishes a standardized, quantitative dataset that integrates fragmented evidence from multiple sources, providing a comprehensive foundation for quantitative microbial risk assessment (QMRA) and artificial intelligence-based predictive modeling of pathogen dynamics in agricultural commodities.

OP1-08

Physicochemical and microbial dynamics of Kimchi and predictive modeling of *Yersinia enterocolitica* in cabbage kimchi

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Kimchi is a traditional fermented food that undergoes dynamic physicochemical and microbiological changes during storage. As it is not heat-treated, microbial control is essential to ensure safety. *Yersinia enterocolitica* is a cold-tolerant foodborne pathogen and may be introduced through soil-contaminated raw materials. This study aimed to evaluate the quality of commercial Kimchi and to develop predictive models for *Y. enterocolitica*. Twenty commercial Kimchi products were analyzed for physicochemical (salinity, organic acids, pH, acidity) and microbiological (total aerobic bacteria, coliforms, lactic acid bacteria, *Escherichia coli*) parameters after 0, 3, and 7 days of storage to establish baseline data for subsequent experiments. To develop predictive models, cabbage Kimchi was inoculated with *Y. enterocolitica* and stored at 4, 10, 15, 25, and 35°C to obtain growth curves. Growth data were fitted to the Baranyi primary model to estimate kinetic parameters which were subsequently used to construct secondary models. In parallel, machine learning approaches were applied to incorporate time-dependent variables such as pH and lactic acid bacteria (LAB) counts. In the quality analysis of commercial kimchi, pH decreased while acidity and lactic acid concentrations increased during storage. LAB counts increased, whereas *E. coli* was not detected. The behavior of *Y. enterocolitica* was characterized by an initial proliferation phase followed by rapid inactivation, coinciding with decreasing pH and increasing LAB levels. Accordingly, the mathematical model was structured by partitioning the kinetic data into growth and inactivation phases, and the fitted model exhibited satisfactory goodness-of-fit to the observed data. Machine learning algorithms further captured nonlinear and multifactorial interactions-particularly those associated with pH and LAB dynamics-demonstrating superior predictive performance relative to conventional mathematical approaches. Overall, this study elucidates the interplay between microbial kinetics and physicochemical dynamics during kimchi fermentation and provides a scientific basis for the establishment of proactive safety management strategies for fermented foods.

OP2-01

Simultaneous concentration of foodborne pathogens using tetraethylenepentamine-coated magnetic nanoparticles with filtration

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This study combined filtration with electrostatically charged tetraethylenepentamine (TEPA)-functionalized magnetic nanoparticles (MNPs) and evaluated their efficiency in capturing *Escherichia coli* O157:H7 and *Salmonella* Typhimurium. Specifically, the difference in the capture efficiency of TEPA-MNPs for *E. coli* O157:H7 and *S.* Typhimurium, individually and simultaneously, was investigated. The applicability of this method for rapid detection was validated using real-time PCR on egg products. Capture efficiencies exceeding 80% were achieved for both pathogens. Furthermore, the method enabled concentration and detection of *E. coli* O157:H7 and *S.* Typhimurium at 10^1 CFU/g by real-time PCR. Combining TEPA-MNPs with filtration enhanced detection sensitivity compared to centrifugation or TEPA-MNPs alone. Although filtration alone produced the lowest Ct values for *E. coli* O157:H7 under certain conditions, the combined method still allowed reliable detection of both pathogens at low concentrations. These results indicate that coupling TEPA-MNPs with filtration is a rapid and effective alternative to conventional enrichment, enabling efficient detection of foodborne pathogens in real food matrices.

OP2-02

Quality control model for predicting spiciness and sweetness in spicy sauce using rapid, non-destructive, eco-friendly NIR

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Spiciness and sweetness are key sensory attributes that determine the quality and consumer acceptance of spicy sauces. This study aimed to develop real-time prediction models for spiciness and sugars in spicy sauce using Near-Infrared Spectroscopy (NIRS), a rapid, non-destructive, and eco-friendly analytical method. Spectral data were collected using an NIR instrument, and reference values for calibration were obtained through High-Performance Liquid Chromatography (HPLC). The raw spectral data were pre-processed using various techniques, including smoothing, Standard Normal Variate Transformation (SNVT), and derivatives. These pretreated spectra were then analyzed using multivariate statistical methods, such as Partial Least Squares (PLS) and Principal Component Regression (PCR), to construct optimized prediction models for spiciness (capsaicin, dihydrocapsaicin, total capsaicinoids, SHU, and piperine) and sugars (fructose, glucose, sucrose, maltose, and total sugars). Model performance was evaluated in terms of accuracy, robustness, and predictive reliability to identify the most suitable approach for real-time quality control applications. The findings highlight the potential of NIRS as a sustainable and efficient tool for monitoring multiple sensory-related compounds in complex sauce matrices, thereby contributing to improved process control and consistent product quality in the food industry.

OP2-03

Development and optimization of UHPLC-MS/MS method for highly sensitive simultaneous quantification of eight sugar alcohols

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Recently, sugar alcohols have been increasingly used in processed foods as low-calorie sweeteners, humectants, and stabilizers, highlighting the need to evaluate their levels as food additives. In this study, sample preparation procedures and analytical conditions were optimized for the simultaneous determination of eight sugar alcohols in processed foods using UHPLC-MS/MS. As a result, a method was developed for the efficient separation and quantification of eight sugar alcohols (erythritol, xylitol, sorbitol, mannitol, inositol, maltitol, lactitol, and isomalt). The method was validated for linearity, limits of detection (LOD) and quantification (LOQ), accuracy, and precision, and its reproducibility was confirmed through inter-laboratory validation. All analytes showed excellent linearity ($r^2 \geq 0.998$) over the range of 0.005-0.25 mg/L, with LODs and LOQs of 0.0007-0.0072 mg/L and 0.0021-0.0219 mg/L, respectively. Accuracy and precision for bread and sauce matrices were verified by intra- and inter-day recovery tests in accordance with AOAC guidelines. Furthermore, the applicability of the method was evaluated for various food types in which sugar alcohols are widely used, including bread, sauce, candy, soft drinks, fish cake, snacks, and frozen desserts.

OP2-04

Microbiological analysis and hyperspectral imaging combined with artificial intelligence for non-destructive detection of defective red pepper powders

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Red pepper (*Capsicum annuum L.*) is susceptible to quality deterioration due to discoloration (Huinari disease) during drying and storage. Among its various causes, microbial contamination is particularly critical, as it can produce toxins and pose serious risks to human health and food safety. However, once processed into powder form, such adulteration are difficult to detect visually. This study compared the microbiological and chemical properties of defective red pepper powder (DRPP) and normal red pepper powder (NRPP), and evaluated hyperspectral imaging (HSI) as a non-destructive detection tool. DRPP showed significantly reduced free sugars and organic acids but higher pH and capsaicinoid contents, reflecting microbial metabolism and stress-induced chemical changes. Microbial community analysis revealed that pathogenic genera such as *Pantoea*, *Diaporthe*, and *Glomerella* were predominantly detected in DRPP. HSI (900-1700 nm) was applied for non-destructive detection of DRPP. Two-dimensional correlation spectro-scopy reduced the spectral variables from 112 to 15 informative wavelengths. Among the machine learning models, support vector regression with standard normal variate and Savitzky-Golay first derivative (SG-1) preprocessing produced the best results, with a residual predictive deviation ($RPD > 7.9$; values above 3 indicate excellent predictive ability). Recurrent neural networks with normalization and SG-1 preprocessing also performed highly, showing strong correlations between predicted and measured values (Rc^2 and $Rp^2 > 0.98$). In addition, visualization maps successfully localized defective regions within mixed powders. These results highlight HSI's potential as a rapid, non-destructive method for real-time monitoring of red pepper powder quality and safety.

OP2-05

Development of propagation strategy and characterization of phage vB_LmoP_KFSLM4 infecting *Listeria monocytogenes*

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The isolation and propagation of *Listeria monocytogenes* (LM)-specific phages are still challenging due to the long generation time and lower energy production efficiency of LM as a host. This study assessed the efficacy of three phage propagation methods including two-stage culture (TSC), TSC with glucose addition (TSCG), and the plate wash method (PWM) to determine the optimal method for LM-specific phage propagation. Then, the LM-specific phage was propagated in the modulated medium (peptone-yeast extract-NaCl-MOPS) supplemented with various concentrations of glucose or glycerol in the range of 1-10 g/L using TSCG. After purification using CsCl-gradient ultracentrifugation, the morphology of the phage was observed using TEM. Whole genome sequencing of the phage was performed using the Oxford Nanopore PromethlOn 2 Solo platform. The host range of the phage was tested against 50 foodborne pathogens. Temperature and pH stability of the phage were assessed by incubating it at various temperatures (-80-70°C) and pHs (1-12) for 1 h. Among three propagation methods, the phage vB_LmoP_KFSLM4 achieved a significantly higher titer of 10.18±0.01 log PFU/mL using TSCG method ($p<0.05$). LM generation time was significantly reduced from 3.27±0.18 h to 1.82±0.07 h in the modulated medium with 3 g/L ($p<0.05$). The purified phage vB_LmoP_KFSLM4 was characterized into a siphovirus-like phage with a non-contractile tail length of 163.59±12.53 nm and an icosahedral head length of 70.97±6.54 nm. The phage vB_LmoP_KFSLM4 consisted of 37,745 bp and 65 ORFs and was classified as a phage within the genus Psavirus. Host range analysis exhibited that the phage vB_LmoP_KFSLM4 had a narrow specificity with LM only. The phage vB_LmoP_KFSLM4 was stable under a wide range of pHs (4-11) and temperatures (-80-50°C). This study demonstrated an efficient phage propagation strategy and the potential of the phage as a promising biocontrol agent against LM.

OP3-01

Single-person households' dietary behaviors and food waste typologies

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This study explores the behavioral drivers of food waste among single-person households in South Korea, with particular attention to differences across waste types. Drawing on nationally representative data from the 2024 Korean Consumer Behavior Survey for Food, complex sample analyses were conducted to identify key determinants. Respondents were categorized according to their dominant type of food waste: leftovers, pre-cooking waste, or spoiled/expired food. The results indicate that pre-cooking waste emerged as the dominant form of food waste, and it was disproportionately observed among women over 60, individuals who shop mainly offline, cook frequently, maintain regular eating routines, and seldom use delivery or dine out ($p < .05$). Despite showing high awareness of food waste issues and claiming consistent efforts to limit it, this group continued to generate substantial waste. These findings underscore the need for structural, system-level measures-beyond individual behavioral change-to effectively address food waste. The study contributes practical insights for designing targeted interventions that support sustainable food practices in an aging, single-person household-oriented society.

OP3-02

Labeling systems and consumer educational approaches for the safe use of foods for special medical purposes

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Amid the rapid growth of the market for Foods for Special Medical Purposes (FSMPs), as purchasing patterns transition from relying on healthcare professional recommendations to direct consumer choice, the need for education and information has become critical for ensuring product safety and efficacy. This study aimed to examine the characteristics of FSMPs distinct from conventional foods and to compare the labeling systems of the European Union (EU), the United States (U.S.), and Korea to suggest improvements for safer use. Current product labeling practices were also reviewed to identify regulatory differences among countries. FSMPs are foods intended for dietary management of disease, differing from pharmaceuticals for disease treatment and health functional foods for maintenance of health. In the EU and U.S., consumers receive essential information for safe use, while healthcare professionals are provided with additional details to guide appropriate product selection. This system reinforces that FSMPs should be used under the medical supervision. In contrast, in Korea, identical labeling information is given to both consumers and professionals, and information allowed in the EU and U.S. is only partially permitted. To promote the safe use of FSMPs, labeling based on scientific evidence should be expanded, and education should enable consumers to understand product characteristics and choose appropriately. Consumer education programs are needed to raise awareness that FSMPs are foods for dietary management of disease and to support informed product selection.

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OP4-01

Comparative studies of colorimetric and laser-speckle thermography from lateral flow assay for food safety applications

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Lateral flow assays (LFAs) are widely used in point-of-care diagnostics because of their low cost, ease of use, and rapid results. Despite these advantages, their limited sensitivity restricts their effectiveness in detecting foodborne pathogens at concentrations below regulatory limits. In this study, we investigated two complementary sensing methodologies-laser speckle thermography (LST) imaging and colorimetric line-intensity analysis-to enhance the performance of commercially available LFAs. The first method relied on the smartphone-based color images processed with machine learning algorithms while LST utilizes the plasmonic effect from gold nanoparticles (GNP) used in the conventional LFA strips. When matching wavelength of light is used, GNP absorbs the incoming laser and generates heat which, in turn, modifies the local refractive index. The effect of the modification is captured by the change in Fourier transform magnitudes of the speckle images. While both modalities showed detection thresholds of 10^4 CFU/ml, the colorimetric approach provided the added benefit of quantitatively estimating bacterial concentrations. These results highlight the potential of integrating optical and computational tools with unmodified LFAs to improve sensitivity and advance portable biosensing platforms for real-time food safety monitoring.

OP4-02

Biofilm formation and analysis of EPS architecture comprising polysaccharides and lipids by *Pseudomonas aeruginosa* and *Escherichia coli* on food processing surfaces

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Biofilms pose persistent and often underestimated challenges in seafood processing environments, where pathogens such as *Pseudomonas aeruginosa* and *Escherichia coli* rapidly adhere to and colonize food contact surfaces. This study explores biofilm formation on widely used industrial substrates including aluminum, silicone rubber, stainless steel, and polyethylene terephthalate across both early and late developmental stages. Phenotypic assays confirmed progressive biofilm maturation, with aluminum and silicone rubber exhibiting the highest levels of accumulation. Structural and metabolic evaluations revealed increasing robustness over time, reflected by intensified extracellular matrix activity and greater biomass production. Spectroscopic analyses using FTIR and ^{1}H NMR identified compositional alterations in the extracellular polymeric substances (EPS), notably a shift toward enhanced lipid complexity while polysaccharide constituents remained consistently abundant. Microscopic visualization through CLSM and FE SEM captured the progression from initial surface attachment to dense, mature architectures, displaying distinct species and surface specific morphologies. Overall, the findings underscore the critical role of material type in shaping biofilm behavior and highlight the importance of implementing surface tailored sanitation strategies to effectively mitigate contamination risks in seafood processing systems.

OP4-03

Temporal and comparative analysis of biofilm formation by *Escherichia coli*, *Salmonella* Typhimurium and *Pseudomonas aeruginosa* using CLSM and biomass quantification

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Biofilm formation by foodborne pathogens is a major challenge in food safety, as these microbial communities enhance survival on food-contact surfaces and resist conventional cleaning practices. This study evaluated biofilm development by *Escherichia coli*, *Salmonella* Typhimurium, and *Pseudomonas aeruginosa* at 24, 48, 72, and 96 h of incubation. Biofilm biomass was quantified using the crystal violet (CV) assay, while biofilm structure and architecture were assessed through confocal laser scanning microscopy (CLSM). The results demonstrated species-specific and time-dependent differences. *P. aeruginosa* produced the most abundant and structurally complex biofilms, showing progressive increases in biomass and thickness across all time points. In contrast, *E. coli* and *S.* Typhimurium formed comparatively thinner and less organized biofilm, with slower biomass accumulation over time. Across all species, biofilm development progressed from early attachment at 24 h to maturation between 72-96 h. These findings provide systematic insights into the kinetics of biofilm formation in major foodborne pathogens and emphasize the need for time-targeted strategies to prevent biofilm establishment in food processing environments.

OP4-04

Novel *Yersinia enterocolitica* O3-specific bacteriophages isolated from the environment: Biofilm inhibition on food-contact surfaces and promising applications for cold-chain food safety

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The aim of this study was to isolate a lytic bacteriophage from the natural environment that specifically targets *Yersinia enterocolitica* O3. To characterize the isolated phage, designated CAU_YEP3, we assessed its viability and genomic sequence, and further evaluated its potential as a biocontrol agent by determining its ability to reduce biofilms of *Y. enterocolitica* O3 in food-related settings. CAU_YEP3 exhibited rapid adsorption, with over 90% adsorption achieved within 20 minutes, a latent period of approximately 40 minutes, and an average burst size of 201 PFU/cell. The phage demonstrated high specificity toward *Y. enterocolitica* serotype O3 and remained stable under a wide range of pH and temperature conditions. Genomic analysis revealed that CAU_YEP3 does not belong to any previously reported family and was classified as "Others," likely due to its unique genomic composition. Moreover, CAU_YEP3 effectively reduced *Y. enterocolitica* O3 biofilms on food-contact surfaces and within food matrices. Specifically, reductions of 1.57 ± 0.08 log CFU/cm^2, 2.49 ± 0.08 log CFU/cm^2, and 0.64 ± 0.08 log CFU/cm^2 were observed on LDPE, SS, and SR surfaces, respectively. These results indicate that this environmentally derived bacteriophage has strong potential for application in controlling *Y. enterocolitica* O3 biofilms and enhancing food safety under diverse conditions.

OP4-05

Effects of freeze-thaw conditions on single- and dual-species biofilms of *Listeria monocytogenes* and *Pseudomonas aeruginosa* on stainless steel surfaces

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Freezing is a widely used food preservation process because of their effectiveness in inhibiting microbial growth and maintaining food quality. However, outbreaks of foodborne illness and detections of pathogens such as *Listeria monocytogenes* in frozen foods continue to be reported. These pathogens may be protected by *Pseudomonas aeruginosa*, a strong biofilm former on food-processing surfaces, thereby increasing risks to food safety. Nevertheless, the effects of freeze-thaw processes on biofilms remain poorly understood. This study evaluated the effects of freeze-thaw exposure on *L. monocytogenes* biofilms (LM), *P. aeruginosa* biofilms (PA) and dual-species biofilms of *L. monocytogenes* and *P. aeruginosa* (LP) formed on stainless steel. The treatments combined rapid (RF, -80°C) or slow (SF, -20°C) freezing with thawing at refrigeration temperature (CT, 4°C) or room temperature (RT, 25°C). Subsequently, biofilm biomass, cell viability, membrane integrity, and gene expression were analyzed. Cell viability of LM and PA was highest under SF-CT with minimal temperature fluctuations, whereas greater temperature fluctuations increased cell damage and depolarization, leading to death. In LP, which contained abundant extracellular polymeric substances (EPS), no significant differences in biomass or cell viability were observed among the freeze-thaw treatments. This suggested that EPS maintained the stability of biofilms and buffered against temperature fluctuations. Moreover, the structural position of *L. monocytogenes* within LP conferred protection, allowing survival during freeze-thaw. Although freeze-thaw treatment killed some bacteria, surviving cells displayed increased virulence gene expression. This highlights the need for improved hygiene strategies targeting biofilms to ensure food safety in frozen food production and distribution.

OP4-06

Induction of viable but non-culturable *Salmonella* using sodium hypochlorite and their resuscitation through antioxidant-mediated strategy

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Despite chlorine treatment of fresh produce, *Salmonella* can survive due to its unique ability to enter a viable but non-culturable (VBNC) state, leading to underestimation of microbial detection. Thus, understanding the physiological characteristics of VBNC *Salmonella* and developing resuscitation strategies are necessary for its accurate detection. This study aimed to induce VBNC *Salmonella* by exposure to sodium hypochlorite and then characterize their morphology, enzymatic, and metabolic activities. It further aimed to develop antioxidant-mediated resuscitation approach. The VBNC state was induced by exposing selected *S.* Enteritidis (SE) and *S.* Typhimurium (ST) to various concentrations of sodium hypochlorite for 5 min. The culturability and viability of VBNC *Salmonella* state were confirmed using TSA plate method and LIVE/DEAD BacLight kit, respectively. Their morphological changes were examined by TEM and ATP levels were measured by luminescence using the BacTiter-Glo assay. Enzymatic activities of VBNC *Salmonella* were profiled using the API ZYM kit. Finally, their resuscitation efficacy was assessed in TSB with/without catalase or sodium pyruvate at 37°C and confirmed using TSA plate method. VBNC induction in SE and ST was confirmed at 30 ppm sodium hypochlorite without colony formation whereas viability of VBNC SE and ST were determined to be 8.4% and 5.3%, respectively. The cell size of SE and ST were reduced up to 47% and 51% and their ATP level was maintained 23% and 21%, respectively. Compared with the culturable state, VBNC *Salmonella* exhibited reduced activity for most enzymes, with complete loss of α-galactosidase and α-glucosidase whereas acid phosphatase and naphthol-AS-BI-phosphohydrolase activities were sustained. The catalase-meditated resuscitation was found to be the most efficient strategy to recover VBNC *Salmonella*.

OP4-07

AI-assisted genome-informed qPCR platform for rapid on-site detection of mastitis pathogens to enhance dairy food safety

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Rapid on-site identification of mastitis-associated pathogens is crucial for herd health management, milk hygiene, and overall food safety. In this study, we developed a field-deployable flat-chip quantitative PCR (qPCR) platform that enables rapid differentiation of members of the *Streptococcus bovis/Streptococcus equinus* complex (SBSEC) directly from swabs or milk within 30 minutes. A genome-scale taxonomic re-evaluation of 206 SBSEC genomes was performed to correct frequent misclassifications. Using the resulting pangenome presence/absence matrix, machine learning-assisted feature selection was applied to identify species-resolving genetic markers that maximized discriminatory power among closely related taxa. These markers guided the design of four species-specific qPCR assays targeting *S. alactolyticus*, *S. equinus*, *S. gallolyticus*, and *S. lutetiensis*. The portable 10-well microfluidic chip completes 40 amplification cycles in approximately 20 minutes and allows simultaneous detection of all four species along with internal controls. Analytical validation showed no cross-reactivity across 47 non-target microorganisms commonly present in dairy environments, with excellent reproducibility (Ct variation < 0.05). The limit of detection reached 10^1 CFU/ml for most species and 10^0 CFU/ml for *S. alactolyticus* in milk matrices, yielding standard curves with $R^2 > 0.98$ across 10^7-10^1 CFU/ml ranges. To assess analytical accuracy, 28 SBSEC isolates from raw milk were examined by portable qPCR, MALDI-TOF MS, and whole-genome sequencing (WGS). Complete agreement was observed in 25 isolates, while three discrepancies were resolved by WGS, confirming the qPCR identification. Field application across eight dairy farms and retail milk products (n = 100) confirmed practical utility, detecting SBSEC in 51 samples, predominantly *S. equinus* (35%) and *S. gallolyticus* (34%). On-site results using the direct-buffer extraction method showed 100 % concordance with laboratory re-extractions. This genomics-informed, portable qPCR platform achieves WGS-level accuracy at the point of need, supporting farm-to-fork biosurveillance and early detection of foodborne pathogens critical to dairy quality assurance and consumer protection.

OP5-01

Green synthesis of silver nanoparticles using *Bacillus rugosus* HH2 supernatant with broad-spectrum antibacterial properties

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Green synthesis of nanoparticles has gained increasing attention as a sustainable alternative to conventional chemical reduction methods, minimizing reliance on toxic reductants. In this study, silver nanoparticles (AgNPs) were synthesized in an eco-friendly using the cell-free supernatant of *Bacillus rugosus* HH2 (HH2-CFS) as both reducing and stabilizing agents. The formation of HH2-AgNPs was confirmed by UV-Vis spectroscopy, while their morphology, crystalline structure, and stability were characterized by SEM, TEM, EDS, SAED, XRD, DLS, zeta potential, and FT-IR analyses. SEM and TEM revealed spherical particles with an average diameter of 42.24 ± 7.30 nm. SAED and XRD confirmed a face-centered cubic structure, while EDS verified the presence of silver. FT-IR spectra showed characteristic hydroxyl peaks, indicating that bioactive compounds in HH2-CFS acted as both reducing and capping agents. DLS analysis revealed a hydrodynamic diameter of 132.81 nm, and the zeta potential value of -27.1 mV demonstrated colloidal stability. The synthesized HH2-AgNPs exhibited potent antibacterial activity against both Gram-positive (*Staphylococcus aureus*, *Listeria monocytogenes*) and Gram-negative (*Pseudomonas aeruginosa*, *Escherichia coli*) bacteria, with MIC values of 32, 32, 16, and 32 μg/mL, respectively. Agar well diffusion assays showed greater antibacterial activity against Gram-negative bacteria compared to Gram-positive bacteria. Growth curve and time-kill kinetic assays confirmed concentration-dependent bacteriostatic and bactericidal effects. FE-SEM analysis revealed severe membrane disruption and cytoplasmic leakage, providing direct evidence of a membrane-targeting antibacterial mechanism. Collectively, these findings suggest that HH2-AgNPs represent a sustainable, eco-friendly antibacterial nanomaterial with strong potential to complement or replace conventional antibiotics in food safety and biomedical applications. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2025-00555808).

OP5-02

Phenyllactic acid inactivates *Cronobacter sakazakii* through cell membrane destruction, biofilm retardation, and altered gene expression

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Cronobacter sakazakii is a foodborne pathogen of major concern due to its association with powdered infant formula and its ability to form persistent biofilms. Phenyllactic acid (PLA), a phenolic organic acid produced by lactic acid bacteria, has recently gained attention as a natural antimicrobial with broad-spectrum activity against foodborne pathogens by disrupting their cellular and membrane integrity. However, its antimicrobial activity toward *C. sakazakii* has not yet been researched. The objective of this study was to investigate the effect of PLA against *C. sakazakii* biofilm through the cell membrane, biofilm formation, and gene expression. The SDS-PAGE result showed a decrease in the intensity of degraded protein bands after PLA treatment. PLA treatment reduces cell surface hydrophobicity by altering outer membrane proteins and makes the cell less adhesive, thereby preventing the formation of biofilms. PLA induces protein damage, leading to enzyme inactivation and disruption of essential metabolic processes. It decreases cell surface hydrophobicity, thereby impairing bacterial adhesion for biofilm development. PLA also compromises cell wall integrity, increasing permeability and resulting in leakage of intracellular components such as nucleic acids (DNA). Furthermore, PLA treatment collapses the membrane potential. FE-SEM demonstrates pronounced morphological changes, including cell shrinkage, rupture, and lysis. These data provide novel insight into *C. sakazakii* responses to PLA exposure. These mechanisms indicate that PLA exerts a broad spectrum of antibacterial and antibiofilm activities by targeting both structural and functional components of *C. sakazakii*. Understanding these mechanistic insights provides a foundation for developing PLA-based interventions to enhance food safety and mitigate the risks posed by this emerging pathogen.

OP5-03

Korean food safety research trends and thematic evolution (2015-2024): Comparing before and after COVID-19

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This study conducted a bibliometric analysis of trends and thematic changes in domestic food safety research by analyzing 1,615 papers from KCI and SCOPUS databases from 2015-2024, divided into periods before and after the COVID-19 pandemic (2020). Domestic food safety research showed an annual growth rate of 7.9% with strengthened multidisciplinary characteristics and increased publication in international journals. By institution, Seoul National University produced the most papers overall, while Chung-Ang University ranked first after the pandemic, and clusters of regional hub universities and university-government research institute collaborations were identified. International collaboration expanded from 45 to 70 countries, strengthening global networks and diversifying internationalization centered on Asia and the Middle East regions. The most notable aspect in research themes was the rapid emergence of advanced technology applications as core areas alongside existing traditional food safety keywords. Additionally, the increase in risk assessment and biosensor-related research shows that the research focus is shifting from post-incident response to prevention. Keyword analysis identified four major areas: comprehensive food safety management, microbial control technologies, food quality maintenance, and fermented food safety, with post-COVID-19 expansion into detection and monitoring research utilizing advanced technologies such as deep learning, nanomaterials, and active packaging. Based on the research findings, implications for promoting domestic food safety research and strengthening global collaboration were presented.

OP5-04

Effects of thermo-focused ultrasound treatment on microbial inactivation and physicochemical properties of green tea latte

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This study aimed to evaluate the suitability of thermo-focused ultrasound as a new pasteurization technology to replace the long-temperature long-time (LTLT) method for producing green tea latte. The microbial inactivation effect and physicochemical properties of green tea latte subjected to thermo-focused ultrasound treatment were investigated. Samples were treated at 50°C with a frequency of 400 kHz and a power of 100 W for 0, 5, 10, 20, and 30 min. The initial inoculum levels of the pathogens were 4.14, 4.10, 4.36, and 4.26 log CFU/mL for *Listeria monocytogenes*, *Escherichia coli* O157:H7, *Salmonella* Enteritidis, and *Staphylococcus aureus*, respectively. The number of all pathogens showed a significant reduction ($p < 0.05$) with increasing treatment time and was not detected after 30 min of thermo-focused ultrasound treatment. In contrast, heat treatment alone (50°C) showed no microbial inactivation effect, and focused ultrasound treatment alone (400 kHz, 100 W) resulted in <1 log CFU/mL reductions for all pathogens. Therefore, thermo-focused ultrasound treatment was applied at 50°C, 400 kHz, and 100 W for 30 min, and its physicochemical properties were compared with those of LTLT-treated green tea latte. Thermo-focused ultrasound treatment resulted in the smallest particle and fat globule sizes, the lowest zeta potential, and the highest turbidity. Unlike the LTLT-treated green tea latte, which showed phase separation and sedimentation during storage, the thermo-focused ultrasound-treated green tea latte exhibited improved dispersion stability. The thermo-focused ultrasound-treated green tea latte showed no significant change in pH ($p > 0.05$). In conclusion, thermo-focused ultrasound treatment at 50°C, 400 kHz, and 100 W for 30 min can be applied as a new pasteurization technology for producing green tea latte, improving microbial safety, enhancing dispersion stability, and preventing quality changes.

OP5-05

Biosurfactant from *Bacillus velezensis* DG5714: Isolation, extraction, characterization, and evaluation of its potential as a natural emulsifier

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Synthetic emulsifiers are effective and cost-efficient; however, their potential health and environmental risks, coupled with the limited supply of natural surfactants, underscore the need for sustainable alternatives with comparable performance. In this study, a biosurfactant-producing bacterium was isolated and characterized, and its potential application as a natural emulsifier was assessed. Among 50 strains obtained from soil, *Bacillus velezensis* DG5714 exhibited the strongest surface activity in drop-collapse, oil-spreading, emulsification index (EI24), and surface-tension assays. The crude biosurfactant, extracted by acid precipitation and liquid-liquid extraction, was characterized using UPLC-Q-TOF/MS, FTIR, NMR, and UV-Vis, confirming a high content of surfactin C. The biosurfactant reduced the surface tension of water from 72.60 ± 0.54 mN/m to 23.13 ± 0.54 mN/m, with a critical micelle concentration (CMC) of 0.1 mg/mL. It maintained emulsifying activity under varied pH, temperature, and salinity, and thermogravimetric analysis confirmed stability up to 200 °C. For food applicability, emulsifying activity (EI24) in soybean, sunflower, olive, and corn oils, as well as foaming ability, were compared with lecithin. The biosurfactant exhibited superior emulsifying activity in corn and sunflower oils (45.43 ± 1.24% and 44.71 ± 1.68%, respectively) compared with lecithin (39.84 ± 1.14% and 39.42 ± 2.15%). At the CMC, lecithin failed to produce foam, whereas the biosurfactant showed an initial foaming ability of 26.82 ± 2.82%, retaining 20.00 ± 0.58% after 1 h. Overall, the biosurfactant from *B. velezensis* DG5714 demonstrates promising functional properties as a potential food-grade emulsifier, warranting further investigation to confirm its industrial applicability. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2025-00555808).

OP5-06

Natural phlorotannins against *Pseudomonas aeruginosa* virulence: Multi-target inhibition and molecular insights for safe therapeutics

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Pseudomonas aeruginosa is an extremely versatile opportunistic pathogen that infects animals, plants, and humans. Its complex regulatory network, horizontal gene transfer, and large genome contribute to antibiotic resistance and a diverse set of virulence mechanisms. In this study, we assessed 15 structurally distinct phlorotannins against 18 key virulence-related proteins, such as quorum-sensing exotoxins, adhesion proteins, siderophore receptors, motility, biofilm formation, and secretion systems. Molecular docking and 50 ns molecular dynamics simulations showed that compounds such as 2-phloroeckol, 7-phloroeckol, phlorofucofuroeckol A, and phlorofucofuroeckol B formed strong, stable interactions with important targets like Fe (3+)-pyochelin receptor, ferripyoverdine receptor, and phenazine-1-carboxylate-methyltransferase, with binding free energies as low as -12.24 kcal/mol. These compounds exhibited a diverse range of non-covalent interactions, including hydrogen bonds and π-π stacking, often with key active-site residues in the target proteins. Drug-likeness and environmental safety assessments using pkCSM and VEGA (Q)SAR models indicated improved oral bioavailability, low toxicity, minimal cytochrome interactions, and mostly non-mutagenic profiles. This study suggests that phlorotannin has potential as an environmentally friendly alternative for combating *P. aeruginosa* infections by targeting a broad spectrum of virulence factors through safe, natural substances.

OP5-07

Beta-lactamase genes in lactic acid bacteria: Genomic, structural, and functional insights into a hidden reservoir of antimicrobial resistance

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Lactic acid bacteria (LAB) are widely used in food production and as probiotics. However, their potential role in the spreading of antimicrobial resistance (AMR) remains unexplored. A major AMR mechanism is the production of beta-lactamases, enzymes that degrade beta-lactam antibiotics such as penicillins and cephalosporins. Although beta-lactamase production is well-documented in most pathogenic bacteria, the diversity and functionality of these enzymes in LAB remain underexplored. Given the growing concerns over AMR, understanding the prevalence and functional diversity of beta-lactamases in LAB is crucial, particularly because these bacteria may serve as reservoirs for AMR genes and thereby contribute to horizontal gene transfer (HGT) in microbial communities, particularly those frequently encountered in the food industry. Here, we explored the genomic diversity of beta-lactamase genes in LAB in a broad range of publicly available LAB genomes and assemblies in the NCBI RefSeq and GenBank databases. Our findings revealed the presence of two distinct types of beta-lactamase genes in LAB: ampC-type beta-lactamases (class C), which are likely to have developed within LAB lineages, and blaTEM-type beta-lactamases (class A), potentially acquired via HGT. Phylogenetic and structural analysis revealed similarities between LAB-derived ampC enzymes and clinically relevant class C beta-lactamases, while blaTEM-type genes were identified to be often flanked by mobility-related genetic elements, indicating a potential for HGT. Molecular docking studies further showed that LAB beta-lactamases may hydrolyze a broad spectrum of beta-lactam antibiotics, particularly aminopenicillins and cephalosporins. The multi-faceted analysis presented here provides a comprehensive understanding of the genetic diversity, evolutionary dynamics, and functional characteristics of beta-lactamases in LAB. These findings will contribute to the broader field of AMR research, highlighting the importance of monitoring beta-lactamase production by LAB and its implications for food safety and clinical applications.

OP5-08

Comprehensive genomic and functional characterization of kimchi-derived lactic acid bacteria *Weissella cibaria* and *Weissella confusa*

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The genus *Weissella* has gained attention as a valuable group of lactic acid bacteria with notable applications in probiotics and functional foods. In this work, six strains isolated from traditional kimchi, including *W. cibaria* and *W. confusa*, were systematically characterized through genomic and phenotypic approaches. Comparative genome analysis revealed clear species-level differences: *W. cibaria* showed enrichment of genes linked to DNA replication and cell cycle regulation, while *W. confusa* displayed broader metabolic capacity and motility-associated genes. Antibiotic resistance assessment identified both intrinsic and acquired determinants, such as multidrug efflux systems and class-specific resistance genes. Nevertheless, susceptibility testing confirmed an overall safe profile, with sensitivity to commonly used antibiotics except for intrinsic vancomycin resistance, a known feature of lactic acid bacteria. Probiotic evaluation demonstrated strong survival under acidic pH, bile salts, and digestive enzymes, indicating gastrointestinal resilience. Certain *W. cibaria* and *W. confusa* strains achieved particularly high survivability, underscoring their potential as robust probiotic candidates. *W. confusa* strains also showed greater cell surface hydrophobicity, suggesting stronger adhesion and colonization ability. Morphological examination by FE-SEM revealed species-specific traits, with *W. cibaria* forming elongated rods and *W. confusa* exhibiting shorter compact rods. Overall, these findings highlight the genetic adaptations, safety characteristics, and functional properties of *Weissella*, supporting its application in fermented foods and health-promoting formulations.

OP5-09

Influence of dietary sugars on *Streptococcus mutans* biofilm formation and the inhibitory potential of quercetin

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Dental caries is a sugar-driven, biofilm-mediated disease that affects nearly 80% of the global population, with *Streptococcus mutans* recognized as a key contributor to biofilm formation and caries progression. This study aimed to investigate the influence of different sweeteners and the natural flavonoid quercetin on *S. mutans* biofilms across hydroxyapatite (HA), stainless steel (SS), titanium (Ti), and zirconia (Zi) surfaces. The results showed that sucrose supported the highest level of biofilm growth, whereas alternative sweeteners significantly suppressed development, with sucralose being the most effective. Among the tested surfaces, HA facilitated the highest biofilm accumulation while Zi exhibited the least. Based on these findings, sucrose-rich HA conditions were chosen to evaluate the antibiofilm activity of quercetin. Quercetin markedly reduced biofilm formation, eradicated established biofilms, and disrupted virulence traits such as adhesion, surface hydrophobicity, auto-aggregation, and acid production, with CLSM and SEM confirming biofilm elimination and structural damage. Overall, the study highlights that replacing sucrose with alternative sweeteners can serve as a preventive strategy, while natural bioactives such as quercetin provide a potent means to control *S. mutans* biofilms even under sugar-rich conditions, offering promising avenues for reducing caries risk and advancing biofilm-targeted dental care.

OP5-10

Appraisal of cinnamon leaf oil for controlling *Salmonella* Typhimurium biofilms on chicken and food contact surfaces

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Salmonella Typhimurium is a major foodborne pathogen that persists on poultry and food contact surfaces through biofilm formation, challenging food safety management. This study investigated the antibiofilm efficacy of cinnamon leaf oil (CLO) against *S.* Typhimurium ATCC 14028 on chicken meat and common food processing surfaces, including stainless steel (SS), polyethylene terephthalate (PET), low-density polyethylene (LDPE), and silicone rubber (SR). CLO exhibited a minimum inhibitory concentration (MIC) of 0.09%. At MIC and higher levels, CLO significantly ($P < 0.05$) reduced 24-h-old biofilms across all tested surfaces, with reductions exceeding 2.0 log CFU/cm^2 on SS and LDPE. On chicken meat, CLO inhibited biofilm development by approximately 1.5 log CFU/cm^2 and reduced pre-formed biofilms by approximately 2.0 log CFU/cm^2. Mechanistic assays demonstrated that CLO disrupted cellular hydrophobicity, reduced ATP levels, and impaired auto-aggregation and motility, thereby weakening biofilm stability. Microscopy confirmed structural damage and increased cell death. Quality analysis revealed no adverse effects on chicken color, though moderate decreases in hardness and gumminess were observed with increasing CLO concentrations. Sensory evaluation indicated minor aroma changes but no unacceptable alterations in texture. Overall, CLO demonstrated strong antibiofilm and bactericidal activity, supporting its potential as a natural intervention for controlling *S.* Typhimurium biofilms in poultry and food processing environments.

OP5-11

Targeting foodborne pathogens: Integrating natural and synthetic molecules for safer foods

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Biofilm generation by foodborne pathogens is a major concern in the food industry, jeopardizing food safety and public health. These microbial aggregations, entrenched in extracellular polymeric compounds, are more resistant to antimicrobial treatments, cleaning methods, and environmental conditions. Conventional disinfection alone is insufficient, demanding novel technologies and procedures that incorporate several control mechanisms. Beyond standard antibiotics, researchers have investigated several synthetic and natural options for controlling foodborne infections. Several natural compounds derived from marine sources, bacteria, fungi, plants, and animals have been identified as having antimicrobial, antibiofilm, and anti-virulence activities against foodborne diseases. Natural molecules such as phytochemicals, essential oils, polyphenols, and antimicrobial peptides exhibit broad-spectrum antimicrobial activity through a variety of mechanisms, including disruption of cell walls and membranes, interference with genetic replication, inhibition of biofilm formation, and disruption of quorum sensing. Green-synthesized nanoparticles (NPs) have emerged as viable antibacterial agents due to their biocompatibility, low cost, and environmental sustainability. Various biological sources, including plants, algae, bacteria, fungi, and marine organisms, serve as reducing agents for NP synthesis, offering advantages over chemical techniques. These biogenic NPs have considerable antibiofilm and antivirulence properties, allowing them to enter biofilm matrices and disrupt cell-to-cell communication processes successfully. These natural, synthetic, and bioinspired NPs provide sustainable alternatives to conventional antimicrobials, addressing the growing issue of antimicrobial resistance. Funding: This research was a part of the project titled ‘Global Bluefood leadership project (RS-2025-02373103)’, funded by the Ministry of Oceans and Fisheries, Korea.

OP5-12

Smartphone-based colorimetric biosensor platform for food safety: Detection of residual antibiotics via microbial metabolism

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Ensuring food safety requires rapid and sensitive detection of antibiotic residues directly in food products. In this study, we developed a smartphone-assisted microbial colorimetric assay that exploits glucose metabolism as a biological signal for antibiotic screening. The platform integrates four bacterial species with varying antibiotic susceptibilities, where metabolic activity is monitored using phenol red as a pH-sensitive reporter. Antibiotic exposure suppressed acid production, resulting in distinct colorimetric signatures that were further quantified through smartphone-based RGB image analysis. This approach enabled the discrimination and quantification of eight antibiotics at concentrations down to 0.5-1 μg/mL. Validation in diverse food matrices, including milk, chicken, pork, and beef, confirmed reliable detection across complex sample environments. The assay was implemented as a smartphone application, providing a portable, low-cost, and equipment-free solution suitable for point-of-care testing. These results highlight the potential of integrating microbial metabolism with digital sensing as an effective tool for antibiotic residue monitoring in food safety management.

OP5-13

Enhanced microbiological assay for highly sensitive and accurate detection of antibiotic residues in livestock products and eggs

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Antibiotics are used for the prevention and treatment of animal diseases, but improper use causes antibiotic residues in livestock products. To detect such antibiotic residues, the Korea Food Code recommends instrumental analyses and microbiological assays using indicator microbes. Microbiological methods have gained attention for high-throughput screening due to their simplicity and cost-effectiveness. However, the current microbiological methods cover a limited range of antibiotics and lack the sensitivity needed to meet maximum residue limits (MRLs). They can also yield false positives in eggs because of naturally occurring antimicrobial proteins such as lysozyme and ovalbumin. In this study, we optimized the assay media for each indicator strain to enhance detection sensitivity, and improved extraction and pretreatment procedures to broaden the detectable range and further increase sensitivity. Specifically, to improve the accuracy of evaluating residual antibiotics in eggs, antibiotics were extracted using various buffers and then heated to inactivate proteinaceous antimicrobial substances. The resulting supernatant was subjected to the microbiological assay, and an acetone:citrate buffer achieved lower detection limits and reduced false positives. These findings indicate that optimizing assay media and extraction methods can effectively enhance the sensitivity and reliability of antibiotic residue detection in livestock products.

OP5-14

Development of a pH-responsive pectin-chitosan bilayer carvacrol nanoemulsion for improved shrimp preservation

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Shrimp rapidly decay during storage due to protein degradation, lipid oxidation, and microbial growth, leading to increase pH. Carvacrol, a natural preservative, has been considered for seafood preservation, but its volatility, poor solubility, and rapid release limit practical application. Therefore, more stable controlled-release systems are required to improve the applicability of carvacrol. In particular, pH-responsive designs are critical because they enable intelligent sustained release in response to spoilage-associated pH changes. Thus, this study developed a pH-responsive pectin-chitosan bilayer based carvacrol nanoemulsion (P-CHCNE) with improved structural stability and sustained release. Compared with carvacrol nanoemulsion (CANE) and chitosan single-layer coated carvacrol nanoemulsion (CHCNE), P-CHCNE exhibited lower polydispersity index (0.21 ± 0.00) and higher encapsulation efficiency ($98.67 \pm 0.78\%$), indicating superior stability. Bilayer formation of P-CHCNE was confirmed by fourier-transform infrared spectroscopy and transmission electron microscopy, and the formulation remained stable for 25 days. In release profile, CANE and CHCNE released over 90% of carvacrol within 12 h, whereas P-CHCNE achieved a sustained release of about 83% over 72 h. In addition, pH-responsive profiles of P-CHCNE showed accelerated release under neutral to mildly alkaline conditions (pH 7-8.5). Additionally, P-CHCNE showed pronounced antimicrobial activity at pH 7-8.5. When applied to refrigerated shrimp, P-CHCNE suppressed protein degradation, lipid oxidation, and microbial growth, thereby delaying pH increase and extending shelf life by approximately 3 days. Therefore, P-CHCNE represents a promising intelligent preservation system with structural stability and pH responsiveness, effectively enhancing the safety of foods prone to spoilage-related pH increases.

OP5-15

Development of an edible antimicrobial coating containing bacteriophage YEPA1 to control *Salmonella* contamination in foods

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Salmonella is a major foodborne pathogen that poses significant public health concerns worldwide. To mitigate this risk, we investigated the use of bacteriophage YEPA1 as a natural antimicrobial agent. YEPA1 is a lytic phage capable of infecting a broad range of *Salmonella* serovars. We developed an edible coating by incorporating YEPA1 into a whey protein isolate (WPI) matrix for direct application onto food surfaces. The resulting film was transparent, odorless, and flexible, making it suitable for food applications. Antibacterial activity was evaluated in broth, where the YEPA1-WPI film achieved a reduction of more than 4.4 log CFU in *Salmonella* counts, demonstrating strong antimicrobial efficacy. When applied to cherry tomatoes, the coating helped maintain surface hardness and visual quality during storage compared to untreated controls. In artificially contaminated tomatoes, the coating led to a *Salmonella* reduction exceeding 1.67 log CFU, further confirming its antimicrobial efficacy. Ongoing studies aim to assess the stability of phage viability within the coating and to monitor any physicochemical changes that may occur during storage. These findings suggest that phage-based edible coatings represent a promising, consumer-friendly approach to enhancing food safety and extending shelf life.

OP5-16

Evaluation of critical control point effectiveness and improvement HACCP plan for bakery products manufacturing process

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In this study, microbiological unsuitable cases among bakery products were investigated, and the effectiveness of critical control point (CCP) in bakery products was estimated to suggest improvement HACCP plan. As a result of the unsuitable data in bakery products, the highest unsuitable is cream-filled bakery products. The contamination of total aerobic bacterical counts in before and after CCP, and final product were 3.6±0.1, 2.1±0.1, and 2.5±0.6 log cfu/g respectively. Currently, the CCP management for cream covers blend ratio, product temperature, usage time, and workplace temperature, but lacks specific process for direct microbiological contamination control. *Escherichia coli*, *Staphylococcus aureus*, and *Salmonella* spp. at approximately 1.0 log CFU/g were inoculated in dairy cream, processed milk cream, and vegetable cream. Ethanol (99.9%) was added at concentrations of 0.5, 1.0, and 1.5%, and microbial growth was assessed at 10, 15, 25, and 35°C over different storage times. At 10°C after 15 days, microbial counts in creams with 1.5% ethanol were significantly lower than in those without ethanol. At 15°C after 72 hours, dairy cream and processed milk cream reached to 7-8 log CFU/g without ethanol, but 4-6 log CFU/g with 1.5% ethanol. At 25°C after 24 hours, dairy cream and processed milk creams were 8-9 log CFU/g without ethanol but 6 log CFU/g with 1.5% ethanol. At 35°C after 12 hours, dairy cream and processed milk creams were 8-9 log CFU/g without ethanol but 6-7 log CFU/g with 1.5% ethanol. These results showed that adding at least 1% ethanol contributes in enhancing microbiological safety in cream-filled bakery. Thus we suggest that ethanol adding process could be a novel CCP in cream-filled bakery.

OP5-17

Antimicrobial, anti-biofilm, and anti-inflammatory activities of Korean Red Ginseng extract and lactic acid bacteria against oral pathogens

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The present study investigated the antimicrobial, anti-biofilm, and anti-inflammatory activities of Korean Red Ginseng (KRG) extract and KRG-bioconverted postbiotics by Lactic Acid Bacteria (LAB) against major oral pathogens. Four representative strains, *Streptococcus mutans*, *Streptococcus sobrinus*, *Porphyromonas gingivalis*, and *Porphyromonas gulae*, were tested using growth curve analysis and crystal violet assay. Anti-inflammatory activity was evaluated in RAW 264.7 macrophages by measuring nitric oxide production using the Griess reagent. KRG extract did not significantly reduce bacterial growth and biofilm formation ($p > 0.05$). Anti-inflammatory activity was observed at concentrations of 200, 500, and 1,000 μg/mL, with the strongest effect at 1,000 μg/mL, where nitrite production was suppressed by more than 60% compared with the LPS-treated control ($p < 0.05$). Based on our previous findings that *Lactobacillus kefiranofaciens* DD2 exhibited the most potent antimicrobial and anti-biofilm activities among the LAB strains tested against cariogenic bacteria, DD2 was selected for KRG bioconversion. Compared with non-bioconverted DD2 postbiotics, KRG-bioconverted DD2 postbiotics (DD2 BC) exhibited significantly enhanced antimicrobial and anti-biofilm effects at 1,000 μg/mL, with concentration-dependent efficacy also observed at 500 and 200 μg/mL ($p < 0.05$). For anti-inflammatory activity, *Lentilactobacillus kefiri* LK12, which was particularly effective against periodontal pathogens, was used for bioconversion. The KRG-bioconverted LK12 postbiotics (LK12 BC) exhibited significantly greater anti-inflammatory activity than both non-bioconverted LK12 postbiotics and DD2 BC ($p < 0.05$). Collectively, KRG-bioconverted postbiotics demonstrated enhanced functional activities compared with their non-bioconverted forms. In particular, DD2 BC showed significant antimicrobial and anti-biofilm effects against cariogenic bacteria, while LK12 BC demonstrated strong anti-inflammatory efficacy by attenuating LPS-induced inflammation in RAW 264.7 macrophages. These findings highlight microbial bioconversion as a promising strategy to enhance the functional efficacy of herbal extracts for oral health.

OP5-18

Optimization of generating groundwater sterilization reactive species using cold plasma through response surface methodology

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The occurrence of fungi in groundwater results in significant threat to agriculture, industry, and drinking water. Fungi, such as *Aspergillus* niger and *Alternaria alternata*, not only degrade the taste and odor of groundwater, but also cause human health risks through the release of toxins and allergens. Conventional heat treatments are ineffective in removing heat-resistant spores such as mold spores, which can lead to recontamination, and chemical disinfection has the serious limitations of reacting with organic matter in groundwater to produce dangerous carcinogenic disinfection byproducts (DBPs), such as trihalomethanes (THMs). To address these limitations, this study employed cold plasma (CP), nonthermal sterilization technology, with the aim of optimizing the generation of reactive species for sterilization, including reactive oxygen species (ROS) such as ozone (O_3), hydroxyl radicals, and hydrogen peroxide, along with reactive nitrogen species (RNS) including nitrogen dioxide (NO_2) and peroxynitrite. Response Surface Methodology (RSM) was employed to optimize the generation conditions of reactive species, using gas flow rate (5-8 L/min) and oxygen-nitrogen mixing ratio (10-100%) as independent variables. The optimum condition of generating maximum amount of ROS and RNS was determined to be a gas flow rate of 7.54 L/min and a mixing ratio of 59.09%. Based on the optimum condition, the predicted maximum amount of generated O_3 and NO_2 were 70.79 ppm and 102.27 ppm, respectively. The actual maximum amount of generated O_3 and NO_2 were 67.01 ppm and 103.11 ppm, respectively. The response errors between the predicted and actual values were 5.64% and 0.72%, both of which were less than 10%. Therefore, the model equations derived from RSM were found to be suitable for optimizing the production of O_3 and NO_2. For the further study, we will assess the sterilization efficiency and elucidate the sterilization mechanism in the future studies.

OP5-19

Genomic epidemiology of livestock-associated methicillin-resistant *Staphylococcus aureus* in Korean pig farms: Clonal expansion of CC398 and emergence of a novel lineage

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Livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA) poses a considerable concern in pig farming due to its multidrug resistance and zoonotic potential. However, the genetic characteristics of LA-MRSA in Korean pig farms remain poorly understood. Thus, we investigated the prevalence and antimicrobial resistance profiles of LA-MRSA in Korean pig farms and further characterized their genomic features using whole-genome sequencing (WGS). A total of 1,515 samples were collected from 74 pig farms nationwide, yielding 96 MRSA isolates from 17 farms. Antimicrobial susceptibility test revealed that all isolates exhibited multidrug resistance. Molecular typing demonstrated that clonal complex 398 (CC398; ST398, spa type t571, SCCmec type V) was the dominant lineage. Notably, 35 isolates carried an SCCmec type III+V combination, which has not been reported in Korea. WGS analysis of 28 representative isolates identified six clonal clusters and seven single tons, with four clusters spanning different provinces, providing evidence for potential inter-farm transmission. Complete genome analysis revealed a novel SCCmec variant, found in a distinct cluster of six isolates from two separate farms purchasing pigs from the same breeding company. Furthermore, we identified a novel MRSA lineage, ST4174, belonging to CC5, which carried an uncharacterized SCCmec element. To our knowledge, this is the first report of ST4174 as MRSA, underscoring the emergence of non-CC398 lineages in Korean pig farms. Taken together, our findings reveal extensive clonal expansion of CC398 and the emergence of novel SCCmec variants in Korean pig farms. Notably, a previously unreported MRSA lineage (ST4174) was also identified. These results emphasize the importance of enhanced surveillance, targeted biosecurity measures, and prudent antimicrobial stewardship to mitigate the spread of LA-MRSA within livestock populations and reduce the risk of zoonotic transmission to humans.

OP5-20

Rapid dissemination of pESI-carrying *Salmonella* Infantis in Korea: Insights into probable zoonotic transmission under a One Health framework

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The global spread of *Salmonella* Infantis harboring a pESI megaplasmid poses a significant public health risk due to its strong association with multidrug resistance (MDR), enhanced virulence, and environmental persistence. This study aimed to investigate the molecular epidemiology and transmission dynamics of pESI-carrying *S.* Infantis in the Korean poultry production chain and in human clinical cases. In total, 295 *Salmonella* isolates were obtained from poultry sources (farms, slaughterhouses, and markets) in 2023, of which 219 (74.2%) were identified as *S.* Infantis. Twenty-two human isolates collected between 2016 and 2023 were additionally included. Among the 241 *S.* Infantis isolates, 218 poultry-derived and one human-derived isolate carried pESIs and exhibited MDR phenotypes, frequently harboring $bla_{CTX\text{-}M\text{-}65}$ along with multiple resistance determinants. Whole-genome sequencing comparisons revealed strong genetic relatedness between poultry and human pESI-positive isolates, suggesting a probable zoonotic transmission through the chicken supply chain. Comparative structural analysis of pESIs further demonstrated close structural similarity between Korean and U.S. pESIs, suggesting a possible international epidemiological link. This study documents the rapid clonal expansion of pESI-positive *S.* Infantis in the Korean poultry sector and provides the first evidence of its occurrence in human clinical isolates in Korea. These findings highlight the urgent need for strengthend global surveillance, improved biosecurity in poultry production, and regulatory measures to curb the spread of MDR *S.* Infantis.

OP5-21

Isolation and characterization of a novel *Yersinia enterocolitica* phage INFJ1 with biocontrol potential in food matrices

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Yersinia enterocolitica is a major pathogen that causes yersiniosis and poses a persistent threat to global food safety. The increasing emergence of multidrug resistance *Y. enterocolitica* strains has drawn attention to the use of bacteriophages as a sustainable alternative. In this study, we isolated and characterized a novel lytic phage, INFJ1, from sewage samples collected at the Nanji Sewage Treatment Center in Goyang-si, Korea. INFJ1 specifically infects *Y. enterocolitica* serotypes O:3, O:9 and O:5,27. Genomic and morphological analyses revealed that INFJ1 belongs to the genus Felixounavirus and possesses 85,342 bp of dsDNA encoding 146 open reading frames. No antibiotic resistance genes, virulence factors, or lysogeny-related genes were identified. One-step growth analysis indicated INFJ1 has a latent period of 40 min and burst size of 200 PFU per infected cell. To evaluate its antimicrobial efficacy in food matrices, lettuce and carrot samples inoculated with *Y. enterocolitica* were treated with INFJ1 at a multiplicity of infection (MOI) of 10,000. Over a 48 h period at both 4°C and 25°C, INFJ1 treatment demonstrated substantial antimicrobial activity against *Y. enterocolitica*, achieving reductions of up to 4 logs in bacterial counts. These findings suggest that INFJ1 may serve as a promising biocontrol agent *Y. enterocolitica* in food safety applications.

OP6-01

Seasonal variation of tetrodotoxin and analogues in Korean pufferfish (*Takifugu pardalis*) and risk assessment of dietary exposure in Korean population

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Tetrodotoxin (TTX) is a potent neurotoxin found at high concentrations in pufferfish *Takifugu pardalis*. Despite its common consumption in Korea, few studies have examined seasonal variations in TTX and its analogues. This study investigated seasonal changes in TTX and its analogue composition in Korean *T. pardalis* using UHPLC- triple quadrupole and UHPLC-Q-Orbitrap mass spectrometry. TrideoxyTTX was the predominant analogue. TTX and its analogues peaked in January, which coincided with the spawning season, and again between August and October, corresponding to rising sea temperatures. The highest toxicity levels of TTX, 4-epiTTX, and 4,9-anhydroTTX in edible muscle tissues were observed during the spawning period in January. Exposure assessments showed that in January, 2023, the estimated daily intake of TTX analogues among Koreans aged 50-64 exceeded the EFSA acute reference dose. These findings suggest that reproductive processes and sea temperature significantly influence TTX accumulation in pufferfish, increasing toxicity and exposure risks to the toxin.

40th 한국식품위생안전성학회 정기학술대회

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Food Safety and 40th KoSFoS Annual Meeting

Poster Presentation List

The Science of Food Safety :
Bridging Research and Application

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Su Jin Yum[1], Woojung Kim[1], Jun Nyeong Ku[1], Seung Min Kim[2], Hee Gon Jeong[1*]
[1]*Department of Food Science and Technology, Chungnam National University, Daejeon, Korea*
[2]*Korea National Open University, Seoul, Korea*

P1-02 **Monitoring and risk assessment of pesticide residues on processed fruits and vegetables**

Jihye Mun*, Jueun Park
Agricultural and Fishery Products Inspection Office, Ulsan Institute of Health and Environment, Ulsan, Korea

P1-03 **Comparative study of detection limits in the revised and conventional yeasts and molds test methods of the korean food code**

Eun Her, Ye Eun Ham, In Ho Lee, Kyung Shik Park, Jin-Hyun Kim, Seung-Hyeon Jung*
Food Safety Science Institute, OTOKI Corporation, Anyang, Korea

P1-04 **Pesticide residues and risk assessment in agricultural products from public wholesale markets in Gyeongsangnam-do, Korea**

Da Seul Paeng, Areum Jo, Jin-Hee Na, Bo Ram Kim, Yoon-Ju Seok, Jang-Ho Kim, Yeong Hee Yeo, Hye-Jung Kim*
Jinju Agricultural Products Inspection Center, Department of Food and Drug Research, Health and Environment Research Institute of Gyeongsangnam-do, Jinju, Korea

P1-05 **Optimization of an analytical method for iodine-129 determination in foodstuffs by liquid scintillation counting**

Ahreum Lim, Daehyeon Kim, Jungusk Oh*
Analytical Support Team, RADSOL Co., Ltd, Daejeon 34013, Korea

P1-06 **Evaluation of changes in quality and flavor characteristics of shrimp jeotgal added with kimchi-derived lactic acid bacteria**

Geon Hee Lee, Young-Min Kim*
Department of Food Tech, Chonnam National University, Gwangju 61186, Korea

P1-07 **Climate factor-based predictive modeling of pesticide residue detection trends: A case study of agricultural products in sejong city**

Ji Won Kim, Seung Woo Nam, Ji Yeon Yang, Si Won Kim, Ji Eon Park, Ji Hyun Park, Jung Woo Ryu, Kyong Yong Jung*
Sejong Institute of Health & Environment, Division of Food Research, Sejong, Korea

P1-08 **Investigation of protein content and hazardous substances in protein supplements selling in jeonbuk state**

So-Yeon Kim, Jong-Ho Park, So-Jeong Park, Mi-Rae Jang, Hyun-Jeong Choi, Chae-Eun Lee, Yu-Mi Lee, Tae-Hyuk Kwon, Jae-Suk Seo*
Food Analysis Division, Jeonbuk State Institute of Health and Environment, Imsil, Korea

P1-09 **Significance of food labeling compliance in global export markets**

Yimei Xin, Younsoo Kim*, Jin Kim, Hye Min Kim, Min-Chul Kang
Global Regulatory Center/Pulmuone Technology Institute, Pulmuone Co., Ltd, CheongJu, Korea

P1-10 **Development of predictive models for establish the use by date of market milk**

Seong Jun Lee, Sang Su Lee, Ye Been Baek, Gyung Jin Bahk*
Department of Food and Nutrition, Kunsan National University, Gunsan, Korea

P1-11 **Insights into the genomic traits, antibiogram profiling and biofilm dynamics of *Vibrio parahaemolyticus* and *Vibrio vulnificus*: Implications for seafood safety**

Nigar Sultana Meghla[1,2,3], Soo-Jin Jung[1,2], Syeda Roufun Nesa[1,2], Md Furkanur Rahaman Mizan[1,2], Iksoon Kang[4], Sang-Do Ha[1,2*]
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[3]*Department of Microbiology, Jashore University of Science and Technology, Jashore-7408, Bangladesh*
[4]*Department of Animal Science, California Polytechnic State University, San Luis Obispo, CA 93407, USA*

P1-12 **Human biomonitoring-based exposure assessment and risk characterization of bisphenols (BPA, BPS, BPF) in the Korean population**

Min-Ju Kim, Yong-Kook Kwon, Hyung-Jun Kim, Seungyoung Park, Gunyoung Lee, Hye Young Lee*

Safety Risk Assessment Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Osong Health Technology Administration Complex, Cheongju 25159, Korea

P1-13 **A survey on pesticide residues and risk assessment for agricultural products from wholesale market in Gyeonggi-do**

Yu-Na Song, Kyong-Shin Ryu, Young-Ju Choi, Hye-Yeon Lee, Han-Na Lee, Youn-Ho Kim, Jeong-Hwa Seo, Sun-Jae Bang, Su-Kyong Moon*

Department of Agricultural and Fishery Products Inspection, Gyeonggi-do Institute of Health and Environment, Guri 11916, Korea

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Min Jeong Kim*, Young Ae Park, Jae Eun Kwak, Young Hye Park, Ju Yeon Jo, Hyo In Jang, Mi Sun Kim, Tae Rang Kim, Hyun Jeong Kim, Ju Sung Park

Seoul Metropolitan Government Research Institute of Public Health and Environment, Seoul 13789, Korea

P1-15 **Microbial quality of fresh and frozen berry products in commercial distribution**

You Jin Myung, Sun Ae Kim*

Department of Food Science and Biotechnology, Ewha Womans University, Seoul, Korea

P1-16 **Results of safety testing on household chemical products (2024)**

Eun Ji Won*, Jung Yun Hwang, Kyoung Nam Kim, Mi Young Park, Min Kyung Kim, Ho Cheol Yun, Young Sun Choi, Min Ryeong Sim

Food&Drug Research Division, Ulsan Institute of Health and Environment, Ulsan, Korea

P1-17 **A study on the current status and limitations of existing consumption pattern data for developing a quantitative microbial risk assessment framework for novel foods**

Sun A Kim, Gyeong Min Lee, Yong Joon Park, Yixuan Sun, Haifeng Wang, Pan Gao, Young-Min Bae, Sun-Young Lee*, Yang Ju Son*

Department of Food and Nutrition, Chung-Ang University, Anseong 17546, Korea

P1-18 **Comprehensive microbial profiling and microbiological quality assessment of edible seaweeds in Korea: Including bacteria and fungi**

Ji Eun Sung, Sun Ae Kim*

Department of Food Science and Biotechnology, Ewha Womans University, Seoul, Korea

P1-19 **Antimicrobial resistance in *Pasteurella multocida* isolated from swine with respiratory disease: A two-year comparative study**

Hei Leem Park[1], Se Hui Park[1], Hye Won Lee[2], Doo Sung Cheon[3], Tae Jin Cho[2,4], Sun Ae Kim[1*]

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[4]*Department of Food Regulatory Science, College of Science and Technology, Korea University, Sejong, Korea*

P1-20 **Assessment of veterinary drug residues in livestock products distributed in Korea using a multi-residue method**

Hyeon Uk Kim*, Jun Young Choi, Soo Yeon Kim, So Young Um, Eun Kyung Yoon

Hazardous Substances Analysis Division, Seoul Regional Office of Food and Drug Safety, Ministry of Food and Drug Safety, Seoul, Korea

P1-21 **Effects of addition of green tea extract to mealworm chitosan film on the shelf life of pork patties**

Yixuan Sun, Haifeng Wang, Yong Joon Park, Sun A Kim, Pan Gao, Yang Ju Sun*, Gyeong Min Lee

Department of Food and Nutrition, Chung-Ang University, Anseong, Korea

P1-22 **A trend change in processed food consumption and intake rates in koreans using data from the national health and nutrition examination survey (2014-2023)**

Soo Jin Kong, Eun Bin Choi, Seul Bin Baik, Se Eun Park, Ji Min Ahn, Na Hyeon Kim, Ki Sun Yoon*
Department of Food and Nutrition, Kyung Hee University, Seoul, Korea

P1-23 **Monitoring of pesticide residues for agricultural products distributed in the Gangseo area of Seoul in 2024**

Chun Yeong Lee*, Yeo Joon Son*, Jung Im Jang, Ju Yeon Jo, Min Keong Kim, Joo Hyun Park, Hye Eun Gwon, Eun Sun Yun
Gangnam Agro-Fishery Inspection Station, Seoul Metropolitan Government Research Institute of Public Health and Environment, Seoul 05699, Korea

P1-24 **A study on the safety assessment of tar dyes in processed foods in Korea**

Hye-Rin Shim, Min-Ji Seog, Yee-un Seo, Hae-Soon Lee, Jin-Hyun Kim, Seung-Hyeon Jung*
Food Safety Science Institute, OTOKI Corporation, Anyang, Korea

P1-25 **Persistence of pathogenic *Escherichia coli* on cross-contaminated food-contact surfaces simulating seasoning containers: Impact of nutrient residues on survival**

So Yoon Choi[1], Seo Yoon Choi[1], Ga-Hee Ban[1], Tae Jin Cho[2,3], Changsun Choi[4], Min Suk Rhee[5], Sun Ae Kim[1*]
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P1-26 **Py-GC/MS as a reliable strategy for evaluating food-contact polymeric materials and additives**

Young-Min Kim[1*], Byeongcheol Lee[2], Joon Kim[3], Tae-Young Kim[4], Hyeonjeon Cha[4], Chang-Beom Park[5], Sunghwan Kim[6]
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P1-27 **Monitoring assessment of biogenic amines including histamine in seafood**

Ye-Eun Seo, Min-Ji Seog, Hye-Rin Shim, Hae-Soon Lee, Jin-Hyun Kim, Seung-Hyeon Jung*
Food Safety Science Institute, OTOKI Corporation, Anyang, Korea

P1-28 **Lightweight object detection model for real-time imported food safety management**

Jun Woo Park[1], Jun Hyun Oh[2], Mi Kyung Park[3], Young Duk Kim[1*]
[1]*Division of Future Mobility Research, DGIST, Daegu 42988, Korea*
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[3]*School of Food Science and Biotechnology, Kyungpook National University, Daegu 41566, Korea*

P1-29 **Investigation of radioactive and heavy metal contamination in seafood distributed in the Jeju area**

Hyun-Jeong Oh, Chang-Hui Yang, Doseung Lee, Young-Hee Kim, Eun-A Ko*
Institute of Health and Environment, Jeju Special Self-Governing Province, Jeju, Korea

P1-30 **Risk assessment of physicochemical deterioration in Atlantic salmon (*Salmo salar*) under long-term frozen storage and post-thaw conditions**

Ah Leum Kim[1], Gi-Un Seong[1], Hyo Jin Kim[1], Sang Bong Lee[1], Gyuseok Lee[1], Kee-Jai Park[2], Jeong Ho Lim[1], Seul-Ki Park[1*]
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[2]*Food Convergence Research Division, Korea Food Research Institute, Wanju, Korea*

P1-31 **Predictive algorithms for overlapping and co-administration safety based on the cross-nutrient database**

SangMin Lee[1,2], JeongYoung Kim[1], Kwang Suk Ko[3,4], Seungyoun Jung[3,4], Seok-Hee Lee[5], Byeong-Chul Kang[1,2], Ga-Hee Shin[1,2*]
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P1-32 **Safety and quality assessment of fish by-products from Atlantic salmon and olive flounder for value-added utilization**

Ye-Won Kim[1], Gi-Un Seong[1], Hyo Jin Kim[1], Ah Leum Kim[1], Jeonghan Moon[1], Kee-Jai Park[2], Jeong-Ho Lim[1], Seul-Ki Park[1*]

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P1-33 **Evaluation of *Staphylococcus aureus* biofilm formation and cross-contamination in a milk processing environment**

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P1-34 **Safety evaluation of cutting board oils and waxes for wooden kitchen utensils**

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P1-35 **Microbiological safety assessment of selected agricultural by-products for potential food applications**

Hyemi Kang, Ji Woo Jung, Jaehyeon Kwon, Hyang Sook Chun[*], Hyun-Gyun Yuk[*]

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P1-36 **Enhancing safety and functional properties of anchovy sauce by-products through reaction flavor and microencapsulation technology**

Sumin Kim[1], Changheon Lee[2], Jeong Ho Yang[1], Seong Hyeon Choi[1], Kyeonghwan Hwang[1,2], Yong-Jun Cha[1], Daeung Yu[1,2*]

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P1-37 **Monitoring of heavy metals (Lead, Total mercury, Cadmium, Total arsenic, and Inorganic arsenic(III, V)) in health functional food**

Ju-young Lee[1], Jeong-Yun Yang[1], Sun-Jung Baek[1], Young-Kyoung Kim[1*], Dahui Kim[2], Choong-In Yun[3], Shinae Choi[4], Young-Jun Kim[2,3*]

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P1-38 **Development of a system for identifying off-odor compounds originating from paper box**

Jae Yeon Lee, Sang Mo Kang, Jin Won Lee, Chi Woong Kim, Jiong Min Rye, Cheong Tae Kim[*], Ka Young Choi

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P1-39 **Development of the food list, food sampling, and preparation for Total Diet Study in Korea**

Sun Ah Ban, Hye Seung Cha, Ha Jin Kim, Yoon Young Na, Mi Kyeong Song, Wan Ting Zhao, Bo Kyoung Moon[*]

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P1-40 **Isolation, identification, and confirmation of *Listeria innocua* from enoki mushroom (*Flammulina velutipes*) from commercial products**

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P2-01 **Method validation for the determination of mecoprop-p in agricultural commodities using quechers extraction and lc-ms/ms**

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P2-02 **Development and validation of an Internal standard-based quantitative method for Vitamin D3**

Ye Jin Lee, Ji Yoon Kim*, Yun sik Woo, Kyu Bin Hong
Food Safety Team, BINGGRAE Food Research Center, Namyangju, Korea

P2-03 **The bio-safety of artificial intelligence-designed recombinant peptide delivery systems expressed in *E. coli* for improvement of memory**

Kyuha Oh[1], Byunggi Jang[2], Young Ho Koh[2,3*]
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P2-04 **Validation of Korean Food Code standards in commercially distributed honey**

MinJi Seog*, HyeRin Shim, GaYeong Lee, HaeSoon Lee, JinHyun Kim, SeungHyeon Jung
Food Safety Science Institute, OTOKI Corporation, Anyang, Korea

P2-05 **Analytical method development for colistin in livestock and fishery products using high performance liquid chromatography-tandem mass spectrometry**

Yeong-Ju Jo, Ye-bin Jang, Mi-ok Kim*, Gui-Hyun Jang, Jae-eun Mun
Pesticide and Veterinary Drug Residues Division, National Institute of Food & Drug Safety Evaluation, Cheongju 28159, Korea

P2-06 **Qualitative determination of halquinol analogues and metabolites in livestock and fishery products using LC-QTOF**

Yunseon Kwak, Su-Min Kim, Hyun Jin Lim, JiHyun Lee*, Gui-Hyun Jang, Jea-Eun Mun
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Cheongju 28159, Korea

P2-07 **Multiresidue determination of veterinary drugs in fishery products by LC-MS/MS**

Ye-Bin Jang, Yeong-Ju Jo, Mi-Ok Kim*, Gui-Hyun Jang, Jae-Eun Mun
Pesticide and Veterinary Drug Residues Division, Food Safety Evaluation Department, National Institute of Food and Drug Safety Evaluation, Cheongju 28159, Korea

P2-08 **Multi-residue analysis of residual substances in honey and royal jelly with LC-MS/MS using a modified QuEChERS method**

Jin Ha Sim, So-Yeon Noh, Min A Kim, Gyu Baek Kim, Man Ho Choi, Hyo Jin Chang*, Gui-Hyun Jang, Jae-Eun Mun
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P2-09 **Development of a simultaneous multi-residue LC-MS/MS method for prohibited and exempted veterinary drugs**

So-Yeon Noh, Jin Ha Sim, Min A Kim, Gyu Baek Kim, Man Ho Choi, Hyo Jin Chang*, Gui-Hyun Jang, Jae-Eun Mun
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P2-10 **Analysis method for strontium (^{89}Sr) in food**

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P2-11 **Validation of analytical method for diminazene, methomyl and tetramethrin in fishery products by liquid chromatography tandem mass spectrometry**

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P2-12 **Improved detection of *Campylobacter* in chicken carcass samples using bolton broth supplemented with an additional antibiotic**

Younghun Jee, Jungwhan Chon*
Department of Food Science and Biotechnology, Kangwon National University, Chuncheon 24341, Korea

P2-13 **Evaluation of cefoxitin- and cefotetan-supplemented bolton broth for the selective enrichment of *Campylobacter***

Eunsu Cho, Jungwhan Chon*
Department of Food Science and Biotechnology, Kangwon National University, Chuncheon 24341, Korea

P2-14 **A vaildation of analytical method for cyhexatin, azocyclotin and fenbutatin oxide residue in agricultural products**

Seo-Young Shin[1], Myeong-Ae Kim[1*], Ja-Min Goo[1*], Jung-Mi Lee[2*], Chan-Hyeok Kwon[2*], Jae-Eun Mun[2*], Gyu-Hong Han[1*]
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P2-15 **Optimization and validation of LC-MS/MS method for the determination of coating agents in food contact materials**

Ji Hea Moon, Yu Kyung Lee, Jyong Eun Myung, Jin Hee Lee, Hye Ri Kwon, Da Hee Lee, Jeong In Oh, Yu-Na Jo, Youn Jeong Han, Inju Park, Ji Won Ko, Sang Eun Park, Jwa Haeng Park, Dong Woo Shin*
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P2-16 **Comparison study on sulfur dioxide (SO_2) test in food by monnier williams modified method and using liquid chromatography-tandem mass spectrometry (LC-MS/MS)**

Seul Lee, Su Ji Jeong, Ah Hyeon Jo, Ah Hyun Kim, Hee Moon*, Yang Jun An
Jeollanam-do Health and Environment Research Institute, Mooangun 58568, Korea

P2-17 **Selection and improvement of fatty acid composition of *Rhodotorula toruloides* mutant strains by NTG treatment**

Yeong Hyeon Jo, Tae Sun Kang*
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P2-18 **Changes in delta-9 desaturase sequence linked to lipid profile shifts in *Rhodotorula toruloides***

Soo Min Lee, Jeong Eun Park, Tae Sun Kang*
Department of Food Science and Technology, Seoul Women's University, Seoul, Korea

P2-19 **Optimization of treatment conditions to prevent discoloration of yellowtail red muscle using cell-free supernatant from *Leuconostoc citreum* M8**

Da-Hyeon Yoon[1], Du-Min Jo[2], Min-Ung Kim[1], Ji-Hwan Choi[3], Ju-Hong Kang[1], Do-Kyun Kim[1], Young-Mog Kim[1*]
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P2-20 **Performance comparison of Petrifilm® *Bacillus cereus* count plates and MYP agar for detecting *B. cereus* in cake and triangular Kimbap**

Yeonhee Seo[1], Hyejun Choi[2], Kyunghyun Lee[2], Yoojung Heo[1], Seongil Kang[1*]
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[2]*Lotte R&D Center, Seoul, Korea*

P2-21 **Development of pretreatment method for microplastic analysis in processed fishery foods**

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P2-22 **Evaluation of microplastic damage during pretreatment using SEM and μ-FTIR**

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P2-23 **Development of automated MOSH/MOAH analysis system in edible oils using online LC-GC-FID**

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P2-24 Evaluation of a cation exchanger resin as a substitute for phosphoryl cellulose for caramel I/III classification

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P2-25 Comparative evaluation of hplc-uvd and gc-fid methods for improved quantification of tocopherols as nutritional fortifiers

Sieun Yu[1], Chaebin Park[1], Chaeyeon Song[1], Sowon Yang[1], Soojeong Choi[1], Sun-Il Choi[2], Ok-Hwan Lee[2], Hee-Jae Suh[1*]

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P2-26 Comparison of parameters between AOAC and CODEX for verifying a rapid detection kit of residual veterinary drugs

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P2-27 Modification of methanol analysis method in various alcoholic beverages using GC-FID

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P2-28 Expansion of multi pesticide residues analysis methods in agricultural products by GC-MS/MS

Ho Won Chang[*], Chan Woong Park, Hyo In Kim, Chae Rim Shin, Jae Won Lee, Woo Young Lee, Soon Han Kim

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P2-29 Rapid identification of microorganisms from various food sources using Bruker MALDI Biotyper® and detection of *Listeria monocytogenes* via MBT Subtyping

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P2-30 Comparison of Scoville Heat Unit (SHU) measurement methods for instant ramen

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P2-31 Analytical method for multi-component jelly-based health functional foods

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P2-32 Py-GC/MS coupled with F-Search as a reliable tool for monitoring insect contamination in foods

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P2-33 Application of Lactophenol Cotton Blue staining to the Howard mold count method to improve objectivity

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P2-34 Development of a simultaneous analytical method for three yellowed rice mycotoxins in food

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P2-35 Development of a glycyrrhizic acid analysis method in foods using HPLC

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P2-36 Optimization of QuEChERS-LC-MS/MS for the simultaneous determination of 17 furanocoumarins in various food matrices

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P2-37 Development of an LC-MS/MS method for the determination of sulfites in foods

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P2-38 Profiling of primary metabolites in Korean red pepper (*Capsicum annuum*) according to ripening stage

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P2-39 Improving identification methods for water-soluble carotenoid-based food colorants beyond conventional solvent extraction

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P2-40 Study on temperature-dependent migration from disposable cutlery

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P2-41 Rapid alternative approach for commercial sterility testing of long shelf-life foods using the Soleris® method

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P2-42 Development and validation of an LC-MS/MS method for spiromesifen and its metabolite in export agricultural products

Hanyeol Bang*, A Hyeon Seong, Ji Won Choi, In Jae Park

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P2-43 Differentiation of m/z peaks for *Salmonella* serovar identification using MALDI-TOF MS

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P2-44 Improved selective detection of *Bacillus cereus* and *B. thuringiensis* in food using a newly modified MYPA

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P2-45 Enhanced formulation of selective media to improve the detection ability for *Bacillus cereus* and *B. thuringiensis* in contaminated food samples

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P2-46 A PAM-free asymmetric RPA-CRISPR/Cas12a system for detection of *Escherichia coli* O157:H7

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P2-47 Filtration-assisted PAM-independent RPA-CRISPR/Cas12a detection of *Salmonella* Typhimurium in fresh-cut fruits

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P2-48 Automated pre-treatment using magnetic nanoparticles for molecular diagnostics of foodborne bacteria

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P2-49 Evaluation of the GENE-UP® BREW WILD YEAST kit for rapid detection of *Dekkera* spp. in the carbonated beverage industry

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P2-50 Improved detection method of foodborne viruses in sugar-preserved strawberries

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P2-51 Development and optimization of analytical method for dilauryl thiodipropionate using HPLC-PDA

Yeon-Seok Seong, Ji-Hyun Im, Xiaolu Fu, June-Seok Lim, Min-Hye Kim, Ok-Hwan Lee*
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P2-52 Comparative analysis of quantitative methods for vitamin E derivatives (D-α-tocopheryl acetate, DL-α-tocopheryl acetate, and D-α-tocopheryl succinate) across countries

Hyun-Woo Oh[1], Geun-Hee Cho[2], Ji-Hyun Im[2], Xiaolu Fu[2], June-Seok Lim[2], Tae-Woong Song[2], Min-Hye Kim[2], Young-Jae Heo[1], Su-Jong Kim[1], Hee-Jae Suh[3], Sun-Il Choi[1,2], Ok-Hwan Lee[1,2*]
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P2-53 Establishing the simultaneous analytical methods for anatoxins and cyliderospermopsins in agricultural products by using UPLC-MS/MS

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P2-54 **Application of a validated analytical method for the determination of anatoxin-a and cylindrospermopsin in diverse agricultural products**

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P2-55 **Monitoring of major cannabinoids (THC, CBD) content in hemp seed oil-containing foods using LC-MS/MS method**

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P2-56 **Development of an NIR quality control model for predicting spiciness and sweetness in spicy sauce**

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P2-57 **Method validation of chloride, nitrate and ammonium ions in edible ice using ion chromatography**

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P2-58 **Simultaneous determination and validation of anthocyanins and ellagic acid in strawberries using UHPLC-MS/MS**

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P2-59 **Development of a detection method for unauthorized GM squash events ZW20 and CZW3**

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P2-60 **Simultaneous LC-MS/MS determination of parent and modified mycotoxins in cereal, nut, and seed-based foods**

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P2-61 **Study on the analytical method for taurine in infant/follow-up formulas**

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P2-62 **Optimization of analytical method for β-carotene in nutrition-emphasized food products**

Keum Hee Hwang*, Hee Sun Jeong, Hye Jin Jo, You-Gyoung Park, Soon Ho Lee

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P2-63 **Optimization and characterization of *Listeria monocytogenes*-specific phage vB_LmoP_KFSLM5**

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P2-64 Development of a simple lateral flow strip using a *Brucella* metabolite peptide for rapid diagnosis of *Brucella* infection

Hye-Jin Kim[1], Jeong-Eun Lee[2], Ik-Jun Choi[1], Dong-Gyu Lee[1], Ho-Jin Song[1], In-Gyu Jung[1], Sung-Jin Lee[1], Ji Yoon Chang[3,4], Won-Bo Shim[3,4*]

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P2-65 Detection of edible insect adulteration in food using a monoclonal antibody-based lateral flow assay

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P2-66 Validation of an LC-MS/MS method for the determination of diethylstilbestrol (DES) and medroxyprogesterone acetate (MPA) in minor and other animal species

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P2-67 Validation of an analytical method for nitrovin in minor and other animal species using LC-MS/MS

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P3-01 Consumer awareness survey for providing accurate information on health functional foods

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P3-02 Design of a dietary education program tailored for GLP-1 users: A model utilizing functionally labeled foods (lentil-based peanut butter)

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OnHand Company, Iksan, Korea

P3-03 Functional bioactivities of *Bacillus coagulans* isolates from Indonesian fermented foods in relation to metabolic syndrome

Aninditya Artina Setiaputri[1], Minji Kim[2], Iman Mukhaimin[1], Young-Mog Kim[1,2*]

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P3-04 Status of veterinary drug residue testing in imported livestock products and an analysis of domestic regulatory management

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P3-05 Assessing hygiene practices of Korean fresh produce farms for the implementation of FSMA produce safety rule

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P4-01 Analysis of *Bacillus cereus* toxin gene characteristics and antibiotic resistance

Yoo Jung Sun*, Won-Sig Lee, Hyun-Jung Ko, Soo-Min Lim, Hyen Chung Cho, Hye-Bin Lee, Hyeon-Ji Lee, Soo-Yeon Lee, Kyung-Ae Kim, Soo-Son Lim, Meyong-Hee Kim, Wan-Soon Kwak

Food Poisoning Prevention Division, Incheon Metropolitan City Institute of Public Health and Environment, Incheon, Korea

P4-02 **Research and trends analysis of food-borne disease pathogens in Ulsan ('17-'24)**

Jongseok Oh, Seonhwa Kim, Eunhee Choi, Hyunju Lee, Jaesun Choi, Daekyo Kim, MInjeong Kim, Yeonsu Lee, Eunkyung Lim, Youngsun Choi, Minryuoung Shim, Changhyun Kim*

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P4-03 **Research on the contamination of foodborne pathogens in agricultural products distributed in Ulsan**

Hye Ri Kim*, Ji Wook Kim, Yoon Ju Lee, Jun Young Park, Nan Sook Han

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P4-04 **Optimizing a novel trivalent inactivated *Salmonella* vaccine strategy for the prevention of salmonellosis in poultry**

Eun-Seo Kang, Dong-Yeong Kim, Joann-Gavin Shin, Jin Hur*

College of Veterinary Medicine, Jeonbuk National University, Iksan 54596, Korea

P4-05 **Development of a novel inactivated vaccine against *Salmonella* Enteritidis infection in Hy-Line Brown chickens**

Eun-Seo kang, Dong-Yeong Kim, Joann-Gavin Shin, Jin Hur*

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P4-06 **Antibacterial effects of different parsnip (*Pastinaca sativa*) cultivars and plant parts against foodborne pathogens**

Youngjae Shin[2*], Tae-Sung Kim[1], Hyerin Shim[2], Jiwon Go[2], Dayeong Gu[2], Sang-Soon Kim[1]

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P4-07 **Risk assessment of major foodborne pathogens in ham products**

Jeong Min Lee, Yun Hee Choi, Ji Won Park, Oun Ki Chang, Jang Duck Choi*

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P4-08 **Temperature- and time-dependent microbial succession in packaged beef revealed by next-generation sequencing (NGS)**

Seang Kyu Kim, Sang Su Lee, Ye Been Baek, Gyung Jin Bahk*

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P4-09 **Isolation and characterization of bacteriophages against antibiotic-resistant *Staphylococcus aureus***

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P4-10 **Temporal and comparative analysis of biofilm formation by *Escherichia coli*, *Salmonella* Typhimurium and *Pseudomonas aeruginosa* using CLSM and biomass quantification**

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P4-11 **Biofilm formation and analysis of EPS architecture comprising polysaccharides and lipids by *Pseudomonas aeruginosa* and *Escherichia coli* on food processing surfaces**

Shirin Akter[1,3], Md. Ashikur Rahman[1,3], Md. Ashrafudoulla[4], Hwayoung Lee[1,3], Gaeul Lee[2,3], Sang-Do Ha[1,2,3*]

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P4-12 Development of an Ultrafast PCR-based method for the rapid detection of pathogenic *Vibrio*

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P4-13 Survival of *Listeria monocytogenes* and quality attributes of ground beef during frozen storage

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P4-14 Exploring the fate of *Salmonella enterica* serovar Typhimurium and *Listeria monocytogenes* in an *in vitro* fecal fermentation model: Interaction with gut microbiota

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P4-15 Isolation and characterization of phages for controlling *Listeria monocytogenes*

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P4-16 Temporal and spatial patterns of norovirus and microbial source tracking markers across rivers of mid-west area, South Korea

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P4-17 Characteristics of pathogenic *Escherichia coli* isolated from cattle and pig slaughterhouses during 2020 to 2025

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P4-18 Complete genome sequence of *Salmonella enterica* serovar Enteritidis strain MFDS1025534 isolated from food

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P4-19 Novel *Yersinia enterocolitica* O3-specific bacteriophages isolated from the environment: Biofilm inhibition on food-contact surfaces and promising applications for cold-chain food safety

Harim Lee[1,3], Soo-Jin Jung[1,3], Chaeryeong Oh[2,3], Sang-Do Ha[1,2,3*]
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P4-20 Phenotypic and genotypic characterization of *Vibrio vulnificus* isolated from seafood

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P4-21 Pathogenic and genotypic profiles of *Clostridium perfringens* isolates in South Korea, 2020-2024

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P4-22 Genomic characterization of an enteroaggregative *Escherichia coli* MFDS1028192 isolated from a kitchen countertop

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P4-23 Comparative genomic analysis of *Yersinia enterocolitica* in Korea: Genetic characteristics and diversity

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P4-24 Evaluation of predictive models describing the growth and death patterns of pathogenic *Escherichia coli* in cooked spinach under different storage temperatures and periods

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P4-25 Detection of norovirus on environmental surfaces in childcare centers

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P4-26 Survey on norovirus contamination and microbiome analysis of environmental samples from domestic childcare centers

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P4-27 Establishment of a monitoring system for foodborne pathogens through investigation and surveillance of foodborne outbreaks in Korea

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P4-28 Rapid and accurate serotyping of foodborne pathogens using Nanopore-based NGS panel

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P4-29 Performance evaluation of the NGS-based multiplex panel for detection of foodborne pathogens compared with real-time PCR

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P4-30 Growth behavior of *Salmonella* Enteritidis in plant-based egg and liquid whole egg products at various storage temperatures

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P4-31 Data-driven prediction of food hazards: Strategic directions for preventive risk management

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P4-32 Comparative analysis of virulence factors and antimicrobial susceptibility in *Staphylococcus aureus* from bovine mastitis and normal raw milk

San-Yi Kim, Jaewoong Lim, Eun-Ah Jung, So-Yeon Kwon, Soo-Ah Lee, Hojin Choi, Jiyoon Wi, Kun-Ho Seo*

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P4-33 Antimicrobial mechanism of different organic acids against *Escherichia coli* O157:H7 under alkaline condition

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P4-34 Gompertz model-based analysis of freezing curve dynamics and survival of foodborne pathogens under different freezing rates

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P4-35 Influence of freezing rate and storage duration on survival and post-thaw growth of foodborne pathogens

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P4-36 Formation and detection of viable but non-culturable *Salmonella* Typhimurium in acidic foods during cold storage

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P4-37 Characteristics of the viable but nonculturable (VBNC) state of *Salmonella enterica* serovar Typhimurium induced by lactic acid and cold stress

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P4-38 Genome-based discrimination of *Bacillus thuringiensis* and *Bacillus cereus* using a Bt-specific qPCR marker

Kwang-Kyo Oh, Seung-Mi Seo, Do Young Jung, Injun Hwang, Myeong-In Jeong, Kyung Min Park, Dong Suk Park*
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P4-39 Sublethal injury of *Escherichia coli* O157:H7 in food models under freeze-thaw

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P4-40 Effects of freeze-thaw conditions on single- and dual-species biofilms of *Listeria monocytogenes* and *Pseudomonas aeruginosa* on stainless steel surfaces

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P4-41 Genomic characterization of a vancomycin- and teicoplanin-resistant *Enterococcus faecalis* ST6 isolate harboring a plasmid-borne vanA operon in South Korea

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P4-42 Antifungal effect of riboflavin-mediated 405 nm light emitting-diodes on *Penicillium italicum* on mandarin and its impact on fruit quality

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P4-43 Glycan-mediated magnetic separation of *Escherichia coli* O157:H7 from lettuce

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P4-44 Bioinformatics-guided development and comparative evaluation of qPCR, POC PCR, and ddPCR assays for rapid detection of *Vibrio campbellii* and *Vibrio harveyi*

Eiseul Kim, Dabin Kim, Min-Ki Shin, Seung-Min Yang, Hae-Yeong Kim*
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P4-45 From farm to gut: Transferable phenicol-oxazolidinone resistance in food-animal *Enterococci* and the risk of human microbiome spillover

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P4-46 Characterization of ESBL-producing *Escherichia coli* isolated from broiler farm environments in Korea

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P4-47 Verification of a PCR-based assay for the rapid detection of *Campylobacter coli* in food against the standard culture method

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P4-48 First identification and genomic characterization of *Enterobacter cloacae* complex ST555 isolated from a leafy vegetable farm in South Korea

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P4-49 Experimental transmission of human norovirus from hand or glove to food contact surfaces

Songfeng Jin[1], Soontag Jung[1], Dong Jae Lim[1], Daseul Yeo[1], Hyojin Kwon[1], Seongwon Hwang[1], Danbi Yoon[1], Tae Jin Cho[3], Sun Ae Kim[4], Min-Suk Rhee[2], Changsun Choi[1*]
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P4-50 Monitoring of six foodborne viruses in childcare facilities using RT-qPCR in South Korea 2024-2025

Dong Jae Lim[1], Seongwon Hwang[1], Soontag Jung[1], Daseul Yeo[1], Hyojin Kwon[1], Danbi Yoon[1], Songfeng Jin[1], Ki Won Lee[3], Yun O[4], Tae Jin Cho[3,4], Sun Ae Kim[4], Min-Suk Rhee[2], Changsun Choi[1*]
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P5-01 pH-responsive hydrogel delivery system of phage and prebiotics for targeted control of *Klebsiella pneumoniae*

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P5-02 Monitoring of residual formaldehyde in table napkins and cocktail napkins

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P5-03 Appraisal of cinnamon leaf oil for controlling *Salmonella* Typhimurium biofilms on chicken and food contact surfaces

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P5-04 Fabrication and physicochemical stabilization of natural ingredient-based nano-emulsions using a biosurfactant from *Bacillus velezensis* GJ1 and thyme oil

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P5-05 Biosurfactant from *Bacillus velezensis* GJ1: Antibacterial potential and mechanistic insights against *Listeria monocytogenes*

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P5-06 Influence of dietary sugars on *Streptococcus mutans* biofilm formation and the inhibitory potential of quercetin

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P5-07 Calcium-crosslinked pectin films for pectinase-triggered controlled release of bacteriophages in food packaging

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P5-08 Functional and structural evaluation of *Weissella*-derived postbiotics as natural inhibitors of *Aeromonas hydrophila*

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P5-09 Comprehensive genomic and functional characterization of kimchi-derived lactic acid bacteria *Weissella cibaria* and *Weissella confusa*

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P5-10 Deep learning-based food poisoning prediction index incorporating environmental and real-time news data

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P5-11 Receptor-specific phage cocktail effectively controls AMR *Salmonella* Typhimurium and limits BIM emergence in foods

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P5-12 Investigation of antibiotic resistance in *Salmonella* isolates from meat in Gwangju Metropolitan City, 2022-2024

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P5-13 Fish gelatin-based nanoplatforms with maltol-gold coating: Multifunctional antimicrobial approaches for safer foods

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P5-14 Bactericidal efficacy of sodium hypochlorite against three *Salmonella* spp. on eggshells

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P5-15 Effect of storage temperature on the survival and internal penetration of *Salmonella* Enteritidis in washed eggs

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P5-16 Sustainable utilization of undervalued onions for biofilm removal and shelf-life extension of ready-to-eat chicken

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P5-17 Effect of cell-free supernatant application method on discoloration prevention of tuna (*Thunnus orientalis*) muscle

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P5-18 Changes of active ingredient content in food-contact surface sanitizing solutions in storage duration with accelerated age-conditioning

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P5-19 Bactericidal effects of UV-C irradiation on eggshells contaminated with *Salmonella*

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P5-20 Immunofluorescence-assisted investigation of Human Astrovirus-1 in oyster processing and product

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P5-21 Fabrication of chitooligosaccharide/polyvinyl alcohol films incorporating postbiotics with antibacterial and antioxidant properties

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P5-22 Genomic and phenotypic characterization of *Salmonella* isolates from agricultural environments

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P5-23 Evaluation of the antiviral potential of citrus peel extract against Hepatitis A virus on food production and processing environments

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P5-24 Control of *Staphylococcus aureus* biofilm using a cold plasma patch and synergistic effect with antibiotic

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P5-25 Gallic acid-mediated photodynamic inactivation against antibiotic-resistant *Pectobacterium carotovorum* subsp. *carotovorum* on Chinese cabbage

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P5-26 Effects of *Leuconostoc citreum* M8 suupernatant on color preservation and stability of *Seriola quinqueradiata*

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P5-27 Development of a spray-assisted cold plasma sterilization device equipped with UVC-LED for sustainable food system

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P5-28 Evaluation of critical control point effectiveness and improvement HACCP plan for sandwiches manufacturing process

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P5-29 Comparative evaluation of natural antimicrobial agents against *Escherichia coli* and *Staphylococcus aureus*

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P5-30 Development of a pH-responsive pectin-chitosan bilayer carvacrol nanoemulsion for improved shrimp preservation

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P5-31 Evaluation of critical control point effectiveness and improvement HACCP plan for lunch box manufacturing process

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P5-32 **Antimicrobial, anti-biofilm, and anti-inflammatory activities of kefir-derived lactic acid bacteria postbiotics against oral pathogens**

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P5-33 **Comparative analysis of ESBL-producing *Escherichia coli* between floor- and cage-reared layer hen farms in South Korea**

So-Yeon Kwon, Soo-Ah Lee, Binn Kim, Eun-Ah Jung, San-Yi Kim, Hojin Choi, Jiyoon Wi, Jaewoong Lim, Kun-Ho Seo*
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P5-34 **A non-thermal strategy for controlling stress-adapted *Staphylococcus aureus*: Synergistic role of propyl gallate, UVA, and mild heat**

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P5-35 **Analysis of ammonium persulfate-induced ultrasound inactivation of *Escherichia coli* O157:H7 across stress adaptations and application to fresh produce rinsing system**

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P5-36 **Mechanistic study on the photolysis induced 172 nm excimer lamp and citric acid for microbial control**

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P5-37 **Synergistic effect of Perillaldehyde and Ultrasound for inactivation of *E. coli* O157:H7, *S.* Typhimurium, *L. monocytogenes*, and *S. aureus* in peptone water**

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P5-38 **Enhanced photodynamic inactivation of foodborne pathogens using an ultrasonic riboflavin mist combined with 405 nm blue light**

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P5-39 **Inhibition of biofilm formation and surface decontamination of *Salmonella* Typhimurium using 172 nm excimer lamp**

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P5-40 **Combined effects of ammonium persulfate, ultrasound, and mild heat on *Staphylococcus aureus* grown under various conditions in buffered peptone water and on orange peel**

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P5-41 **Advancement of near-infrared heating with naringenin spray: Mechanistic insights into thermal intensity reduction**

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P5-42 **Enhancing microbial safety of sous vide chicken breast using naringenin-infused sauce: A synergistic approach with mild heat treatment**

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P5-43 **Host-specific *Salmonella* serotypes and antimicrobial resistance in chicken, porcine, and bovine**

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P5-44 **Evaluating drying, heating, and fermentation pretreatments for control of ESBL-Producing *Escherichia coli***

HoJin Choi, Eun-Ah Jung, So-Yeon Kwon, San-Yi Kim, Soo-Ah Lee, JiYoon Wi, Jaewoong Lim, Kun-Ho Seo[*]
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P5-45 **Phage endolysin (LysLM3), a promising solution against *Listeria monocytogenes***

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P5-46 ***In silico* identification of a novel depolymerase gene from *Salmonella* phage vB_SalA_KFSST3 and its genomic safety evaluation for food application**

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P5-47 **Evaluation of the effect of immersion treatment on the reduction of *Listeria monocytogenes* in ready-to-eat pineapple processing**

Ho-Jin Song[1], Ik-Jun Choi[1], Hye-Jin Kim[1], Dong-Gyu Lee[1], In-Gyu Jung[1], Sung-Jin Lee[1], Won-Bo Shim[1,2,3,4]
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P5-48 **Isolation of proteolytic *Bacillus* sp. from traditional fermented foods and their inhibitory effects on foodborne pathogens and biofilm formation**

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P5-49 **Phenyllactic acid inactivates *Cronobacter sakazakii* through cell membrane destruction, biofilm retardation, and altered gene expression**

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P6-01 **Investigation of mycotoxin contamination in Valentine's chocolates distributed in Seoul**

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P6-02 **Fungal diversity and mycotoxin contamination in stored wheat**

Ja-Yeong Jang, Ju-Young Na, Seul-Gee Back, So-Jung Kim, Parthiban Subramanian, Hyo-Won Choi[*]
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P6-03 **Cytotoxicity analysis of bovine gelatin-based bioink containing *Euterpe oleracea* extract for cultured meat production**

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P6-04 **Assessment of neonicotinoid insecticide residues in leafy and fruit vegetables from Seoul (2022-2024)**

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P6-05 **Survey of eight mycotoxins in Jeju-do market foods by LC-MS/MS**

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P6-06 **Analysis of mycotoxins in wheat using NIRS**

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P6-07 **Biochemical assessment of cicadamide-4 from cicadae periostracum and its cytotoxic effect including acute oral toxicity using an ICR mice model**

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P6-08 **Development of alternative methods for drug toxicity testing for replacing rodent models**

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P6-09 **Analysis of bioactive components and antioxidant activities of Hwaljingigo**

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P6-10 **Comprehensive *in vitro* evaluation of the functional activities of Hwaljingigo**

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P6-11 **Estrogen receptor alpha-dependent induction of lipid accumulation in 3T3-L1 adipocyte by clofentezine, clomazone, metconazole**

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Poster Presentation

The Science of Food Safety :
Bridging Research and Application

P1

P1-01

From young-radish to yeolmu-kimchi: Effects of EHEC contamination on microbial communities and fermentation safety

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This study aimed to evaluate the microbial safety of young-radish kimchi (yeolmu-kimchi) when prepared from raw materials contaminated with enterohemorrhagic *Escherichia coli* (EHEC), a pathogenic bacterium previously implicated in foodborne outbreaks and detected in the native microbiota of young radish. A total of 60 young radish samples were collected in April and August from Goyang and Dongducheon, Korea. The native microbiota was profiled by 16S rRNA gene sequencing using CLC Genomics Workbench, and seven potential pathogenic species, including *Bacillus cereus*, enteropathogenic *E. coli* (EPEC), *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa*, were quantitatively confirmed. Yeolmu-kimchi was then prepared from EHEC-contaminated and uncontaminated radish, and microbial succession, EHEC and spoilage bacteria counts, pH, and salinity were monitored during fermentation. At the phylum level, Proteobacteria, Firmicutes, and Actinobacteria were dominant in both groups; at the class level, Gammaproteobacteria, Bacilli, Alphaproteobacteria, Actinobacteria, and Betaproteobacteria prevailed. In contaminated kimchi, EHEC initially dominated but sharply declined after early fermentation, coinciding with an increase in lactic acid bacteria (LAB). Around day 30, LAB counts decreased and *Pseudomonas* spp. increased, indicating the onset of spoilage. Both groups showed a rapid pH drop to -4.4-4.5 within 5 days, remaining stable until day 30; thereafter, pH gradually increased, with significantly higher values in the contaminated group on days 50 and 70. These results suggest that pathogenic contamination can influence early fermentation dynamics, potentially stimulating LAB growth and acid production, contributing to pathogen suppression. This study underscores the importance of raw material quality and storage conditions in ensuring the microbial safety and fermentation quality of yeolmu-kimchi. This work was supported by BK21 FOUR Program by Chungnam National University Research Grant, 2025.

P1-02

Monitoring and risk assessment of pesticide residues on processed fruits and vegetables

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This study assessed pesticide residues (401 compounds) in 120 processed fruit and vegetable products distributed in Ulsan, South Korea. Residues were detected in 32.5% of samples, with acetamiprid, tebuconazole, and flonicamid being the most frequently detected. The detected pesticides were primarily systemic or lipophilic. A total of 48 pesticides were detected across 157 occurrences, but none exceeded the MRLs. Overall, detection rates in processed foods were 30-40% lower than those in raw commodities, although certain products exhibited higher residue levels than their raw counterparts. Estimated %ADI values ranged from 0.0003% to 0.7658%, indicating that all residues were within safe limits and the overall exposure risk to consumers remains low.

P1-03

Comparative study of detection limits in the revised and conventional yeasts and molds test methods of the korean food code

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The Ministry of Food and Drug Safety (MFDS) Notice No. 2023-72 announced a revision to the yeasts and molds test method in the Korean Food Code. The procedure was changed from dispensing 1 mL of diluted sample onto agar plates to spreading 0.1 mL of diluted sample onto agar plates. This modification is expected to increase the detection limit and the risk of false positives in non-compliant products. Therefore, this study compared the detection limits of the conventional and revised test methods. Experiments were conducted using *Aspergillus niger* and *Penicillium cyclopium*. In the conventional method, 1 mL of diluted sample was aseptically transferred into at least two sterile petri dishes, followed by the addition of 15 mL of Potato Dextrose Agar (PDA), mixing, and solidification. In the revised method, 0.1 mL of diluted sample was spread onto at least two PDA plates. Both methods involved incubation at 25°C for three days, after which the number of colonies formed was counted. In the 1 mL plating method, both *A. niger* and *P. cyclopium* yielded colony counts at the level of 10^0 CFU/mL. In contrast, with the 0.1 mL spreading method, both *A. niger* and *P. cyclopium* were detected at the 10^1 CFU/ml level with a probability of 20% and 50%, respectively. Furthermore, colonies were not detected using the 0.1 mL spreading method in 80% and 50% of plates for *A. niger* and *P. cyclopium*, respectively, even when 100% were detected by the 1 mL spreading method. These results indicate that the 0.1 mL spreading method may lead to overestimation of actual fungal quantity, and failure to detect colonies in the 0.1 mL spreading method may increase the possibility of false negatives. Thus, this study highlights the need for careful interpretation of results when applying the revised yeasts and molds test method.

P1-04

Pesticide residues and risk assessment in agricultural products from public wholesale markets in Gyeongsangnam-do, Korea

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This study investigated pesticide residues and dietary risks in 3,396 agricultural products distributed through public wholesale markets in Gyeongsangnam-do from 2022 to 2024. Residues were detected in 66.3% of samples, and 0.8% exceeded maximum residue limits (MRLs). Fruits and vegetables showed the highest detection rates, while multi-residue detection was common in pome fruits, with some samples containing more than four pesticides. The top 20 most frequently detected pesticides accounted for 61.4% of all detections, primarily insecticides and fungicides. Seasonal and commodity-specific trends were observed, with higher detection rates in late summer and early autumn. The hazard indices (HI, %ADI) of pesticides exceeding the MRLs were calculated using average residual amount (mg/kg) and the acceptable daily intake (ADI). The values ranged from 0.0% to 7.3%, suggesting they were within safe levels. However, the frequent occurrence of multiple residues and MRL violations in certain commodities highlight the need for targeted monitoring and cumulative risk assessment, particularly for vulnerable consumers. These findings underscore the importance of effective pesticide management strategies to safeguard food safety and public health.

P1-05

Optimization of an analytical method for iodine-129 determination in foodstuffs by liquid scintillation counting

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This study optimized an analytical method for the determination of iodine-129 (I-129) in foodstuffs using liquid scintillation counting (LSC). I-129, a long-lived artificial β-emitting radionuclide, is primarily generated from nuclear reprocessing facilities and nuclear weapon tests. With a half-life of approximately 1.57×10^7 years, I-129 can persist in the environment once released, bioaccumulates through the food chain, and ultimately enter the human body, thereby requiring continuous monitoring. For sample preparation, foodstuffs were dried and pulverized, then combusted in a high-temperature furnace under an optimized protocol. The volatilized iodine was effectively trapped in a mixed solution of 0.1 M HNO_3 and 0.1 M $NaHSO_3$, which selectively retained iodine while minimizing interference from radionuclides such as carbon-14 (C-14). For LSC measurement, the trapping solution was mixed with Goldstar cocktail. Interference from tritium (H-3), a low-energy β-emitter, was reduced by restricting the counting window. Detection efficiency was established through a quenching curve constructed with I-129 standard solutions prepared under varying quench conditions, enabling conversion of count rates to activity concentrations. Validation with five representative foodstuffs confirmed that the method achieved an average recovery of 96.67% while satisfying the criteria for both accuracy and precision. In addition, the optimized method consistently achieved an MDA below the target value of 5 Bq/kg across all samples. These findings demonstrate that the method provides a reliable and robust approach for the quantification of I-129 in diverse food matrices and can be directly applied to long-term environmental monitoring and food safety assessment.

P1-06

Evaluation of changes in quality and flavor characteristics of shrimp jeotgal added with kimchi-derived lactic acid bacteria

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Jeotgal, a traditional fermented food, has long been used as a Korean ingredient in various dishes. Recently, with the growing emphasis on low-salt diets in line with healthy eating trends, jeotgal consumption has begun to decline significantly. This increased attention to low-salt jeotgal has also led to a growing demand for more diverse jeotgal products. In this study, lactic acid bacteria (LAB) strains derived from kimchi, which enhance flavor and extend shelf life, were artificially added to shrimp jeotgal samples. The effects of LAB addition on the quality and flavor changes of shrimp jeotgal were investigated. Response Surface Methodology (RSM) was used to optimize LAB treatment conditions for each shrimp jeotgal sample. Based on the Box-Behnken design, the number and type of LAB strains were set as variables to explore the optimal conditions for the shrimp jeotgal-LAB mixture treatment, thereby establishing the manufacturing conditions for the final product. The storage conditions were fixed at 5°C under refrigeration, and the weight of each shrimp paste sample was set at 500 g. The experimental analyses included physicochemical indices of the shrimp paste samples, such as pH, acidity, salinity, and organic acid content, as well as microbiological indices, such as the total aerobic bacterial count and lactic acid bacterial count. In conclusion, this experiment obtained meaningful results in developing a higher-quality shrimp paste product than shrimp paste without additives through the addition of lactic acid bacteria, and confirmed that shrimp paste with added lactic acid bacteria maintained better quality than existing shrimp paste products.

P1-07

Climate factor-based predictive modeling of pesticide residue detection trends: A case study of agricultural products in sejong city

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Climatic conditions have direct and indirect effects on agricultural production environments and pesticide use. Therefore, predicting trends in pesticide residue detection according to climate factors can provide important scientific evidence for establishing food safety management policies. This study aimed to investigate the influence of climatic factors on pesticide residue detection in agricultural products from Sejong City and evaluated the suitability of a predictive regression model. Monthly pesticide residue detection records from 2022 to 2024, along with monthly average data on humidity, rainfall, and temperature, were analyzed using multiple regression analysis. The results showed that humidity and rainfall had statistically significant effects on pesticide residue detection ($p < 0.05$), whereas the effect of temperature was not statistically significant ($p > 0.05$). Nonetheless, temperature was retained in the final model due to its importance as a fundamental climatic factor, and its inclusion did not significantly shift the explanatory power of the model ($\Delta AIC < 2$). Additionally, model adequacy assessments and residual diagnostics confirmed that the assumptions of regression analysis were met, and thus the model secured both explanatory and predictive power. Therefore, the predictive model developed in this study is expected to be used as a scientific basis for predicting the detection of residual pesticides in agricultural products in Sejong City and the establishment of safety management policies.

P1-08

Investigation of protein content and hazardous substances in protein supplements selling in jeonbuk state

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This study aimed to assess the protein content and the presence of harmful substances in protein supplements, including heavy metals (lead and cadmium), melamine, and mycotoxins (aflatoxins B1, B2, G1, G2, and M1). A total of 80 protein supplement products, categorized into powder, beverage, and snack & bar forms, were analyzed. The protein content was evaluated based on the labeled values to ensure compliance with standards for both general and functional food categories. The measured protein levels ranged 80.4% to 109.5% of the labeled content, with animal-based products exhibiting the highest protein concentrations, followed by mixed animal-plant and plant-based products. Among different product forms, powder-type supplements showed the highest average protein content. In the heavy metal analysis, lead was detected in 17 products and cadmium in 31 products, with 14 products containing both. Snack & bar-type products had the highest detection rates, whereas beverage-type products had the lowest. However, all detected levels were below the provisional safety limits. Melamine was not detected in any samples, confirming compliance with food safety standards. Mycotoxin analysis revealed aflatoxin contamination in 13 products (16.3%), though all detected levels were within regulatory limits. Overall, these findings suggest that protein supplements available on the market generally comply with safety standards concerning protein content and harmful substances.

P1-09

Significance of food labeling compliance in global export markets

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With the acceleration of global food trade, compliance with food labeling regulations has emerged as a key task in risk assessment and compliance management. Requirements such as nutrition labeling, allergen declaration, and health claims act as non-tariff trade barriers and are frequently identified as major causes of non-compliance in export processes. An analysis of Korean food export non-compliance cases over the past three years showed that violations of labeling standards accounted for about 30% of all cases, constituting the largest proportion. This underscores the clear need for proactive regulatory monitoring. This study examined the food labeling regulatory systems and trends in major export markets, including the United States, Europe, Japan, China, Australia and New Zealand. The analysis revealed that regulatory tightening, such as the introduction of front-of-package (FOP) nutrition labeling in the United States and Canada and the comprehensive revision of food labeling standards in China, is reinforcing non-tariff barriers. These developments have a direct impact on corporate export strategies, suggesting that systematic regulatory monitoring and strengthening of internal compliance capacity are crucial response measures. Furthermore, while the complete harmonization of global food labeling standards faces practical limitations, the study discusses the potential for partial harmonization and mutual recognition through international cooperation frameworks.

P1-10

Development of predictive models for establish the use by date of market milk

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This study was conducted for the purpose of developing a predictive model for total bacterial counts of market milk according to temperature changes in a distribution environment. The purchased milk was stored at each temperature of 4, 10, 15, 20 and 25°C, and the growth level of total bacterial counts was analyzed for 4 to 30 days depending on temperature conditions. The Baranyi model was used as the primary model, and the primary model was developed based on the growth data of total bacterial counts obtained through experiments. Maximum specific growth rate (SGR), lag time (LT), and maximum population density (MPD) were obtained as the growth parameters of the primary model. As a result of statistical validation of each temperature condition, RMSE ranged from 0.0000 to 0.2054, A_f ranged from 1.0000 to 1.1757, and B_f ranged from 0.9638 to 1.0926. As a secondary model, an exponential non-linear regression model was applied to develop a secondary model for the growth parameters obtained from the primary model. R^2 values were 1.0000, 0.9999, and 0.9967 for SGR, LT, and MPD, respectively. The tertiary model was developed to predict the growth level of total bacterial counts according to temperature conditions based on the Excel program. As a statistical validation for the final tertiary model, R^2 was 0.9986, A_f was 1.0639, and B_f was 1.0175, which showed high suitability. Using the developed predictive model, it is possible to estimate the appropriate consumption period of milk according to temperature and time. And it can minimize the waste of resources caused by the current sell by date labeling system and provide guidelines for consumers to safely intake milk.

P1-11

Insights into the genomic traits, antibiogram profiling and biofilm dynamics of *Vibrio parahaemolyticus* and *Vibrio vulnificus*: Implications for seafood safety

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Although the global seafood consumption patterns differ by choice and availability, seafood inevitably contributes to a substantial amount of daily protein intake. However, seafoods and its associated contact surfaces can be associated with pathogenic bacterial hazards including *Vibrio* species. *Vibrio parahaemolyticus* and *Vibrio vulnificus* are major seafood-borne pathogens affecting public health and trade. This study investigated their virulence, genetic diversity, antibiotic resistance, and biofilm-forming ability on seafood surfaces. Virulence genes were detected by PCR, genetic relatedness were assessed via REP-PCR, and antimicrobial resistance profiled using disk diffusion, revealing high multidrug resistance. Biofilm formation was quantified by microtiter plate assay and visualized with CLSM and FE-SEM, confirming strong adhesion and mature biofilm structures. Results showed *V. parahaemolyticus* and *V. vulnificus* predominating and forming two genetically distinct clusters. Additional analyses included quorum-sensing (Autoinducer-2 activity), hydrophobicity, exopolysaccharide production, and motility (swimming, swarming, twitching), all of which correlated with virulence in each species. The persistence of multidrug-resistant, strong biofilm-producing (high biofilm formation indexed) virulent *Vibrio* strains highlights the urgent need for ongoing monitoring and targeted control measures to ensure seafood safety.

P1-12

Human biomonitoring-based exposure assessment and risk characterization of bisphenols (BPA, BPS, BPF) in the Korean population

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Bisphenols (BPs), well-known endocrine disruptors, have been widely used in food can linings and water pipe coatings due to their high heat resistance and strength (especially BPA), prompting regulatory authorities worldwide to establish standards and restrictions. Recently, the increasing use of BPA substitutes (BPS, BPF) has highlighted the need for updated human health risk evaluations to support safety management. Therefore, this study aimed to evaluate the risk levels of three BPs (BPA, BPS, BPF) in the Korean population using a human biomonitoring-based exposure assessment approach. Urinary concentrations of BPs (KoNEHS, Cycle 3: '15-'17, Cycle 4: '18-'20) were integrated with a physiologically based toxicokinetic model to estimate exposure levels. When a human-based guidance value (HbGV) was available (BPA), risk was characterized using the hazard index (HI), whereas for substances without an HbGV (BPS, BPF), the margin of exposure (MOE) approach was applied. The HbGV for BPA was 20 μg/kg BW/day, the point of departure (POD) for BPS was 20 mg/kg BW/day, and in the absence of BPF-specific POD, the POD of BPA (1.53 mg/kg BW/day) was used. Additionally, exposure trends were compared across survey cycles and age groups. As a result, the risk of the BPs among the Korean population was well below health concern thresholds. For BPA, the HI was ≤0.001 (0.1% of the HbGV), MOE for BPS (16,260,163) and BPF (1,471,154) exceeded their respective uncertainty factors (BPS: 1,000; BPF: 100). BPA showed a gradual decrease (16.2→9.2 ng/kg BW/day), whereas BPS increased (0.52→1.23 ng/kg BW/day). BPF exposure remained largely stable, except in certain subgroups (BPF exposure doubled in 13-18-year-olds). Overall, due to ongoing regulatory policies implemented in Korea, health risk concerns for BPs among the Korean population have remained low; however, as the BPA substitutes BPS and BPF show an increasing trend, continuous monitoring will be necessary in the future.

P1-13

A survey on pesticide residues and risk assessment for agricultural products from wholesale market in Gyeonggi-do

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This study was conducted to monitor the residual pesticides and to assess their risk to human health in agricultural products from wholesale market in Gyeonggi-do. A total of 7,686 samples was analyzed and 20 samples in 13 commodities violated maximum residual limits (MRLs) and the rate of detection and violation was 39.2% and 0.5%, respectively. The frequent products that exceeded MRLs were Lettuce and Young radish (3 times), Spinach, pepper and Chicory (2 times) etc. Among 380 pesticides tested, 86 pesticides were detected and among them, 16 pesticides were detected over MRLs. The frequently detected pesticides were Dinotefuran (160, 11.1%), Chlorfenapyr (130, 9.0%), Fluopyram (122, 8.4%), Azoxystrobin (67, 4.6%), Fluxametamide (64, 4.4%) etc. The frequently violated pesticides were Terbufos (5, 20.8%), Phorate (3, 12.5%), Imicyafos and Propamocarb (2, 8.3%) in order. Comparing the estimated daily intake (EDI) of pesticides with the acceptable daily intake (ADI) to assess their risk, Hazard Index (%ADI) was 0.0000-54.3469%. This risk assessment study showed that the values of hazard index (%) were less than 100%, indicating that the consumption of these local agricultural food products was not harmful for human health.

P1-14

Health risk assessment of total sugars and caffeine intake from dessert café foods and beverages in Seoul

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The rapid expansion of dessert cafés in Korea has led to increased consumption of sugar- and caffeine-rich products. Although concerns have been raised regarding the health risks associated with excessive intake of desserts and beverages, research on their nutritional composition remains limited. This study aims to evaluate the total sugar and caffeine contents of dessert café products and to assess their potential health risks in relation to dietary guidelines. A total of 129 samples (46 desserts and 83 beverages) were collected from dessert cafés across Seoul. Total sugars were determined using UPLC with a refractive index detector, calculated as the sum of fructose, glucose, lactose, maltose, and sucrose. Caffeine was analyzed using HPLC with a diode-array detector. The results revealed a wide range in total sugars (N.D.-53.8 g/serving) and caffeine (N.D.-199.47 mg/serving) levels. A combination of one dessert and one beverage provided up to 101.0 g of total sugars or 338.16 mg of caffeine in a single serving. In addition, social media-trending customized beverages contained up to 58.6 g of total sugar or 254.69 mg of caffeine per serving. Taken together, these amounts may exceed the recommended limits for free sugar (<10% of daily energy intake, World Health Organization) and caffeine (≤2.5 mg/kg of body weight, Ministry of Food and Drug Safety, Korea) for children and adolescents, highlighting the need for caution in this population. Going forward, continued monitoring of the nutritional composition of dessert café products is essential to keep pace with the rapidly evolving market.

P1-15

Microbial quality of fresh and frozen berry products in commercial distribution

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Berries are popular for their flavor and health benefits but are highly perishable and vulnerable to microbial contamination during storage and distribution. Fresh and frozen berries have occasionally been linked to foodborne outbreaks, highlighting the need for microbiological assessment. This study aimed to evaluate the microbiological quality of four types of berries-strawberries (*Fragaria* × *ananassa*), blueberries (*Vaccinium corymbosum*), and raspberries (*Rubus crataegifolius*, *Rubus idaeus*)-commercially distributed in Korea. Quantitative analyses of aerobic bacteria, coliforms, *Escherichia coli*, yeast/mold were conducted. A total of 92 samples were collected between April and May 2025, consisting of strawberries (n = 30; fresh and frozen), blueberries (n = 31; fresh and frozen), raspberries (*Rubus idaeus*, n = 15; frozen), and Korean raspberries (*Rubus crataegifolius*, n = 16; fresh). Aerobic plate counts were detected across all berry types, with the highest levels found in Korean raspberries (4.25 log CFU/g), markedly higher than those in strawberries (1.93 log CFU/g), blueberries (1.61 log CFU/g), and raspberries (0.60 log CFU/g). Coliforms were detected only in a few samples, with relatively higher counts in four Korean raspberry samples (average 1.76 log CFU/g), compared to other berry types. *E. coli* was not detected in any sample. Yeast and mold counts were relatively higher than aerobic plate counts, especially in Korean raspberries (5.41 log CFU/g), which exhibited significantly higher fungal levels compared to other berries ($p < 0.001$). According to the Korean Food Code, only frozen berries have established *E. coli* criteria, and all tested samples complied with these standards. These findings provide baseline data on the microbiological safety of berry products and emphasize the need for improved hygiene control during distribution.

P1-16

Results of safety testing on household chemical products (2024)

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This study was conducted to evaluate the chemical safety of sanitary supplies and hair cosmetics that are closely associated with daily life, with the aim of creating a safer consumer environment. From January to December 2024, a total of 121 samples (68 sanitary products and 53 hair cosmetics) were analyzed for multiple safety parameters, including formaldehyde, methanol, 1-hexene, 1-octene, fluorescent whitening agents, pH, dioxane, and heavy metals such as lead, arsenic, mercury, cadmium, nickel, and antimony. The results showed that most hazardous substances were not detected in sanitary products. Trace amounts of formaldehyde (up to 23 mg/kg) and lead (up to 4 mg/kg) were identified in a few samples; however, all levels complied with regulatory standards. In hair cosmetics, dioxane was detected at concentrations up to 5 μg/g, while heavy metals such as lead, arsenic, cadmium, mercury, and antimony were either below the quantification limit or within permissible thresholds. These findings demonstrate that the majority of household chemical products meet established safety standards and indicate that current regulatory measures are functioning effectively. Continuous monitoring and proactive inspections, particularly for vulnerable product categories and frequently used items, will be essential to further ensure consumer safety and strengthen public health protection. Keywords: household chemical products, sanitary products, hair cosmetics, safety assessment, heavy metals

P1-17

A study on the current status and limitations of existing consumption pattern data for developing a quantitative microbial risk assessment framework for novel foods

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Recent food consumption trends are rapidly changing due to the increasing elderly population, the rise of single-person households, and the growing demand for health-oriented products. Changes in food trends have led to the emergence of new food items such as home meal replacements (HMRs), protein-fortified foods, and foods for special medical purposes (FSMPs). Consequently, there is a growing need to assess the current status of microbial hazards associated with new foods and to establish appropriate regulatory frameworks. Quantitative microbial risk assessment requires data on food intake and consumption patterns. However, existing national databases such as the Korea National Health and Nutrition Examination Survey (KNHANES) and the Food Code primarily use raw material-based classifications, which do not adequately reflect the consumption patterns of novel foods. Therefore, this study first analyzed recent food trends to identify newly emerging food products, and then investigated the kinds of baseline consumption data required for conducting the quantitative microbial risk assessment of these products. According to analyses conducted by the Korea Rural Economic Institute (KREI), the most commonly consumed food items among Koreans include bread and bakery products, traditional snacks, processed meat products, instant and frozen foods, milk, and side dishes. Among these, HMR, protein-based foods, and FSMP have shown consistent increases in market share and consumption proportion. However, existing survey data alone (e.g., KNHANES, KREI Food Consumption Behavior Survey) are insufficient to assess their consumption patterns and potential microbial hazards. Therefore, complementary surveys that better reflect consumption patterns of novel foods, as well as the establishment of a risk assessment framework based on such data, are required. This study highlights the need for complementary data collection on the consumption patterns of novel foods to support quantitative microbial risk assessment and strengthen food safety management.

P1-18

Comprehensive microbial profiling and microbiological quality assessment of edible seaweeds in Korea: Including bacteria and fungi

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Seaweeds, rich in nutrients such as vitamin B and taurine, have attracted increasing attention not only in Asia but also in Western countries as a sustainable food source. However, the surface of seaweed provides a nutrient-dense environment conducive to microbial growth and biofilm formation, which makes them susceptible to contamination by pathogenic microorganisms and highlights the need for proper microbial management. This study collected distributed seaweed samples (n = 90) from April to June 2025; 50 laver (*Porphyra*), 20 kelp (*Saccharina japonica*), and 20 sea mustard (*Undaria pinnatifida*). Quantitative analysis of total aerobic bacteria, Escherichia coli/coliforms, and fungi were conducted, providing insights into both bacterial and fungal communities. Significant differences were observed in the average aerobic bacterial counts among the three seaweed types ($p < 0.001$), with laver exhibiting the highest average count (3.81 log CFU/g), followed by sea mustard (3.02 log CFU/g) and kelp (1.54 log CFU/g). Fungal counts were detected in 16 laver, 7 kelp, and 8 sea mustard samples, with 1.43, 1.04, and 1.24 log CFU/g on average, respectively. *E. coli* or coliforms were not detected in any of the seaweed samples. The results revealed interspecies variability in bacterial counts and affirming that seaweed typically displays low levels of fungal contamination. This study offers foundational data on bacterial and fungal populations in commercially distributed seaweed, which may contribute to quality control and food safety management in the seaweed industry.

P1-19

Antimicrobial resistance in *Pasteurella multocida* isolated from swine with respiratory disease: A two-year comparative study

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Pasteurella multocida is a major respiratory pathogen in swine, causing pneumonia and atrophic rhinitis, and resulting in considerable economic losses to the swine industry. With the widespread use of antimicrobials in livestock, antimicrobial resistance has been spreading, promoting the emergence of resistant bacteria in animals and posing potential health risks to consumers. Therefore, this study aimed to investigate the antimicrobial resistance patterns of *P. multocida* isolated from swine, in order to identify resistance trends and provide baseline data for antimicrobial usage strategies. During 2024-2025, *P. multocida* was isolated from lung tissue or nasal/pharyngeal swab samples collected from swine showing respiratory symptoms in Korea. A total of 35 isolates in 2024 and 33 isolates in 2025 were subjected to antimicrobial susceptibility testing against 18 antimicrobials. The results showed that resistance to 8 antimicrobials in both years, with particularly high resistance levels to oxytetracycline (48.6% in 2024, 53.8% in 2025) and florfenicol (22.9% in 2024, 57.7% in 2025). Over the two-year comparison, resistance rates increased by more than 10% for 4 antibiotics, with substantial rises in enrofloxacin by 27.1% and in florfenicol by 34.8%. In addition, isolates were susceptible to ceftiofur and tilmicosin in 2024, whereas resistance to these agents emerged in 2025. These findings highlight the current status of antimicrobial resistance in *P. multocida* from swine and suggest that the continued use of antimicrobials in livestock may contribute to increasing resistance rates. This study underscores the need for continuous monitoring of antimicrobial resistance in swine respiratory pathogens, as well as the importance of prudent antimicrobial use throughout the livestock industry.

P1-20

Assessment of veterinary drug residues in livestock products distributed in Korea using a multi-residue method

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Veterinary drugs are commonly used in livestock production to prevent and treat infectious diseases in cattle, thereby improving animal health and productivity. However, the misuse or overuse of veterinary drugs may lead to the presence of drug residues in livestock-derived foods, posing potential risks to human health, including antimicrobial resistance, allergic reactions, and toxic effects. Therefore, continuous monitoring of veterinary drug residues in livestock products is essential for ensuring food safety and protecting public health. In Korea, safety inspections of livestock products are conducted at various stages of production and distribution, in accordance with the Maximum Residue Limits (MRLs) and the Positive List System (PLS). In this study, a total of 178 samples of beef and pork collected from domestic markets were analyzed for veterinary drug residues using a validated multi-residue method based on liquid chromatography-tandem mass spectrometry (LC-MS/MS). Among the samples tested, 17 were found to contain detectable residues. Importantly, all detected levels were below the established MRLs, indicating compliance with Korean food safety standards. These findings suggest that the current monitoring system in Korea is effective in controlling veterinary drug residues in livestock-derived foods, while also emphasizing the need for continuous surveillance to minimize potential public health risks. [This research was supported by a grant (No. 23191MFDS279) from the Ministry of Food and Drug Safety of Korea in 2025.]

P1-21

Effects of addition of green tea extract to mealworm chitosan film on the shelf life of pork patties

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The development of functional packaging materials has become a critical issue in the field of food science. Chitosan, a widely abundant natural biopolymer, has film-forming properties and biodegradability. In this study, we explored mealworm (Tenebrio molitor) as an eco-friendly and novel alternative source of chitosan. Mealworm is a representative edible insect with high nutritional value and it contains approximately 5% chitosan. Green tea extract (GTE) is rich in tea polyphenols, serves as a fine natural antioxidant. Therefore, this study aimed to develop a novel functional packaging film by incorporating GTE into a mealworm-derived chitosan matrix, and to evaluate its effects on the quality and shelf life of pork patties during cold storage. Fresh pork patties were packaged with four types of film: gelatin film, mealworm chitosan film, and mealworm chitosan films containing 0.8% or 1.6% GTE. Then, patties were stored at 4°C for 25 days. As a result, the addition of GTE significantly enhanced the antioxidant properties and UV barrier capacity of the mealworm chitosan films. During cold storage, GTE-added mealworm chitosan films effectively hindered lipid oxidation and protein degradation in pork patties. Moreover, the composite films suppressed microbial growth and improved sensory quality of pork patties throughout the storage period. These finding demonstrate the potential of mealworm-derived chitosan as a functional edible film material, and highlight the synergistic role of GTE in enhancing the film's ability to prolong the shelf life of food products.

P1-22

A trend change in processed food consumption and intake rates in koreans using data from the national health and nutrition examination survey (2014-2023)

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This study analyzed data from the Korea National Health and Nutrition Examination Survey (KNHANES) conducted from 2014 to 2023 to examine trends in processed food consumption in Korea. Processed foods were classified into 24 groups according to the Korean Food Code established by the Ministry of Food and Drug Safety (MFDS). Three indicators were utilized: per capita intake (g/person/day), daily intake frequency (times/person/day), and intake rate, calculated based on individual identifiers. In 2023, the highest per capita intakes were observed for alcoholic beverages (562.99 g), followed by milk products (235.80 g), foods for special medical purposes (232.30 g), beverages (173.70 g), and prepared meals (163.45 g). From 2014 to 2023, the most notable increases were seen in alcoholic beverages (+80.34 g), followed by prepared meals (+57.14 g), soybean curds or muk (Starch Jellies) (+45.26 g), beverages (+35.34 g), and processed meat products and packaged meats (+31.29 g). Recent data indicate that beverages have the highest intake rate (0.59) and daily intake frequency (1.56), followed by confectioneries, breads, or rice cakes (0.20; 1.31), milk products (0.19; 1.32), and alcoholic beverages (0.12; 1.34). These findings elucidate the scope and distribution of processed food consumption in Korea over the past decade and provide valuable insights for food surveillance efforts for consumer protection.

P1-23

Monitoring of pesticide residues for agricultural products distributed in the Gangseo area of Seoul in 2024

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This study investigated pesticide residues in 2,465 agricultural products distributed in the Gangseo area of Seoul in 2024. Sample preparation was performed using the quick, easy, cheap, effective, rugged, and safe (QuEChERS) method in accordance with the Food Code (Korea) Multi-Residue Pesticide Analysis Method II, and a total of 470 pesticides were analyzed by liquid chromatography-tandem mass spectrometry (LC-MS/MS, 223 compounds) and gas chromatography-tandem mass spectrometry (GC-MS/MS, 247 compounds). Among the samples, 57 (2.3%) exceeded the maximum residue limits (MRLs), and 799 (32.4%) contained pesticide residues within standard limits. By commodity group, vegetables showed the highest number of MRL violations (50 cases, 2.4%), of which leafy vegetables accounting for the majority (42 cases, 3.5%). The most frequently detected pesticides exceeding MRLs were terbufos (7 cases), diazinon (6 cases), and phorate (5 cases). Detection rates were highest in fruits (60.0%), followed by vegetables (35.3%) and spices (34.8%). For risk assessment, the estimated daily intake (EDI) of pesticides in fruits, which showed the highest detection rate, was compared with the acceptable daily intake (ADI). The results ranged from 0.0058% to 9.4047% of ADI, indicating that the pesticide exposure levels were within safe limits.

P1-24

A study on the safety assessment of tar dyes in processed foods in Korea

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Tar dyes, also known as petroleum-based synthetic food colorants, are artificial additives that have been widely used to enhance the appearance of processed foods. Concerns regarding their potential health risks have led to strengthened international regulations. Recently, the U.S. Department of Health and Human Services (HHS) and the Food and Drug Administration (FDA) announced the official phased withdrawal of eight representative tar dyes (Citrus Red No. 2, Orange B, Green No. 3, Red No. 40, Yellow No. 5, Yellow No. 6, Blue No. 1, and Blue No. 2). This study evaluated the current safety status of processed foods distributed in Korea. A detailed monitoring and analytical survey was conducted of major processed foods marketed over the past three years, including sauces, noodles, pickled products, and frozen foods. The analysis of 548 tested samples showed that none of these dyes were detected (ND), thus scientifically confirming the safety of processed foods currently available in the Korean market. This study demonstrates that the domestic food manufacturing and management system is responding promptly to global regulatory changes and contributing to the supply of safe foods to consumers. Furthermore, it provides baseline data to support the development of response strategies in the Korean food industry under strengthened international regulations on food additives.

P1-25

Persistence of pathogenic *Escherichia coli* on cross-contaminated food-contact surfaces simulating seasoning containers: Impact of nutrient residues on survival

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Yukhoe, a traditional Korean raw beef dish, is a traditional Korean food widely enjoyed domestically and internationally. Pathogenic *Escherichia coli* from Yukhoe can cross-contaminate food-contact surfaces, thereby representing a significant food safety concern. This study investigated the survival of pathogenic *E. coli* on polyethylene terephthalate (PET) coupons simulating seasoning container surfaces. To reproduce real handling conditions, Yukhoe inoculated with pathogenic *E. coli* was first pressed onto latex gloves, and the cross-contaminated gloves were subsequently pressed onto PET coupons under 0.2 kg/cm^2 pressure for 1 minute each. Cross-contaminated PET coupons were stored at 5°C, 25°C, and 35°C for up to 35 days, with bacterial survival assessed quantitatively and qualitatively. A control group without nutrient residues derived from Yukhoe was also tested. Pathogenic *E. coli* survived longest at 5°C regardless of nutrient residues, remaining quantifiable until day 35 with nutrient residues, whereas without residues both quantitative and qualitative detection was no longer observed after day 21. At 25°C, nutrient residues supported survival, with pathogenic *E. coli* were quantifiable up to day 14 and persistence was confirmed qualitatively through day 35. In the absence of residues, quantitative detection was undetectable from day 14 and qualitative detection by day 28. At 35°C, survival was the shortest. With nutrient residues, pathogenic *E. coli* was still quantifiable for up to 14 days, although only qualitative detection persisted thereafter until day 35. Without residues, quantitative detection was absent from day 1 and no qualitative detection was observed beyond day 28. These results demonstrate that nutrient residues markedly prolong the survival of pathogenic *E. coli* on food-contact surfaces, particularly under refrigeration. The findings emphasize the importance of strict hygiene and sanitation practices to minimize the risk of prolonged microbial persistence and subsequent foodborne illness.

P1-26

Py-GC/MS as a reliable strategy for evaluating food-contact polymeric materials and additives

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Food-contact polymeric materials (UCPs), including utensils, containers, and packaging, are widely used in food applications. However, labeling typically specifies only the main polymer, omitting minor constituents and potentially safety-related additives. Conventional FT-IR methods are effective for single polymers but limited for detecting minor components in composites. This study evaluated pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS) for comprehensive UCP characterization, with a focus on the additive tris(2,4-di-tert-butylphenyl) phosphite (TDTB-PO3) and its oxidized form, tris(2,4-di-tert-butylphenyl) phosphate (TDTB-PO4). Thirty commercial samples were analyzed using evolved gas analysis-MS (EGA-MS) and flash Py-GC/MS for polymer identification, along with thermal desorption-GC/MS (TD-GC/MS) for additive screening and quantification. Results showed consistent labeling for utensils and containers, while several packaging samples were misclassified or composite, such as wax-coated paper or polyethylene blended with nylon-6. Additives including paraffin wax, antioxidants, stabilizers, and plasticizers were detected. TDTB-PO3 and TDTB-PO4 levels ranged from 30 to 140 μg/g, well below the FDA threshold of 0.2%. Recovery rates of 80-100% with RSD <10% confirmed method accuracy and precision. Overall, Py-GC/MS proved to be an efficient and reliable strategy for simultaneously assessing polymer types, composite structures, and additive contents in UCPs. Acknowledgements: This work was supported by a grant (24192MFDS044) from the Ministry of Food and Drug Safety in 2025

P1-27

Monitoring assessment of biogenic amines including histamine in seafood

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Biogenic amines (BAs) are nitrogen compounds primarily produced by the decarboxylation of amino acids by microorganisms. Consuming seafood rich in BAs can act as neurotransmitters in the body and affect the cardiovascular system, including blood pressure regulation and blood flow disorders. Furthermore, BAs are not easily destroyed by heating, smoking, or freezing. This study aimed to monitor 11 types of BAs in seafood samples, including raw and processed foods, collected from 2018 to 2024. Among the 11 BAs monitored-tryptamine, phenylethylamine, putrescine, cadaverine, histamine, serotonin, tyramine, spermidine, noradrenaline, dopamine, and spermine-histamine is the only compound with established regulatory limits. It is considered the primary target substance for safety management in aquatic products. In this study, none of the 193 samples exceeded the recommended safety threshold for histamine. This indicates that all analyzed aquatic products complied with current safety standards regarding histamine content. Other BAs have been detected in seafood at varying concentrations. This surveillance highlights the importance of continuous monitoring of BAs in aquatic products to ensure consumer safety and maintain quality standards. These test results provide essential data for seafood risk assessment and demonstrate the need for ongoing monitoring of BAs in seafood.

P1-28

Lightweight object detection model for real-time imported food safety management

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When consuming imported foods, it is important that their safety is guaranteed and their ingredients are clearly identified in a real time manner because the foreign products do not always meet the safety standards of importing country. In addition, even though many people consume the same food, individual allergies and health conditions vary, which makes it essential to have personalized information about the product. To tackle these issues, we designed safety information model customized to each age group and patient types regarding 100 kinds of imported foods which is most commonly consumed in South Korea. Then, we implemented a noble AI system that makes this information easily accessible by taking a picture via a digital camera. In particular, since the customized information should be easily and rapidly available to consumers via their portable devices (e.g. smartphone), a lightweight design for the AI model is also essential. To this end, we also proposed a compact and optimized model which is designed to minimize computational overhead of the legacy convolution operations of YOLOv11 by changing it to Depthwise Separable Convolution (DSC) and omitting P3 and P4 from the network head while maintaining detection accuracy. To validate the performance, we conducted several experiments using our original dataset for 100 kinds of imported food, and confirmed that the proposed AI model simultaneously provides high detection accuracy and low computational overhead. As a result, when the proposed model is applied to a smart phone based edge system, consumers can be easily provided food safety information in real time. Acknowledgments: This research was supported by a grant (no. 21163MFDS518) from Ministry of Food and Drug Safety of Korea.

P1-29

Investigation of radioactive and heavy metal contamination in seafood distributed in the Jeju area

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To ensure the safety of distributed seafood, 161 marine products in circulation in Jeju in 2025 were analyzed for gamma nuclides (^{134}Cs, ^{137}Cs, ^{131}I, ^{40}K), the beta nuclide ^{3}H, and heavy metals (lead, cadmium, arsenic, and mercury). Analysis of radioactive materials revealed that the naturally occurring radionuclide ^{40}K had a concentration range of 42.96 to 598.42 Bq/kg. The artificial radionuclides ^{134}Cs, ^{137}Cs, and ^{131}I all showed values below the minimum detectable concentration (MDA). Tritium (^{3}H) was also analyzed in 72 cases and found to be below the MDA. For heavy metals in fish and mollusks, lead was in the range of not detected to 0.05 mg/kg, cadmium was not detected to 0.092 mg/kg, and arsenic was in the range of 0.174 to 38.32 mg/kg. All samples containing heavy metals were found to be within the acceptable standards. The results of this study suggest that continuous monitoring of radiation is necessary to alleviate public anxiety about radioactive contamination. This data can also serve as a basis for establishing heavy metal management standards for contaminants that currently have no established limits.

P1-30

Risk assessment of physicochemical deterioration in Atlantic salmon (*Salmo salar*) under long-term frozen storage and post-thaw conditions

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Frozen storage is a common method for preserving seafood. However, extended freezing and subsequent thawing may accelerate physicochemical deterioration, thereby affecting product quality and consumer safety. This study investigated the effects of different freezing durations (0, 1, 5, 15, and 30 days at -18°C) on the post-thaw quality of Atlantic salmon (*Salmo salar*) during subsequent storage at 5 and 15°C. Quality indicators included drip loss, thiobarbituric acid reactive substances (TBARS), texture profile analysis (TPA), and fatty acid composition. Drip loss significantly increased with longer freezing durations (0.48 to 2.35 g/100 g, $P<0.05$), and TBARS values increased from 0.43 to 0.93 mg MDA/kg, indicating enhanced lipid oxidation. Texture parameters (hardness, gumminess, and chewiness) progressively declined with extended freezing and elevated storage temperatures, reflecting myofibrillar degradation. Notably, polyunsaturated and monounsaturated fatty acids (PUFAs and MUFAs) appeared to increase during storage, a trend attributed to the release of membrane-bound fatty acids due to tissue disruption and drip-associated concentration effects rather than genuine nutritional enhancement. These findings suggest that long-term frozen storage and high post-thaw temperatures synergistically accelerate quality deterioration in salmon, underscoring the importance of integrated monitoring of physicochemical parameters for seafood risk assessment and improved cold chain management. This research was supported by the Main Research Program (E0211001-05) of the Korea Food Research Institute (KFRI) funded by the Ministry of Science and ICT.

P1-31

Predictive algorithms for overlapping and co-administration safety based on the cross-nutrient database

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The concurrent intake of dietary supplements and pharmaceuticals is rapidly increasing, raising concerns about safety risks from both overlapping and co-administration. This study aimed to establish the Cross-Nutrient Database (CNDB), a Neo4j-based graph database integrating ingredient information, and to develop predictive algorithms for overlapping intake and co-administration safety to enhance consumer safety and regulatory support. The overlapping intake algorithm assesses risks from excessive consumption of the same ingredient across products by combining ingredient data with dietary survey intake imputed using Minimum Habitual Intake (MHI), and then estimating hazard quotients (HQ) against upper intake levels (ULs). The co-administration algorithm evaluates risks from different ingredients taken together by generating combinations and applying a rule-based scoring system informed by toxicity databases, ADME data, CTD, and literature reviews, accounting for absorption competition and synergistic toxicity. The overall framework operates as two parallel pathways-overlapping intake and co-administration-whose outcomes are integrated into a combined result providing a comprehensive safety profile. This architecture enables simultaneous evaluation of over-intake and interaction risks, improving the accuracy and applicability of safety assessment. In a persona-based scenario, a 30-year-old male consuming four dietary supplements for joint health, weight management, liver health, and minerals was analyzed. In overlapping intake analysis, total EPA and DHA intake was 73 mg/day, below both the minimum (500 mg) and maximum (2,240 mg) reference levels, and thus classified as under threshold. In co-administration analysis, evidence indicated potential interactions, including 1 ADME finding, 9 CTD disease associations, 42 gene targets, and 3 literature reports, classified into a risk level. Beyond algorithmic design, this study highlights practical applications. The system provides personalized guidance for consumers, risk analysis for policymakers, and decision support for industry and researchers. The CNDB-based algorithms offer real-time predictions, bridging the gap between product development and consumer safety, and supporting regulatory oversight and informed choices.

P1-32

Safety and quality assessment of fish by-products from Atlantic salmon and olive flounder for value-added utilization

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Fish by-products are increasingly recognized as a resource with nutritional and industrial potential, but systematic evaluations of their sanitary safety and hygiene management remain limited. This study aimed to evaluate their potential for safe and value-added utilization in food and related industries. To clarify sanitary safety and potential risks, we measured total viable cell count (TVC), coliforms, total volatile basic nitrogen (TVB-N), and heavy metals (Pb, Cd, and As). Additionally, to determine nutritional and functional value, we assessed proximate composition, amino acid composition, free amino acids, selected minerals (e.g., calcium, iron, zinc), and histamine levels. All samples maintained freshness with TVB-N values below the regulatory limit of 20 mg%, with olive flounder viscera showing a relatively high level of 15.54 mg%. In contrast, some by-products of Atlantic salmon and olive flounder exhibited microbial contamination exceeding the food safety standard of 5 log CFU/g in TVC, and coliforms were detected in all samples except for olive flounder skin. This study provides a comprehensive evaluation of the microbiological and chemical characteristics of Atlantic salmon and olive flounder by-products, offering baseline data for future risk assessment and the development of guidelines for their safe utilization. This research was supported by Korea Institute of Marine Science & Technology Promotion (KIMST) funded by the Ministry of Oceans and Fisheries (02263222).

P1-33

Evaluation of *Staphylococcus aureus* biofilm formation and cross-contamination in a milk processing environment

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Staphylococcus aureus is a major foodborne pathogen frequently associated with milk products. In milk processing, stainless steel surfaces provide conducive sites for biofilm formation, and these biofilms can spread via cross-contamination, posing a significant threat to product safety. This study evaluated *S. aureus* biofilm formation and cross-contamination potential in different media and contact by simulating milk processing environments. *S. aureus* biofilms formed on stainless steel surfaces in ultra-high temperature (UHT) milk, tryptone soy broth (TSB; nutrient-rich medium) and phosphate-buffered saline (PBS; nutrient-deficient medium). Cross-contamination was assessed by transference after immersing in liquid media (UHT milk and PBS) and by contacting with solid packaging surfaces including glass, polyethylene (PE), and polyethylene terephthalate (PET). Biofilms were scraped with a cell scraper to recover sessile cells. Biofilm biomass was 8.643 ± 0.368 log CFU/cm^2 in TSB, 7.592 ± 0.210 log CFU/cm^2 in UHT milk, and 6.903 ± 0.172 log CFU/cm^2 in PBS. Biofilm biomass was highest in TSB, but EPS content was highest in UHT milk with carbohydrates 41.87 ± 2.69 μg/mL and proteins 14.03 ± 1.45 μg/mL. Cross-contamination transfer rates were highest in biofilms formed in milk, which correlated with the lowest observed cell hydrophobicity (23.146 ± 1.117%). These results highlight the risk of cross-contamination with *S. aureus* biofilm in milk, which poses a safety risk to food products.

P1-34

Safety evaluation of cutting board oils and waxes for wooden kitchen utensils

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Wooden kitchen utensils have gained popularity for their eco-friendliness and aesthetic appeal; however, their porous nature makes them susceptible to cracking, deformation, and microbial contamination. To address these challenges, maintenance products such as oils and waxes are commonly applied to prevent drying and improve water resistance. Nevertheless, insufficiently refined oils or waxes may contain harmful substances that can migrate into food and pose potential health risks. While the European Union regulates food contact materials under EC No. 1935/2004, specific domestic and international standards for cutting board oils and waxes remain lacking. In this study, pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS) was employed to analyze the major components of cutting board oils and waxes, and solvent-extraction GC/MS was also conducted to evaluate the presence of compounds listed in regulatory frameworks for hazardous substances in food-contact oils. The findings are expected to provide essential data for establishing management criteria to ensure the hygienic and safe use of wooden utensils, while also offering both academic and practical evidence to strengthen food safety management systems for household chemical products. Acknowledgements: This work was supported by a grant (24192MFDS043) from the Ministry of Food and Drug Safety in 2025

P1-35

Microbiological safety assessment of selected agricultural by-products for potential food applications

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Agricultural by-products such as pear pomace, apple pomace, and soybean curd residue are gaining attention as sustainable raw materials and functional ingredients. However, ensuring their microbiological safety is essential before their use in food systems. This study evaluated the microbial quality of selected by-products, including heat- and freeze-dried pear pomace, apple pomace, and soybean curd residue. Microbiological analyses were conducted to determine total aerobic counts, *Escherichia coli*, coliforms, yeasts and molds, and the presence of major foodborne pathogens (*Salmonella* spp. and *Bacillus cereus*). Total aerobic bacteria were highest in apple pomace (6.61 log CFU/mL), moderate in soybean curd residue (3.99 log CFU/mL), and lowest in pear pomace [2.68 (heat-dried) and 1.69 (freeze-dried) log CFU/mL]. Coliform levels were also highest in apple pomace (4.93 log CFU/mL). *E. coli* was not detected in heat-dried pear pomace, apple pomace, or soybean curd residue, but was present at 1.56 log CFU/mL in freeze-dried pear pomace. Yeast and mold counts were 7.55 log CFU/mL in apple pomace and 2.00-2.49 log CFU/mL in pear pomace and soybean curd residue. Neither *Salmonella* spp. nor *B. cereus* were detected in any sample. These findings indicate that agricultural by-products can vary in microbial load, with apple pomace showing the highest counts. Thus, appropriate hygienic handling, drying operations, and storage control are necessary to ensure the safe and sustainable utilization of these materials in food applications.

P1-36

Enhancing safety and functional properties of anchovy sauce by-products through reaction flavor and microencapsulation technology

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Anchovy sauce, a traditional Korean fermented seafood product, is widely utilized in kimchi fermentation and various culinary applications. However, its industrial applicability and consumer acceptance were restricted by excessive salt content, pronounced fermentation-derived odor, and the accumulation of biogenic amines. This study aimed to develop a value-added product from anchovy sauce residue (AR) through reaction flavor induction (ARF) followed by microencapsulation (ARFP), in order to reduce biogenic amine formation while preserving bioactive constituents. AR was thermally processed and filtered to obtain control (ARC), after which amino acid precursors (threonine, glutamic acid, and glycine) were incorporated and reacted at 98°C for 2 h to generate ARF. The ARF was spray dried under the optimal condition (cyclodextrin (20%, w/w) and gum arabic (6.22%, w/w), inlet temperature was 162.42°C, and feeding rate was 300 mL/h) determined by response surface methodology (RSM). Biogenic amine evaluation revealed that ARFP induced a 79.5% reduction in histamine and an 89.1% reduction in putrescine compared to ARC, meeting the safety standards of international and Korean regulations, including those of the EU (100 mg/kg) and the FDA (50 mg/kg). Functional analysis revealed that ARF exhibited high antioxidant capacity, as indicated by its DPPH radical scavenging activity (88.23%) and ACE inhibitory activity (89.86%). After encapsulation, ARFP retained substantial bioactivity, including antioxidant and anti-inflammatory properties. Overall, these results confirmed that combining reaction flavor induction with microencapsulation constituted a viable strategy to decrease biogenic amine accumulation while conserving functional compounds in anchovy sauce residues. This research demonstrates the feasibility of value-added utilization of seafood fermentation by-products and their potential industrial applications in the global functional food.

P1-37

Monitoring of heavy metals (Lead, Total mercury, Cadmium, Total arsenic, and Inorganic arsenic(Ⅲ, Ⅴ)) in health functional food

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This study was carried out to assess the risk with heavy metal standards in health functional foods distributed in the market. In order to improve the current heavy metal specifications (Lead, Total mercury, Cadmium, Total arsenic, and Inorganic arsenic (III, V)) for health functional foods by reflecting recent consumption patterns, we selected the top 20 functional food ingredients based on high consumption, high intake frequency, and contamination levels of each heavy metal. Approximately 305 samples of health functional foods were collected and analyzed. Each heavy metal was analyzed in accordance with the test methods for hazardous substances in the Food Code, specifically for Lead, Total mercury, Cadmium, Total arsenic, and Inorganic arsenic (III, V). Method verification was performed using KRISS certified reference materials (108-01-008, 108-02-004) and a reference material (FAPAS T07499QC) to ensure analytical reliability. In addition to monitoring items for which regulatory standards already exist, items without established specifications were also analyzed. This allowed us to both secure foundational data for the improvement of heavy metal standards in health functional foods and confirm that the current heavy metal levels in these products are being managed safely. Acknowledgements: This research was supported by a grant (25192MFDS007) from Ministry of Food and Drug Safety in 2025.

P1-38

Development of a system for identifying off-odor compounds originating from paper box

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The paper-based materials are widely used in packaging due to their sustainability and convenience. However, during storage, paper packaging can emit off-odors caused by volatile compounds, potentially affecting product quality and consumer perception. Volatile compounds were analyzed using gas chromatography-ion mobility spectrometry (GC-IMS). A total of 13 compounds were identified in the unprocessed paper box sample, including 5 aldehydes, 3 alcohols, 1 terpene and 5 ketones. In the processed paper box sample, 18 compounds were detected, consisting of 6 aldehydes, 4 alcohols, 1 sulfur, 1 ester and 6 ketones. The results reveal significant differences in volatile composition between the two samples, highlighting the influence of processing on odor formation. These results establish a solid basis for advancing odor management in paper-based packaging systems and for enhancing the sensory attributes of packaged products.

P1-39

Development of the food list, food sampling, and preparation for Total Diet Study in Korea

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The Total Diet Study (TDS) is an approach for estimating and monitoring dietary exposures to chemical residues that may be present in food at levels harmful to human health. Unlike traditional methods that analyze raw food ingredients, the TDS focuses on cooked foods, providing exposure estimates that are closer to real-life consumption patterns. This study was conducted to establish a methodology for the preparation of analytical samples for TDS in Korea. First, a food list representing the recent typical diets of Koreans was developed based on the standardized procedure using 552 items appearing in the dietary intake data of 2016-2019 Korea National Health and Nutrition Examination Survey. According to the criteria for selecting food items, 307 items were selected: those that were within 95% of cumulative intake, had a consumption frequency of 1% or higher, and contributed to 95% of cumulative intake of fat. Second, selected food items were collected from 17 supermarkets in the eight largest cities in Korea. Each food item from the 17 supermarkets was pooled in equal amounts, to create composite samples, which were then cooked. Cooking methods were selected by matching each food type with a corresponding method used in cooking more than 5% of the intake amount of each food or with more than 5% frequency of use. As a result, 1,259 'food and cooking method' pairs were extracted. Prior to cooking, food items are pooled by mixing equal quantities from different brands and distribution channels to produce composite samples. Foods were then cooked using the selected methods. After cooking, all samples were homogenized and stored at -80°C until analysis (This research was supported by a grant (24192KFDA038) from Korea Food & Drug Administration in 2025).

P1-40

Isolation, identification, and confirmation of *Listeria innocua* from enoki mushroom (*Flammulina velutipes*) from commercial products

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A multinational *Listeria monocytogenes* outbreak occurred from 2016 to 2020, linked with enoki mushroom imported from Korea. Thus, in this study, a total of 15 enoki mushroom (*Flammulina velutipes*) samples were purchased from 3 major supermarkets in Korea to identify the prevalence of *Listeria* spp. in enoki mushroom. Isolation of *Listeria* spp. was carried out with pre-enrichment and enrichment using *Listeria* enrichment broth and Fraser broth, respectively. Out of 15 samples, 11 samples were confirmed to be positive (73.3%) for *Listeria* spp. on PALCAM agar. Of 11 positive samples, 55 suspected *Listeria* spp. colonies (n=5) were selected and subjected to colony PCR. By colony PCR, 11 colonies were confirmed to be positive for the *hylA* gene and the *inl* gene. All 55 suspected *Listeria* colonies were further analyzed by 16S rRNA sequencing, and all the colonies were confirmed to be *Listeria innocua* ATCC 33090. Furthermore, based on the phylogenetic tree constructed from 16S rRNA gene sequences, our isolate was grouped with *Listeria innocua*, indicating a close genetic relationship.

P2

P2-01

Method validation for the determination of mecoprop-p in agricultural commodities using quechers extraction and lc-ms/ms

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A reliable analytical method for the determination of Mecoprop-p, a phenoxyalkanoic acid herbicide used to control broadleaf weeds in cereal crops, was developed and validated using the QuEChERS extraction procedure coupled with liquid chromatography-tandem mass spectrometry (LC-MS/MS). As no maximum residue limits (MRLs) for Mecoprop-p have been established by CODEX, the development of a validated method is essential for residue monitoring and food safety assessment. The method employed the EN QuEChERS approach with PSA and $MgSO_4$ for sample clean-up. Excellent linearity was achieved over the concentration range of 0.001-0.075 mg/L, with correlation coefficients (R^2) exceeding 0.99. Method validation was conducted across five representative agricultural commodities. Mean recoveries of Mecoprop-p at three spiking levels (LOQ, 10×LOQ, and 50×LOQ; n = 3) ranged from 91.1% to 105.1%, with relative standard deviations (RSDs) below 9.0%. These results meet the residue analysis criteria set by CODEX guidelines, demonstrating the method's accuracy, precision, and robustness. Consequently, the proposed method is suitable for the detection and quantification of Mecoprop-p in agricultural products and can serve as a reference method for future MRL establishment.

P2-02

Development and validation of an Internal standard-based quantitative method for Vitamin D3

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Vitamin D3 (cholecalciferol) plays a critical role in the absorption and metabolism of calcium and phosphorus, and its deficiency can lead to various health issues such as osteoporosis and rickets. However, due to its fat-soluble nature, the sample preparation process is complicated, and analyte loss frequently occurs during analysis. In addition, methods based on external standard calibration often show variability within and between laboratories, resulting in poor reproducibility. To address these limitations, this study introduced Vitamin D2 as an internal standard to compensate for analyte loss and to establish a more accurate and reproducible method for the quantification of Vitamin D3. In this study, Food samples were spiked with Vitamin D2 as an internal standard and analyzed by HPLC-PDA with a six-port switching valve. Validation followed AOAC guidelines, assessing specificity, linearity, LOD, LOQ, accuracy, and precision. Linearity was determined from calibration curves using varying concentrations of Vitamin D3 and Vitamin D2. Accuracy was evaluated via recovery tests, and precision was assessed as intra- and inter-day RSD (%). The internal standard method showed improved repeatability and reproducibility compared with the external standard. Calibration curves showed excellent linearity ($R^2 > 0.999$), recoveries ranged from 70-110%, and precision tests indicated satisfactory RSD values. Statistical analysis ($p < 0.05$) confirmed that accuracy and reproducibility were significantly enhanced. In conclusion, the proposed quantification method for Vitamin D3, employing an internal standard, successfully overcame the limitations of conventional approaches. The method was validated in accordance with AOAC guidelines and demonstrated applicability in real food samples. Therefore, this method is expected to serve as a reliable standard analytical procedure for Vitamin D3 determination.

P2-03

The bio-safety of artificial intelligence-designed recombinant peptide delivery systems expressed in *E. coli* for improvement of memory

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We designed four different recombinant proteins as peptide delivery systems to efficiently transport functional peptides into target cells and tissues using artificial intelligence (AI). In this study, we investigated the safety of AI-designed *de novo* peptide delivery systems expressed in *Escherichia coli* for potential applications in memory enhancement. The four peptide delivery systems were expressed in several *E. coli* expression hosts, showing variable expression levels depending on the host strain. Optimal conditions for protein expression were identified, and the target proteins were subsequently purified. The purity of the recombinant proteins was confirmed by SDS-PAGE analysis. To evaluate bio-safety, the purified proteins were applied to various cell types, including murine macrophage RAW264.7 cells, mouse hippocampal neuronal HT22 cells, human brain microglial HMC3 cells, and human monocytic THP-1 cells. In vitro results suggested that the AI-designed peptide delivery systems were safe for cellular treatments. Mass spectrometry analysis will be conducted to further assess the stability of the purified proteins. In addition, the memory-enhancing effects of these peptide delivery systems will be evaluated using a mild cognitive impairment animal model with the passive avoidance test. This work was results of a study on the “Glocal University” Project, supported by the Ministry of Education and National Research Foundation of Korea (No. GLOCAL-202504430001). Key words: bio-safety, recombinant protein, mild cognitive impairment, passive avoidance test

P2-04

Validation of Korean Food Code standards in commercially distributed honey

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Honey is a widely consumed natural product, valued not only for its nutritional and sensory properties but also for its role as a functional food ingredient. However, issues such as adulteration, unauthorized additives, and improper storage conditions can compromise its quality and safety. Therefore, ensuring the authenticity and regulatory compliance of honey is critical for protecting consumer health and maintaining market reliability. In this study, a total of 31 commercial honey samples were collected from domestic markets and analyzed to evaluate compliance with the specifications stipulated in the Korean Food Code. The parameters examined included hydroxymethylfurfural (HMF), sucrose, fructose, glucose, moisture and acidity. These parameters were analyzed using official Korean Food Code methods, while synthetic food colorants were analyzed using Japanese Official Methods of Analysis (JOMA) and Saccharin sodium was analyzed using an LC-MS/MS method. Results showed that all parameters complied with the regulatory standards. The findings of this study are expected to contribute to strengthening consumer confidence in honey quality and provide useful insights for improving safety management in the domestic honey industry.

P2-05

Analytical method development for colistin in livestock and fishery products using high performance liquid chromatography-tandem mass spectrometry

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Colistin (polymyxin E) is a cationic, non-ribosomal peptide antibiotic that exerts broad-spectrum antibacterial activity against Gram-negative bacteria by disrupting the bacterial membrane and inducing cell death. After several years of clinical use, its application in humans declined due to reports of significant nephrotoxicity and neurotoxicity. Nevertheless, colistin continues to be extensively used as a feed additive and veterinary drug in food-producing animals. Given this toxicity, the occurrence of colistin residues in livestock and aquatic products may pose potential risks to human health. Therefore, the development of a reliable analytical method for the quantification of colistin residues in livestock and fishery products is urgently required. In this study, we developed a high-performance liquid chromatography-tandem mass spectrometry (HPLC-ESI-MS/MS) method for the determination of colistin A and B in livestock and fishery products. Samples were extracted with 1.0 mol/L hydrochloric acid (10% formic acid solution for shrimp) and purified using HLB cartridges. Analytes were separated from matrix components with a reversed-phase column under acidic mobile phase conditions. Matrix-matched calibration curves were linear ($R^2 > 0.99$) over the range of 0.008-0.16 mg/kg. The limits of quantitation (LOQ) ranged from 0.01 to 0.02 mg/kg across different matrices. Mean recoveries ranged from 80.51% to 109.10% at three fortification levels (1×LOQ, 1×MRL, and 2×MRL), with maximum coefficient of variation (C.V.) of 9.78%. The method fulfilled the requirements of the CODEX guidelines (CAC/GL-40). Due to its simplicity, sensitivity, and rapidity, the proposed method is satisfied for routine monitoring of colistin A and B in livestock and fishery products.

P2-06

Qualitative determination of halquinol analogues and metabolites in livestock and fishery products using LC-QTOF

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Halquinol is a veterinary drug used as a non-antibiotic growth promoter. It has been reported to prevent chronic diarrhea and improve feed efficiency in pigs. However, due to toxicological concerns, it has not been approved as a veterinary medicine or feed additive in the EU. This highlights the need for residue monitoring to protect consumer safety. In this study, a qualitative analytical method for Halquinol analogues and metabolites was developed using liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF). Sample preparation was optimized for representative livestock products (beef, pork, chicken, egg, milk) and fishery products (eel, flatfish, shrimp). Simplified extraction and purification steps were applied to reduce matrix interferences. The developed method meets the requirements of the Codex guideline (CAC/GL 71-2009). It also showed high reproducibility and reliability, supported by accurate mass measurements and clear MS/MS fragmentation patterns. Monitoring of livestock and fishery samples was conducted using the established method, and its practical applicability was confirmed. This study provides a basis for efficient monitoring of Halquinol analogues and metabolites and offers important data for future residue limit setting and risk assessment.

P2-07

Multiresidue determination of veterinary drugs in fishery products by LC-MS/MS

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The Positive List System (PLS) uniformly applies a default standard of 0.01 mg/kg for veterinary drugs without established Maximum Residue Limits (MRLs). Residue monitoring of veterinary drugs provides essential data for risk assessment and safety management of fishery products. This study monitored veterinary drug residues in domestically distributed fishery products. Target analytes were those specified in Article 8.3.1 of the Korea Food Code (Simultaneous Multi-Component Test for Veterinary Drugs in Livestock and Aquatic Products). They were analyzed by LC-MS/MS. Eighteen types of fishery products were tested, including saltwater fish, freshwater fish, crustaceans, and shellfish. Of the 222 samples, 190 (85.6%) showed no detectable residues. Among the 32 positive cases (14.4%), enrofloxacin was most frequently detected (14 cases, 43.8%). All detected concentrations were below the MRLs, indicating no residual risk to consumers. Continuous monitoring is essential to ensure food safety, and this study provides baseline data for the safety management of aquatic products in relation to veterinary drug use.

P2-08

Multi-residue analysis of residual substances in honey and royal jelly with LC-MS/MS using a modified QuEChERS method

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Pesticides, antimicrobial agents, antibiotics, and acaricides are widely used in apiculture and may directly or indirectly contaminate honey bee products, resulting in residues in honey and royal jelly. However, no analytical method currently allows simultaneous monitoring of these compounds in both matrices, prompting the development of a new method. Notably, flumethrin and nitrovin are listed in the Food Code with LC-UV methods, which require improvement. A simultaneous multi-residue method for 12 pesticides and veterinary drugs potentially present in honey bee products was developed based on a modified QuEChERS method. Analytes were extracted using water, 0.1% formic acid in acetonitrile, 4 g of $MgSO_4$, and 1 g of NaCl, followed by clean-up with 900 mg of $MgSO_4$ and 300 mg of C18. The method was validated according to CODEX guidelines (CAC/GL 71-2009), demonstrating recoveries ranging from 77.9% to 108.7% with relative standard deviations (RSDs) below 14%. The developed method conforms to international standards and facilitates international collaboration. Ultimately, this method offers a practical and time-efficient solution for laboratories to enhance food safety.

P2-09

Development of a simultaneous multi-residue LC-MS/MS method for prohibited and exempted veterinary drugs

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Current analytical methods in the Food Code for prohibited veterinary drugs require efficient improvement. Also, analytical methods for exempted veterinary drugs need to be newly developed following the implementation of the Positive Listing System (PLS). Therefore, a simultaneous multi-residue analytical method for prohibited and exempted veterinary drugs was established using LC-MS/MS. The method was developed to detect residues of 26 prohibited and exempted veterinary drugs in livestock (beef, pork, chicken, egg, milk, and fat) and fishery products (flatfish, eel, and shrimp). Extraction was performed using 1 mL of 0.1 M EDTA and 9 mL of 80% acetonitrile for livestock and fishery products, excluding milk, and with 10 mL of 80% acetonitrile for milk. Clean-up was carried out using 500 mg of C18 with acetonitrile-saturated hexane. The method was validated according to the CODEX guidelines (CAC/GL 71-2009). Recoveries and coefficients of variation (CV) for all analytes met the CODEX guidelines. No interfering peaks were observed at the retention times of the target analytes, and calibration curves exhibited acceptable linearity ($R^2 > 0.99$). This method improves the analytical efficiency for detecting residues of prohibited and exempted veterinary drugs in livestock and fishery products, thereby contributing to strengthened safety management of these products.

P2-10

Analysis method for strontium (^{89}Sr) in food

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Following the Fukushima nuclear power plant accident, public concern over radioactive contamination has significantly increased in countries geographically close to Japan. This concern has expanded beyond environmental issues such as air and water pollution to potential impacts on food safety. International monitoring of radionuclides in food has been carried out, and the regulatory guidelines for these radionuclides are based on the recommendations of the Codex Alimentarius Commission. In Korea, the Ministry of Food and Drug Safety has conducted annual surveillance and safety assessments of both domestic and imported food products since 2013. Routine monitoring primarily targets gamma-emitting radionuclides such as cesium and iodine; however, in cases where these radionuclides are detected, additional analyses for strontium and plutonium are also performed. In this study, an analytical procedure was established for strontium-89, a radionuclide with a relatively short half-life of approximately 50 days, which may accumulate in food following nuclear accidents. The ashed sample was transferred into a beaker, to which HNO_3 was added for dissolution. Sr resin column was prepared by Sr resin. Prior to sample loading, the column was preconditioned with of HNO_3. Following preconditioning, the sample solution dissolved in nitric acid was carefully loaded onto the Sr resin column. After the final drop had passed through the column, strontium isotopes were eluted with 10 mL of deionized water and collected in a plastic vial. The eluate was immediately subjected to liquid scintillation counter. This extraction chromatography procedure enabled the separation of strontium isotopes from interfering radionuclides, thereby facilitating accurate measurement. The concentration of ^{85}Sr was determined by high-resolution gamma spectrometry to calculate the chemical recovery yield. Since strontium isotopes can be incorporated into the human body and selectively deposited in bone tissue, leading to internal radiation exposure, continuous monitoring and reliable analytical methods are essential to ensure food safety.

P2-11

Validation of analytical method for diminazene, methomyl and tetramethrin in fishery products by liquid chromatography tandem mass spectrometry

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Diminazene, methomyl and tetramethrin are not covered by Food code analytical method (8.3.1 Simultaneous Multi-Component Analytical Method for Veterinary Drugs in Livestock and Fishery Products) for fishery product. This study was conducted to develop new analytical method to determine diminazene, methomyl and tetramethrin residues in fishery products. Diminazene, methomyl and tetramethrin were confirmed and quantified via liquid chromatography tandem mass spectrometry (LC-MS/MS) in the positive ion mode using multiple reaction monitoring (MRM). The sample was extracted with 0.2% formic acid in methanol, and purified with C18 powder. Chromatographic separation was performed on a C18 column (3.5 μm, 2.1 x 150 mm), and quantification was carried out by AB sciex 4500 mass spectrometer. The method validation was performed based on the Codex Alimentarius Commission (CAC) guideline. The limit of quantitation(LOQ) were 0.005 mg/kg for diminazene and 0.002 mg/kg for methomyl, tetramethrin . The linearity of the matrix(Flat fish, Eel, Shrimp) matched calibration curve (R^2) were ≥ 0.99 in the calibration range of 0.001 and 0.08 mg/kg. The average recovery rates were 72.6% to 107.7% at three fortification levels (1 x LOQ, 2 x LOQ, and 10 x LOQ) and the maximum coefficient of variation (C.V.) was 11.2%. This method is expected to improve the efficiency of monitoring veterinary drugs residues in fishery and livestock products, thereby enhance food safety.

P2-12

Improved detection of *Campylobacter* in chicken carcass samples using bolton broth supplemented with an additional antibiotic

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Campylobacter is a leading cause of foodborne illness, with poultry identified as a major reservoir. While Bolton broth is commonly used for selective enrichment, its efficacy is increasingly compromised by extended-spectrum β-lactamase (ESBL)-producing bacteria, resulting in reduced recovery of *Campylobacter*. To address this limitation, a new cephamycin supplement (Cephamycin No. 3), resistant to ESBL hydrolysis, was evaluated as an alternative selective agent. Pure culture assays were performed using reference and wild-type *Campylobacter* strains, along with wild-type ESBL-producing *Escherichia coli.* Cultures were incubated microaerobically at 42°C for 48 h in either standard Bolton broth or Bolton broth supplemented with Cephamycin No. 3. *Campylobacter* populations reached approximately 8 log CFU/mL in both media, while ESBL-producing *E. coli* was only recovered from standard Bolton broth and was completely inhibited in the Cephamycin No.3-supplemented medium. For poultry trials, rinse samples were obtained by washing 12 retail chicken carcasses with 400 mL of buffered peptone water. The rinse fluids were enriched under the same incubation conditions in either 2× blood-free Bolton broth or the same medium supplemented with Cephamycin No. 3, followed by plating onto mCCDA. Cephamycin No. 3 supplementation significantly enhanced detection, with all 12 samples (100%) testing positive, compared to only 4 of 12 samples (33%) with standard Bolton broth ($p < 0.05$). These results demonstrate that Cephamycin 3 markedly improves the selectivity of Bolton broth by effectively suppressing competing flora while supporting robust *Campylobacter* growth, thus enhancing detection sensitivity in poultry-based samples.

P2-13

Evaluation of cefoxitin- and cefotetan-supplemented bolton broth for the selective enrichment of *Campylobacter*

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Campylobacter frequently causes bacterial gastroenteritis worldwide, largely due to exposure to contaminated poultry. Selective enrichment using Bolton broth is a standard practice; however, its reliance on cefoperazone compromises performance in the presence of extended-spectrum β-lactamase (ESBL)-producing bacteria, which can overgrow and mask *Campylobacter* detection. This study evaluated cefoxitin and cefotetan-both stable against ESBL hydrolysis-as alternative selective supplements. Pure culture experiments were conducted using reference and wild-type *Campylobacter* strains, as well as wild-type ESBL-producing *Escherichia coli.* Cultures were incubated microaerobically at 42°C for 48 hours in either standard Bolton broth or Bolton broth supplemented with cefoxitin or cefotetan. *Campylobacter* reached approximately 8 log CFU/mL in all tested media, whereas ESBL-producing *E. coli* was completely inhibited in the cefoxitin or cefotetan-supplemented broth. For chicken trials, rinse samples were obtained by washing 20 retail chicken carcasses with 400 mL of buffered peptone water. The rinse fluids were enriched microaerobically for 48 hours at 42°C in either 2× blood-free Bolton broth, cefoxitin-supplemented 2× blood-free Bolton broth, or cefotetan-supplemented 2× blood-free Bolton broth, followed by plating on mCCDA. The number of *Campylobacter*-positive enrichments was significantly higher in the cefoxitin-supplemented group (18/20, 90%) and the cefotetan-supplemented group (16/20, 80%) compared to the standard Bolton broth (9/20, 45%) ($p < 0.05$). These findings indicate that cefoxitin or cefotetan supplementation effectively suppresses competing flora without inhibiting *Campylobacter* growth, thereby enhancing detection sensitivity in poultry samples.

P2-14

A vaildation of analytical method for cyhexatin, azocyclotin and fenbutatin oxide residue in agricultural products

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Cyhexatin, azocyclotin, and fenbutatin oxide are organotin acaricides that act by inhibiting *mitocondrial* ATP synthase, showing strong efficacy against mites. For cyhexatin, the residue is defined as the sum of azocyclotin and cyhexatin, while for fenbutatin oxide the residue is defined as *fenbutain oxide* itself; their MRLs range from 0.01-140 mg/kg depending on region and commodity. In this study, the quantitative analysis method of cyhexatin, azocyclotin, and fenbutatin oxide in food and agricultural products was verified by the Ministry of Food and Drug Safety. For the validation of this study, five agricultural products (mandarin, potato, soybean, hulled rice and pepper) were used as representatives. Samples were extracted using ethyl acetate: acetonitrile (1:1, 5% formic acid) to enhance extraction efficiency, followed by the QuEChERs (quick, easy, cheap, effective, rugged, and safe) Original method. Purification was performed using d-SPE with anhydrous magnesium sulfate and primary secondary amine (PSA), then filtered and analyzed by LC-MS/MS. The linear standard calibration curves were confirmed showing r-square values higher than 0.99 (coefficient of determination with calibration range). The results of mean recovery rates of cyhexatin and fenbutatin oxide were shown 74.6-102.0%, 73.8-102.0%. The RSDs were also shown less than 6.3%, 5.1% in all five samples. In summary, the proposed method for determination of cyhexatin and fenbutatin oxide residues in foods could be included in the Korean Food Code for enabling the safety management of pesticides.

P2-15

Optimization and validation of LC-MS/MS method for the determination of coating agents in food contact materials

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A LC-MS/MS method has been optimized and validated for the determination of coating agents, used to improve functionality in food equipment and container packaging. Determination was performed by high pressure liquid chromatography (HPLC) coupled to tandem mass spectrometry (MS/MS). Different mobile phases were tested to control the degree of the ionization and good performances were obtained for methanol/water with 0.1% formic acid and /or 20 mM ammonium acetate. Linearity was demonstrated for the agents in the range of 0.1-50 µg/kg. Limits of detection (LOD) (0.16 - 0.39 µg/kg) and limits of quantification (LOQ) (0.50-1.19 µg/kg). 1,4-Butanediol dglycidyl ether (BDDE) and 2-Methyl-4-isothiazolin-3-one (MIT) have acceptable recoveries using the extraction methods, specified in the Korean Standards and Specifications for Utensils, Containers, and Packages (Ministry of Food and Drug Safety Notification), in the range of 77-115% for levels between 1 and 20 µg/kg. Relative standard deviation (RSD) of recoveries were below 10.5%. Selectivity of the method was tested and no spectral interferences were observed in the appropriate retention times. The results are used as a basis to analyze the amount of usage restrictions or compliance with banned substances for products made of the relevant material and use it as basic data for safety management of devices and containers and packaging.

P2-16

Comparison study on sulfur dioxide (SO_2) test in food by monnier williams modified method and using liquid chromatography-tandem mass spectrometry (LC-MS/MS)

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This study was conducted to compare sulfur dioxide test methods, the Monnier-Willams method of the current Food Code, and the LC-MS/MS sulfur dioxide method newly proposed by the U.S. FDA (Food and Drug Administration). To verify the validity of the test method using LC-MS/MS, solid food (cinnamon), liquid food (vinegar), high-fat food (sauce), high-sugar food (sugar), and high-protein food (frozen shrimp) were selected as representative samples, and the selectivity, linearity, limit of detection (LOD), limit of quantification (LOQ), accuracy, and precision were analyzed. Accuracy was evaluated by recovery rate at concentrations of 0.25, 1.25, and 12.5 mg/kg, and showed a range of 90.4 to 107.0 % in all samples. Precision was evaluated by the relative standard deviation (RSD) of the recovery rate and was 0.2 to 7.2 %. In addition, the chromatogram result confirmed that it had selectivity as it did not show any interfering substances at all. The linearity of LC-MS/MS showed good linearity of over 0.99 with an R^2 value of 0.9991 to 0.9998. LOD and LOQ were 0.034 to 0.093 mg/kg and 0.102 to 0.278 mg/kg, respectively, which were lower than the quantitation limit of 10 mg/kg suggested by the current Food Code test method, confirming that it is suitable as an alternative test method.

P2-17

Selection and improvement of fatty acid composition of *Rhodotorula toruloides* mutant strains by NTG treatment

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This study aimed to improve the fatty acid composition of the oleaginous yeast *Rhodotorula toruloides* by selecting spontaneous and chemically induced mutants. A spontaneous mutant with 1.3-fold higher glucose consumption and 1.2-fold higher biomass than the wild type was obtained and used for chemical mutagenesis. Chemical mutagenesis was induced by treatment with 1 mg/mL N-methyl-N-nitro-N-nitrosoguanidine (NTG) for 60 minutes. Screening for oleic acid auxotrophs (Ufa mutants) with impaired △9 desaturase activity, responsible for converting stearic acid to oleic acid, led to the isolation of 13 mutants. Seven major fatty acids were analyzed in these mutants: oleic acid, palmitic acid, stearic acid, linoleic acid, myristic acid, α-linolenic acid, and palmitoleic acid. Total saturated fatty acid (TSFA) content increased compared to the wild type, with SM1 and YH3 showing the highest values among the mutants. Compared to the wild type (oleic acid 43%, palmitic acid 35%, stearic acid 5%, TSFA 43%), SM1 had oleic acid at 15%, palmitic acid at 8%, and stearic acid at 49%, resulting in a TSFA content of 58%. YH3 had oleic acid at 15%, palmitic acid at 22%, and stearic acid at 37%, resulting in a TSFA content of 61%. Therefore SM1 and YH3 are suitable for the production of yeast lipids with increased saturated fatty acid content.

P2-18

Changes in delta-9 desaturase sequence linked to lipid profile shifts in *Rhodotorula toruloides*

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Oleaginous yeasts are microorganisms capable of accumulating large quantities of single-cell oils, and they are attracting attention as sustainable alternatives to plant oils such as palm and soybean oil. These yeasts offer the advantage of tunable lipid production through cultivation conditions or genetic engineering. This study aimed to isolate and characterize mutant strains of the oleaginous yeast, *Rhodotorula toruloides*, to explore improvements in lipid productivity and changes in lipid composition. We generated a diverse mutant library by treating cells with N-methyl-N'-nitro-N-nitrosoguanidine and screened candidates for altered lipid profiles. Including wild type, 9 mutants, showing modified lipid composition were isolated. Genomic DNA from these mutants was extracted using a combination of zymolase and the LiOAc-SDS method, afterwards, primers for sequencing were designed. We performed nucleotide sequencing on the delta-9-desaturase gene from *R. toruloides*. The analysis focused on a 2,570 bp region that included the gene's main coding region and 5' untranslated region. A comparison of the sequencing results from 9 mutant strains with the wild-type strain revealed two distinct single nucleotide polymorphisms (SNPs) in two of the strains. In the YH3 mutant, a C-to-T SNP was identified at position 1125 bp, located within exon 3. Similarly, the SM1 mutant exhibited a C-to-T SNP at position 2427 bp, which is located in exon 7. These specific mutations are believed to be responsible for the observed phenotypic changes in the respective strains. Further studies are needed to elucidate how the observed genomic variations can influence the changes in fatty acid composition.

P2-19

Optimization of treatment conditions to prevent discoloration of yellowtail red muscle using cell-free supernatant from *Leuconostoc citreum* M8

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Seriola quinqueradiata (yellowtail fish) is recognized as a nutritionally valuable fish species, rich in high-quality proteins and omega-3 fatty acids such as EPA and DHA. However, during storage and distribution, the red muscle often browns due to myoglobin oxidation, reducing market value and consumer acceptability. This study evaluated the inhibitory effect of the cell-free supernatant derived from *Leuconostoc citreum* M8 (LCFS), previously reported to exhibit strong antioxidant activity, on the discoloration of yellowtail red muscle. Response Surface Methodology (RSM) with a Box-Behnken Design (BBD) was employed to optimize three independent variables: dipping ratio (X_1, w/v), dipping time (X_2, s), and LCFS dilution ratio (X_3, v/v). LCFS-treated samples maintained significantly higher a* values than controls. The most effective treatment was observed at a 1:3 X_1, 30-40 s X_2, and either undiluted or 1:5 X_3. The RSM model predicted optimized values of 0.08, 0.98, and -0.99 for X_1, X_2, and X_3, respectively. All independent variables significantly affected the dependent variables-redness (a* value; Y1), sensory appearance (Y_2), and redness score (Y_3) ($p < 0.01$). Predicted values ($Y_1 = 12.95$, $Y_2 = 5.00$, $Y_3 = 4.98$) closely matched experimental results ($Y_1 = 12.82 \pm 0.90$, $Y_2 = 5.00 \pm 0.00$, $Y_3 = 5.00 \pm 0.00$), validating the RSM-BBD model. Overall, LCFS effectively suppressed oxidative discoloration and improved sensory quality, presenting a promising strategy to enhance the storage stability and marketability of yellowtail products. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2021-NR060118).

P2-20

Performance comparison of Petrifilm® *Bacillus cereus* count plates and MYP agar for detecting *B. cereus* in cake and triangular Kimbap

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Bacillus cereus is a foodborne pathogen that frequently contaminates grain- and rice-based foods and poses a significant public health risk. Accurate and efficient detection methods are therefore required to ensure food safety. In this study, two representative ready-to-eat products, cake and triangular Kimbap, were used to evaluate the performance of Petrifilm® *Bacillus cereus* Count Plates (Petrifilm BC) compared with conventional MYP agar as recommended by the Korean Food Code. The objective was to assess whether Petrifilm BC could serve as a practical alternative, reducing time and labor, lowering reagent costs, and enabling detection on a single medium. Cake and triangular Kimbap samples (25 g each) were diluted 1:10 in 0.85% saline and inoculated with B. cereus at three concentrations: low (-100 CFU/mL), medium (-10^2 CFU/mL), and high (-10^4 CFU/mL). Each dilution was plated on MYP agar (1 mL per 3 plates) and Petrifilm BC (1 mL per plate), followed by incubation at 30 °C for 24 h. For cake samples, t-test showed no significant difference in colony counts between MYP and Petrifilm BC at all inoculation levels (p = 0.250, 0.113, and 0.111). In triangular Kimbap, no significant differences were observed at low and medium levels (p = 0.331 and 0.336), whereas a significant difference was detected at the high inoculation level (p = 0.000). This result may be attributable to the complex food matrix and higher background microflora in Kimbap, which can accentuate subtle differences in selectivity and colony recognition between the two media when microbial levels approach the upper countable limit. These findings suggest that Petrifilm BC can be a reliable and rapid alternative to the standard MYP agar method for detecting *B. cereus* in food groups with relatively low background microflora or at lower contamination levels.

P2-21

Development of pretreatment method for microplastic analysis in processed fishery foods

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Plastic waste in marine environments is broken down into microplastics (MPs) and nanoplastics (NPs) by UV radiation, erosion and wave action. These plastic particles circulate through the ecosystem, which can lead to human exposure through the consumption of various processed fishery foods. Therefore, we developed pretreatment method for microplastic analysis in processed fishery food. Processed fishery foods contain complex components such as proteins and lipids, which can interfere with microplastic analysis. In addition, some reagents such as HCl used for organic compounds pretreatment may damage some plastic polymers. In this study, we developed pretreatment method optimizing digestion solvent (KOH, H_2O_2), time (24-72h), temperature (40-60°C) and sample amount (0.5-10 g). The method was validated with accuracy, precision, and selectivity according to ISO Standardization. And more than 10 samples were collected from local market for each fish types and analyzed. The results of this study are expected to provide a useful basis for improving the accuracy of microplastic analysis in processed fishery food and contribute to the establishment of future food safety management systems.

P2-22

Evaluation of microplastic damage during pretreatment using SEM and μ-FTIR

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The presence of microplastics (MPs) in food has recently been recognized as a critical issue in food safety. Pretreatment is essential for analyzing MPs in food; however, the process may cause damage to MPs, thereby reducing the accuracy and reliability of the analysis. This study was conducted to develop pretreatment methods that facilitate the accurate analysis of microplastics in food without causing damage. For this purpose, damage tests were performed using three types of microplastic standards (STDs) commonly detected in food-polystyrene (PS, 200 μm), polyethylene (PE, 45-53 μm), and polymethyl methacrylate (PMMA, 45-53 μm). The STDs were spiked into solvents, and pretreatment was performed at different agitation speeds and times during organic matter decomposition. The damage was evaluated using scanning electron microscopy (SEM) and micro-Fourier transform infrared spectroscopy (μ-FTIR). The morphological damage was observed by SEM, whereas no chemical structure changes were detected by μ-FTIR. These results suggest that optimizing pretreatment conditions was needed to minimize polymer damage and ensure reliable microplastic analysis in food safety assessments.

P2-23

Development of automated MOSH/MOAH analysis system in edible oils using online LC-GC-FID

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Mineral oil hydrocarbons (MOHs) are found in various industries such as food packaging materials, printing inks, processing aids for food additives, and release agents, so there is a possibility they could be transferred to food. Mineral oil aromatic hydrocarbons (MOAH) are considered genotoxic causing cancer. In 2022, the European Food Safety Authority (EFSA) proposed maximum levels for MOAH in foods (including fats and oils) with potential recall measures for products exceeding these limits. The chemical complexity of MOHs has made the chromatographic separation of their individual components very difficult. Also, there are many interfering substances such as biogenic alkanes and olefins. This study established a fully automated MOSH/MOAH analysis system in edible oils using Online LC-GC-FID. Biogenic alkanes and olefins require prior online sample treatment to avoid over-quantification of MOSH (using AlOx clean-up) and more critically for MOAH (using performic acid epoxidation). These automated pre-treatment steps ensure accurate differentiation between mineral oil origin and biogenic hydrocarbons. The analysis method was validated against verification criteria including specificity, limit of detection (LOD), limit of quantitation (LOQ) and repeatability, all of which were found to be within acceptable ranges. This method achieves a lower LOQ (0.5 mg/kg) than the ISO 20122:2024 international standard method (1 mg/kg). These results will enable future research on MOHs reduction and food safety enhancement by providing foundational data.

P2-24

Evaluation of a cation exchanger resin as a substitute for phosphoryl cellulose for caramel I/III classification

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Caramel colors are widely used food colorant used to give a brown hue to various food products. They are classified into four types, making their classification essential for quality control and regulatory compliance. The official methods for classifying caramel colors include ion exchange using phosphoryl cellulose and DEAE cellulose, which facilitate the separation of different caramel classes based on their charge properties. However, phosphoryl cellulose is no longer produced, which is crucial in separating caramel I from caramel III. Alternative methods must be explored to maintain effective classification. In this study, we used a novel cation exchanger resin as a potential replacement for phosphoryl cellulose, aiming to maintain the separation efficiency of caramel classes while ensuring regulatory compliance. The separation process was optimized by evaluating the performance of resin across a range of pH conditions and varying the caramel/resin ratio. This resin successfully separated caramel I from caramel III, potentially offering a viable alternative in the absence of phosphoryl cellulose.

P2-25

Comparative evaluation of hplc-uvd and gc-fid methods for improved quantification of tocopherols as nutritional fortifiers

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This study aimed to improve the quantification methods for tocopherols as nutritional fortifiers by comparing and evaluating the applicability of high-performance liquid chromatography (HPLC) and gas chromatography (GC) methods specified in domestic and international standards. For the domestic method, as specified in the Korean Food Additives Code, GC equipped with a flame ionization detector (FID) and an HP-5 column (30 m × 0.32 mm, 0.25 μm) was used to quantify d-α-tocopherol and mixed tocopherols (α, β, γ, δ). The calibration curve exhibited excellent linearity (R^2 > 0.99), with limits of detection (LOD) and quantification (LOQ) of 0.83 mg/L and 2.51 mg/L, respectively. Accuracy and precision were satisfactory, ranging from 100.2-103.5% (RSD 0.3-0.96%) for intra-day and 100.5-102.5% (RSD 0.14-0.65%) for inter-day analysis. For the international method, HPLC with a UV detector (UVD) and a Capcellpak Silica SG120Å column (4.6 mm × 250 mm, 5 μm) was employed. This method also showed excellent linearity (R^2 > 0.99), with LOD and LOQ values of 0.57-0.65 mg/L and 1.74-1.98 mg/L, respectively. The accuracy and precision were 96.4-106.8% (RSD 1.5-2.1%) for intra-day analysis and 95.2-114.9% (RSD 2.6-3.8%) for inter-day analysis. Overall, both domestic and international methods were reproducible, and the comparative analysis between HPLC-UVD and GC-FID verified their applicability for the quantitative determination of tocopherols as nutritional fortifiers.

P2-26

Comparison of parameters between AOAC and CODEX for verifying a rapid detection kit of residual veterinary drugs

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Currently, with the increasing consumption and importation of livestock products in Korea, veterinary drug residues continue to be detected. In the Korea Food Code (Standards and Specifications for Foods) includes both a screening test method and an LC-MS/MS analytical method for detecting veterinary drug residues. However, the screening test method require large sample volumes, long incubation times, substantial experimental equipment. The LC-MS/MS method also has difficulties in field application due to the use of expensive instruments and long analysis times. For this reason, the development of rapid kits has been continuously pursued. Nevertheless, these developed rapid kits is currently in a situation where the method verification are inadequate, making it difficult for users and testing institutions to use them with confidence. Therefore, this study aims to establish a domestic method verification for rapid kits to ensure reliability and to assist users and testing institutions in selecting appropriate rapid kits. AOAC parameters include limit of detection (LOD), limit of quantitation (LOQ), specificity, sensitivity, accuracy, recovery, reproducibility, ruggedness and matrix-specific validation, while CODEX parameters contain LOD, LOQ, sensitivity, false negative rates, specificity, reproducibility, ruggedness, stability test and Inter-laboratory study. Verification clearly define the essential parameters such as LOD, LOQ, specificity, sensitivity and stability for screening analysis using rapid kit.

P2-27

Modification of methanol analysis method in various alcoholic beverages using GC-FID

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Methanol is present in alcoholic beverages, either naturally produced during fermentation or illegally added, and excessive intake can cause serious health risks. Therefore, accurate analysis is essential for safety and quality control. The current Korean Food Code method is a GC-FID-based procedure established for takju, but it lacks pretreatment protocols suitable for other alcoholic beverages and has limitations in analytical conditions and the use of internal standard. In this study, pretreatment methods (direct injection, distillation, and degassing) were optimized according to beverage characteristics, and analytical conditions applicable to 11 types of alcoholic beverages were established. The recovery and precision under the developed method met AOAC criteria. Among the internal standard candidates (acetonitrile, 3-pentanol, and 4-methyl-1-pentanol), 3-pentanol was selected as the most suitable internal standard due to its absence in matrices,physicochemical similarity to methanol, clear peak separation, and relative response factor (RRF) consistency. Matrix effects were within 20% for all 11 beverage types, and validation parameters (specificity, linearity, LOD, LOQ, accuracy, and precision) all satisfied AOAC criteria. In conclusion, developed method could be used to methanol analysis across a wide range of alcoholic beverages.

P2-28

Expansion of multi pesticide residues analysis methods in agricultural products by GC-MS/MS

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The Ministry of Food and Drug Safety (MFDS) lists approximately 700 pesticide residues analysis methods in Korea Food Code to ensure food safety. Various multi-component and single-component pesticide residues analysis methods exist, and expanding multi-component analysis methods is necessary for rapid and efficient inspections. In this study we examined the possibility of including gas chromatography-mass spectrometry (GC-MS/MS) method among single-component analysis methods and other multi-component analysis methods to expand the multi-component analysis method - method 2 (capable of simultaneous analysis of 514 substances). The following contenents were verified by selecting Four pesticides (Biphenyl, Hexachlorobenzene, Flometoquin, and Azinphos-ethyl) applicable to the test solution preparation method and GC-MS/MS analysis conditions of multi-component analysis method - method 2. The linear range was 0.005 ~ 0.1 mg/kg, the Coefficient of determination (R^2) was 0.99 higher, the average recovery rate of 5 replicates at 3 levels (LOQ, 5LOQ 10LOQ) was 70.3 ~ 103.8%, and the Coefficient of variation (CV%) was below 14.4%. This result conformed to the Codex guidelines (Codex CAC GL40) and the National Institute of Food and Drug Safety Evaluation's “Guidelines on Standard Procedures for Establishing Food, etc. Testing Methods (2025)”. This study is expected to strengthen food safety management by enabling rapid and efficient pesticide residues analysis through the expansion of multi-component pesticide residues analysis methods.

P2-29

Rapid identification of microorganisms from various food sources using Bruker MALDI Biotyper® and detection of *Listeria monocytogenes* via MBT Subtyping

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Rapid and accurate identification of foodborne microorganisms is essential for ensuring food safety. Among them, *Listeria monocytogenes* is a major foodborne pathogen that poses significant public health risks. Therefore, precise detection and species-level discrimination are crucial. In this study, we aimed to evaluate the performance of the MBT Subtyping module of the Bruker MALDI Biotyper system for the accurate identification of *Listeria* species isolated from various food products. From March 2024 to June 2025, a total of 477 microbial tests were conducted. The tested food types consisted of 52 categories, including packaged meat, ready-to-eat foods, pickled products, seafood products, sauces, and fermented soybean pastes. Two systems, MALDI Biotyper and Vitek 2, were employed, with special emphasis on applying the MBT Subtyping module for species-level identification of *Listeria* isolates. Among the overall results, 218 cases were identified as *Bacillus cereus* group, 90 cases as *Salmonella* group, and 48 cases as *Listeria* group. A detailed analysis of *Listeria* revealed 32 cases that were precisely identified at the species level: *L. monocytogenes* (23 cases), *L. innocua* (8 cases), and *L. walshimeri* (1 case). These findings demonstrate the capability of the MBT Subtyping module in discriminating *Listeria* species with high accuracy from real food-derived samples. This study confirms that the Bruker MALDI Biotyper with the MBT Subtyping module can provide reliable and accurate species-level identification of *Listeria* isolates obtained from food samples. The findings highlight the potential application of MALDI-TOF MS-based analysis for food safety monitoring, enabling rapid pathogen detection and contributing to the strengthening of hygiene management systems in the food industry. All results were provided by KAFRI (Korea Advanced Food Research Institute of Korea Food Industry Association). Keywords: rapid microbial identification, confirmation of *Listeria monocytogenes*, MALDI-TOF, MBT Subtyping Module

P2-30

Comparison of Scoville Heat Unit (SHU) measurement methods for instant ramen

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Spiciness is a key factor in consumer preference for instant noodles, and the Scoville Heat Unit (SHU), based on capsaicin content, is widely used for product selection. In Korea, there is no official capsaicin measurement for capsaicin presented in the Food Code, making it difficult to verify the spiciness of products. This study compared the spiciness of popular spicy instant noodles on the market using three analytical methods, including KS H 2508:2021 and the ASTA method. Typically, products indicate their SHU values based on the seasoning or sauce, but in this study, the spiciness was also measured in the cooked form as consumed by customers. As a result of a comparative analysis of the different analytical methods, the KS method using ultrasonic extraction showed the highest efficiency and consistency. Based on the KS method analysis, the seasoning itself of the spiciest noodle showed an SHU value of 6,432, whereas the soup-type instant noodle had only 191 SHU. In the case of spicy stir-fried noodles, the SHU value was 2,603 based on the sauce, but 272 SHU in the cooked form, making it the spiciest in terms of actual consumption. These results highlight the limitations of current labeling practices that rely solely on seasoning or sauce and emphasize the need for standardized methods that reflect consumer experience. This study is expected to contribute to the development of official guidelines for spiciness evaluation.

P2-31

Analytical method for multi-component jelly-based health functional foods

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The recent demographic shift toward an aging population, coupled with the global COVID-19 pandemic, has fundamentally transformed health functional foods (HFFs) from discretionary supplements to essential healthcare products, resulting in unprecedented market expansion. While manufacturers have responded by developing sophisticated multi-ingredient formulations to address diverse consumer needs, this complexity poses significant analytical challenges due to matrix interference effects among bioactive compounds. Current analytical methodologies remain primarily oriented toward single-component determination, rendering them inadequate for contemporary formulation types, particularly jelly-based delivery systems which present unique extraction and separation challenges. These analytical limitations compromise both pre-market quality assurance and post-market surveillance capabilities, necessitating the development of robust, validated methodologies suitable for complex HFF matrices. This study presents the development and validation of a comprehensive method specifically optimized for multi-component analysis in complex HFF formulations. Through systematic evaluation of 124 commercial HFF products containing 43 distinct ingredients (comprising 15 nutritional and 28 functional components), we identified ten critical analytes exhibiting significant content variability: L-theanine, hydroxycitric acid (HCA), carotene, selenium, niacinamide (vitamin B_3), and vitamins A, B_1, B_2, B_6, and E. All validation studies were performed using jelly-based formulations as the model matrix. The developed method successfully addressed key analytical challenges, including enhanced extraction efficiency from gel matrices, improved resolution of previously undetectable components, and effective mitigation of inter-component interference. Method validation parameters demonstrated excellent linearity, precision, and accuracy across all target analytes. This validated methodology represents a significant advancement in HFF quality control, offering regulatory agencies and industry stakeholders a practical, field-deployable solution for comprehensive ingredient verification. The approach is expected to substantially enhance both regulatory compliance monitoring and consumer safety assurance in the rapidly evolving HFF market. Acknowledgement This research was supported by a grant (24192MFDS070) from Ministry of Food and Drug Safety in 2025

P2-32

Py-GC/MS coupled with F-Search as a reliable tool for monitoring insect contamination in foods

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Safeguarding food safety remains a pressing issue, especially when the presence of insect residues undermines product integrity and consumer health. Conventional morphological classification techniques are frequently insufficient when only partial body fragments are retrieved. In this work, we explore the utilization of pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS), combined with a tailored F-Search spectral database, to achieve rapid and reliable identification of insect species frequently encountered as food adulterants. Six species, examined in both adult and larval forms, displayed unique pyrolysis signatures dominated by protein- and lipid-derived molecules such as toluene, phenol, cresol, indole, and multiple fatty acids. Chemometric evaluations, including correlation mapping, principal component analysis, and network topology assessment, confirmed high intra-species reproducibility and clear inter-species differentiation. The customized F-Search system facilitated automated classification with an accuracy of ≥92%, even when analyzing fragmented remains. Collectively, these findings demonstrate the promise of Py-GC/MS coupled with F-Search as a powerful and dependable approach for insect detection in food quality assurance. Acknowledgement: This research was supported by a grant (24192MFDS051) from Ministry of Food and Drug Safety in 2025.

P2-33

Application of Lactophenol Cotton Blue staining to the Howard mold count method to improve objectivity

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The Howard mold count method is a subjective microscopic test currently listed in the AOAC and Korean Food Code. Mold identification relies solely on visual judgment without confirmatory validation, which may lead to false positives or false negatives. To enhance accuracy, Lactophenol Cotton Blue (LCB) staining was introduced. A 5% pectin solution (5 g, 15 g, and 25 g) was evaluated to prevent aggregation caused by interactions with LCB. Tomato paste and red pepper powder were inoculated with *Aspergillus brasiliensis* (NCPF 2275) for method validation. Two experienced analysts compared Howard mold counts with and without LCB staining. When 15 g of the 5% pectin solution was added, the results were the most stable. The recovery rate without staining was 56.4%, whereas LCB staining yielded a significantly higher rate of 109.4%. These findings suggest that the conventional unstained method may produce false positives or false negatives due to subjective inconsistencies, and highlight the potential of LCB staining to improve the objectivity and accuracy of mold enumeration.

P2-34

Development of a simultaneous analytical method for three yellowed rice mycotoxins in food

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Mycotoxins are secondary metabolites produced by molds that can occur throughout the stages of food production, including harvesting, storage, and distribution. These compounds are primarily produced by species of *Aspergillus*, *Fusarium*, and *Penicillium*. In particular, contamination by *Penicillium* spp. during storage can result in the formation of red or yellow pigments, leading to rice discoloration and the generation of toxic compounds collectively known as yellowed rice mycotoxins. Notable examples include citrinin, citreoviridin, and penicillic acid, all of which have been reported to contaminate agricultural commodities and pose potential health risks to humans. In this study, analytical methods were developed for the simultaneous determination of three representative yellowed rice mycotoxins. The method utilized QuEChERS-based sample preparation followed by HPLC-MS/MS analysis, incorporating carbon-13 (^{13}C)-labeled internal standards to enhance quantification accuracy and method reliability. Method validation demonstrated satisfactory accuracy and precision in accordance with CODEX guideline criteria when applied to representative food matrices, including white rice, red rice, and peanuts.

P2-35

Development of a glycyrrhizic acid analysis method in foods using HPLC

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Licorice (*Glycyrrhiza uralensis*) has been traditionally used as a herbal medicine and food ingredient, and its primary sweet compound, glycyrrhizic acid, is also widely utilized as a food additive. Glycyrrhizic acid, which is approximately 50 to 100 times sweeter than sucrose, is gaining increasing importance due to its various reported biological activities, including anti-inflammatory, anti-allergic, and antiviral properties. However, the absence of a standardized test method for analyzing glycyrrhizic acid content and quality control in foods has posed a challenge to accurate analysis. This study aimed to develop and validate a high-performance liquid chromatography (HPLC)-based method for the effective quantitative analysis of glycyrrhizic acid in food products. The analytical procedure involved dissolving and extracting glycyrrhizic acid in water, followed by centrifugation and purification using a C18 Sep-Pak cartridge to elute the adsorbed sweet components. The resulting solution was then concentrated under reduced pressure and filtered through a 0.45 μm PTFE filter before undergoing qualitative and quantitative analysis by HPLC with a C18 column and a UV-Vis detector. The total analysis time was 20 minutes, with the mobile phase consisting of a 5:2 mixture of methanol and 2% acetic acid in an isocratic mode. The analytical procedure was validated following CODEX guidelines. The linearity of calibration curves was 0.9998 between the concentration range from 0.1 to 100 mg/L. The limits of quantitation (LOQ) were 3.88, 3.59, and 3.12 mg/kg for seasoned foods, beverages, and meat products, respectively. The recovery of analytical method was 87.1-107.8% for seasoned foods, and 85.0-106.7% for beverages, and 90.0-108.6% for meat products. This improved HPLC-based method can be effectively utilized for the analysis of glycyrrhizic acid in food, and it is expected to significantly contribute to quality control and safety assessment within the food industry.

P2-36

Optimization of QuEChERS-LC-MS/MS for the simultaneous determination of 17 furanocoumarins in various food matrices

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Furanocoumarins are naturally occurring phytochemicals in Apiaceae vegetables and citrus fruits, known for their phototoxicity and potential drug-food interactions. Among the furanocoumarins, 5-methoxypsoralen is classified as IARC Group 2A, while 8-methoxypsoralen is classified as IARC Group 1. This study aimed to optimize a rapid and reliable method for determining furanocoumarins in diverse foods. A QuEChERS-based extraction coupled with ultra-high-performance liquid chromatography-triple quadrupole mass spectrometry (UHPLC-QqQ-MS/MS) was optimized for quantifying 17 furanocoumarins, including psoralen and angelicin. Extraction parameters (salts composition, extraction solvents, and clean-up sorbents) were evaluated in five representative matrices (mandarin, tofu, sweet potato, cabbage seed, and soybean oil) classified according to the AOAC food triangle approach. The optimized method demonstrated excellent linearity ($r^2 > 0.99$), low detection and quantitation limits (0.03-1.70 μg/kg and 0.07-4.36 μg/kg), and satisfactory accuracy and precision, meeting CODEX guideline. This approach enables efficient monitoring of furanocoumarins across various food types and provides a practical tool for future exposure and risk assessment studies.

P2-37

Development of an LC-MS/MS method for the determination of sulfites in foods

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Sulfites are widely used as a preservative and antioxidant in the food industry and is commonly detected in beverages, dried fruits, and processed foods. Excessive intake of sulfites can cause adverse effects such as allergies. The United States Food and Drug Administration (FDA) requires labeling of foods containing sulfites at concentrations greater than 10 mg/kg and has implemented official analytical methods based on LC-MS/MS for their quantification. However, no standardized LC-MS/MS method for sulfite determination has been officially developed in Korea. In this study, a method for quantifying total sulfites was developed across various food matrices, including liquid foods (wines), high-fat foods (breads), and low-fat foods (seasonings). Sulfites were converted to the stable derivative hydroxymethylsulfonate (HMS) using formaldehyde and analyzed by liquid chromatography-tandem mass spectrometry (LC-MS/MS). The method was validated for linearity, accuracy, precision, limit of detection (LOD), and limit of quantification (LOQ), achieving satisfactory recovery even at regulatory levels below 10 mg/kg. These results ensure reliability for compliance with international labeling requirements.

P2-38

Profiling of primary metabolites in Korean red pepper (*Capsicum annuum*) according to ripening stage

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The ripening of Korean red pepper (*Capsicum annuum*) involves distinct metabolic changes that influence its nutritional value and quality traits, yet systematic comparisons across cultivars and tissues remain limited. Using gas chromatography-tandem mass spectrometry (GC-MS/MS), we identified and quantified 149 primary metabolites in peppers differing in maturity stage, cultivar (Bulcolor, Callazzang, Kaltanbaksa, Subicho), and tissue (pericarp and seed). Multivariate analyses revealed that ripening stage and tissue type accounted for clearer differentiation than cultivar, with 44 metabolites (VIP > 1) contributing significantly to this separation. Immature fruits contained higher levels of nucleosides and nucleobases, including uridine, adenosine, guanosine, and adenine, which are consistent with active nucleotide metabolism during early development, whereas mature fruits showed increased accumulation of amino acids commonly linked to flavor formation and serving as precursors for secondary metabolite biosynthesis. These results highlight stage- and tissue-specific metabolic signatures that can be used to better understand pepper ripening and quality attributes.

P2-39

Improving identification methods for water-soluble carotenoid-based food colorants beyond conventional solvent extraction

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Carotenoids are natural pigments distributed in microorganisms and plants, imparting yellow, orange, and red colors to a variety of foods. These compounds are valued not only for their vibrant colors but also for their potential health benefits, including antioxidant, anti-obesity, and immune-modulatory effects. They exist both as natural and synthetic forms and have broad applications in different fields. In the Korean Food Additives Code, carotene, oleoresin paprika, annatto extract, tagetes extract, and tomato color are classified as pigments predominantly composed of carotenoids. However, their lipophilic property limits their application in aqueous food matrices such as beverages and desserts. To enhance their applicability, water-soluble carotenoid-based colorants have been increasingly commercialized in various formulations. Nevertheless, the official identification methods in Korea apply only to lipophilic carotenoids. In this study, commercial carotenoid-based water-soluble colorants (β-carotene, oleoresin parprika, tomato colors) were evaluated based on domestic and international identification standards, those from CODEX, Food and Drug Administration (FDA), and Ministry of Health, Labour and Welfare (MHLW). The results showed that the solvents (antimony trichloride, chloroform, toluene) specified in the current identification methods were not suitable for water-soluble pigments. Instead of these organic solvents, water and ethanol were tested as solvents. Therefore, this study aims to establish a robust framework for identifying these water-soluble pigments through comparative analysis of internationally recognized methods. These findings could provide a scientific basis for standardizing analytical methods and broader the application of carotenoid-based water-soluble food colorants across diverse food systems.

P2-40

Study on temperature-dependent migration from disposable cutlery

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This study was conducted to evaluate the migration substances from disposable utensils under high-temperature conditions. Spoons, forks, chopsticks, and knives made of wood, polystyrene (PS), polypropylene (PP), and polylactic acid (PLA) were tested. Migration tests were performed in accordance with the Standards and Specifications for Utensils, Containers, and Packaging, using food simulants at 70°C and 100°C. Lead (Pb), arsenic (As), potassium permanganate consumption, overall migration, and sulfur dioxide (SO_2) were evaluated. Levels of arsenic and potassium permanganate consumption were significantly higher at 100°C compared with 70°C ($p < 0.05$). Overall migration was significantly higher with 4% acetic acid as the simulant ($p < 0.05$). Lead and sulfur dioxide showed no significant changes across conditions ($p > 0.05$). With the growing use of disposable utensils driven by food delivery and packaging, safety concerns are increasing. Some of our results show that migration increases under high-temperature conditions; however, all measured levels remained below the migrant specification, indicating that disposable utensils made of these materials can be considered safe for practical use.

P2-41

Rapid alternative approach for commercial sterility testing of long shelf-life foods using the Soleris® method

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Commercial sterility testing plays a crucial role in ensuring the safety and quality of long shelf-life foods, but the conventional procedure requires up to 13 days for completion. This lengthy timeline can delay critical production and distribution decisions, posing challenges for food manufacturers. Therefore, the development of rapid and reliable alternative methods is of significant interest to the industry. In this study, the Soleris® NF-105 system was evaluated as a rapid alternative method for sterility testing of a representative long shelf-life product, Galbitang (Korean beef rib soup). Samples were artificially inoculated with *Staphylococcus capitis* and *Streptococcus oralis* at three levels: uninoculated control (n = 3), low (<10 CFU/g, n = 20), and high (>100 CFU/g, n = 3). For the alternative method, samples were pre-incubated at 36°C for 3 days, followed by microbial detection within 24 h using Soleris® vials. The traditional K-Food Code method involved 10 days of pre-incubation at 36°C, an additional day at room temperature (24-26°C), and subsequent transfer to Fluid Thioglycollate medium with 48 h of incubation at 36°C. Paired qualitative analysis was performed to compare the two methods. Results showed that all uninoculated controls were negative, and the alternative method achieved 100% agreement with the traditional method across all inoculation levels. These findings confirm that the Soleris® system provides equivalent analytical performance to the K-Food Code reference method. Importantly, the time to result was reduced by approximately 9 days, allowing sterility confirmation in just 36 h of incubation plus 24 h detection. The study demonstrates that the Soleris® NF-105 method can serve as a practical and robust alternative for sterility testing of long shelf-life foods. By enabling earlier decision-making and product release, this approach offers significant benefits in terms of operational efficiency, cost savings, and consumer safety assurance.

P2-42

Development and validation of an LC-MS/MS method for spiromesifen and its metabolite in export agricultural products

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Spiromesifen is an insecticide widely used to control aphids and mites in agricultural products. In Korea, residue analysis has been limited to spiromesifen itself. However, several countries, including Japan and the United States, have established maximum residue limits (MRLs) that also include the major metabolite, spiromesifen metabolite M01 (spiromesifen-enol). Therefore, there is a growing need for analytical methods capable of simultaneously detecting both spiromesifen and its metabolite in export agricultural products. Considering the diverse range of agricultural products exported from the Gyeongnam region, it is important to develop a simultaneous analytical method that meets international MRL standards. In this study, we developed and validated an LC-MS/MS method for the simultaneous determination of spiromesifen and its metabolite M01. Sample preparation followed the QuEChERS protocol, and the method was tested on various export agricultural products. Validation was performed according to CODEX (CXG 90-2017) and SANTE guidelines. The method demonstrated excellent linearity for both compounds (r^2 > 0.998). Recoveries ranged from 82.4% to 98.5%, reflecting good accuracy and sensitivity. The limits of detection (LOD) and quantification (LOQ) were confirmed to be between 0.69-1.17 μg/kg and 2.09-3.53 μg/kg, respectively. The analytical method developed in this study is expected to be a valuable tool for effectively monitoring spiromesifen and its metabolite in agricultural products destined for export.

P2-43

Differentiation of m/z peaks for *Salmonella* serovar identification using MALDI-TOF MS

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Salmonella spp. are major microorganisms for control in food and table eggs and discrimination at the serovar level is essential in the event of foodborne outbreaks. MALDI-TOF mass spectrometry is widely used for microbial identification and is effective for rapid and accurate species-level classification; however, its discriminatory power at the serovar level remains limited. In particular, under the Korean microbiological safety regulations, serovar-level identification of *Salmonella* isolated from table eggs-such as Enteritidis, Typhimurium, and Thompson-is strictly required. In this study, four strains of *S.* Enteritidis, five strains of *S.* Typhimurium, and two strains of *S.* Thompson were cultured on TSA and BAP media at 35-37°C for 24 and 48 hour, respectively, and subsequently identified using the VITEK® MS PRIME (bioMérieux). Only peaks consistently detected under both conditions were selected for comparison across serovars. The results showed that *S.* Enteritidis reproducibly observed peaks at m/z 3,158, 3,579, and 4,496, whereas *S.* Typhimurium observed 12 distinctive peaks including m/z 3,439, 4,365, 4,497, 4,964, 6,573, and 7,098. For *S.* Thompson, reproducible unique peaks such as m/z 4,925, 5,382, and 9,524 were observed. Peaks were considered identical if they matched within a ±0.5 Da range. These findings demonstrate that reproducible serovar-specific peaks can be identified among major *Salmonella* serovars, highlighting the potential of MALDI-TOF MS for rapid serovar-level identification. This approach may contribute to enhanced food safety management and the advancement of rapid *Salmonella* detection systems.

P2-44

Improved selective detection of *Bacillus cereus* and *B. thuringiensis* in food using a newly modified MYPA

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Detection of *Bacillus cereus* in food can be complicated by competing background microflora, especially in fermented or minimally processed products. This study evaluated the use of a new beta-lactam antibiotic agent, as a selective additive to Mannitol-Yolk-Polymyxin Agar (MYPA) to enhance its specificity. More than thirty *B. cereus* and *B. thuringiensis* strains were assessed for the additional antibiotic susceptibility. All strains grew on MYPA supplemented with 32 µg/mL, indicating their MIC exceeds this concentration. Recovery tests using 0, 4, 8, and 16 µg/mL showed consistent colony formation ($p > 0.05$), supporting 16 µg/mL as the optimal concentration. The modified medium was applied to five food types-including soybean paste, vegetable salad, and red pepper powder-spiked with 10^3-10^4 CFU/g of *B. cereus*/*thuringiensis*. In every tested matrix, recovery on the modified medium was equal to or greater than that on conventional MYPA. Additionally, the modified media suppressed background flora more effectively: in heavily contaminated samples, competing colonies decreased from TNTC to countable levels. The modified medium also preserved key morphological features, such as pink pigmentation and lecithinase halos, aiding colony recognition. These findings suggest the additional antibiotic agent improves MYPA's selectivity without reducing *B. cereus* recovery, offering a practical approach for more accurate detection in foods with complex microbial backgrounds.

P2-45

Enhanced formulation of selective media to improve the detection ability for *Bacillus cereus* and *B. thuringiensis* in contaminated food samples

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Accurate detection of *Bacillus cereus* in foods can be hindered by overgrowth of background microbiota, especially in fermented or spice-rich products. In this study, a modified version of Mannitol-Yolk-Polymyxin Agar (MYPA) was evaluated by supplementing it with a new cephalosporin agent. More than thirty *B. cereus* and *B. thuringiensis* strains were tested to determine the agent's minimum inhibitory concentration (MIC) and its effect on colony recovery. All strains grew at 32 μg/mL, suggesting MIC values of at least 64 μg/mL. The optimized medium was applied to five food types-including soybean paste, red pepper powder, juice, and vegetables salad-artificially inoculated with up to 10^3-10^4 CFU/g of the test strains. Compared to standard MYPA, the modified medium consistently achieved similar or higher recovery across all matrices. It also substantially reduced background flora, decreasing colony overgrowth from TNTC to countable number of colonies per plate especially in red pepper powder and soybean paste. These improvements enhanced the visibility of target colonies through clearer lecithinase halos and preserved pink pigmentation. However, in vegetable samples, both media failed to suppress competing flora, highlighting matrix-specific limitations. Overall, this modified MYPA supplemented with a new cephalosporin offers a practical enhancement for detecting *B. cereus* in foods with complex microbiological profiles.

P2-46

A PAM-free asymmetric RPA-CRISPR/Cas12a system for detection of *Escherichia coli* O157:H7

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Rapid and accurate detection of *Escherichia coli* O157:H7 is essential for food safety. Recently, detection methods combining isothermal amplification with CRISPR/Cas12a system have been actively developed. However, recognition of dsDNA requires a protospacer adjacent motif (PAM) site (e.g., TTN or TTTN). This requirement limits the applicability of Cas12a in genomic regions lacking PAM site. To overcome this limitation, PAM-free CRISPR/Cas12a system for *E. coli* O157:H7 detection was developed, based on asymmetric recombinase polymerase amplification (Asy-RPA). Asy-RPA generates ssDNA from dsDNA, thereby activating Cas12a trans-cleavage without the limitations of the PAM site. This method allows fluorescence-based visual detection within 1 h and achieves a detection sensitivity of as low as 10^2 CFU/mL. Future optimization of the method and application to real food matrices could lead to the development of a versatile PAM-free detection platform for various foodborne pathogens.

P2-47

Filtration-assisted PAM-independent RPA-CRISPR/Cas12a detection of *Salmonella* Typhimurium in fresh-cut fruits

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Salmonella Typhimurium is a major foodborne pathogen associated with fresh-cut fruits, where it can cause infections during processing and consumption, highlighting the need for rapid on-site detection to ensure food safety. Recombinase polymerase amplification (RPA)-clustered regularly interspaced short palindromic repeats (CRISPR) assays are widely used for the detection of nucleic acids. However, conventional Cas12a-based detection is constrained by the requirement for a protospacer adjacent motif (PAM) on double-stranded DNA, limiting target sequence selection and assay design flexibility. This study established a PAM-independent RPA-CRISPR/Cas12a detection system by incorporating T7 exonuclease treatment to enable the generation of single-stranded DNA from amplification products. This post-amplification enzymatic step converts RPA products into single-stranded DNA, enabling PAM-independent recognition and trans-cleavage activity by Cas12a. The approach facilitates broader crRNA and primer design, increasing assay adaptability across target regions. Furthermore, considering the potential for low-level contamination in food matrices, a filtration-based sample enrichment step was integrated before nucleic acid extraction. This enables the effective concentration of bacterial cells from large-volume samples, thereby significantly enhancing detection sensitivity. The concentrations of the ssDNA reporter, the ratio of Cas12a to crRNA, and the reaction time were optimized. The detection limit of the system in broth was 10^4 CFU/mL. When applied to artificially contaminated fresh-cut fruits, *S.* Typhimurium was reliably detected at 10^3 CFU/g and 10^3 CFU/mL following filtration-based enrichment. In conclusion, this PAM-independent CRISPR/Cas12a detection platform, leveraging a decoupled amplification and detection workflow with filtration-based sample preparation, represents a promising tool for on-site food safety diagnostics.

P2-48

Automated pre-treatment using magnetic nanoparticles for molecular diagnostics of foodborne bacteria

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Nucleic acid-based molecular diagnostic methods enable the fast and accurate detection of foodborne bacteria. However, low bacterial loads and inhibitors present within complex food matrices can compromise the accuracy of the detection results. Although various pre-treatment techniques have been developed to improve the precision of foodborne bacterial detection, the integration and simplification of these procedures are essential for their broad and practical application. This study aimed to develop an automated pre-treatment method for the accurate molecular diagnostics of foodborne bacteria. This approach utilizes magnetic nanoparticles (MNPs) and targets *Salmonella* Typhimurium and *Listeria monocytogenes*. Arginine-modified chitosan-MNPs (Arg-CS@Fe_3O_4) were used for bacterial concentration, while T4 lysozyme was used for bacterial cell lysis. Subsequently, a silica-based technique was used for DNA purification. The efficiency of each pre-treatment procedure was assessed and compared with conventional techniques, including centrifugation, boiling and commercial kit component. The automated MNPs-based method (AMM) was developed using a DNA extractor, and its automation was validated. The performance of AMM was assessed in pure cultures and fresh-cut apples using real-time PCR. The results demonstrated that the AMM facilitated the simultaneous pre-treatment and detection of *S.* Typhimurium and *L. monocytogenes* using multiplex real-time PCR. In the fresh-cut apples, *S.* Typhimurium and *L. monocytogenes* were simultaneously detected at concentrations of 10^2 and 10^3 CFU/g, respectively, representing a 10-fold improvement in sensitivity compared with the boiling method as a pre-treatment approach. These findings suggest the potential of AMM as a sensitive and rapid pre-treatment approach for detecting foodborne bacteria in fresh-cut apples.

P2-49

Evaluation of the GENE-UP® BREW WILD YEAST kit for rapid detection of *Dekkera* spp. in the carbonated beverage industry

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Microbial spoilage by yeasts is a major issue in the beverage industry, causing quality decline and economic loss. *Dekkera* spp. (formerly *Brettanomyces* spp.), resilient in low pH and high sugar, cause off-flavors in non-alcoholic drinks like carbonated beverages. Traditional detection methods require over 5-day incubation, limiting rapid release. This study evaluated bioMérieux's real-time PCR GENE-UP® system and BREW WILD YEAST KIT for rapid *Dekkera* spp. detection in carbonated beverages. Commercial 350 mL canned cider inoculated with *Dekkera bruxellensis* was tested per recommended protocols. Un-inoculated samples verified no matrix interference. Detection limit (LoD) was assessed with 10^1 to 10^4 CFU/mL inoculation levels. Both 3-day incubated and non-incubated samples were analyzed. Results showed reliable detection with no interference. *D. bruxellensis* was detected at concentrations as low as 10^1 CFU/mL in both sample types. The 3-day incubation produced faster Cp values, indicating better detection of low-level contamination. This method shortens detection time by up to 4 days compared to traditional techniques. In conclusion, the GENE-UP® system with BREW WILD YEAST KIT allows faster and accurate detection of *Dekkera* spp., reducing product release risk and improving production efficiency in carbonated beverage manufacturing.

P2-50

Improved detection method of foodborne viruses in sugar-preserved strawberries

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Foodborne viruses such as norovirus (NoV) and hepatitis A virus cause acute gastroenteritis infection through person-to-person and contaminated food. Recently, food poisoning occurred due to berries contaminated with NoV worldwide. Therefore, it is important to identify food and environmental routes of viral transmission, as well as to develop and improve detection method of viruses. Since strawberries contain RT-qPCR inhibitors, additional purification steps should be performed for sensitive amplification. The aim of this study was to improve the detection of viruses in sugar-preserved strawberries (SPS). SPS (25 g) was inoculated with 3.87×10^2 to 1.60×10^6 genome copies/g of MNV. MNV from SPS was eluted using pectinase and TGBE buffer (pH 9.5) and concentrated with polyethylene glycol (PEG) or tube with 50 kDa membrane ultrafiltration filter (UF). Detection limit was observed 3.87×10^2 genome copies/g through inhibitor removal steps. Importantly, although the detection sensitivity of UF was comparable to that of PEG, UF provided advantages in terms of simplified experimental steps and reduced processing time. This methodological improvement suggests that UF-based concentration could serve as a practical alternative to PEG precipitation. The development of a detection method for foodborne viruses in sugar-preserved products will contribute to enhancing public health by enabling timely outbreak investigations.

P2-51

Development and optimization of analytical method for dilauryl thiodipropionate using HPLC-PDA

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Dilauryl thiodipropionate (DLTDP) is a diester of thiodipropionic acid used as a food additive to enhance oxidative stability in oils and fats. The Codex Alimentarius Commission allows its use up to 200 mg/kg, and it is approved in some countries, but in Korea it is not designated as a food additive. Therefore, establishing a precise and reliable analytical method for DLTDP is required to support safety evaluation and harmonization with international standards. In this study, a high performance liquid chromatography (HPLC)-photodiode array (PDA) method was developed based on existing HPLC-refractive index detector (RID) conditions. During this process, the run time was determined using the retention time of the standard, and the RID method was verified with a column of same stationary phase. These conditions were then applied to PDA analysis with comparisons of detection wavelength (202 nm, 210 nm), column (CapcellPak C18, Sunfire C18), and column temperature (35°C, 40°C). The results demonstrated that 210 nm provided superior linearity and lower limit of detection (LOD), limit of quantification (LOQ), and CapcellPak C18 at 35°C yielded a sharp peak at 11.28 min. Thus, CapcellPak C18 at 35°C and 210 nm was identified as the optimized condition for the analysis of DLTDP.

P2-52

Comparative analysis of quantitative methods for vitamin E derivatives (D-α-tocopheryl acetate, DL-α-tocopheryl acetate, and D-α-tocopheryl succinate) across countries

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The growing importation and utilization of nutrient fortifiers has heightened the importance of ensuring the quality and safety of raw materials. Nevertheless, analytical methods for quality assessment and specification differ across countries, which can result in discrepancies in test outcomes for identical materials. This highlights the need for comparative evaluation and validation to ensure the consistency and reliability of analytical results. In this study, quantitative methods for vitamin E homologues, including D-α-tocopheryl acetate, DL-α-tocopheryl acetate, and D-α-tocopheryl succinate, were comparatively examined across multiple countries. For D-α-tocopheryl acetate, gas chromatography (GC) is employed in Korea and China, whereas high-performance liquid chromatography (HPLC) is applied in Japan. For DL-α-tocopheryl acetate, titration is utilized in Korea, GC in China, and HPLC in Japan. In the case of D-α-tocopheryl succinate, GC is used in both Korea and China. Validation of these country-specific approaches demonstrated that, despite methodological differences, analytical consistency and objectivity can be maintained. Moreover, assessment of accuracy, precision, detection limits, and quantification limits further confirmed the robustness and reliability of the evaluated methods. Overall, these findings indicate that in the quantification of vitamin E homologues, and more broadly in nutrient analysis, the selection of analytical methods can be flexibly tailored to the analytical objectives and experimental conditions while ensuring scientific validity and international comparability.

P2-53

Establishing the simultaneous analytical methods for anatoxins and cyliderospermopsins in agricultural products by using UPLC-MS/MS

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Over the last decades, harmful freshwater cyanobacterial blooms have increased worldwide due to eutrophication and climate change. *Cyanobacteria* produce various cyanotoxins, including microcystin, nodularin, cylindrospermopsin, and anatoxin. Among these cyanotoxins, the microcystins are the most well-known and extensively studied. However, cylindropermopsin (CYN) and anatoxin-a (ATX) have also been recognized as important cyanotoxins, and in recent years, attention has increasingly focused on their public health relevance. This study aimed to establish a UPLC-MS/MS method for determining CYN, ATX, and their analogs in agricultural products. Internal standards were used to improve quantification accuracy, with extraction carried out in 25% acetonitrile and subsequent SPE clean-up. The method was validated for specificity, accuracy, precision, linearity, recovery, limit of detection (LOD), and limit of quantitation (LOQ), and demonstrated satisfactory performance in accordance with CODEX guidelines. In conclusion, this validated method provides a reliable analytical approach and may support the establishment of regulatory standards for CYNs and ATXs in agricultural products, ultimately helping to protect public health.

P2-54

Application of a validated analytical method for the determination of anatoxin-a and cylindrospermopsin in diverse agricultural products

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Recent climate change and river eutrophication have contributed to an increased frequency of harmful cyanobacterial blooms in domestic freshwater systems. In addition to the well-known cyclic peptides, microcystins (MCs) and nodularin (NOD), other cyanobacterial toxins such as anatoxin-a (ATX) and cylindrospermopsin (CYN) have been reported to exert toxic effects. Various international studies have reported the detection of ATX and CYN in leafy vegetables, including lettuce and spinach, thereby raising public health concerns. These findings underscore the need to evaluate the applicability and reliability of analytical methods across a diverse range of agricultural commodities. In a previous study, an analytical method was developed that enables the simultaneous quantification of four ATX and CYN congeners in agricultural products. Building on the foundation, the present study aimed to extend the application of this method to a broader spectrum of crops, including both vegetables and fruits such as peach, sweet potato, and carrot, ultimately assessing its performance across eleven different commodities. The analytical results were found to comply with CODEX guidelines, demonstrating that the method can be successfully applied for the quantitative determination of ATX and CYN. Accordingly, this study provides a framework that may support the establishment of regulatory standards for four ATX and CYN congeners in agricultural products, thereby contributing to public health protection.

P2-55

Monitoring of major cannabinoids (THC, CBD) content in hemp seed oil-containing foods using LC-MS/MS method

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With the recent increase in the distribution of hemp seed oil-containing foods, precise monitoring of trace cannabinoids such as tetrahydrocannabinol (THC) and cannabidiol (CBD) has become essential. This study aimed to establish a proactive response system for controlled substances potentially detected in commercially available hemp seed oil products in Korea and to accurately quantify representative cannabinoids (THC and CBD) to evaluate their safety. Samples were subjected to methanol extraction according to the Korean Food Code, followed by optimized liquid-liquid extraction. Analyses were performed using LC-MS/MS equipped with a C18 column under Multiple Reaction Monitoring (MRM) mode. The validated method demonstrated high selectivity in complex food matrices, with a limit of quantification (LOQ) below 0.1 mg/kg, and showed excellent reliability. Monitoring of commercial hemp seed oil-containing food products revealed that both THC and CBD were detected at varying levels in most samples. As a result of monitoring, THC and CBD were detected in 29 out of a total of 30 samples, but all were detected within the criteria of the Korean Food Code. Notably, THC and CBD were detected with concentrations ranging from undetected to 7 mg/kg and undetected to 18 mg/kg respectively. The LC-MS/MS-based analytical method established in this study enables precise determination and continuous monitoring of residual THC and CBD in hemp seed oil-containing foods. These findings provide a scientific basis for ensuring consumer safety, fostering confidence in verified products, and contributing to public health protection.

P2-56

Development of an NIR quality control model for predicting spiciness and sweetness in spicy sauce

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Spiciness and sweetness are major sensory factors influencing the quality of spicy sauces. Real-time prediction models for spiciness and sugars were developed using Near-Infrared Spectroscopy (NIRS), a rapid, non-destructive, and eco-friendly technique. NIR spectra were collected and calibrated with reference data obtained by high-performance liquid chromatography (HPLC). After spectral pre-processing using smoothing, Standard Normal Variate Transformation (SNVT), and derivative methods, multivariate analyses such as Partial Least Squares (PLS) and Principal Component Regression (PCR) were applied. The developed models showed promising predictive performance for spiciness (capsaicin, dihydrocapsaicin, total capsaicinoids, SHU, and piperine) and sugars (fructose, glucose, sucrose, maltose, and total sugars), indicating the potential of NIRS-based models for rapid quality assessment. These results demonstrate that NIRS can serve as an efficient and sustainable tool for simultaneous prediction of multiple sensory-related compounds in complex sauce matrices.

P2-57

Method validation of chloride, nitrate and ammonium ions in edible ice using ion chromatography

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In the Korea Food Code, conventional chemical methods including titration and colorimetric assays have limitations due to high reagent consumption and low accuracy and efficiency for ion determination in edible ice. This study validated ion chromatography (IC) methods for determining three inorganic ions in edible ice as safety markers. Chloride and nitrate ions were determined simultaneously by anion IC method, while ammonium ion was analyzed separately under a different cation IC condition. The methods were validated for linearity, limit of detection (LOD), limit of quantification (LOQ), precision, and accuracy. Chloride and nitrate ions showed excellent linearity in the range of 0.5-100 mg/L ($r^2 \geq 0.999$), and ammonium ion in the range of 0.1-2.0 mg/L ($r^2 \geq 0.991$). LOD/LOQ values were 0.03/0.09 mg/L for chloride ion, 0.04/0.11 mg/L for nitrate ion, and 0.01/0.03 mg/L for ammonium ion. In addition, cross-validation was performed to assess the inter-laboratory reproducibility of the analytical methods. The application of the validated methods to various edible ice samples confirmed its suitability for analyzing the three inorganic ions.

P2-58

Simultaneous determination and validation of anthocyanins and ellagic acid in strawberries using UHPLC-MS/MS

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Strawberries are a valuable source of bioactive phenolic compounds, including anthocyanins and ellagic acid, which contribute to their functional and nutritional value. While previous studies have primarily focused on anthocyanins across a broad range of berries, this study concentrated exclusively on strawberries to investigate their major bioactive compounds. This study aimed to establish a reliable ultra-high-performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) method for the simultaneous quantification of cyanidin-3-glucoside, pelargonidin-3-glucoside, pelargonidin-3-rutinoside, and ellagic acid in strawberries. The developed method was validated by assessing specificity, linearity, precision, accuracy, and limits of detection (LOD) and quantification (LOQ). Finally, the validated method was applied to strawberries from various cultivars (Jukhyang, Maehyang, Arihyang, Seolhyang, Kingsberry, Vitaberry, and Geumsil) and growing regions (Nonsan, Miryang, Wanju, Gurye, and Sancheong) in Korea, providing a practical framework for the analysis and monitoring of major bioactive compounds in strawberries.

P2-59

Development of a detection method for unauthorized GM squash events ZW20 and CZW3

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This study developed a sensitive and selective detection method for the genetically modified (GM) squash events ZW20 and CZW3, which are not approved for food consumption in Korea and are difficult to identify in processed foods. The detection method was designed and validated on three platforms: conventional PCR (cPCR), quantitative real-time PCR (qPCR), and digital PCR (dPCR). The developed method can specifically identify these GM squash events based on their unique genetic signatures and can effectively differentiate them from 88 other items, including approved GM crops such as soybeans, maize, cotton, and canola, as well as non-GM crops. A key advantage of this approach is that the combined cPCR and dPCR strategy offers significant benefits in time and cost efficiency for qualitative analysis while enabling quantitative analysis without requiring an external standard curve. This study demonstrates the critical importance of accurate and reliable detection methods for ensuring food safety and regulatory compliance of genetically modified crops. The proposed method is scientifically sound and practical, providing regulatory agencies with a valuable tool for monitoring unauthorized GM events in food systems. This work is anticipated to contribute substantially to future GMO management and oversight.

P2-60

Simultaneous LC-MS/MS determination of parent and modified mycotoxins in cereal, nut, and seed-based foods

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Modified mycotoxins-formed during plant or animal metabolism or food processing-co-occur with parent toxins and can revert to parent forms in the gastrointestinal tract. To capture occurrence more comprehensively, we developed a single-run liquid chromatography-tandem mass spectrometry (LC-MS/MS) method with hydrophilic-lipophilic balance (HLB) cartridge clean-up to quantify 37 targets in cereal, nut, and seed-based foods. The analyte panel covered regulated mycotoxins-aflatoxins, ochratoxin A, fumonisins, deoxynivalenol, and zearalenone-and nonregulated toxins such as nivalenol and T-2/HT-2, together with major metabolic (Phase I/II) and processing-derived forms. The method was found to be fit for purpose across cereal, nut, and seed matrices. We applied the method to more than 390 products, including rice, maize, peanut, sesame, and derived items. The assessment showed frequent Fusarium-toxin contamination, dominated by zearalenone and fumonisins; multiple toxins often co-occurred within single samples. Among modified forms, Phase I zearalenone metabolites (α-zearalenol, β-zearalenol, α -zearalanol) predominated, whereas Phase II conjugates, such as sugar- or sulfate-linked forms, were less common. The modified-to-parent zearalenone ratio was matrix dependent, ranging from -10% to several hundred percent, and in some foods modified forms exceeded parent levels, indicating that omission of modified forms can understate contamination profiles. These findings support routine inclusion of modified mycotoxins in surveillance alongside parent toxins and careful consideration in exposure and risk assessment as the evidence base for individual modified forms continues to develop.

P2-61

Study on the analytical method for taurine in infant/follow-up formulas

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Taurine is an ingredient that supports various physiological functions in the body, including brain development in children, visual function, and bile acid metabolism. While adults can synthesize it by themselves, as infants and toddlers cannot do it sufficiently they are supplied it through breast milk or infant formula. A new nutritional standard for taurine has been established for the selective addition of taurine to infant/follow-up formulas containing essential nutrients. Therefore, a new analytical method was required to quantify taurine in the foods. This study was aimed to establish and validate a method for identifying and quantifying taurine by comparing the officially reported methods for taurine analysis. Taurine in formulas was extracted using distilled water, derivatized with a dansyl chloride solution, and analyzed using LC-UVD at 254 nm with a C18 column. The gradient conditions of the mobile phase (10 mM sodium acetate (pH 4.2) and acetonitrile) were optimized to improve peak shape and achieve separation of the taurine and interference peaks. The taurine content in the formulas available on the market was found to be comply with the nutritional standard of 12.0 mg/100 kcal or less. And the method was satisfied with the AOAC validation guidelines for specificity, linearity, limit of detection and quantitation, precision, and accuracy. This new method is useful for providing the reliable nutritional information and for managing the standards and specifications of foods, especially infant/follow-up formulas. This research was conducted with the budget (24191MFDS066) of Ministry of Food and Drug Safety in 2025.

P2-62

Optimization of analytical method for β-carotene in nutrition-emphasized food products

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Recently, the foods fortified with beta-carotene (β-carotene), a type of carotenoid well known as a source of pro-vitamin A, which supports vision and skin health have been developed. As fortified nutrients are widely used in food products and the release of nutrition-emphasized labeled foods has increased, analytical methods are required to ensure the effectiveness and safety of nutrients through appropriate quality control. And it is necessary to manage and monitor the nutrition-emphasized food products, in order to provide consumers with accurate nutritional information and guidance on adequate nutrient intake. Therefore, this study aimed to develop and validate an analytical method for β-carotene. High-performance liquid chromatography (HPLC)-based methods which were published in the Korean Health Functional Food Code, and the AOAC report were examined to establish and optimize analytical conditions. β-carotene in foods was analyzed using HPLC with a photodiode array detector and a C18 reverse-phase column. The mobile phases were (A) acetonitrile and methanol (85:15, v/v), and (B) dichloromethane, at a flow rate of 1.0 mL/min. The performance characteristics for method validation, such as specificity, linearity, detection limits, precision, and accuracy, were confirmed to ensure satisfaction with the AOAC validation guidelines. The method was then applied to samples containing β-carotene to verify its reliability, and the tested samples were found to be acceptable for the nutritional components labeling. This method could be used to determine the β-carotene content of various types of nutrition-emphasized food products and support the research and development of new products in the food industry. This research was conducted with the budget (24191MFDS066) of Ministry of Food and Drug Safety in 2025.

P2-63

Optimization and characterization of *Listeria monocytogenes*-specific phage vB_LmoP_KFSLM5

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Listeria monocytogenes (LM) is a resilient foodborne pathogen capable of persisting in diverse environments, posing significant risks to public health and food safety. As a promising biocontrol strategy for LM, the propagation of vB_LmoP_KFSLM5 was optimized and it was characterized. To determine optimal conditions for phage propagation, temperature (30°C and 37°C) and multiplicity of infection (MOI; 0.0001-10) were optimized. Afterwards, the host range of vB_LmoP_KFSLM5 was evaluated against 49 foodborne pathogens using dot assay. The morphology of the phage was observed by TEM. Whole-genome sequencing of vB_LmoP_KFSLM5 was conducted using the Oxford Nanopore PromethION 2 Solo platform. After de-novo assembly, its genome was annotated using the RAST server and NCBI BLASTP. Phylogenetic analysis was performed using VICTOR server with the d0 formula and iTOL. Optimal propagation was achieved at 37°C with an MOI of 0.01, yielding a high titer of 2.5×10^{11} PFU/mL. The phage exhibited a narrow lytic activity against LM. vB_LmoP_KFSLM5 has an icosahedral head (65.02±7.78 nm) with a long tail (393.69±97.90 nm). Furthermore, genome of vB_LmoP_KFSLM5 consisted of dsDNA with 37,618 bp and GC content of 34.7%. It encodes 63 functional and 38 hypothetical ORFs, lacking virulence factor genes. Phylogenetic analysis revealed that vB_LmoP_KFSLM5 belongs to the Caudoviricetes class. This study successfully established conditions for maximizing phage yield and characterized vB_LmoP_KFSLM5, supporting its potential application in controlling LM for food safety.

P2-64

Development of a simple lateral flow strip using a *Brucella* metabolite peptide for rapid diagnosis of *Brucella* infection

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Brucellosis is a prevalent zoonotic disease transmitted through the consumption of unpasteurized dairy products and contaminated meat, posing a significant threat to public health. Therefore, there is an urgent need for the development of rapid and accurate diagnostic technologies to ensure food safety within the entire food supply chain. In this study, we developed a competitive lateral flow immunoassay (LFA) strip utilizing a monoclonal antibody directed against a *Brucella* infection-specific metabolite peptide. The strip was constructed using NanoLuc-peptide immobilized on a test line and a gold nanoparticle (GNP)-labeled monoclonal antibody as a detection reagent. The developed strip was visually readable within approximately 10 minutes. The limit of detection (LOD) was approximately 50 μg/mL in phosphate-buffered saline (PBS) and approximately 200 μg/mL in serum matrices (fetal bovine serum and newborn calf serum, 1:1 dilution). Notably, the test line was maintained in all negative controls, with no false positives observed, demonstrating high specificity. This study presents a *Brucella* peptide detection method applicable even in complex food matrix environments. It demonstrates its potential as a point-of-care diagnostic platform that can contribute to food safety management and the prevention of zoonotic diseases at slaughterhouses, dairy production, and distribution stages.

P2-65

Detection of edible insect adulteration in food using a monoclonal antibody-based lateral flow assay

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In this study, a competitive lateral flow assay (LFA) was developed using a monoclonal antibody (MAb) specific to thermal-stable soluble protein (TSSP) of *Tenebrio molitor* larva (TML), a known food allergen. Gold nanoparticles (GNP) were synthesized using 60 μg of antibody to stabilize the nanoparticles. and the antigen-binding reactivity of the GNP-antibody conjugates was confirmed. Subsequently, the antigen amount applied to the test line of the immuno-strip was optimized. The sensitivity of the assay was evaluated using samples at concentrations of 100, 30, 10, 3, 1, and 0.1%. The immuno-strip was able to detect TML down to a concentration of 1%, while showing negative results below that level. To assess the specificity of the developed immuno-strip, cross-reactivity tests were performed using six species of edible insects, including TML, and five food samples that could potentially be mixed with edible insects. Positive reactions were observed only in edible insect samples, while control (non-insect) samples showed negative results. These results indicate that the developed immuno-strip can serve as a rapid and specific tool for detecting the presence of edible insects in food products.

P2-66

Validation of an LC-MS/MS method for the determination of diethylstilbestrol (DES) and medroxyprogesterone acetate (MPA) in minor and other animal species

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Diethylstilbestrol (DES) and medroxyprogesterone acetate (MPA) are banned veterinary drugs, previously used as growth promoters via estrogen/progesterone receptor pathways, due to established human health risks. A sensitive LC-MS/MS analytical method for the determination of these compounds was validated across various minor and other animal species in Korea. Samples of sheep, duck, frog, mealworm, and quail eggs were purchased from online platforms and retail markets, processed according to Method 8.3.10 of the Korean Food Code. The extraction procedure involved: weighing 2 g of sample, adding 2 mL of 10 mM ammonium fluoride (pH 4.6) and extracting with 12 mL of 1% acetic acid in ACN:MeOH (1:1, v/v) The supernatant was mixed with 12 mL of Hexane, and the lower layer was collected. After nitrogen concentration, the residue was reconstituted with MeOH for LC-MS/MS analysis. DES was analyzed in negative mode with MRM transitions of m/z 267.10 to 251.11 (quantifier) and 267.10 to 237.09 (qualifier). MPA was analyzed in positive mode with transitions of m/z 387.24 to 123.08 (quantifier) and 387.24 to 327.22 (qualifier). For DES, method limits of quantification (MLOQs) were 0.01 mg/kg (sheep), 0.005 mg/kg (duck), 0.005 mg/kg (frog), 0.0005 mg/kg (mealworm), and 0.0002 mg/kg (quail egg). The calibration curves demonstrated strong linearity across the calibration range with correlation coefficients (r^2) of 0.9971-0.9993 (all ≥0.990). Recoveries at MLOQ, 2MLOQ, and 10MLOQ levels were 91.9-102.5%, 94.5-99.9%, and 90.6-100.8%, respectively, with a relative standard deviation (RSD) of ≤ 9.4%. For MPA, MLOQs were 0.002 mg/kg (sheep, duck, frog, mealworm) and 0.0008 mg/kg (quail egg). The calibration curves demonstrated strong linearity across the calibration range with correlation coefficients (r^2) of 0.9912-0.9992 (all ≥0.990). Recoveries at MLOQ, 2MLOQ, and 10MLOQ were 92.7-112.4%, 96.6-103.2%, and 86.3-115.3%, respectively, with a RSD of ≤12.1%. These results demonstrate that the method delivers regulatory-grade sensitivity, linearity, and precision for DES and MPA across matrices from minor and other animal species, supporting routine monitoring and regulation.

P2-67

Validation of an analytical method for nitrovin in minor and other animal species using LC-MS/MS

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Nitrovin is a veterinary drug that was previously used for growth promotion and disease prevention, but its use in food-producing animals has been banned both domestically and internationally due to safety concerns. Therefore, the development and validation of an analytical method for nitrovin are essential. However, most existing official analytical methods have focused on major livestock species such as cattle, pigs, and chickens, making it necessary to evaluate their applicability to minor and other animal species. In this study, sheep, duck, quail eggs, mealworms, and frogs were selected as representative samples of such species. The validity of the sample preparation and instrumental analysis for nitrovin was verified. Samples were purchased online, prepared according to the Food Code Section 8.3.6.2, Nitrovin Method 2, and analyzed using LC-MS/MS. The method limit of quantitation (MLOQ) was 0.005 mg/kg, and the linearity range was 0.0025-0.1 mg/kg. The correlation coefficient (r^2) of the calibration curve within the calibration range was satisfactory (≥0.990) for all tested species. Recovery tests were performed at concentrations of 0.005, 0.01, and 0.05 mg/kg. The recovery rates were 79.7-114.6% for sheep (RSD ≤12.3%), 88.3-111.2% for duck (RSD ≤8.5%), 79.1-117.2% for quail eggs (RSD ≤9.9%), 82.6-103.8% for mealworms (RSD ≤9.1%), and 92.2-110.3% for frogs (RSD ≤7.8%), all of which were within the acceptable range, demonstrating the reliability of the method. These results confirm that the established analytical method for nitrovin is sufficiently reliable and accurate for application to minor and other animal species. Accordingly, the validated method is expected to contribute to the safety management of animal products derived from these species and serve as a reliable official testing procedure.

P3-01

Consumer awareness survey for providing accurate information on health functional foods

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In modern society, health functional foods have become essential for maintaining and enhancing health, and the market for these products in Korea is growing rapidly. However, this growth has led to an increase in side effects, posing potential health risks to consumers. This study was performed to identify issues in the perception, purchase, and consumption processes of functional health foods among 2,000 adults aged 20-69 years residing in five metropolitan areas: Seoul and its surrounding metropolitan areas. The survey was conducted online, and data were analyzed using SPSS software. The main findings revealed that 68.9% of respondents reported consuming health functional foods, with immune function enhancement cited as the most common reason for their use. Additionally, consumers purchased health functional foods primarily through online channels, with family and friends, TV programs, and social networking sites as major sources of information. However, 21.2% of respondents reported side effects, raising concerns about the safety of these products. This study emphasizes the importance of consumer education and information provision. Systematic education and information dissemination are necessary for proper selection and consumption of health functional foods. These efforts may contribute to the sustainable development of the health functional foods market and help ensure consumer protection.

P3-02

Design of a dietary education program tailored for GLP-1 users: A model utilizing functionally labeled foods (lentil-based peanut butter)

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The rapid increase in the use of GLP-1 receptor agonists such as semaglutide (Wegovy) and tirzepatide (Mounjaro) has highlighted the need for complementary dietary strategies to support glycemic control. Despite pharmacological treatment, many users experience challenges with postprandial glucose spikes due to irregular snacking behaviors. This study proposes an educational intervention program that incorporates a functional peanut butter formulated with lentils (*Lens culinaris)* and banaba leaf (*Lagerstroemia speciosa*) extract containing corosolic acid. A literature review was conducted to evaluate evidence supporting glycemic control through lentils, peanuts, and banaba leaf extract. Based on this evidence, a 4-week intervention model was designed for GLP-1 users (n=50, anticipated), replacing high-carbohydrate snacks with the functional peanut butter while providing structured education on food labeling and glycemic management. Expected outcomes include reduced postprandial glucose variability, improved satiety, and enhanced consumer understanding of functional food labeling. This study underscores the potential role of functional labeled foods in complementing pharmacotherapy, promoting healthier dietary behaviors, and improving consumer trust in food labeling.

P3-03

Functional bioactivities of *Bacillus coagulans* isolates from Indonesian fermented foods in relation to metabolic syndrome

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Metabolic syndrome, defined by the concurrent presence of obesity, hyperglycemia, and dyslipidemia, represents a major global public health concern and is a key risk factor for type 2 diabetes. Current therapeutic options remain limited, underscoring the need for alternative strategies such as probiotic. *Bacillus coagulans*, a spore-forming bacterium resilient to gastrointestinal conditions, has emerged as a promising candidate functional food ingredient. In this study, two isolates of *B. coagulans* (F2 and P5) obtained from Indonesian fermented fish products were evaluated for their potential metabolic health-promoting properties. Both isolates exhibited notable α-glucosidase inhibitory (45.34-64.77% for F2 and 45.41-62.23% for P5) with IC50 values of 46.18 and 45.37 μg/mL, respectively. These inhibitory effects were comparable to, or in some cases greater than, those reported for lactic acid bacteria. A reduction in cholesterol levels was also observed, with F2 isolate showing slightly higher sctivity (22.23-40.24%) compared to P5 (21.36-38.29%) in bile salt-supplemented media; however, these differences were not statistically significant ($p > 0.05$). Additionally, both isolated retained α-amylase inhibitory activity, indicating further potential for modulating carbohydrate metabolism. Collectively, these findings suggest that *B. coagulans* isolates exhibits multifunctional bioactivities relevant to the management of metabolic syndrome and support its application as a probiotic ingredient in the development of functional foods targeting metabolic health.

P3-04

Status of veterinary drug residue testing in imported livestock products and an analysis of domestic regulatory management

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The use of veterinary drugs has increased annually for purposes such as disease treatment and productivity enhancement in livestock and aquaculture products, and the government conducts residue testing to ensure the supply of safe livestock products to consumers. Therefore, this study comparatively analyzed the veterinary drug analytes and the domestic management status for five species of livestock products-beef, pork, chicken, milk, and eggs-imported into Korea from 52 countries over the past seven years. To derive management priorities for the veterinary drugs used, we developed a priority-determination algorithm that incorporates both exposure level and toxicity level. The algorithm classifies each of exposure and toxicity into five grades, assigns up to 5 scores per grade, and yields a maximum total score of 25. Applying this algorithm, we evaluated 9,567 risk-score cases across the five livestock species from 52 countries; scores ≥5 and <10 accounted for approximately 39.9%. Among the five livestock species, the proportion of cases with risk scores ≥20 was highest in eggs, followed by beef, pork, milk, and chicken. The numbers of veterinary drugs that both scored ≥15 and are currently managed were: cattle (50), swine (35), chicken (21), eggs (21), and milk (59). When compared with domestic testing criteria, in eggs, amprolium (score 15) was not included as a testing target. In milk, 13 substances-including florfenicol and sarafloxacin-are not permitted domestically. After reviewing the top five risk scores and inspection items of the major importing countries for five livestock species, it is advisable to consider adding residues such as cefquinome, zeranol, gentamicin, and maduramycin as priority inspection targets in the domestic monitoring plan. Additionally, substances such as colistin, amprolium, and florfenicol are not currently included in the domestic testing plan and therefore appear to require further review for enhanced management.

P3-05

Assessing hygiene practices of Korean fresh produce farms for the implementation of FSMA produce safety rule

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Listeria monocytogenes underscores the critical importance of hygiene management in fresh produce production and highlights the necessity of implementing the Food Safety Modernization Act (FSMA) Produce Safety Rule. This study aimed to evaluate the hygienic management practices of Korean fresh produce farms and identify the differences between the Korean Good Agricultural Practices (GAP) certification and FSMA regulations. A comparative analysis was conducted between the Korean GAP and the U.S. FSMA to identify regulatory differences. A survey based on a 5-point Likert scale was developed, where 5 indicated excellent management and 1 indicated inadequate management. The survey consisted of 99 items across 7 fields and was administered to 196 fresh produce farms in Korea. The results revealed that GAP-certified farms (n = 130) had an average score of 3.38, which was higher than that of non-certified farms (n = 66, 2.79). However, the overall average score for all farms was 2.91. Among the evaluated areas, agricultural water management (2.55) and record-keeping (2.51) scored below the overall average, indicating critical gaps that require improvement even among GAP-certified farms. These findings suggest that the current GAP framework has limitations and underscore the importance of adopting the FSMA Produce Safety Rule as a means to enhance hygiene management in Korean fresh produce farms. This study provides foundational data to support improvements in farm hygiene practices and regulatory alignment with international standards.

P4

P4-01

Analysis of *Bacillus cereus* toxin gene characteristics and antibiotic resistance

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Bacillus cereus causes a range of diverse clinical symptoms depending on the toxins it produces, and accurate laboratory diagnosis of the causative pathogen and associated toxins is required in cases of foodborne illness. However, current Korean Food Standards only provide criteria and specifications for certain foods, and there are no standardized testing guidelines for toxin genes. Therefore, this study aimed to assess the hazard level of *B. cereus* in cooked foods in Incheon City and to provide foundational data for the reinforcement of food standards and the introduction of toxin gene testing. A total of 110 *B. cereus* isolates were analyzed for toxin genes, and 33 toxin profiles were identified. Among them, 21 isolates (19.1 %) harbored all nine enterotoxin genes (*bceT-cytK-entFM-hblA-hblC-hblD-nheA-nheB-nheC*), followed by 13 isolates (11.8 %) carrying *bceT-entFM-hblA-hblC-hblD-nheA-nheB-nheC*. In addition, three of the eight isolates harboring the emetic toxin gene(ces) were detected in cooked foods, specifically cold noodles, suggesting a potential association with certain food types. Antimicrobial susceptibility testing revealed high resistance to β-lactam antibiotics, including ampicillin and penicillin, whereas high susceptibility was observed for chloramphenicol, ciprofloxacin, and clindamycin. Notably, daptomycin showed variable responses among isolates, indicating that careful dosage considerations are required for its therapeutic use. In conclusion, *B. cereus* harbors diverse toxin genes and exhibits resistance to some antibiotics, indicating a considerable potential hazard to food safety. Therefore, establishing a systematic surveillance system and developing antimicrobial susceptibility standards are warranted. Moreover, the antimicrobial resistance data obtained in this study are expected to serve as practical information for the prevention and treatment of *B. cereus* foodborne illness.

P4-02

Research and trends analysis of food-borne disease pathogens in Ulsan ('17-'24)

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The purpose of this research is analysis the trends of food-borne pathogens and related outbreaks from 2017 to 2024 in Ulsan to prevent upcoming events of outbreaks. Our goal is clarified the pathogenic factors of latent risk in Ulsan and rural area nearby. Total number of outbreaks and cases are 67 times and 894 persons. In the period of research, outbreaks of bacterial infection are decreased and viral infection diseases are increased. Cases of restaurant outbreaks have a trend that getting lowered and getting smaller in its scale by period. In contrast, outbreaks and cases relate to meal service facillities are more increased than the pandemic period of COVID-19. The most frequent pathogens are pathogenic *E. coli*(EPEC), *Salmonella* spp., *Campylobacter jejuni*, Norovirus, *Kudoa septempunctata* are fundamental pathogens detected in outbreaks and found in research period continuously. In comparative study between Ulsan and domestic area in Korea, Norovirus, *Salmonella* spp. and *Campylobacter jejuni* are same outstanding reasons of food-borne diseases. There are not pathogens that develop illness abnormally high in Ulsan and not in other rural area at the same time, but the proportion of Norovirus in Ulsan is higher than the domestic average of outbreaks or cases.

P4-03

Research on the contamination of foodborne pathogens in agricultural products distributed in Ulsan

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In recent years, foodborne illnesses linked to agricultural products have been rising worldwide. This, combined with the growing consumption of fresh, unprocessed produce, highlights the importance of hygiene management. This study examined the contamination status of foodborne pathogens in agricultural products distributed in Ulsan and provides baseline data for risk assessment. Results showed that *Bacillus cereus* and *Staphylococcus aureus* were the most common contaminants in both heat-treated and non-heat-treated products, with higher levels in the latter. *B. cereus* was found in 76.5% of non-heat-treated samples, especially lettuce, followed by chili peppers and water parsley. A comparison of eco-friendly and conventionally grown products revealed higher contamination in conventional produce. This difference is attributed to systematic safety management, such as GAP certification, in eco-friendly products. *Listeria monocytogenes*, a high-risk pathogen, was detected in mushrooms, with serotype 1/2a most frequently identified consistent with major outbreaks worldwide. Its strong biofilm-forming ability makes it difficult to eliminate, even in GAP certified products. After a fatal 2,020 listeriosis outbreak in the United States linked to Korean enoki mushrooms, Korea mandated “heat before consumption” labeling for mushrooms in 2021. Based on this precedent, the study emphasizes expanding mandatory labeling and establishing microbiological standards for unprocessed produce. Overall, the findings reaffirm the need for strict hygiene management and robust legal regulations to reduce risks of foodborne illness during agricultural product distribution. This study also provides essential data for future microbial risk assessments and policy development.

P4-04

Optimizing a novel trivalent inactivated *Salmonella* vaccine strategy for the prevention of salmonellosis in poultry

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The optimization of a prevention program utilizing a novel trivalent inactivated *Salmonella* bacterial vaccine to protect poultry from salmonellosis was evaluated in this study. A total of 50 Hy-Line Brown layers were divided into 5 groups, A to E, each containing 10 hens. Group B hens were immunized with the SG9R vaccine, group C hens were immunized with the trivalent inactivated *Salmonella* bacterial vaccine, and group D hens were primed with SG9R and boosted with the trivalent inactivated *Salmonella* bacterial vaccine. Group E hens were injected with sterile PBS as a control. All hens in groups B to E were orally challenged with a mixture of wild-type *S.* Enteritidis, *S.* Typhimurium, and *S.* Gallinarum (approximately 6×10^9 CFU/0.2 ml/bird). Serum IgG titers, $CD3^+CD4^+$ T-cell levels, and $CD3^+CD8^+$ T-cell levels in group D were significantly higher than those in group A. Additionally, all birds in groups A to D exhibited no clinical symptoms and survived after the virulent challenges, whereas all chickens in group E died. The challenge strains of *S.* Enteritidis, *S.* Typhimurium, and *S.* Gallinarum were not isolated from the liver, spleen, cecum, and cloaca of of chickens in Group D. These findings indicate that priming with SG9R and boosting with the trivalent inactivated *Salmonella* vaccine can be an effective strategy for preventing *Salmonella* infections in poultry by inducing robust protective humoral and cellular immune response. Acknowledgements: This research was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry, IPET (No. RS-2025-02217958).

P4-05

Development of a novel inactivated vaccine against *Salmonella* Enteritidis infection in Hy-Line Brown chickens

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In this study, the protective efficacy of HJP34-inactivated *Salmonella* Enteritidis whole bacterial cells as a vaccine candidate against *S.* Enteritidis infection was evaluated in Hy-Line Brown chickens. The HJP34, antimicrobial peptide, was obtained from KOMA Biotechnology (Seoul, South Korea). A total of 40 Hy-Line Brown layers were divided into three groups (A to C): Group A (n = 15), Group B (n = 10), and Group C (n = 15). Chickens in Group B were injected with sterile PBS, while those in Group C were primed with the inactivated *S.* Enteritidis vaccine at 6 weeks of age and were boosted at 9 weeks of age. At three weeks post-boost, five hens from each of Groups B and C were sacrificed, and their splenocytes were collected. The splenocytes were restimulated with *S.* Enteritidis extracts to evaluate T cell responses by flow cytometry (FACS) and cytokine expression by real-time PCR. All birds in Groups B and C were orally challenged with approximately 5×10^9 CFU/0.2 mL/bird of wild-type *S.* Enteritidis. Serum IgG titers, $CD3^+CD4^+$ T cell levels, $CD3^+CD8^+$ T cell levels, and IFN-γ expression in Group C were significantly higher than those in Group A. Following the virulent challenge, all birds in Groups A, B, and C survived without clinical symptoms. Notably, *S.* Enteritidis was not recovered from the liver, spleen, cecum, or cloaca in Groups A and C, whereas the challenge strain was isolated from these organs in Group B. These results indicate that priming and boosting with HJP34-inactivated *S.* Enteritidis whole bacterial cells can be an effective strategy to protect Hy-Line Brown chickens against *Salmonella* infection by inducing robust humoral and cellular immune responses. Acknowledgements: This research was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry, IPET (No. RS-2025-02217958).

P4-06

Antibacterial effects of different parsnip (*Pastinaca sativa*) cultivars and plant parts against foodborne pathogens

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This study examined the antimicrobial potential of parsnip (*Pastinaca sativa*) extracts against three major foodborne pathogens: *Salmonella* Typhimurium, *Escherichia coli* O157:H7, and *Listeria monocytogenes*. Extracts were obtained from different cultivars (Warrior and Albion) and plant parts, including leaf, stem, skin, cortex, and pith. In the disk diffusion assay, no inhibitory zones were detected for leaf and stem extracts, suggesting limited detectable activity with this method. In contrast, the 96-well plate assay revealed growth inhibition of *S.* Typhimurium and *L. monocytogenes* by several extracts. Subsequent evaluations using selective media demonstrated that extracts from Warrior leaf (W-L), Albion leaf (A-L), and Warrior skin (W-Skin) effectively suppressed the growth of *L. monocytogenes*, while stem, cortex, and pith extracts showed little or no effect. These results indicate that the antimicrobial properties of parsnip differ according to plant part and bacterial species, with the strongest activity observed against *L. monocytogenes*. Overall, this study provides preliminary evidence of the antibacterial potential of parsnip extracts and suggests their possible application as natural agents for controlling foodborne pathogens. Further research using diverse extraction techniques and broader experimental conditions is required to validate these findings and explore their practical applications in food safety.

P4-07

Risk assessment of major foodborne pathogens in ham products

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Foodborne illness caused by pathogenic microorganisms remains a major global public health concern. Among various food categories, processed meat products such as hams and sausages are widely consumed, and their increased intake highlights the importance of microbial safety management. In this study, we investigated the contamination status of major foodborne pathogens in ham products distributed in Korea, with the aim of providing surveillance data for microbial risk assessment. Four representative pathogens(*Salmonella* spp., *Listeria monocytogenes*, *Staphylococcus aureus* and *Clostridium perfringens*) were selected for monitoring. A total 1,205 ham samples, including sterilized and non-sterilized products, were collected and analyzed according to microbial standards and specifications. The results showed that all tested samples met the current microbiological criteria, and no contamination exceeding the permissible limits was detected. These findings confirm that ham products distributed in Korea are generally well managed with respect to microbial safety. Nevertheless, considering the continuous changes in dietary habits and consumption patterns, ongoing monitoring and systematic studies are required to strengthen microbial risk assessment and ensure consumer safety. This study provides useful baseline data for establishment of food safety policies ham products.

P4-08

Temperature- and time-dependent microbial succession in packaged beef revealed by next-generation sequencing (NGS)

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Ensuring microbiological safety and determining accurate use-by dates for packaged beef are critical challenges in modern food distribution systems. Spoilage is largely governed by dynamic shifts in microbial communities under different storage conditions. Beef loin samples were obtained from retail markets and stored at 5, 10, 20, and 30°C for 72 hours. Next-generation sequencing (NGS) was performed to investigate microbial community dynamics across storage temperatures. At 5°C, lactic acid bacteria such as *Lactobacillus*, *Leuconostoc*, and *Carnobacterium* gradually became dominant, indicating mild fermentation. At 10°C, an increase in *Photobacterium* suggested the early onset of spoilage. At 20°C and 30°C, spoilage-associated genera including *Clostridium* and *Lactococcus* proliferated rapidly, and at 30°C, *Alkalibaculum* emerged as the predominant taxon, reflecting an advanced stage of ecological succession toward spoilage. By integrating quantitative modeling with microbial ecological profiling, this study establishes a scientific foundation for enhancing the accuracy of use-by date determination and improving microbiological safety management in packaged beef.

P4-09

Isolation and characterization of bacteriophages against antibiotic-resistant *Staphylococcus aureus*

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Staphylococcus aureus is a major foodborne pathogen associated with serious health risks and increasing levels of antibiotic resistance, underscoring the urgent need for alternative control strategies. Among these, bacteriophages have attracted attention as natural and highly specific biocontrol agents in food safety applications. This research aimed to evaluate lytic bacteriophages targeting *S. aureus* were isolated from environmental sources and systematically characterized to evaluate their potential utility in food-associated environments. Host range testing against 10 of *S. aureus* strains demonstrated broad lytic activity. Transmission electron microscopy revealed that the phage possessed a hexagonal head with a diameter of 98.4 nm and a long tail measuring 181.8 nm. One-step growth curve analysis showed a latent period of approximately 20 min and a burst size of 36.15 PFU/cell, with adsorption rates reaching 95% within 30 min. For stability assessment, the phage was exposed to a range of physicochemical conditions, including pH values from 2 to 12 and temperatures up to 80°C. The phage maintained infectivity across these conditions, indicating robustness under diverse food processing and storage environments. *In vitro* planktonic lysis assays conducted at MOIs from 0.01 to 100 demonstrated significant reductions in *S. aureus* viability over 24 hrs. Antibiotic susceptibility testing confirmed multidrug resistance in host strains, including resistance to methicillin, vancomycin, and several additional antibiotics. Whole-genome sequencing revealed a GC content of 29.8%, and phylogenetic analysis based on complete genome alignment placed the phage within the Herelleviridae family, closely related to *Staphylococcus* phages vB_SauM_Romulus and vB_SauM_Remus. Collectively, these findings demonstrate that the isolated phage represents a stable and effective candidate for controlling *S. aureus* in food safety applications.

P4-10

Temporal and comparative analysis of biofilm formation by *Escherichia coli*, *Salmonella* Typhimurium and *Pseudomonas aeruginosa* using CLSM and biomass quantification

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Biofilm formation by foodborne pathogens is a major challenge in food safety, as these microbial communities enhance survival on food-contact surfaces and resist conventional cleaning practices. This study evaluated biofilm development by *Escherichia coli*, *Salmonella* Typhimurium, and *Pseudomonas aeruginosa* at 24, 48, 72, and 96 h of incubation. Biofilm biomass was quantified using the crystal violet (CV) assay, while biofilm structure and architecture were assessed through confocal laser scanning microscopy (CLSM). The results demonstrated species-specific and time-dependent differences. *P. aeruginosa* produced the most abundant and structurally complex biofilms, showing progressive increases in biomass and thickness across all time points. In contrast, *E. coli* and *S.* Typhimurium formed comparatively thinner and less organized biofilm, with slower biomass accumulation over time. Across all species, biofilm development progressed from early attachment at 24 h to maturation between 72-96 h. These findings provide systematic insights into the kinetics of biofilm formation in major foodborne pathogens and emphasize the need for time-targeted strategies to prevent biofilm establishment in food processing environments.

P4-11

Biofilm formation and analysis of EPS architecture comprising polysaccharides and lipids by *Pseudomonas aeruginosa* and *Escherichia coli* on food processing surfaces

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Biofilms pose persistent and often underestimated challenges in seafood processing environments, where pathogens such as *Pseudomonas aeruginosa* and *Escherichia coli* rapidly adhere to and colonize food contact surfaces. This study explores biofilm formation on widely used industrial substrates including aluminum, silicone rubber, stainless steel, and polyethylene terephthalate across both early and late developmental stages. Phenotypic assays confirmed progressive biofilm maturation, with aluminum and silicone rubber exhibiting the highest levels of accumulation. Structural and metabolic evaluations revealed increasing robustness over time, reflected by intensified extracellular matrix activity and greater biomass production. Spectroscopic analyses using FTIR and ^{1}H NMR identified compositional alterations in the extracellular polymeric substances (EPS), notably a shift toward enhanced lipid complexity while polysaccharide constituents remained consistently abundant. Microscopic visualization through CLSM and FE SEM captured the progression from initial surface attachment to dense, mature architectures, displaying distinct species and surface specific morphologies. Overall, the findings underscore the critical role of material type in shaping biofilm behavior and highlight the importance of implementing surface tailored sanitation strategies to effectively mitigate contamination risks in seafood processing systems.

P4-12

Development of an Ultrafast PCR-based method for the rapid detection of pathogenic *Vibrio*

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The genus *Vibrio* comprises halophilic Gram-negative bacilli distributed in marine and estuarine environments worldwide. Among more than 100 reported *Vibrio* species, some species infect humans causing gastroenteritis or septicemia. Recently, global warming and rising seawater temperatures have expanded the distribution of *Vibrio* infections and advanced their detection period. Accordingly, it is thought that an efficient and field-applicable detection method is needed to ensure the safety of aquatic food products. In this study, we developed a rapid and accurate method for detecting pathogenic *Vibrio* species, including *Vibrio parahaemolyticus*, *V. vulnificus*, *V. mimicus*, and *V. alginolyticus*, using an Ultra-Fast PCR technique applicable to field settings. Genetic markers were selected through comparative genomics, and corresponding primers and probes were designed. To evaluate specificity, sensitivity and detection limits, both conventional PCR and Ultra-Fast PCR were performed, confirming primer specificity and achieving detection down to 10^4 copies/μL with Ultra-Fast PCR. Furthermore, food application testing with seafood samples demonstrated the applicability of the method. These findings suggest that the developed Ultra-Fast PCR technique could be effectively utilized for the early diagnosis and prevention of pathogenic *Vibrio* species in the food industry.

P4-13

Survival of *Listeria monocytogenes* and quality attributes of ground beef during frozen storage

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Listeria monocytogenes is a major foodborne pathogen that tolerates low temperatures, raising concerns for refrigerated and frozen meat products. However, studies on its survival in frozen beef remain limited. In this study, the survival of *L. monocytogenes* and total aerobic bacteria was evaluated in ground beef stored at 4, -4, -10, and -18°C for up to 168 days, along with the physicochemical properties. Over the storage period, *L. monocytogenes* declined by 1.07-3.06 log, while total aerobic bacteria decreased by 0.22-0.38 log, with no significant differences among temperatures. Physicochemical analysis revealed that pH remained unchanged, while drip loss and thiobarbituric acid reactive substances (TBARS) increased according to storage temperature. Redness showed a decreasing trend by increasing temperature. These outcomes indicate that *L. monocytogenes* is able to persist in ground beef even under frozen conditions, emphasizing the need for stringent food safety measures during processing, storage and consumption.

P4-14

Exploring the fate of *Salmonella enterica* serovar Typhimurium and *Listeria monocytogenes* in an *in vitro* fecal fermentation model: Interaction with gut microbiota

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Salmonella enterica serovar Typhimurium and *Listeria monocytogenes* are important foodborne pathogens that cause intestinal diseases through the consumption of contaminated food. Upon entering the host, these pathogens encounter the gut microbiota, which serves as the primary innate defense system. Interactions between pathogens and gut microbiota can influence each other and ultimately alter the microbial community profile. In this study, we investigated the interactions between human gut microbiota and pathogens using an *in vitro* fecal fermentation model. *S.* Typhimurium increased the abundance of short-chain fatty acid (SCFA)-producing bacteria, including *Bacteroides*, *Parabacteroides*, and members of the *Clostridia* group, while reducing the abundance of *Escherichia-Shigella*. Metabolite analysis revealed that SCFA and ethanol concentrations remained comparable between infected and non-infected groups. In contrast, *L. monocytogenes* induced distinct shifts in specific bacterial groups, including *Bacteroides*, *Bifidobacterium*, and the *Mediterraneibacter gnavus* group, and was associated with an increase in ethanol production. The findings from this study provide valuable insights into the complex interactions between foodborne pathogens and the human gut microbiota, and they offer a comparative reference for interpreting future studies in this field.

P4-15

Isolation and characterization of phages for controlling *Listeria monocytogenes*

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Listeria monocytogenes is a foodborne pathogen that can survive under refrigeration and poses a serious threat to vulnerable populations, including the elderly, pregnant women, and infants. Therefore, the development of effective control strategies is essential. In this study, two *L. monocytogenes* specific bacteriophages, PLM22 and PLM40, were isolated from river water using different host strains. PLM22 exhibited broad host range, infecting serotypes 1/2a, 1/2c, 3a, 4a, 4b, 4c, and 4d, whereas PLM40 exhibited narrow host range with high serotype specificity. Thermal stability tests showed that both phages retained infectivity at 4-50°C, although titers gradually decreased at higher temperatures. In pH stability, PLM22 retained infectivity between pH 5-11, while PLM40 remained stable in the range of pH 4-11. Morphological anylsis revealed that both phages possessed long, non-contractile tails, classifying them as members of the *Siphoviridae* family. These findings suggest that the isolated phages possess both high specificity and stability, indicating their potential as biocontrol agents for effective management of *L. monocytogenes* in food.

P4-16

Temporal and spatial patterns of norovirus and microbial source tracking markers across rivers of mid-west area, South Korea

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Norovirus (NoV) is a major cause of acute gastroenteritis and is frequently transmitted through contaminated water. This study investigated the prevalence of norovirus genogroups I (GI) and II (GII) and their association with human-specific microbial source tracking (MST) markers in river water from Daejeon and Sejong area, South Korea. A total of 108 water samples were collected monthly from nine sites along the Geum River system between February 2024 and January 2025, including sites receiving wastewater treatment plant discharges. NoV GI detection peaked in June and July (100%), while no positives were found in November. NoV GII was most frequent in December (88.9%) and lowest in September (11.1%). The mean concentrations of HF183, CPQ_056, and CPQ_064 were 3.43, 4.75, and 3.92 log GC/100 mL, respectively. Both NoV GI and GII showed positive correlations with MST markers and total dissolved solids, while CPQ_056 and CPQ_064 were negatively correlated with water temperature. These results highlight the persistence of norovirus in riverine environments and suggest that MST-based monitoring is a useful tool for tracking human fecal contamination and improving water quality management.

P4-17

Characteristics of pathogenic *Escherichia coli* isolated from cattle and pig slaughterhouses during 2020 to 2025

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Pathogenic *Escherichia coli* (*E. coli*) is a significant foodborne zoonotic pathogen of global concern. The emergence of multidrug-resistant pathogenic *E. coli* strains constitutes a growing public health challenge. We investigated the distribution of virulence genes, O-serotypes, and antimicrobial resistance in pathogenic *E. coli* isolated from domestic slaughterhouses. A total of 2,306 samples were collected from 41 slaughterhouses in South Korea from April 2020 to May 2025, including 470 cattle carcasses, 530 pig carcasses, and 1,306 environmental samples. The serotypes and virulence factors were determined by PCR targeting O-antigen genes and multiplex real-time PCR, respectively. Antimicrobial susceptibility was assessed by broth microdilution using the KRNV6F Sensititre Panel containing 16 antimicrobial agents, according to CLSI guidelines. A total of 21 pathogenic *E. coli* strains were isolated, of which 10 serotypes (O66, O76, O9, O113, O153, O18, O109, O159, O168, and O28) were identified. Among the isolates, 18 were identified as Shiga toxin-producing *E. coli* (STEC) and 3 as enteropathogenic *E. coli* (EPEC). The virulence genes *stx1*, *stx2*, *eaeA*, and STh/STp were detected, with all EPEC strains carrying the *eaeA* gene. Antimicrobial resistance was prevalent among the isolates, with three strains identified as multidrug-resistant, exhibiting resistance to more than five antimicrobial agents. These findings highlight the need for continuous monitoring and systematic antimicrobial resistance surveillance to ensure the safety of meat products, despite generally satisfactory hygienic management in domestic slaughterhouses.

P4-18

Complete genome sequence of *Salmonella enterica* serovar Enteritidis strain MFDS1025534 isolated from food

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Salmonella enterica is a major food-borne pathogen that poses a significant public health concern. Here, we report the complete genome sequence of *Salmonella* strain MFDS1025534, which was isolated from Japchae associated with a food-borne outbreak at a kindergarten in 2023. Whole-genome sequencing was performed using the Illumina MiSeq and Oxford Nanopore MinION platforms. Raw FASTQ reads from both platforms were de novo assembled using Unicycler (v0.5.1). Hybrid assembly resulted in two contigs. The complete genome consists of a 4,773,944 bp chromosome and a 59,360 bp plasmid. The plasmid carries IncFIB and IncFII replicons. Gene prediction identified 4,782 coding sequences (CDSs), 88 tRNAs, and 22 rRNAs in the chromosome, as well as 91 CDSs in the plasmid. The strain was predicted to belong to serovar Enteritidis (9:g,m:-) using SeqSero v1.2. Virulence factors and antimicrobial resistance genes were identified using the Virulence Factor Database (VFDB) and ResFinder v4.7.2, respectively. This strain harbors several virulence factors, including *csgA* (curli fimbriae subunit), *invA* (SPI-1 T3SS inner membrane protein), and *sodC1* (Cu/Zn superoxide dismutase). The genome sequence of strain MFDS1025534 contributes to a better understanding of the pathogenic characteristics of this food-borne pathogen.

P4-19

Novel *Yersinia enterocolitica* O3-specific bacteriophages isolated from the environment: Biofilm inhibition on food-contact surfaces and promising applications for cold-chain food safety

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The aim of this study was to isolate a lytic bacteriophage from the natural environment that specifically targets *Yersinia enterocolitica* O3. To characterize the isolated phage, designated CAU_YEP3, we assessed its viability and genomic sequence, and further evaluated its potential as a biocontrol agent by determining its ability to reduce biofilms of *Y. enterocolitica* O3 in food-related settings. CAU_YEP3 exhibited rapid adsorption, with over 90% adsorption achieved within 20 minutes, a latent period of approximately 40 minutes, and an average burst size of 201 PFU/cell. The phage demonstrated high specificity toward *Y. enterocolitica* serotype O3 and remained stable under a wide range of pH and temperature conditions. Genomic analysis revealed that CAU_YEP3 does not belong to any previously reported family and was classified as "Others," likely due to its unique genomic composition. Moreover, CAU_YEP3 effectively reduced *Y. enterocolitica* O3 biofilms on food-contact surfaces and within food matrices. Specifically, reductions of 1.57 ± 0.08 log CFU/cm^2, 2.49 ± 0.08 log CFU/cm^2, and 0.64 ± 0.08 log CFU/cm^2 were observed on LDPE, SS, and SR surfaces, respectively. These results indicate that this environmentally derived bacteriophage has strong potential for application in controlling *Y. enterocolitica* O3 biofilms and enhancing food safety under diverse conditions.

P4-20

Phenotypic and genotypic characterization of *Vibrio vulnificus* isolated from seafood

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Vibrio vulnificus is a significant public health concern, as sepsis may result from consuming contaminated seafood or from wound exposure to contaminated seawater. This study investigated the virulence genes, antimicrobial resistance, and genetic diversity of *V. vulnificus* isolates obtained from seafood. A total of 118 isolates were collected from 65 shellfish and 53 fish samples. Genetic analysis showed the presence of *glnA* and *toxR* in all isolates (100%), while *rtxA* and *vvh* were detected in 97.5% and 94% of isolates, respectively. Antimicrobial susceptibility testing revealed that 27% of the isolates were resistant to ampicillin. Genetic diversity was assessed using multilocus sequence typing (MLST) and single nucleotide polymorphism (SNP) analysis. MLST identified 81 distinct sequence types (STs), with ST335 being the most prevalent, representing 6.8% of isolates and occurring in both shellfish and fish. SNP analysis indicated low genetic homology among the isolates, reflecting considerable genotypic diversity. These findings highlight the need for food safety measures to reduce the risk of *V. vulnificus* contamination in seafood.

P4-21

Pathogenic and genotypic profiles of *Clostridium perfringens* isolates in South Korea, 2020-2024

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In this study, we evaluated the pathogenicity profiles of 87 *Clostridium perfringens* isolates, comprising 79 obtained from various food products and 8 from environmental samples, collected in South Korea between 2020 and 2024. We investigated toxin types, multilocus sequence typing (MLST), antimicrobial resistance genes, and virulence factors. Toxin types were distributed as follows: type A (n=63), type C (n=1), type F (n=14), and type G (n=9). MLST analysis identified sequence types including ST21 (n=6), ST41 (n=6), ST135 (n=5), ST335 (n=3), ST149 (n=2), and ST383 (n=2). 47 isolates possessed previously unreported sequence types. The common antimicrobial resistance identified were tetracycline(*tetA*(*P*), n=68; *tetB*(*P*), n=51) and macrolide-lincosamide-streptogramin B(*erm*(Q), n=12). Regarding virulence factors, all isolates harbored *cpa*(α-toxin), *colA*(κ -toxin), and *cloSI*(clostripain-like protease) genes, while 15 isolates carried the *cpe* gene encoding enterotoxin, the major determinant of foodborne illness in *C. perfringens*. In addition, colonization-associated genes, including *nagH*, *nagI*, *nagJ*, *nagK*, *nagL*, *nanH*, *nanI*, and *nanJ*, were prevalent in most isolates. Of the 15 *cpe*-positive isolates, 8 showed resistance exclusively to tetracycline, and these resistant isolates carried only *nanH* among the colonization-associated genes. Our results indicate that *C. perfringens* isolates are genetically diverse and exhibit widespread tetracycline resistance, highlighting the need for continued genomic surveillance and characterization.

P4-22

Genomic characterization of an enteroaggregative *Escherichia coli* MFDS1028192 isolated from a kitchen countertop

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Enteroaggregative *Escherichia coli* (EAEC) is a major food-borne pathogen responsible for acute gastroenteritis, typically presenting with diarrhea in humans. This study presents the complete genome sequence of *E. coli* strain MFDS1028192, which was isolated in 2023 from a restaurant kitchen countertop in South Korea. Genomic DNA was extracted using a genomic DNA prep kit for bacteria (QIAGEN) and sequencing was performed with the Illumina MiSeq and Oxford Nanopore MinION platforms. Raw FASTQ reads from both platforms were de novo assembled using Unicycler (v0.4.8). The hybrid assembly resulted in a complete genome sequence consisting of a chromosome (5,271,616 bp) and two plasmids (93,955bp, 91,921bp) with GC contents of 50.51, 47.8%, and 47.1%, respectively. Gene prediction revealed 5,003 CDSs, 97 tRNAs, and 22 rRNAs on the chromosome, and 115 and 145 CDSs on the two plasmids, respectively. The serovar of MFDS1028192 was predicted as O17:H18 using SerotypeFinder (v2.0). *In silico* analysis using the Virulence Factor Database (VFDB) identified a total of 218 virulence-associated genes, including the EAEC master regulator gene *aggR*. Moreover, resistance genes associated with β -lactam, quinolone, and macrolide antibiotics were detected, indicating a multidrug-resistant (MDR) genotype. As an environmental isolate from a restaurant kitchen countertop, this strain's complete genome provides a valuable resource for elucidating the genetic basis of EAEC pathogenicity and antimicrobial resistance.

P4-23

Comparative genomic analysis of *Yersinia enterocolitica* in Korea: Genetic characteristics and diversity

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Yersinia enterocolitica is a major food-borne zoonotic pathogen responsible for gastrointestinal infections worldwide. In this study, we conducted a comparative genomic analysis of 223 *Y. enterocolitica* isolates obtained from food and environments in Korea. Core genome multilocus sequence typing (cgMLST) identified 72 core-genome types (CTs), and allele difference analysis based on cgMLST revealed genomic diversity among the isolates. Biotype prediction based on phylogenetic clustering indicated that biotype 1A (193/223) was the most common, followed by biotype 2 (22/223) and biotype 4 (8/223). Virulence factor profiling revealed the presence of the *inv* gene in the majority of isolates. *ail* and T3SS-associated genes were detected only in biotype 2 (22) and biotype 4 (8). Among the enterotoxin genes, *yaxA* and *yaxB* were present in all isolates, while *ystA* and *ystB* exhibited biotype-specific distributions: *ystA* was identified only in biotype 2 and biotype 4, whereas *ystB* was exclusively present in biotype 1A. Furthermore, all isolates were found to carry the β-lactamase gene (*blaA*) as well as the streptogramin resistance gene (*vatF*). Our results indicate that *Y. enterocolitica* isolates in Korea possess substantial genetic diversity and resistance determinants, emphasizing the importance of continuous monitoring and reinforced food safety practices.

P4-24

Evaluation of predictive models describing the growth and death patterns of pathogenic *Escherichia coli* in cooked spinach under different storage temperatures and periods

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Leafy greens, including spinach, are highly susceptible to contamination by pathogenic microorganisms because of their large surface area and frequent contact with the environment during production. Consequently, foodborne outbreaks linked to leafy vegetables have been increasingly reported worldwide. Cooked spinach is consumed as a side dish around the world, especially in South Korea, where it is often served in mass meals. However, pathogenic microorganisms can proliferate during storage after cooking, which can lead to food safety concerns. Among foodborne pathogens, *Escherichia coli* (*E. coli*) is of particular concern due to its ability to survive and proliferate under a wide range of food storage conditions. Therefore, this study aimed to evaluate predictive models for describing the growth and death patterns of pathogenic *E. coli* in cooked spinach under different storage temperatures and periods. Storage temperatures were set at 5, 10, 15, 20, and 30°C, and storage periods were varied according to each temperature to enable a more detailed assessment of growth and death characteristics under different storage conditions. Primary modeling with the Baranyi and Roberts model showed that lag time (LT) decreased and specific growth rate (SGR) increased as storage temperature rose. LT and SGR values estimated from the primary model were then applied in secondary polynomial models, which showed high determination coefficients (r^2 = 0.970 for SGR and 0.962 for LT), indicating good agreement with experimental data. Model validation at 17°C, a temperature not used for model development, demonstrated predictive performance, as both bias factor (B_f) and accuracy factor (A_f) values for LT and SGR were within the acceptable range. These findings provide a scientific basis for microbial risk assessment and temperature management strategies for controlling pathogenic *E. coli* in cooked spinach dishes.

P4-25

Detection of norovirus on environmental surfaces in childcare centers

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Norovirus is a leading cause of acute gastroenteritis, with high incidence rates driven by seasonal factors, such as winter, and hygiene vulnerabilities in group-feeding facilities. This study examined norovirus contamination and genotype distribution in the living environments of 41 childcare centers in South Korea. Environmental samples were collected primarily from locations with a high risk of person-to-person contact and cross-contamination. The presence and genotype of norovirus were confirmed using RT-qPCR, conventional PCR, and nucleotide sequencing. Norovirus was detected in 17 (1.3%) of 1,306 samples. Of these, 12 were from shared living areas, 2 each from restrooms and kitchens, and 1 from the teacher's workspace. Among the 17 samples that were positive for norovirus, detection rates were high in areas repeatedly exposed to children: 5 (29.4%) from toys and 4 (23.5%) from floor mats, indicating possible virus transmission via daily use items. Genome sequencing identified the following norovirus genotypes: GII.2 (1 case), GII.4 (3 cases), and GII.17 (13 cases), with GII.17 emerging as the predominant genotype. This study provided an overview of the current status of norovirus contamination and genotype characteristics in childcare center environment. These results imply that improving disinfection standards could be essential to avoiding foodborne infections.

P4-26

Survey on norovirus contamination and microbiome analysis of environmental samples from domestic childcare centers

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Norovirus is a major virus that causes acute gastroenteritis in all age groups, posing a significant public health concern, especially in facilities where infants and toddlers live in group surroundings. This study was conducted to assess the prevalence of norovirus contamination in 150 samples collected from six childcare centers from January to March 2025. This study investigated the distribution of norovirus genotypes and microbiome changes in 62 environmental swabs, including those with detected norovirus, to determine potential environmental risk factors. Viral RNA was analyzed using conventional RT-PCR targeting specific regions of the ORF1 and ORF2 genes. Genotypes GII.17 (12/62, 19%) and GII.4 (1/62, 1.6%) were detected using electrophoresis followed by Sanger sequencing. Microbial DNA was analyzed using 16S rRNA gene sequencing to characterize the microbial communities. For microbiome analysis, the samples were divided into groups of norovirus-positive and norovirus-negative. Although alpha diversity indices (Chao1, Shannon, and Simpson) showed no significant difference between the two groups, beta diversity (Weighted UniFrac; $F=2.987$, $r^2=0.052$, $p=0.039$ and Unweighted UniFrac; $F=1.798$, $r^2=0.032$, $p=0.032$) revealed statistically significant differences in the community structure. Taxonomic richness analysis indicated a significantly higher abundance of the genus *Chryseobacterium* in the norovirus-positive group. These results suggest that specific microbial taxa may be associated with norovirus-contaminated environments and may serve as useful indicators for developing strategies to prevent food poisoning and hygiene management in childcare centers.

P4-27

Establishment of a monitoring system for foodborne pathogens through investigation and surveillance of foodborne outbreaks in Korea

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In Korea, foodborne outbreaks are persistent public health concern. The increasing difficulty in identifying causative agents is attributed to the emergence of novel and variant pathogens, driven by diverse food sources and climate change. This study aimed to establish a system for the investigation and traceability of these outbreaks through the collection and characterization of foodborne pathogens from various sources. To achieve this, we collected a total of 735 samples Gyeonggi-do, Chungcheongbuk-do, Chungcheongnam-do, Sejong City, Gyeongsangbuk-do, and Jeollabuk-do. From these samples-which included beef, pork, poultry, agricultural products, and seafood-a total of 240 isolates were obtained. The isolated pathogens were: *Bacillus cereus* (n = 97), *Clostridium perfringens* (n = 9), *Escherichia coli* (Enterohemorrhagic *E. coli*, n = 29; Enteropathogenic *E. coli*, n = 10; Enterotoxigenic *E. coli*, n = 3), *Listeria monocytogenes* (n = 33), *Salmonella* spp. (n = 12), *Vibrio parahaemolyticus* (n = 3), and *Yersinia enterocolitica* (n = 44). It was confirmed that the isolated pathogens varied according to the type of monitoring sample. To expand the scope of this study, additional samples will be collected from Gyeongsangnam-do, Jeollanam-do, Gangwon-do, and Jeju-do. The obtained foodborne pathogens will be analyzed through serotyping, biochemical assays, and whole genome sequencing (WGS) for further characterization.

P4-28

Rapid and accurate serotyping of foodborne pathogens using Nanopore-based NGS panel

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In contemporary society, foodborne illnesses continue to occur sporadically and persistently, and this trend highlights the critical need for effective food safety management. Among various strategies, genome analysis of foodborne pathogens through next-generation sequencing (NGS), particularly those prevalent in Korea, plays a crucial role in the development of rapid and accurate diagnostic tools. This study aims to evaluate the applicability of a foodborne pathogen-specific NGS (FPD-NGS) panel based on Oxford Nanopore sequencing. The Nanopore platform delivers real-time sequence data with minimal library preparation, and this feature allows serotype determination to proceed quickly and efficiently. A total of 23 pathogenic *Escherichia coli* strains (EPEC, EHEC, ETEC), isolated through national surveillance of agricultural and livestock products, and 17 *Salmonella* spp. strains obtained from outbreak investigations were analyzed with the panel. Serotype-specific genetic markers, including the O-antigen (wzx) and H-antigen (fliC) genes, served as targets for identification. All samples achieved an amplicon read depth of ≥10, and this depth ensured reliable serotype classification. These results demonstrate that the FPD-NGS panel has strong potential as a rapid and effective method for the surveillance and diagnosis of foodborne pathogens.

P4-29

Performance evaluation of the NGS-based multiplex panel for detection of foodborne pathogens compared with real-time PCR

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Rapid and accurate on-site analysis is essential for the identification of the causes of foodborne illness. This study evaluated the feasibility of the application of a simultaneous detection method using a multiplex NGS-based panel targeting 17 major foodborne pathogens. The panel was designed to screen species-specific and virulence-associated genes and was validated with both Nanopore and MiSeq platforms. Food samples collected nationwide were initially screened for bacterial presence using real-time PCR. Positive samples were then subjected to Nanopore and MiSeq panel sequencing for species identification and cross-validation. Compared with real-time PCR, Nanopore and MiSeq sequencing demonstrated higher accuracy and improved detection performance. These findings highlight the potential of NGS-based multiplex panels to enhance both the speed and accuracy of foodborne pathogen detection, thereby contributing to more effective food safety management and outbreak monitoring systems.

P4-30

Growth behavior of *Salmonella* Enteritidis in plant-based egg and liquid whole egg products at various storage temperatures

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Plant-based egg analogues (PBEAs) are emerging as sustainable alternatives to conventional eggs; however, their microbiological safety remains insufficiently characterized. This study evaluated the microbial quality of a commercial liquid whole egg (LWE) and a plant-based egg (PBE) product, and investigated the growth behavior of *Salmonella* Enteritidis under different storage conditions. Microbiological analyses showed higher total aerobic counts in PBE (2.37 ± 0.07 log CFU/mL) than in LWE (0.77 ± 0.10 log CFU/mL), while coliforms, *E. coli*, and *S.* Enteritidis were not detected in either product. Both products were inoculated with *S.* Enteritidis at approximately 4.0 log CFU/mL and stored at 5, 10, 15, and 25°C. Growth was modeled using the modified Gompertz equation to estimate lag time (LT), specific growth rate (SGR), and maximum population density (MPD). No *S.* Enteritidis growth was observed at 5°C, whereas significant proliferation occurred at temperatures ≥10°C. At 10°C, LT was shorter in LWE (3.40 days) than in PBE (4.87 days), with SGRs of 0.98 and 0.51 log CFU/day, respectively, indicating that *S.* Enteritidis growth in LWE was faster than in PBE. However, differences in growth kinetics of *S.* Enteritidis between LWE and PBE decreased with increasing temperature. At 15-25°C, LT values ranged from 4.40-17.06 h, and SGRs reached up to 0.49 log CFU/h. These results demonstrate that PBE supports *S.* Enteritidis growth similarly to LWE at the temperatures above 15°C, emphasizing the importance of strict hygiene and cold-chain management to ensure the microbial safety of PBEAs.

P4-31

Data-driven prediction of food hazards: Strategic directions for preventive risk management

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Climate change is transforming global food safety by complicating supply chains and increasing the likelihood of emerging hazards. These challenges demand a shift from reactive management to predictive, science-based systems that anticipate risks and support timely interventions. This review systematically examines the influence of climatic and environmental drivers on the occurrence and spread of foodborne hazards, focusing on biological agents and natural toxins. Building on comparative analyses of domestic and international data-driven prediction frameworks, we outline strategic directions for establishing and operating a national food risk prediction platform. Policy recommendations prioritize predictive analytics-based inspection, risk-based hygiene monitoring, climate scenario-guided planning, and strengthened international data-sharing frameworks. Together, these strategies support the transition to proactive, intelligence-driven food safety governance, positioning the food risk prediction framework as a central hub for national and global risk prevention.

P4-32

Comparative analysis of virulence factors and antimicrobial susceptibility in *Staphylococcus aureus* from bovine mastitis and normal raw milk

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Identifying *Staphylococcus aureus* (SA) virulence determinants-including antimicrobial resistance-linked to bovine mastitis enables precision therapy. Although clinical-subclinical differences in hemolysin and biofilm have been reported, phenotypic differences between isolates from bovine mastitis milk (BMM) and normal raw milk (NRM) remain poorly characterized. Therefore, we compared key virulence phenotypes and antimicrobial susceptibility between BMM and NRM derived isolates. The milk samples were collected from 16 dairy farms located in the Chungcheong region of Korea, comprising BMM (Somatic Cell Count, SCC>200,000cells/mL, n = 30) and NRM (SCC≤200,000 cells/mL, n = 36). Bacterial isolation was performed on CHROMagar™ Mastitis GP. SA isolates were identified by MALDI-TOF MS. Virulence phenotypes were evaluated via hemolysis, gelatinase, and biofilm formation activity tests. Antimicrobial susceptibility tests were conducted using the Sensititre GPALL1F panel. A total of 47 and 25 SA strains were isolated from BMM and NRM samples, respectively. Differences between BMM and NRM were observed in β-hemolysis (89.2% vs 80.0%), gelatinase production (2.7% vs 0.0%), and strong biofilm formation (20.45% vs 0%, $p<0.05$). In antimicrobial susceptibility testing, SA from BMM showed resistance to ciprofloxacin(10%), levofloxacin(10%), and quinupristin/dalfopristin(65%). NRM isolates also exhibited resistance to quinupristin/dalfopristin(56%) and, notably, to ampicillin(52%). Elevated β-hemolysis, gelatinase activity, and strong biofilm formation in BMM isolates indicate a higher likelihood of clinically relevant *Staphylococcus aureus* in mastitis milk, which typically presents with increased SCC. These findings support the validity of SCC as a milk-quality and udder-health indicator. Integrating these virulence readouts with SCC could enable earlier diagnosis and risk stratification of bovine mastitis. Future work should include comparative metagenomic analyses of BMM versus NRM to resolve community shifts and transmission reservoirs.

P4-33

Antimicrobial mechanism of different organic acids against *Escherichia coli* O157:H7 under alkaline condition

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This study investigated the antimicrobial mechanism of 1% various organic acids (OAs) against *Escherichia coli* O157:H7 ATCC 35150 at pH 10 in Luria-Bertani broth without NaCl (LBWS). Eight OAs and HCl were used in this study: formic (FA), acetic (AA), propionic (PA), lactic (LA), butyric acid (BA), malic (MA), tartaric (TA), and citric acid (CA). Following acid treatment, the intracellular reactive oxygen species (ROS) levels, membrane permeability, and membrane potential determined using H_2DCFDA, propidium iodide (PI), and bis-(1,3-dibutylbarbituric acid) trimethine oxonol ($DiBAC_4(3)$), respectively. As a result, noticeable higher intracellular ROS levels were observed in TA, CA, and HCl treatments ($p < 0.05$), whereas no significant differences were detected for the other OAs ($p > 0.05$). Consistently, CA was the most effective in increasing membrane permeability, followed by TA. On the other hand, MA showed no effect on membrane integrity, with no significant difference compared to the control ($p > 0.05$). Surprisingly, a significant increase in membrane potential was detected exclusively in *E. coli* O157:H7 treated with MA ($p < 0.05$). Additionally, membrane damage in cells treated with MA, TA, and CA was examined using transmission electron microscopy (TEM), which revealed outer membrane disruption and structural loss in all treated cells. Therefore, these results elucidate the antimicrobial mechanism of OAs under alkaline conditions; however, further research is needed for a more comprehensive understanding.

P4-34

Gompertz model-based analysis of freezing curve dynamics and survival of foodborne pathogens under different freezing rates

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Freezing, a widely used method for food preservation, can be broadly divided into rapid and slow freezing. However, most studies have focused on final survival, with limited investigation into the relationship between freezing rate and pathogen survival. This study aimed to analyze freezing curves according to sample volume using Gompertz modeling to estimate phase characteristics (cooling rate, plateau period, freezing rate), and to compare the survival pattern of foodborne pathogens (*Salmonella* Typhimurium, *Listeria monocytogenes*, *Escherichia coli* O157:H7, *Yersinia enterocolitica*) in TSB under rapid and slow freezing conditions at -20°C. Although the overall freezing curve pattern was similar across volumes, phase lengths differed. Specifically, larger volumes showed faster cooling to 0°C, while Gompertz modeling indicated longer plateau phases and reduced freezing rates. For survival experiments, the freezing rate was defined as 45.62°C/h for rapid freezing (5 mL TSB) and 6.62°C/h for slow freezing (50 mL TSB). Pathogen counts decreased below 6 log CFU/mL within 3 h in rapid freezing, whereas in slow freezing, most bacteria except *Y. enterocolitica* remained above 6 log CFU/mL after 8 h. No clear survival differences were observed across different freezing curve phases. These findings suggest that freezing rate critically influences microbial survival, although further research in complex food systems is required to validate these results.

P4-35

Influence of freezing rate and storage duration on survival and post-thaw growth of foodborne pathogens

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Frozen foods are widely consumed for their convenience, but they pose safety concerns due to microbial contamination. The growth of pathogenic microorganisms may vary depending on freezing conditions and storage duration. Therefore, this study evaluated the effects of freezing rate and storage duration on the survival and post-thawing regrowth of major pathogens. A cocktail of four pathogens was inoculated into 5 mL and 50 mL of TSB, and then frozen at -20°C for short (24 h) and long (28 days) periods. Survival and the presence of injured cells was determined after thawing at room temperature. Furthermore, regrowth was monitored by measuring OD600 over 24 h at 25°C compared to unfrozen control. After 24 h of freezing, significant reductions were observed in *Salmonella* Typhimurium (2.25-3.22 log CFU/mL), *Escherichia coli* O157:H7 (3.96-4.59 log CFU/mL), and *Yersinia enterocolitica* (3.12-3.21 log CFU/mL), with a corresponding increase in injured cells. Survival patterns were generally similar across freezing rates, although minor differences in reduction may reflect volume-dependent cooling dynamics. Post-thaw regrowth at 25°C exhibited significantly extended lag times compared to unfrozen controls. These findings highlight variability in pathogen survival and suggest that freezing rate and storage duration may influence microbial resistance. Further studies in complex food systems are needed to confirm these effects.

P4-36

Formation and detection of viable but non-culturable *Salmonella* Typhimurium in acidic foods during cold storage

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In our previous study, we showed that *Salmonella* Typhimurium could be induced into a viable but non-culturable (VBNC) state under lactic acid and low temperature stress in laboratory media. Building on this, the present study investigated whether VBNC formation occurs in acidic foods, including dongchimi and yogurt, during storage at 4 and -20°C, and evaluated detection using PMAxx-qPCR. Culturable cells were enumerated on xylose lysine deoxycholate (XLD) and tryptic soy agar (TSA) plates, while viable cells were simultaneously assessed by fluorescence microscopy and PMAxx-qPCR over 21 days. A strong linear correlation ($r^2 = 0.9838$) between bacterial counts and Ct values confirmed the high reliability of PMAxx-qPCR. After 21 days, culturable counts markedly decreased in both foods, with no colonies on XLD under certain conditions (dongchimi at -20°C, yogurt at 4°C), while TSA showed slightly higher but still low levels. In contrast, PMAxx-qPCR detected substantially higher viable populations, ranging from 5.89 log CFU/ml in dongchimi (-20°C) to 8.07 log CFU/ml in yogurt (4°C). These findings demonstrate that although culturability was lost under acidic and cold stress, *S.* Typhimurium survived in the VBNC state and could be reliably detected by PMAxx-qPCR.

P4-37

Characteristics of the viable but nonculturable (VBNC) state of *Salmonella enterica* serovar Typhimurium induced by lactic acid and cold stress

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Salmonella enterica serovar Typhimurium is a major foodborne pathogen characterized by multiple virulence determinants, including invasiveness and toxin production. The viable but nonculturable (VBNC) state is a dormant physiological form in which cells remain viability but cannot be detected by conventional culture techniques. In this study, *S.* Typhimurium was exposed to 0.5, 1.0, and 2.0% lactic acid (LA) combined with low temperature stress at 4 and -20°C. At 4°C, intracellular ROS levels increased in a concentration-dependent manner, reaching approximately 600-700 RFU at 2.0% LA, whereas cells stored at -20°C exhibited markedly higher ROS levels (> 1000 RFU) in both TSB and DW. Resuscitation assays showed that VBNC cells recovered after temperature upshift to 37°C only under limited conditions. Notably, pyruvate or catalase supplementation restored culturability in up to 2/3 of replicates at 1.0-2.0% LA, while recovery in plain TSB was observed sporadically (≤1/3 of replicates). TEM analysis revealed distinct phenotypic changes in VBNC cells, including condensed cytoplasm, membranes damage, and large vacuole-like structures, which contrasted with intact morphology of untreated controls. These results demonstrate that exposure to LA and cold stress induces *S.* Typhimurium into the VBNC state, exhibiting elevated intracellular ROS and distinct morphological alterations, and could partially resuscitate under specific recovery conditions.

P4-38

Genome-based discrimination of *Bacillus thuringiensis* and *Bacillus cereus* using a Bt-specific qPCR marker

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Bacillus thuringiensis (Bt) is widely used as a microbial pesticide in agriculture, whereas its close relative *Bacillus cereus* (Bc) is a foodborne pathogen of public health concern. Their high genomic similarity has long complicated species-level discrimination, undermining risk assessment in food safety and agricultural monitoring. Here, we analyzed 292 genomes, including 50 isolates from agricultural products and environments in Korea, to clarify taxonomic boundaries and identify species-specific molecular markers. Comparative genomics based on average nucleotide identity (ANI) and digital DNA-DNA hybridization (dDDH) resolved Bt-Bc species boundaries and yielded a curated dataset for downstream analyses. Toxin gene profiling showed that enterotoxins (*nhe*, *hbl*, *cytK*) are broadly distributed in both species, while insecticidal genes (*cry*, *vip*) are enriched in Bt yet also present in Bc, indicating limited discriminatory value. Pangenome analysis revealed several Bt-specific loci, from which one marker was selected and experimentally validated. The resulting PCR/qPCR assay amplified a single 339-bp product (Tm 78.5°C) exclusively in Bt and demonstrated high specificity with strong linearity for cloned and genomic DNA standards (R^2 = 0.991-0.993). Collectively, this study delivers a genome-informed and experimentally validated assay for reliable Bt-Bc discrimination, providing a practical tool for biosurveillance in agricultural environments and supporting the safe application of Bt-based biocontrol agents in food production systems.

P4-39

Sublethal injury of *Escherichia coli* O157:H7 in food models under freeze-thaw

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Freezing is widely used to inhibit microbial growth and extend the shelf life of foods. However, inappropriate freezing-thawing conditions may induce sublethal injury in foodborne pathogens. In particular, *Escherichia coli* O157:H7 can survive under freezing conditions, and injured cells may recover under favorable environments, posing potential risks to food safety. This study investigated dead, sublethal injury, and recovery of *E. coli* O157:H7 under practical freeze-thaw conditions in different food matrices. Rice cake, fish cake, and cabbage samples were inoculated with *E. coli* O157:H7, frozen at -20°C for 24 h, and thawed under various conditions (4°C for 24 h, 25°C for 2 h, 37°C for 40 min, or microwave thawing for 30 s). Dead and sublethal injury ratio were evaluated, and recovery of injured cells was assessed after incubation in tryptic soy broth (TSB) at 37°C for 3 h. The results showed that *E. coli* O157:H7 exhibited the highest dead ratio in rice cake, whereas fish cake showed the lowest, likely due to the protective effects of proteins and lipids. Sublethal injury varied depending on food type and thawing conditions; rice cake showed the highest injury under 4°C and 25°C thawing, while cabbage showed the lowest injury under 25°C, 37°C, and microwave thawing, possibly related to antioxidant components and the structural properties of the cell wall. Moreover, all foods showed the lowest injury levels at 37°C thawing, and injured *E. coli* O157:H7 subsequently recovered to pre-injury levels after 3 h of incubation at 37°C. These results provide insights into the freeze-thaw responses of *E. coli* O157:H7 and highlight the importance of considering sublethally injured populations in food safety management.

P4-40

Effects of freeze-thaw conditions on single- and dual-species biofilms of *Listeria monocytogenes* and *Pseudomonas aeruginosa* on stainless steel surfaces

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Freezing is a widely used food preservation process because of their effectiveness in inhibiting microbial growth and maintaining food quality. However, outbreaks of foodborne illness and detections of pathogens such as *Listeria monocytogenes* in frozen foods continue to be reported. These pathogens may be protected by *Pseudomonas aeruginosa*, a strong biofilm former on food-processing surfaces, thereby increasing risks to food safety. Nevertheless, the effects of freeze-thaw processes on biofilms remain poorly understood. This study evaluated the effects of freeze-thaw exposure on *L. monocytogenes* biofilms (LM), *P. aeruginosa* biofilms (PA) and dual-species biofilms of *L. monocytogenes* and *P. aeruginosa* (LP) formed on stainless steel. The treatments combined rapid (RF, -80°C) or slow (SF, -20°C) freezing with thawing at refrigeration temperature (CT, 4°C) or room temperature (RT, 25°C). Subsequently, biofilm biomass, cell viability, membrane integrity, and gene expression were analyzed. Cell viability of LM and PA was highest under SF-CT with minimal temperature fluctuations, whereas greater temperature fluctuations increased cell damage and depolarization, leading to death. In LP, which contained abundant extracellular polymeric substances (EPS), no significant differences in biomass or cell viability were observed among the freeze-thaw treatments. This suggested that EPS maintained the stability of biofilms and buffered against temperature fluctuations. Moreover, the structural position of *L. monocytogenes* within LP conferred protection, allowing survival during freeze-thaw. Although freeze-thaw treatment killed some bacteria, surviving cells displayed increased virulence gene expression. This highlights the need for improved hygiene strategies targeting biofilms to ensure food safety in frozen food production and distribution.

P4-41

Genomic characterization of a vancomycin- and teicoplanin-resistant *Enterococcus faecalis* ST6 isolate harboring a plasmid-borne vanA operon in South Korea

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We report the whole-genome characterization of a multidrug-resistant *Enterococcus faecalis* ST6 isolate recovered from a human clinical specimen in South Korea. Antimicrobial susceptibility testing revealed resistance to gentamicin, streptomycin, teicoplanin, vancomycin, tetracycline, ciprofloxacin, and tigecycline. Whole-genome sequencing identified three contigs, two corresponding to chromosomal DNA and one to a plasmid. The plasmid (contig 3) harbored a complete *vanA* operon (*van*HAX) along with *vanY*, and several resistance genes. The coexistence of high-level glycopeptide resistance and multiple aminoglycoside, macrolide, and tetracycline resistance determinants highlights the public health concern posed by such strains. This is, to our knowledge, the first report of an *E. faecalis* ST6 isolate carrying a complete plasmid-borne *van*A cluster including *van*Y in South Korea. This study was supported by the Research Program funded by the Korea Disease Control and Prevention Agency (2024-ER2209-00).

P4-42

Antifungal effect of riboflavin-mediated 405 nm light emitting-diodes on *Penicillium italicum* on mandarin and its impact on fruit quality

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Citrus fruits contain abundant nutrients and moisture, which makes them vulnerable to fungal infection through surface wounds during postharvest transportation and storage. Light emitting diode (LED) illumination at 405 nm exhibits antimicrobial activity against pathogenic and spoilage microorganisms; however, its effectiveness can be limited on foods. This study evaluated the antifungal efficacy of 405 nm LED, with and without riboflavin (RBF) as an exogenous photosensitizer, against *Penicillium italicum* (KACC 44510) on mandarin, and examined potential effects on fruit quality. Mandarins were surface-inoculated with P. italicum spores at approximately 4.0 log CFU/fruit and stored for 7 days at 25°C. In the non-illuminated control and the RBF-only treatment, mold populations increased to about 9.2 log CFU/fruit by day 7. In contrast, both LED alone and RBF-mediated LED illumination effectively suppressed spore germination and maintained counts near the initial level (approximately 4.0 log CFU/fruit) throughout storage. Fruit quality indicators, including weight loss, peel color, vitamin C content, and antioxidant capacity, did not differ significantly among the control, LED, and RBF-mediated LED groups, indicating that illumination did not adversely affect fruit's quality. Therefore, these results demonstrate that the combined treatment of 405 nm LED and 100 μM riboflavin effectively inactivated *P. italicum* spores, suggesting that this technology could be developed as a potential method to control *Penicillium* rot on mandarin surfaces during storage and transportation.

P4-43

Glycan-mediated magnetic separation of *Escherichia coli* O157:H7 from lettuce

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Efficient separation and preconcentration of *Escherichia coli* O157:H7 during sample preparation are critical for its rapid and accurate detection in food matrices. In this study, we quantitatively evaluated the performance of carbohydrate-coated magnetic nanoparticles (cMNPs) in separating *E. coli* O157:H7 from lettuce. Two types of carbohydrate-functionalized cMNPs (A and B) were compared with uncoated MNPs and a no-particle control using artificially contaminated lettuce samples. The separation efficiency was assessed based on colony-forming unit (CFU) counts obtained by the plate count method, and the relative performance of the two carbohydrate coatings was also compared. Both cMNP groups (cMNPs-A and cMNPs-B) achieved at least a ≥2-fold enrichment relative to the no-particle control and showed statistically significant improvement over uncoated MNPs ($p < 0.001$). However, no significant difference was observed between carbohydrate types A and B ($p > 0.05$). These findings demonstrate that glycan coating enhances the separation efficiency of *E. coli* O157:H7 from food matrices, though the magnitude of the effect may vary depending on glycan structure. Further studies are warranted to clarify the influence of different glycans on bacterial separation performance and to optimize coating strategies for practical applications.

P4-44

Bioinformatics-guided development and comparative evaluation of qPCR, POC PCR, and ddPCR assays for rapid detection of *Vibrio campbellii* and *Vibrio harveyi*

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Rapid detection of *Vibrio campbellii* and *Vibrio harveyi* is essential for preventing large-scale losses in aquaculture, yet conventional methods often fail to distinguish between these closely related species, leading to misdiagnosis. In this study, a bioinformatics-based comparative genomic approach was used to identify novel pathogenic markers unique to each species, enabling the design of multiplex PCR assays, including real-time PCR (qPCR), point-of-care PCR (POC PCR), and droplet digital PCR (ddPCR). The neutral zinc metallopeptidase and enterotoxin genes were identified as specific markers for *V. campbellii* and *V. harveyi*, respectively. All three assays exhibited 100% specificity with no cross-reactivity among 67 bacterial strains and high sensitivity, detecting as low as 10^1 CFU/ml for qPCR and POC PCR, and 10^0 CFU/ml for ddPCR. In qPCR and POC PCR, Ct values ranged from 17.3-36.8 across serial dilutions (10^7-10^1 CFU/ml), showing excellent linearity ($R^2 \geq 0.996$). ddPCR achieved absolute quantification down to 0.56 ± 0.24 copies/µl, with $R^2 = 1.000$ over 10^4-10^0 CFU/ml. Validation with spiked sashimi samples confirmed similar detection limits (10^1-10^0 CFU/g), indicating minimal matrix interference. Comparative analyses revealed that ddPCR required -255 min and cost $4.15/sample, qPCR took -100 min and cost $1.20/sample, while POC PCR completed 40 cycles within 20 min at $0.73/sample. These results demonstrate that POC PCR provides the most practical field diagnostic platform, whereas ddPCR offers superior low-level quantification. The developed assays significantly enhance pathogen detection accuracy, enabling timely disease management and improved food safety monitoring in aquaculture systems.

P4-45

From farm to gut: Transferable phenicol-oxazolidinone resistance in food-animal *Enterococci* and the risk of human microbiome spillover

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Enterococci are major commensal bacteria inhabiting the gastrointestinal tract of both humans and animals, where they contribute to gut microbial balance and nutrient metabolism. However, these bacteria can act as opportunistic pathogens and serve as reservoirs of antimicrobial resistance genes that may transfer across species boundaries. Recently, the emergence of transferable phenicol-oxazolidinone resistance genes in *Enterococcus* has raised serious public health concerns due to their potential dissemination within the gut microbiota and through the food chain. This study investigated the prevalence, antimicrobial resistance, and genetic characteristics of phenicol-oxazolidinone resistance genes among *Enterococcus faecalis* and *Enterococcus faecium* isolated from food-producing animals and retail meats in Korea in 2018. Among 327 isolates (282 *E. faecalis*, 45 *E. faecium*), the *optrA*, *poxtA*, and *fexA* genes were detected in 15 (4.6%), 8 (2.5%), and 17 (5.2%) isolates, respectively. Twenty-two isolates exhibited multidrug resistance to florfenicol, tetracycline, erythromycin, and tylosin, and three *E. faecalis* strains were resistant to linezolid (MIC 8 mg/L). Multilocus sequence typing identified eight *E. faecalis* sequence types, with ST593 predominating (43%). Conjugation assays confirmed gene transferability in 17 isolates. Complete genome sequencing of three *E. faecalis* strains revealed that *optrA*, *poxtA*, and *fexA* were located on chromosomes, plasmids, or both, often linked to mobile elements such as IS1216E and Tn554. Notably, strain EFS108 carried *optrA*, *poxtA*, and *cfr*(*D*) concurrently on chromosome and plasmid, the first report in Korea. These findings suggest that enterococci from the animal gut represent an important reservoir of transferable resistance genes with potential spillover into the human intestinal microbiota, underscoring the need for prudent antimicrobial use and continuous surveillance in the food chain.

P4-46

Characterization of ESBL-producing *Escherichia coli* isolated from broiler farm environments in Korea

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ESBL-producing *Escherichia coli* from broiler farms can disseminate into the environment and reach humans through the food chain or direct exposure, representing a major public health concern. This study characterized ESBL-resistant Enterobacteriaceae isolated from broiler farms in South Korea to assess their occurrence. A total of 18 environmental samples (feces and litter) were collected from three broiler farms certified as antibiotic-free and eco-friendly. From these samples, 65 *Escherichia coli* isolates were recovered using CHROMagar™ Orientation with ESBL supplement and ciprofloxacin (2 mg/L) MacConkey agar. Antimicrobial susceptibility profiles were determined by the Sensititre system, which revealed the highest resistance to ampicillin. ESBL production was phenotypically confirmed by DDST, with 61 out of 65 isolates (93.8%) showing positive results. For ESBL genotypic characterization, PCR was performed using primers targeting TEM, SHV, CTX-M-1, and CTX-M-9 groups. The results revealed the presence of *bla*TEM-163 (23%), *bla*CTX-M-55 (38.4%, CTX-M-1 group), and *bla*CTX-M-14 (7.6%, CTX-M-9 group). MLST analysis is currently being conducted on isolates with identical antimicrobial resistance patterns to elucidate their clonal diversity and sequence type (ST) distribution. These findings are expected to contribute to the characterization of ESBL-producing Enterobacteriaceae from broiler farms and to a better understanding of their occurrence.

P4-47

Verification of a PCR-based assay for the rapid detection of *Campylobacter coli* in food against the standard culture method

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The newly established conventional PCR method (PCR method) was compared with the traditional culture method (culture method) on the Korean Food Code for analyzing qualitatively *C. coli* in foods to confirm the time-effective and accurate alternative method. Three food groups to test against various foods were purchased at local markets, including hams(3 samples), simply processed livestock products (3 samples) and instant foods like salad (3 samples). The *C. coli* (ATCC 33559) was inoculated in three concentrations a× (10^2, 10^1 and 1 CFU/25g) on the purchased foods, enriched with Bolton media (Oxoid) and incubated microaerobically at 36±1°C for 4-5 h, followed by the incubation of 42±1°C for 44±4 h. The *C. coli* was identified with the PCR method, focusing on glyA gene. In contrast, the culture method needed the additional incubation time on mCCA (modified Campy blood free agar, Oxoid) media for 48 h in Korean Food Code and was identified by VITEK-MS. The detection patterns at the three concentrations were almost similar in the two test methods. The PCR method was faster and more accurate than the culture method. Therefore, the PCR method was judged to be another alternative to the culture method.

P4-48

First identification and genomic characterization of *Enterobacter cloacae* complex ST555 isolated from a leafy vegetable farm in South Korea

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Enterobacter cloacae complex (ECC) is an emerging opportunistic pathogen exhibiting diverse antimicrobial resistance (AMR) phenotypes. In this study, we report the first identification and whole-genome characterization of an ECC isolate belonging to sequence type ST555, recovered from a leafy vegetable farm in South Korea. Whole-genome sequencing (WGS) revealed multiple AMR genes (*oqxB*, *catA*, *fosA*, *blaACT-28*) and metal resistance operons (*arsR*, *arsD*, *arsA*, *arsB*). The fully assembled plasmid contained a hybrid replicon (IncFIB/IncFII) and a complete MOBF/MPF_F conjugation system, indicating strong potential for horizontal gene transfer. In addition, key resistance-associated genes (*acrF_1*, *marA_1*, *mdtE*) and stress response regulators (*nemA*, *umuC/D*) were identified, suggesting enhanced survival under antibiotic stress. The coexistence of metabolic (*xylB*, *rbs*) and virulence (*dsdC*, *flmA*) genes further supports its ecological adaptability. Phylogenetic analysis showed that the ST555 isolate formed a distinct lineage closely related to known ECC reference strains. Overall, this study provides the first genomic insight into a novel ECC lineage carrying multiple resistance determinants in an agricultural environment.

P4-49

Experimental transmission of human norovirus from hand or glove to food contact surfaces

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Noroviruses are a leading cause of acute gastroenteritis outbreaks worldwide. Transmission primarily occurs via the fecal-oral route, often associated with infected food handlers. Although previous studies used murine norovirus as a human norovirus surrogate for the surface contamination, the experimental transmission data of human norovirus from hand to food contact surfaces were limited. Therefore, this study aimed to investigate the viral transmission from skin to multiple food-contact surfaces using human norovirus GII.4. To mimic contaminated hands, latex gloves and porcine skin (a human skin substitute) were used. Viral transfer rate was measured on commonly used food-contact surfaces, including stainless steel, aluminum, and polypropylene, which were fabricated into coupons for experimental use. Coupons fully immersed in the virus suspension were placed in contact with food-contact surface coupons for 1 min, and viral transfer was quantified using RT-qPCR. Viral transmission was observed from latex gloves to stainless steel (60.53 ± 4.28%), aluminum (31.00 ± 6.13%), and polypropylene (41.02 ± 4.29%), as well as from porcine skin to stainless steel (31.60 ± 14.37%), aluminum (22.34 ± 16.13%), and polypropylene (22.15 ± 0.70%), respectively. The transmission of human norovirus from hands to food-contact surfaces was clearly demonstrated. These findings highlight the critical importance of strict personal hygiene in real-world food-handling environments.

P4-50

Monitoring of six foodborne viruses in childcare facilities using RT-qPCR in South Korea 2024-2025

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As foodborne viruses are highly transmissible to children, intensive surveillance was necessary to prevent the contamination and transmission of viral infections in childcare facilities. Based on the recent 5-year statistics from the Korea Disease Control and Prevention Agency, children under 6 years old are susceptible to foodborne virus infections compared with older age groups. This study aimed to investigate the prevalence and contamination of six major foodborne viruses in childcare facilities across South Korea during 2024-2025. A total of 540 swab samples were collected from 35 childcare facilities in Gwangju, Ansan, and Seoul. The virus contamination of swabs from food preparation surface (cutting board, utensils, gloves, surfaces etc.), serving environments, and restrooms were examined. While RT-qPCR detected norovirus GI, norovirus GII, astrovirus, rotavirus, hepatitis A virus, and adenovirus, sequence analysis confirmed only 1 norovirus GII.7 in a kitchen sink swab. This study can highlight potential areas prone to contamination within childcare facilities and provide scientific evidence to support the development of safety management strategies in childcare facilities.

P5

P5-01

pH-responsive hydrogel delivery system of phage and prebiotics for targeted control of *Klebsiella pneumoniae*

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Klebsiella pneumoniae is a multidrug resistant pathogen designated by WHO as a critical priority due to resistance to last-line antibiotics. In addition to its clinical relevance, *K. pneumoniae* ferments dietary sugars into endogenous alcohol, contributing to non-alcoholic fatty liver disease, especially in immunocompromised hosts. Bacteriophages (phages), with their host specificity, are emerging as promising antimicrobial agents. In this study, we isolated a novel lytic bacteriophage (phage), HJK2, with specificity against *K. pneumoniae*. We encapsulated phage HJK2 into pH-responsive hydrogel beads composed of 1.5% (w/v) alginate and various compositions of prebiotics (inulin and XOS) and crosslinked with 0.1 M $CaCl_2$ through the extrusion method. This platform is designed to protect phages from gastric acidity and enable targeted intestinal release. Prebiotics served dual functions, which were supporting beneficial gut microbiota and enhancing phage stability by modulating the porosity of hydrogel and swelling behavior. The beads were colorless, odorless, and biocompatible, minimizing host disruption. Our formulation supports microbiome homeostasis while providing targeted phage therapy against *K. pneumoniae* colonization. This study presents a novel oral therapeutic platform integrating phage specificity with prebiotic-enhanced hydrogel delivery, offering a promising alternative to antibiotics for drug resistant gut pathogens.

P5-02

Monitoring of residual formaldehyde in table napkins and cocktail napkins

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This study evaluated the residual levels of formaldehyde in 84 table napkins distributed as general consumer products and 21 cocktail napkins regulated as sanitary products. Formaldehyde analysis was performed in accordance with the test method specified in the “Standards and Specifications for Sanitary Products,” using 2,4-dinitrophenylhydrazine (2,4-DNPH) derivatization followed by high-performance liquid chromatography (HPLC). Among the table napkins, formaldehyde was detected in 8 samples above the limit of detection (LOD, 0.004 mg/L), and 2 samples exceeded the limit of quantification (LOQ, 0.013 mg/L). The detected concentrations, adjusted for dilution factors, ranged from 0.053 to 0.162 mg/L, which is well below the regulatory limit of 4 mg/L. No formaldehyde was detected in any of the cocktail napkin samples. These results indicate that while the detected levels pose no immediate safety concern, ongoing monitoring of table napkins is recommended due to their classification as unregulated general consumer products.

P5-03

Appraisal of cinnamon leaf oil for controlling *Salmonella* Typhimurium biofilms on chicken and food contact surfaces

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Salmonella Typhimurium is a major foodborne pathogen that persists on poultry and food contact surfaces through biofilm formation, challenging food safety management. This study investigated the antibiofilm efficacy of cinnamon leaf oil (CLO) against *S.* Typhimurium ATCC 14028 on chicken meat and common food processing surfaces, including stainless steel (SS), polyethylene terephthalate (PET), low-density polyethylene (LDPE), and silicone rubber (SR). CLO exhibited a minimum inhibitory concentration (MIC) of 0.09%. At MIC and higher levels, CLO significantly ($p < 0.05$) reduced 24-h-old biofilms across all tested surfaces, with reductions exceeding 2.0 log CFU/cm^2 on SS and LDPE. On chicken meat, CLO inhibited biofilm development by approximately 1.5 log CFU/cm^2 and reduced pre-formed biofilms by approximately 2.0 log CFU/cm^2. Mechanistic assays demonstrated that CLO disrupted cellular hydrophobicity, reduced ATP levels, and impaired auto-aggregation and motility, thereby weakening biofilm stability. Microscopy confirmed structural damage and increased cell death. Quality analysis revealed no adverse effects on chicken color, though moderate decreases in hardness and gumminess were observed with increasing CLO concentrations. Sensory evaluation indicated minor aroma changes but no unacceptable alterations in texture. Overall, CLO demonstrated strong antibiofilm and bactericidal activity, supporting its potential as a natural intervention for controlling *S.* Typhimurium biofilms in poultry and food processing environments.

P5-04

Fabrication and physicochemical stabilization of natural ingredient-based nano-emulsions using a biosurfactant from *Bacillus velezensis* GJ1 and thyme oil

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Nano-emulsions have been widely utilized in the food industry as multifunctional formulations, including colorants, flavoring agents, and antimicrobials. However, previous studies have predominantly relied on synthetic surfactants, which limit their application in food systems due to safety and sustainability concerns. To overcome these limitations, this study developed a natural ingredient-based nano-emulsion system using a biosurfactant derived from *Bacillus velezensis* GJ1 and thyme oil. First, when the volume ratio of biosurfactant to thyme oil (1:1-16:1) was adjusted, the mean particle size decreased from 825.6 nm to 465.3 nm as the biosurfactant proportion increased, while the polydispersity index (PDI) ranged from 20.2% to 25.4%. Under all conditions, the zeta potential remained highly negative -70.3 mV to -81.4 mV, indicating strong electrostatic stability. Next, upon applying various biosurfactant concentrations (1-30 mg/mL), particle size gradually decreased with increasing concentration, reaching an average of approximately 450 nm and a zeta potential of less than -80 mV at 20 mg/mL, where the most stable emulsion was formed Finally, blending the biosurfactant with natural surfactants such as lecithin and saponin produced distinct synergistic effects on droplet size distribution, PDI, and interfacial stability, underscoring its potential for tailored emulsification performance. Overall, this study demonstrates that stable nano-emulsions can be achieved without synthetic additives and positions the natural biosurfactant-essential oil system as a sustainable and safe platform for food applications. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2025-00555808).

P5-05

Biosurfactant from *Bacillus velezensis* GJ1: Antibacterial potential and mechanistic insights against *Listeria monocytogenes*

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Listeria monocytogenes, a major foodborne pathogen, continues to challenge the food industry due to its strong biofilm-forming ability and increasing resistance to conventional antibiotics. Biosurfactants, amphiphilic metabolites of microbial origin, have recently attracted attention as eco-friendly antibacterial alternatives to antibiotics. In this study, the antibacterial potential of a biosurfactant produced by *Bacillus velezensis* GJ1 was systematically evaluated. The biosurfactant exhibited potent inhibitory activity against *L. monocytogenes*, with a minimum inhibitory concentration (MIC) of 16 μg/mL, comparable to that of gentamicin (8 μg/mL). Growth kinetics and time-kill assays revealed both bacteriostatic and bactericidal effects, achieving complete inhibition at the MIC and a -5 log CFU/mL reduction at 2× MIC. Resistance development assays showed limited adaptation, with only a two- to four-fold MIC increase after serial passages, in contrast to a 16-fold increase observed for gentamicin. Checkerboard microdilution demonstrated strong synergism with gentamicin (fractional inhibitory concentration index 0.25-0.375), reducing the biosurfactant MIC to 2 μg/mL. Mechanistic studies using confocal laser scanning microscopy and transmission electron microscopy confirmed extensive membrane disruption, accompanied by leakage of nucleic acids and proteins. Collectively, these findings establish the GJ1 biosurfactant as a potent and sustainable antibacterial candidate for controlling *L. monocytogenes* in food-related environments. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2025-00555808).

P5-06

Influence of dietary sugars on *Streptococcus mutans* biofilm formation and the inhibitory potential of quercetin

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Dental caries is a sugar-driven, biofilm-mediated disease that affects nearly 80% of the global population, with *Streptococcus mutans* recognized as a key contributor to biofilm formation and caries progression. This study aimed to investigate the influence of different sweeteners and the natural flavonoid quercetin on *S. mutans* biofilms across hydroxyapatite (HA), stainless steel (SS), titanium (Ti), and zirconia (Zi) surfaces. The results showed that sucrose supported the highest level of biofilm growth, whereas alternative sweeteners significantly suppressed development, with sucralose being the most effective. Among the tested surfaces, HA facilitated the highest biofilm accumulation while Zi exhibited the least. Based on these findings, sucrose-rich HA conditions were chosen to evaluate the antibiofilm activity of quercetin. Quercetin markedly reduced biofilm formation, eradicated established biofilms, and disrupted virulence traits such as adhesion, surface hydrophobicity, auto-aggregation, and acid production, with CLSM and SEM confirming biofilm elimination and structural damage. Overall, the study highlights that replacing sucrose with alternative sweeteners can serve as a preventive strategy, while natural bioactives such as quercetin provide a potent means to control *S. mutans* biofilms even under sugar-rich conditions, offering promising avenues for reducing caries risk and advancing biofilm-targeted dental care.

P5-07

Calcium-crosslinked pectin films for pectinase-triggered controlled release of bacteriophages in food packaging

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The rise of antibiotic-resistant bacteria, such as methicillin-resistant *Staphylococcus aureus*, underscores the urgent need for alternative antimicrobial strategies like bacteriophages (phages). In this study, calcium-crosslinked pectin films were developed for enzyme-triggered phage release. A newly isolated lytic phage, SAC, rapidly inhibited *S. aureus* within 1 h at a multiplicity of infection of 1, with bactericidal activity lasting for up to 24 h. SAC remained stable across temperatures (-18 to 60°C) and pH levels (5 to 10), and its genome lacked antibiotic resistance and virulence genes. SAC was incorporated into 1.5% (w/v) pectin films crosslinked with 5% (w/v) calcium chloride, which improved the film's moisture barrier properties by forming a dense polymer matrix and thereby enhanced the protection of phages against external humidity and desiccation. Pectinase exposure accelerated film degradation and phage release. In soy milk, the phage-loaded film reduced bacterial counts by 8.90-log CFU/mL without added pectinase, and by 10.47-log CFU/mL when pectinase was added, compared to those in control group. These results demonstrate the potential of SAC-loaded pectin films as a novel enzyme-responsive system for targeted antibacterial activity in food packaging applications.

P5-08

Functional and structural evaluation of *Weissella*-derived postbiotics as natural inhibitors of *Aeromonas hydrophila*

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Postbiotics derived from lactic acid bacteria represent a promising next-generation approach for controlling pathogenic biofilms in aquaculture and food systems. In this study, postbiotics from *Weissella confusa* and *Weissella cibaria* were qualitatively profiled and functionally assessed for their antibiofilm potential against Aeromonas hydrophila. Metabolite screening revealed a broad repertoire of alcohols, amino acids, fatty acids, organic acids, sugars, and nitrogen-containing compounds, with each strain exhibiting distinct metabolic fingerprints. *W. confusa* was enriched in amino acids and long-chain fatty acids, whereas *W. cibaria* contained higher levels of sugars, organic acids, and polyamines, indicating strain-specific bioactive signatures. FTIR and NMR analyses confirmed structural diversity, identifying functional groups related to polysaccharides, lipids, and organic acids that are associated with interference in microbial adhesion and EPS stability. Functionally, these postbiotics inhibited Aeromonas biofilm formation, with reduced matrix density and impaired bacterial colonization. Confocal microscopy further demonstrated disrupted biofilm architecture and decreased bacterial viability following treatment. Collectively, these findings underscore the dual role of *Weissella* postbiotics as metabolite-rich bioactives and potent antibiofilm agents. Their multifunctional properties highlight their potential as sustainable interventions for mitigating Aeromonas-associated risks in aquaculture and enhancing food safety.

P5-09

Comprehensive genomic and functional characterization of kimchi-derived lactic acid bacteria *Weissella cibaria* and *Weissella confusa*

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The genus *Weissella* has gained attention as a valuable group of lactic acid bacteria with notable applications in probiotics and functional foods. In this work, six strains isolated from traditional kimchi, including *W. cibaria* and *W. confusa*, were systematically characterized through genomic and phenotypic approaches. Comparative genome analysis revealed clear species-level differences: *W. cibaria* showed enrichment of genes linked to DNA replication and cell cycle regulation, while *W. confusa* displayed broader metabolic capacity and motility-associated genes. Antibiotic resistance assessment identified both intrinsic and acquired determinants, such as multidrug efflux systems and class-specific resistance genes. Nevertheless, susceptibility testing confirmed an overall safe profile, with sensitivity to commonly used antibiotics except for intrinsic vancomycin resistance, a known feature of lactic acid bacteria. Probiotic evaluation demonstrated strong survival under acidic pH, bile salts, and digestive enzymes, indicating gastrointestinal resilience. Certain *W. cibaria* and *W. confusa* strains achieved particularly high survivability, underscoring their potential as robust probiotic candidates. *W. confusa* strains also showed greater cell surface hydrophobicity, suggesting stronger adhesion and colonization ability. Morphological examination by FE-SEM revealed species-specific traits, with *W. cibaria* forming elongated rods and *W. confusa* exhibiting shorter compact rods. Overall, these findings highlight the genetic adaptations, safety characteristics, and functional properties of *Weissella*, supporting its application in fermented foods and health-promoting formulations.

P5-10

Deep learning-based food poisoning prediction index incorporating environmental and real-time news data

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Foodborne illnesses remain a persistent threat to public health, with thousands of cases reported annually in Korea. Existing prediction systems, such as the discontinued national food poisoning risk map (2017-2024), relied primarily on limited meteorological factors and static modeling approaches, which restricted both predictive accuracy and adaptability. This study proposes an advanced food poisoning prediction index that leverages a deep learning framework, to integrate diverse risk factors and enable real-time prediction. Key variables include maximum temperature, humidity, fine particulate matter (PM), precipitation, month, and regional information. In addition, the system incorporates classified real-time news streams as dynamic signals of emerging foodborne outbreaks, ensuring that the prediction index reflects the latest epidemiological conditions and public risk trends. We construct and preprocess datasets from governmental health and environmental agencies, augmented with real-time news classification pipelines, to train and validate the model. The deep learning approach is designed to outperform traditional rule-based indices by capturing nonlinear relationships among heterogeneous variables while remaining computationally lightweight for real-time operation. The expected outcome is a continuously adaptive food poisoning index capable of providing district-level risk assessments and supporting timely public health interventions. By integrating environmental indicators with real-time media data, this research enhances predictive precision, responsiveness, and contributes to proactive foodborne illness prevention strategies.

P5-11

Receptor-specific phage cocktail effectively controls AMR *Salmonella* Typhimurium and limits BIM emergence in foods

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Bacteriophages, viruses that specifically infect and lyse bacteria, are increasingly recognized as promising biocontrol agents in food safety due to their host specificity, eco-friendly nature, and ability to remain effective under diverse environmental conditions. However, their application is often hampered by the rapid emergence of bacteriophage-insensitive mutants (BIMs), which arise through bacterial surface receptor modifications and reduce phage efficacy. The objective of this study was to develop and evaluate a receptor-specific phage cocktail to minimize BIM formation and enhance control of *Salmonella* Typhimurium in food matrices. Two phages, STP-1 targeting O-antigen and STP-3 targeting flagella, were selected and combined as a cocktail. Their stability under varying pH and temperature conditions, optimal multiplicity of infection (MOI), and cytotoxicity were assessed. The cocktail was then applied to chicken breast, green salad, cucumber, and milk, and bacterial counts as well as food quality parameters (color, texture, and pH) were monitored during storage. The results demonstrated that the STP-1/STP-3 cocktail effectively prevented bacterial regrowth at MOI 100 in vitro and significantly reduced BIM formation compared to single phage treatments. In food applications, the cocktail achieved substantial reductions in *Salmonella* populations, with the most significant decrease observed in milk (3.8 log CFU/mL). Comparable efficacy was maintained in other foods without adverse effects on quality. Importantly, no cytotoxic effects were detected, supporting the safety of the cocktail. In conclusion, the receptor-specific two-phage cocktail provided a strategic advantage over random mixtures by targeting multiple bacterial receptors, thereby reducing resistance development. These findings highlight its strong potential as a safe and practical biocontrol strategy in food systems.

P5-12

Investigation of antibiotic resistance in *Salmonella* isolates from meat in Gwangju Metropolitan City, 2022-2024

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This study was investigated the antibiotic resistance of *Salmonella* isolates from meat distributed in Gwangju Metropolitan City, South Korea. From 2022 to 2024, 139 *Salmonella* strains isolated from 994 meat products purchased at distribution stores in Gwangju were identified by serotype and then tested for resistance to 16 types of antibiotics. 15 serotypes were identified among the 139 *Salmonella* spp. isolates. The most common of which are *S.* Infantis(70.5% (n=98)) followed by *S.* Typhimurium(11.5% (n=16)) and 13 other serotypes(18.0% (n=25)). Of the total samples, 94.2% (n=131) of the *Salmonella* strains were isolated from poultry. Antibiotic resistance tests revealed that *Salmonella* spp. were more resistant to nitrofuran, penicillin, and cephalosporin antibiotics. Among the tested antibiotics, 13.7% (n=19) of the strains were non-resistant, 10.1% (n=14) were resistant to one antibiotic, and 76.3% (n=106) were multi-drug resistant. There was no statistically significant difference in the multi-drug resistance of *Salmonella* isolated from antibiotic-free certified and non-certified meat. In particular, 98.0% (n=96) of the S. Infantis strains were multi-drug resistant, and 90.8% (n=89) of the *S.* Infantis strains were isolated from poultry. This suggests that bacterial infections frequently occur in poultry raised in intensive environments due to close contact, and suggests the need for monitoring and management of poultry products to reduce *Salmonella* contamination. The results of this study are expected to provide basic data for the epidemiological investigation and treatment of Salmonella food poisoning occurring in the Gwangju area.

P5-13

Fish gelatin-based nanoplatforms with maltol-gold coating: Multifunctional antimicrobial approaches for safer foods

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Biofilms represent a significant challenge in the food industry, consisting of microbial communities encased in extracellular polymeric substances that adhere to surfaces. These structures can be formed by single species or multiple bacterial species, with multi-species biofilms demonstrating higher resistance to antimicrobials than mono-species variants. This work sought to create a nanoformulation (Mal-AuNP-Gel) by synthesizing gold nanoparticles (AuNPs) using maltol (Mal) and covering them with fish gelatin (Gel) to inhibit biofilm formation and microbial pathogen virulence properties. Mal-AuNP-Gel demonstrated increased antimicrobial activity against all pathogens, such as *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Listeria monocytogenes*, *Escherichia coli*, methicillin-resistant *S. aureus,* and *Candida albicans*, with MICs up to 2-fold lower than those of Mal-AuNPs. At the sub-MIC level, Mal-AuNPs-Gel outperformed Mal-AuNPs in inhibiting initial-stage biofilm production by a single species of *P. aeruginosa*, *S. aureus*, and *C. albicans*, as well as a mixed-species biofilm of *S. aureus* and *C. albicans*. These nanoparticles also strongly suppressed key virulence properties of *P. aeruginosa*, including hemolysis, pyoverdine and pyocyanin synthesis, protease activity, and motility. Furthermore, Mal-AuNPs-Gel inhibited the expression of genes related to biofilm formation, quorum sensing, motility, and virulence factors in *P. aeruginosa* at a higher level than Mal-AuNPs, supporting the phenotypic effect. The non-cytotoxic effects of Mal-AuNPs and Mal-AuNPs-Gel at sub-MIC levels, as revealed by in vitro cell cytotoxicity and in vivo phytotoxicity studies, demonstrated the produced nanoparticles' biocompatibility. Funding: This research was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2025-00555808).

P5-14

Bactericidal efficacy of sodium hypochlorite against three *Salmonella* spp. on eggshells

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Salmonella spp. are among the most prevalent foodborne pathogens worldwide. Eggs are an important source of high-quality protein and are consumed globally in both raw and cooked forms, but their association with foodborne pathogens, particularly *Salmonella*, poses a significant public health concern. This study evaluated the bactericidal effects of 150 ppm sodium hypochlorite (NaOCl) against *Salmonella* Enteritidis, *S.* Typhimurium, and *S.* Thompson under different washing conditions. Individual eggs were dipped for 120 s in a final cell concentration of approximately 8-log CFU/mL of each strain and air-dried for 1 h in a biosafety cabinet. Following bacterial attachment to the eggshell, eggs were washed at four temperatures (50°C, 45°C, 40°C, and 35°C) for 15 s, 30 s, or 45 s, after which all samples were homogenized, plated on XLD agar, and incubated at 37°C for 24 h. Bacteria were quantified by colony counting. Washing with 150 ppm NaOCl resulted in reductions greater than 3-log for all three serovars across all tested conditions compared with unwashed eggs. For *S.* Enteritidis, the greatest bactericidal effect was observed at 35°C for 45 s, with a 4.95-log reduction. In the case of *S.* Typhimurium, washing at 45°C for 45 s showed the strongest bactericidal effect, resulting in 5.39-log reduction. Unlike the *S.* Enteritidis and *S.* Typhimurium, *S.* Thompson exhibited an inconsistent time-dependent reduction pattern, although the maximum effect was achieved at 40°C for 45 s (5.17-log). These findings indicate that despite differences in the optimal washing temperature and duration among the three *Salmonella* serovars, egg washing with 150 ppm NaOCl provides a significant bactericidal effect on eggshells contaminated with *Salmonella* spp. This highlights its practical value as a control measure to enhance egg safety in the food supply chain.

P5-15

Effect of storage temperature on the survival and internal penetration of *Salmonella* Enteritidis in washed eggs

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Salmonella Enteritidis (SE) is a major foodborne pathogen associated with egg-related outbreaks. SE shows higher survival on eggshells at low temperature, whereas proliferation is promoted inside eggs at higher temperature. Therefore, this study examined the survival of SE on eggshells under long-term storage at 10°C and 30°C. Each egg was washed in 150 ppm NaOCl for 1 min, inoculated to -2-3 log CFU/mL on the shell surface, and stored at 10°C and 30°C for 20 days. Egg shells and contents were cultured to enumerate SE on 0, 5, 10, 15, and 20 days. In addition, egg weight and albumen height were measured at each sampling point to calculate the Haugh Unit (HU). SE was detected only on the shell surface on day 0 and was not observed on either the shell or contents until 20 days when eggs were stored at 10°C. In contrast, at 30°C, SE counts on eggshells decreased from 3.33-log on day 0 to 1.68-log on day 5, but increased thereafter, reaching 4.58-log by day 20. SE first appeared in egg contents on day 15 and was present in all eggs on day 20. Eggs stored at 10°C consistently showed higher HU values than those stored at 30°C. The results showed that storage at 30°C facilitates SE penetration and proliferation compared with 10°C. Consequently, our findings indicate that 10°C is a more appropriate storage temperature for controlling SE contamination and maintaining egg quality.

P5-16

Sustainable utilization of undervalued onions for biofilm removal and shelf-life extension of ready-to-eat chicken

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Approximately 1.3 billion tons of ugly agricultural produce are discarded annually, leading to significant economic and environmental concerns. Among them, undervalued onions and their byproducts are rich in bioactive compounds and represent valuable resources. This study employed undervalued onions by synthesizing carbon quantum dots (CQDs) from onion peel to investigate their efficacy in removing biofilms from food contact surfaces (plastic, stainless steel, rubber) and used onion juice fermented with *Leuconostoc mesenteroides* as a marinade for ready-to-eat (RTE) chicken breast. In biofilm assays, *Salmonella* Typhimurium formed more biofilms than *Listeria monocytogenes.* Washing with onion peel CQDs for 5 minutes reduced biofilms by 81.61-91.51% for *S.* Typhimurium and over 74% for *L. monocytogenes*, with further reductions exceeding 94% and 95.8-98.8% after 10 minutes, particularly on plastic and stainless steel. When RTE chicken breast was marinated with fermented onion juice and stored at 15 and 25°C, MPD reductions of 1.21-2.06 log CFU/g for *S.* Typhimurium and 1.64-1.89 log CFU/g for *L. monocytogenes* were observed, along with LT extensions of 0.37-4.02 h and 0.54-3.56 h, respectively. At 5°C, *L. monocytogenes* growth was not observed in marinated RTE chicken breast. These findings highlight the potential of undervalued onions to enhance food safety.

P5-17

Effect of cell-free supernatant application method on discoloration prevention of tuna (*Thunnus orientalis*) muscle

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Tuna (*Thunnus orientalis*) is a high-value species commonly consumed as sashimi and sushi, prized for its nutritional value, including high protein content and n-3 unsaturated fatty acids. While the red color of its muscle enhances consumer appeal, oxidative discoloration can occur during processing and distribution. This study evaluated the potential of a cell-free supernatant from *Leuconostoc citreum* M8 (CFS) to prevent discoloration of tuna muscle. Discoloration of red muscle was monitored by measuring color changes over 48 h, and sensory preference was assessed concurrently. In the untreated group, redness (a*) decreased from 15.78 ± 0.24 to 4.98 ± 0.70 after 48 h of storage. In contrast, samples wrapped in packing paper soaked in CFS retained their redness, maintaining a high a value (12.67 ± 0.67) over the same period. These results indicate that CFS effectively preserves the color stability of tuna red muscle. Moreover, the findings suggest that CFS-soaked packing paper can suppress discoloration during distribution and may be applicable for maintaining quality in other red-fleshed fish. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2021-NR060118).

P5-18

Changes of active ingredient content in food-contact surface sanitizing solutions in storage duration with accelerated age-conditioning

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This study aimed to establish a basis for setting reasonable expiration dates for food-contact surface sanitizing solutions. We performed analysis of the active ingredient content and test of the bactericidal activity in these solutions based on storage conditions. To achieve this, we evaluated commercially available food-contact surface sanitizing solutions for their active ingredient content under various high-temperature storage conditions. We also concurrently measured their bactericidal activity. Accelerated storage tests were conducted under three different high-temperature conditions. The results indicated that the active ingredient content decreased in most of the products under these high-temperature conditions. In particular, we observed a significant decrease in the active ingredient content of chlorine-based food-contact surface sanitizing solutions, including chlorine dioxide, sodium hypochlorite, and hypochlorous acid water.

P5-19

Bactericidal effects of UV-C irradiation on eggshells contaminated with *Salmonella*

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Salmonella species are the leading pathogens of foodborne illnesses worldwide and egg can be contaminated with *Salmonella* through vertical and horizontal routes during egg formation in the layer hen or handling in the supply chain. Although UV-C is known to inhibit most bacteria, clear standards for exposure time and intensity are lacking. This study aimed to evaluate its bactericidal effects in relation to exposure time and light intensity.

Each egg was washed in 150 ppm NaOCl for 1 min, inoculated to 3-5 log CFU/mL on the shell surface. UV disinfection was tested at distance between the lamp and eggs to 10 cm (1.8 mW/cm^2) and 20 cm (0.7 mW/cm^2), with exposure times at 0 (untreated), 10 s, and 15 s. After that, eggshells were swabbed, cultured on XLD agar at 37°C for 24 h to detect *Salmonella.*

For eggs inoculated with *S. enteritidis*, exposure to UV-C at 10 cm resulted in substantial bacterial reductions. Especially, the 10 s and 15 s treatment groups showed reductions of 3.76 and 3.90 log, respectively, compared with the untreated group. In contrast, at a distance of 20 cm, a 3.41 log reduction was observed only in the 15 s treatment group. In the case of *S. thompson*, all treatment groups at both 10 cm and 20 cm showed a clear reduction of more than 3 log CFU/mL compared with the untreated eggs.

The results demonstrated that that UV light can be effectively used to reduce *Salmonella* on eggs when applied with adequate intensity and exposure duration.

P5-20

Immunofluorescence-assisted investigation of Human Astrovirus-1 in oyster processing and product

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This study evaluated the antiviral efficacy of chlorine dioxide (ClO_2) and peracetic acid (PAA) as chemical disinfectants, and UV-C irradiation as a physical treatment, against HAstV-1, applied individually or sequentially on three relevant matrices: oysters, stainless steel (SS; food-contact surface), and low-density polyethylene (LDPE; packaging surface). Infectious viral titers were quantified using a modified immunofluorescence (IF) assay, which was optimized for oyster matrices in this study by adjusting virus adsorption time, antibody conditions, and buffer composition to enhance reproducibility and signal clarity. Treatment with ClO_2 (200 ppm, 5 min) and PAA (200 ppm, 1 min) resulted in greater reductions (>2 $\log_{10}$ FFU/mL) on oyster tissues compared to UV-C irradiation (1,800 mJ/cm^2; 1.8 $\log_{10}$ FFU/mL). HAstV-1 levels dropped below the detection limit when treated with ≥ 700 ppm ClO_2 and ≥ 1,500 ppm PAA on SS and ≥ 300 ppm ClO_2 and ≥ 900 ppm PAA on LDPE, respectively. UV-C treatment at 3,600 mJ/cm^2 achieved reductions of 1.37 and 1.63 $\log_{10}$ FFU/mL on SS and LDPE, respectively. Sequential treatments combining ClO_2 (50 ppm) or PAA (150 ppm) with subsequent UV-C irradiation (600 mJ/cm^2) significantly enhanced HAstV-1 inactivation on oyster surfaces, yielding additional reductions of 0.96 and 0.57 $\log_{10}$ FFU/mL, respectively. Texture and color analyses indicated slight decreases in hardness and chewiness ($p < 0.05$); however, no significant differences were observed in elasticity or color parameters ($p > 0.05$). The modified IF assay demonstrated improved reproducibility and signal clarity and was successfully applied for detecting infectious HAstV-1 in oyster matrices.

P5-21

Fabrication of chitooligosaccharide/polyvinyl alcohol films incorporating postbiotics with antibacterial and antioxidant properties

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Packaging materials play a critical role in preserving food quality and ensuring safety; however, synthetic plastics are poorly biodegradable and contribute to environmental pollution. Conventional packaging, which primarily serves as a physical barrier, is inadequate for mitigating stresses such as oxidation and microbial contamination, thereby highlighting the need for sustainable alternatives. Postbiotics, the metabolic byproducts of probiotics, offer diverse biological activities without the use of live microorganisms and can be conveniently applied in powder or solution form. In this study, an eco-friendly packaging film with antibacterial and antioxidant properties was developed by incorporating the cell-free supernatant of *Lactobacillus rhamnosus* into a chitooligosaccharide (COS)/polyvinyl alcohol (PVA) matrix. The film was fabricated by blending postbiotics with COS/PVA, followed by $CaCl_2$ cross-linking and drying. FTIR and XRD analyses revealed the formation of new chemical bonds and reduced crystallinity, indicating strong interactions between COS/PVA and postbiotics. Optical measurements demonstrated markedly improved UV protection, with UV-A shielding increasing from 28.1% in the control film to 91.3% in the postbiotics-incorporated film. Water vapor permeability was also reduced, suggesting enhanced moisture resistance. The postbiotics-based films exhibited strong antibacterial activity against *Escherichia coli* and *Listeria monocytogenes*, confirmed by FE-SEM imaging that revealed cell membrane disruption. In addition, antioxidant capacity, assessed by ABTS and DPPH radical scavenging, FRAP, and TPC, was significantly enhanced. Overall, these results demonstrate that the COS/PVA-postbiotics composite film possesses robust structural stability and superior bioactivity, underscoring its potential as a biodegradable and eco-friendly packaging material to improve food safety and extend shelf life. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2021-NR060118).

P5-22

Genomic and phenotypic characterization of *Salmonella* isolates from agricultural environments

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Agricultural environments harbor genetically diverse *Salmonella* populations with distinct stress responses, requiring subspecies-specific control strategies. We analyzed 55 agricultural *Salmonella* isolates (39 *S. enterica* subsp. *enterica* [I], 16 subsp. *diarizonae* [IIIb]) using whole-genome sequencing and comprehensive bioinformatics analysis. Genomic characterization included multilocus sequence typing (MLST) and serotyping via SISTR, functional annotation using Prokka and eggNOG-mapper, antimicrobial resistance gene detection with ResFinder, virulence profiling through VFDB, and plasmid replicon typing via PlasmidFinder. Stress tolerance phenotypes were quantified using area under the curve (AUC) reduction classification under standardized acid (pH 5.0), alkaline (pH 10.0), and hypersaline (5% NaCl) challenges. Significant subspecies-level differences in stress tolerance profiles were observed. Subsp. *diarizonae* (IIIb) showed significantly enhanced acid resistance (43.8%, 7/16) compared to subsp. *enterica* (7.7%, 3/39; Fisher's exact test, $p = 0.0039$). Salt tolerance followed a similar trend (18.8% vs. 2.6%; $p = 0.069$), while alkaline tolerance showed no significant difference (25.0% vs. 17.9%; $p = 0.712$). Conversely, antimicrobial resistance gene prevalence was significantly higher in subsp. *enterica* (mean = 2.90 unique ResFinder hits) compared to subsp. *diarizonae* (mean = 0.94; Mann-Whitney U test, $p = 0.0046$). Our findings reveal evolutionary divergence where *S. enterica* subsp. *diarizonae* exhibits superior environmental stress tolerance with reduced antimicrobial resistance burden, while subsp. *enterica* carries greater antimicrobial resistance potential. This genomic-phenotypic integration provides critical insights for developing subspecies-targeted, fit-for-purpose disinfection protocols in agricultural water treatment and produce safety management.

P5-23

Evaluation of the antiviral potential of citrus peel extract against Hepatitis A virus on food production and processing environments

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Hepatitis A virus (HAV) is a major foodborne pathogen associated with significant public health concerns and economic burdens worldwide. Therefore, the development of sustainable interventions to mitigate viral transmission through food and contact surfaces is critical. This study evaluated the antiviral potential of citrus peel extract (CPE) as a natural alternative to conventional chemical disinfectants for controlling HAV. CPE, enriched with bioactive flavonoids and polyphenols, was prepared using a concentration method (e.g., vacuum concentration followed by freeze-drying) and analyzed by HPLC, which identified gallic acid, hesperidin, quercetin, nobiletin, and tangeretin as major components associated with antiviral activity. Cytotoxicity was assessed by MTT assay, confirming that 25,000 ppm CPE maintained ≥80% cell viability and could be considered the maximum non-toxic treatment level. In the viral suspensions, CPE treatment generally resulted in concentration- and time-dependent reductions in HAV infectivity, with reductions of 2.48 and 2.59 $\log_{10}$ PFU/mL after 30 and 60 minutes, respectively, and no detectable virus (N.D.) after 90 and 120 minutes at 25,000 ppm was found. On synthetic rubber (SR) surfaces, CPE achieved reductions of 1.35, 1.36, 1.94, and 2.46 $\log_{10}$ PFU/mL after 30, 60, 90, and 120 minutes, respectively. On stainless steel (SS) surfaces, reductions of 1.30 and 2.15 $\log_{10}$ PFU/mL were observed after 30 and 60 minutes, with no detectable virus at 90 and 120 minutes at the same concentration. Notably, CPE exhibited a greater reduction of HAV on SS surfaces than on SR surfaces. These findings demonstrate that CPE exhibits strong antiviral activity against HAV in both suspension and on food-contact surfaces, highlighting its potential as a plant-derived, sustainable intervention to replace or complement chemical disinfectants in food safety management.

P5-24

Control of *Staphylococcus aureus* biofilm using a cold plasma patch and synergistic effect with antibiotic

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Staphylococcus aureus biofilms pose significant challenges in livestock environments due to their high resistance to conventional antimicrobial treatments. This study investigated the bactericidal efficacy of a flexible cold plasma-generating film that can be attached to various biological surfaces and its synergistic interaction with vancomycin against *S. aureus* biofilms. Direct plasma treatment for 10 min achieved more than 5 log CFU/mL reduction in bacterial suspension (~8 log CFU/mL). For pre-formed biofilms, 40 min plasma exposure reduced viable cells by >2 log CFU/cm^2 and decreased total biomass, although regrowth was observed under nutrient-rich conditions. Remarkably, sequential treatment combining plasma exposure followed by vancomycin (500 μg/mL, 48 h) eliminated viable cells below the detection limit, while either treatment alone failed to achieve complete eradication. This synergistic effect suggests that plasma treatment may alter the biofilm matrix structure, potentially allowing antibiotics to better penetrate the biofilm. This combined plasma-antibiotic strategy offers a promising approach for controlling persistent biofilms in livestock environments, potentially reducing antibiotic usage while improving food safety.

P5-25

Gallic acid-mediated photodynamic inactivation against antibiotic-resistant *Pectobacterium carotovorum* subsp. *carotovorum* on Chinese cabbage

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Photodynamic inactivation (PDI) using naturally derived photosensitizers (PSs) and UV light can be utilized as a safe technique to control antibiotic-resistant phytopathogens in vegetable crops. Therefore, this study investigated the antimicrobial effects of PDI treatment using curcumin and gallic acid (GA) under UV-A/B light against antibiotic-resistant *Pectobacterium carotovorum* subsp. *carotovorum* (Pcc) on Chinese cabbages during 2 days of storage at 25°C. Overall, UV-A light did not significantly affect the decay rate of Chinese cabbage ($p > 0.05$). Moreover, exposure to UV-B light, regardless of PS treatment, caused a significantly lower decay rate (0-12.94%) compared to that of a commercial antibiotic for agricultural use (AGA3 sample, 16.68%) ($p < 0.05$). Interestingly, no increase in decay rate was observed in samples treated with GA followed by exposure to UV-B light throughout the 2 days of storage, indicating complete control of soft rot disease. These findings suggest that GA-mediated PDI is an effective and safe technology for controlling soft rot disease caused by Pcc, leading to supplying safe produce in the food industry.

P5-26

Effects of *Leuconostoc citreum* M8 suupernatant on color preservation and stability of *Seriola quinqueradiata*

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Seriola quinqueradiata, yellowtail fish, is a widely consumed red-fleshed fish, rich in high-quality protein, omega-3 fatty acids, and antioxidants such as astaxanthin. However, oxidation of proteins and lipids in *S. quinqueradiata* leads to discoloration and off-flavor during storage and processing, which reduces its marketability. Therefore, in this study, we investigated the effect of cell-free supernatant (LCFS) of *Leuconostoc citreum* M8 strain on maintaining the quality of *S. quinqueradiata* red muscle. Three sample groups were prepared: untreated control (NC), ascorbic acid treatment (AA, 250 ppm), and LCFS treatment (M8). All samples were stored at 4°C and 10°C, and quality parameters-including surface color (a* value), total viable count (TVC), volatile basic nitrogen (VBN), pH, and sensory evaluation-were evaluated every 12 h. The M8 group showed higher initial a* values than NC at both temperatures, and this was observed to be retained for a relatively extended period. Upon comparison of the time required to reach the threshold of 5 log CFU/g, the NC group attained this level at 24 h, whereas the M8 group did so at 48 h, thereby demonstrating a twofold (100%) microbiological quality retention effect. The M8 group exhibited lower VBN levels and indicated effective suppression of off-odor development. Sensory evaluation showed the highest score in the M8 group, while pH exhibited no significant changes regardless of temperature or storage. These results suggest that LCFS prevents discoloration and off-flavor, enhancing the quality and stability of *S. quinqueradiata* red muscle. This approach may provide an effective strategy for improving the stability of red-fleshed seafood. This work was supported by the Global Bluefood Leadership Project, funded by the Ministry of Oceans and Fisheries (RS-2025-02373103), and by the Basic Science Research Program through the National Research Foundation of Korea (NRF), funded by the Ministry of Education (RS-2021-NR060118).

P5-27

Development of a spray-assisted cold plasma sterilization device equipped with UVC-LED for sustainable food system

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Conventional heat-based sterilization methods, such as pasteurization, are widely applied in the food industry, but they often cause nutrient degradation, off-flavor formation, and undesirable changes in texture. This study presents a novel non-thermal sterilization device for sustainable food applications, which integrates cold plasma (CP) and ultraviolet-C LED (UVC-LED) technologies to achieve simultaneous reactive species generation and photolytic inactivation within a single treatment chamber. CP was generated via dielectric barrier discharge (DBD) at atmospheric pressure, and 275 nm UVC-LEDs were arranged to provide uniform irradiation across the treatment volume. A spray module was incorporated to atomize liquid foods into micro-droplets, which increased surface area and enhancing interaction with both plasma and UV light. The reactive species generated from CP play a critical role in damaging microbial cell membranes, disrupting intracellular components, and enhancing overall disinfection efficiency. In particular, the formation of reactive oxygen species (ROS) such as ozone, hydroxyl radicals, and hydrogen peroxide, along with reactive nitrogen species (RNS) including nitric oxide and peroxynitrite, was examined under varying oxygen and nitrogen gas flow rates. Future investigations will validate the spray-assisted CP-UVC LED system in diverse beverage matrices, examining microbial reduction efficacy, preservation of sensory and bioactive attributes, and residual reactive species to ensure safety and regulatory compliance, thereby confirming its potential for industrial application.

P5-28

Evaluation of critical control point effectiveness and improvement HACCP plan for sandwiches manufacturing process

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This study analyzed the effectiveness of critical control point (CCP) in sandwiches manufacturing process and suggest improvement HACCP plan. After the heating process (CCP), total aerobic bacteria in potato powder decreased to 1.6 ± 0.2 log CFU/g, and coliform bacteria were not detected. But after the topping process, total aerobic bacteria increased at 4.6 log CFU/g in the ham-egg-cheese sandwich. These results showed that the heating process (CCP) is effectiveness but the topping process is not sufficient to control the microbial growth. Heated (ham), cooking after heated (egg garnish), and Non-heated (cucumber slices) samples were stored at 15°C, 25°C, and 35°C for 4 hours to evaluate microbial growth in topping process. As a result of this study, total aerobic bacteria were not detected in heated sample at 15°C, but increased from 1.0 ± 0.0 to 2.2 ± 0.0 log CFU/g at 25°C and 35°C. In cooking after heated sample, no growth was observed at 15°C, while 1.1 ± 0.2 log CFU/g was detected at 35°C. In non-heated sample, the initial contaminated bacteria was 2.9 ± 0.0 log CFU/g, increasing to 3.5 ± 0.0, 4.7 ± 0.0, and 5.5 ± 0.1 log CFU/g at 15°C, 25°C, and 35°C, respectively. This result indicates that bacterial growth occurred at 25°C and 35°C, whereas microbial proliferation was effectively inhibited at 15°C. Therefore, maintaining the temperature in topping process below 15°C is necessary to ensure the microbiological safety in sandwiches. This research was supported by a grant (25192MFDS009) from Ministry of Food and Drug Safety in 2025.

P5-29

Comparative evaluation of natural antimicrobial agents against *Escherichia coli* and *Staphylococcus aureus*

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Effective antimicrobial agents are essential for controlling microbial hazards on food contact surfaces and equipment. Continuous development of antimicrobial agents is necessary to ensure reliable efficacy under diverse contamination conditions and to reduce the risk of resistance. In this study, three new antimicrobial agents were evaluated: 25SF-02, 25SF-03, and GS-500. Antimicrobial efficacy was assessed against *Escherichia coli* and *Staphylococcus aureus* using the bacterial surface test method described in the Korean Food Code. The bacterial surface tests showed that GS-500 achieved reductions exceeding 5 log CFU (≥99.999%) against both *E. coli* and *S. aureus* in the presence or absence of organic matter. 25SF-02 achieved ≥5-log reductions against *S. aureus* but did not meet the criterion for *E. coli*. 25SF-03 reduced efficacy in the presence of organic matter and lower log reductions overall. The minimum inhibitory concentration results indicated inhibition of *E. coli* at 31,250 ppm with 25SF-02 and 25SF-03, compared with 156 ppm for GS-500. For *S. aureus*, inhibition occurred at 1,950 ppm with 25SF-02 and 25SF-03, and at 9.8 ppm with GS-500. The minimum bactericidal concentration results showed bactericidal activity against *E. coli* at 31,250 ppm with 25SF-02 and 25SF-03, and at 156 ppm with GS-500. For *S. aureus*, bactericidal activity was observed at 15,600 ppm with 25SF-02, 31,250 ppm with 25SF-03, and 78 ppm with GS-500. Overall, these results demonstrate that GS-500 exhibited the strongest efficacy. However, 25SF-02 and 25SF-03 also achieved measurable pathogen reduction in both surface and broth-based assays. These findings indicate the potential of natural antimicrobial agents as environmentally sustainable alternatives. Further optimization could extend the application of such agents to diverse areas of food safety and public health.

P5-30

Development of a pH-responsive pectin-chitosan bilayer carvacrol nanoemulsion for improved shrimp preservation

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Shrimp rapidly decay during storage due to protein degradation, lipid oxidation, and microbial growth, leading to increase pH. Carvacrol, a natural preservative, has been considered for seafood preservation, but its volatility, poor solubility, and rapid release limit practical application. Therefore, more stable controlled-release systems are required to improve the applicability of carvacrol. In particular, pH-responsive designs are critical because they enable intelligent sustained release in response to spoilage-associated pH changes. Thus, this study developed a pH-responsive pectin-chitosan bilayer based carvacrol nanoemulsion (P-CHCNE) with improved structural stability and sustained release. Compared with carvacrol nanoemulsion (CANE) and chitosan single-layer coated carvacrol nanoemulsion (CHCNE), P-CHCNE exhibited lower polydispersity index (0.21 ± 0.00) and higher encapsulation efficiency (98.67 ± 0.78%), indicating superior stability. Bilayer formation of P-CHCNE was confirmed by fourier-transform infrared spectroscopy and transmission electron microscopy, and the formulation remained stable for 25 days. In release profile, CANE and CHCNE released over 90% of carvacrol within 24 h, whereas P-CHCNE achieved a sustained release of about 83% over 72 h. In addition, pH-responsive profiles of P-CHCNE showed accelerated release under neutral to mildly alkaline conditions (pH 7-8.5). Additionally, P-CHCNE showed pronounced antimicrobial activity at pH 7-8.5. When applied to refrigerated shrimp, P-CHCNE suppressed protein degradation, lipid oxidation, and microbial growth, thereby delaying pH increase and extending shelf life by approximately 3 days. Therefore, P-CHCNE represents a promising intelligent preservation system with structural stability and pH responsiveness, effectively enhancing the safety of foods prone to spoilage-related pH increases.

P5-31

Evaluation of critical control point effectiveness and improvement HACCP plan for lunch box manufacturing process

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This study evaluated the effectiveness of critical control points (CCP) during lunch box manufacturing and proposed improvement HACCP plan. After the heating process (CCP), the total aerobic bacterial count in garlic soy sauce bulgogi was detected at 0.7 ± 0.8 log CFU/g, whereas the final product after the assembly process increased to 1.4 ± 0.2 log CFU/g. These findings indicate that the heating process (CCP) is effective, but microbial control during the assembly process is insufficient. To assess microbial proliferation in the assembly process, heated (garlic bulgogi) and non-heated (musaengchae) samples were stored at 15°C, 25°C, and 35°C for 4 h. The initial contamination of the heated sample was 2.0 ± 0.2 log CFU/g, which was 1.8 ± 0.1 log CFU/g at 15°C, 4.2 ± 0.0 log CFU/g at 25°C, and 4.6 ± 0.0 log CFU/g at 35°C. The initial contamination of the non-heated sample was 5.1 ± 0.1 log CFU/g, which reached 5.2 ± 0.0 log CFU/g at 15°C, 6.5 ± 0.1 log CFU/g at 25°C, and 7.4 ± 0.0 log CFU/g at 35°C. These results showed that bacterial growth was inhibited at 15°C in the assembly process. Therefore, maintaining the temperature in the assembly process below 15°C is necessary to ensure the microbiological safety in lunch boxes. This research was supported by a grant (25192MFDS009) from Ministry of Food and Drug Safety in 2025.

P5-32

Antimicrobial, anti-biofilm, and anti-inflammatory activities of kefir-derived lactic acid bacteria postbiotics against oral pathogens

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This study investigated the antimicrobial, anti-biofilm, and anti-inflammatory activities of postbiotics derived from kefir-isolated lactic acid bacteria (LAB) against four major canine oral pathogens (*Streptococcus mutans*, *Streptococcus sobrinus*, *Porphyromonas gingivalis*, and *Porphyromonas gulae*). A total of 19 LAB strains were screened, and five strains -*Lactobacillus kefiranofaciens* DD2 (DD2), *Lactobacillus kefiranofaciens* LKF4 (LKF4), *Lentilactobacillus kefiri* LK12 (LK12), *Lactiplantibacillus plantarum,* and *Lacticaseibacillus rhamnosus* - were selected for detailed evaluation. Growth curve analysis revealed that DD2 postbiotics significantly suppressed the growth of cariogenic bacteria (*S. mutans* and *S. sobrinus*) ($p < 0.05$), while both DD2 and LK12 postbiotics exhibited strong inhibitory effects against periodontal pathogens (*P. gingivalis* and *P. gulae*) ($p<0.05$). Biofilm assays demonstrated that DD2 showed the most pronounced inhibition across all four pathogens, reducing *P. gulae* biofilm formation to approximately 25% of the untreated control ($p < 0.05$). Cytotoxicity assays in human gingival fibroblasts confirmed that all postbiotics were non-toxic at concentrations ≤10%, maintaining cell viability above 80%. Anti-inflammatory assays in LPS-stimulated RAW 264.7 macrophages demonstrated that DD2 exerted the strongest suppression of nitric oxide production ($p < 0.05$), while LK12 significantly reduced LPS-induced inflammatory responses when applied as a pre-treatment ($p < 0.05$). Collectively, DD2 exhibited the most consistent antimicrobial, anti-biofilm, and anti-inflammatory activities, highlighting its potential as a core functional postbiotic candidate for companion animal oral health. In addition, LK12 emerged as a promising supportive candidate for periodontal disease control and inflammation modulation. Subsequent studies are being conducted to elucidate the molecular mechanisms of action underlying these effects through analysis of pathogen- and host-related gene expression via RT-qPCR.

P5-33

Comparative analysis of ESBL-producing *Escherichia coli* between floor- and cage-reared layer hen farms in South Korea

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Extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* in poultry production represents a critical One Health concern. In this study, 80 ESBL-producing isolates were obtained from environmental samples collected at six layer hen farms in South Korea, and antimicrobial resistance, ESBL genotypes, and clonal diversity were compared between floor-reared and cage-reared systems. All isolates were resistant to ampicillin and third-generation cephalosporins, while imipenem and amikacin susceptibility was preserved. Resistance was significantly higher in floor-housed farms, including tetracycline (45.2% vs. 15.8%, $p<0.01$), chloramphenicol (64.3% vs. 31.6%, $p<0.01$), and trimethoprim-sulfamethoxazole (54.8% vs. 18.4%, $p<0.01$), and multidrug resistance was observed in 53% of isolates with broader co-resistance patterns in floor-housed farms. Genotypic analysis revealed housing-specific distributions, with *bla*TEM-163 significantly more frequent in cage-housed isolates (36.8% vs. 16.7%, $p<0.05$), whereas *bla*CTX-M-14 (40.5% vs. 34.2%) and *bla*CTX-M-55 (9.5% vs. 18.4%) showed no significant differences. MLST demonstrated substantial clonal diversity, with ST1718 and ST10 prevalent in floor-housed farms, while cage farms harbored a wider variety of distinct STs. These findings indicate that poultry housing systems shape the ecology of ESBL-producing *E. coli* by influencing resistance profiles, allele distribution, and clonal diversity, highlighting the need for targeted biosecurity measures and One Health-based surveillance to limit their dissemination.

P5-34

A non-thermal strategy for controlling stress-adapted *Staphylococcus aureus*: Synergistic role of propyl gallate, UVA, and mild heat

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This study evaluated the antimicrobial efficacy of a combinatorial approach utilizing propyl gallate (PG, 20 mM), UVA irradiation (365nm, up to 60 J/cm^2), and mild heat (MH, 50°C) against *Staphylococcus aureus* populations subjected to different stress conditions: non-stressed controls (pH 7.0), acid-adapted cells (pH 5.0), and aridity-stressed variants. All treatments were performed in buffered peptone water using individual or combined interventions. The combined treatment of PG and UVA resulted in negligible bacterial reduction (0-1 log CFU/mL) regardless of adaptation status. In contrast, the triple combination (PG+UVA+MH) exhibited substantial bactericidal activity, achieving 8.16-9.22 log reductions in cell viability following 60 J/cm^2 UVA exposure, with no detectable sublethally injured populations. Mechanistic analysis demonstrated membrane integrity loss in acid-adapted strains, whereas all populations exhibited common lethal effects including enzymatic inactivation, cytoplasmic content leakage, and DNA fragmentation. These results indicate that the combined PG-photodynamic-thermal treatment effectively overcomes stress-induced resistance, offering a viable non-thermal intervention strategy for enhanced microbial control in food processing systems.

P5-35

Analysis of ammonium persulfate-induced ultrasound inactivation of *Escherichia coli* O157:H7 across stress adaptations and application to fresh produce rinsing system

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This study examined the effect of ammonium persulfate-ultrasound (APS-US) treatment on *Escherichia coli* O157:H7 strains with different stress adaptations-non-adapted (NA), acid-adapted (AA), and desiccation-adapted (DA). APS-US synergistically inactivated *E. coli* O157:H7, showing reductions of > 5.48, > 5.42, and 2.41 log CFU/mL for NA, AA, and DA strains, respectively. NA was rapidly inactivated, mainly by sulfate radicals ($SO_4^{\bullet-}$, uptake value = 3.42), while AA exhibited delayed inactivation due to lower phosphatidylethanolamine (PE) content (0.11 g/L) and higher membrane rigidity ($FI_{350/430}$ = 2066.31). DA showed the greatest resistance (2.41 log CFU/mL reduction), likely due to radical scavenging by extracellular humic-like substances (Ex 300-450 nm / Em 350-500 nm). In romaine lettuce rinsing, APS-US reduced DA by 3.0 log CFU/cm^2 without affecting product quality, and the antimicrobial activity of the rinsing solution remained effective through repeated use. These results indicate that stress adaptation modulates *E. coli* O157:H7 resistance to APS-US via differences in membrane composition, radical interaction, and extracellular response, underscoring its promise as a reusable, residue-free disinfection strategy for fresh produce.

P5-36

Mechanistic study on the photolysis induced 172 nm excimer lamp and citric acid for microbial control

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This study evaluated the combined antimicrobial effect of a 172 nm Xe-excimer lamp system (EX), composed of the lamp and a pump, with citric acid (CA) against *E. coli* O157:H7 in distilled water (DW) and on romaine lettuce. In DW, CA alone reduced bacterial counts by 0.55 log CFU/mL, while EX alone achieved a 3.00 log CFU/mL reduction. When applied together, the CA + EX treatment led to a 5.38 log CFU/mL decrease, indicating a synergistic effect. On romaine lettuce surfaces, this combination consistently reduced over 4 log CFU/cm^2 during five repeated cycles, showing stable and effective performance. Mechanistic studies revealed that the combined treatment enhanced microbial inactivation by disrupting bacterial membranes, inactivating enzymes, and damaging DNA. Furthermore, CA contributed to improving ozone stability in DW, enhancing the oxidative disinfection process. No significant changes in color, texture, or total phenolic content of romaine lettuce were observed after treatment. These findings support the practical applicability and safety of the CA + EX system as a promising and eco-friendly approach for microbial control in fresh produce washing and water disinfection.

P5-37

Synergistic effect of Perillaldehyde and Ultrasound for inactivation of *E. coli* O157:H7, *S.* Typhimurium, *L. monocytogenes*, and *S. aureus* in peptone water

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This study investigated the synergistic effects of Perillaldehyde (PA), a natural organic compound found in the herb perilla, and ultrasound (US) on the inactivation of *Escherichia coli* O157:H7, *Salmonella* Typhimurium, *Listeria monocytogenes*, and *Staphylococcus aureus* in buffered peptone water (BPW). PA concentration of 0.2 mM was selected as it represented the threshold at which the combined PA + US treatment began to show a significant enhancement in *E. coli* O157:H7 inactivation compared to either treatment alone. The US amplitude was set to 40%, a condition determined through temperature profiling during a 6 min treatment, ensuring that the sample temperature did not exceed 52.1°C, corresponding to a mild-heat regime. In BPW, PA + US treatment resulted in more than a 7-log reduction in all pathogens after 6 min, except for *S. aureus*, which showed approximately a 4-log reduction. In contrast, PA or US treatment alone exhibited only marginal bactericidal effects. From inactivating mechanism analysis, lipid membrane destruction and intracellular enzyme inactivation were the key factors for pathogen inactivation. This damage was mediated through the disruption of cell membranes, proton gradients, and energy metabolism, as evidenced by the propidium iodide (PI) uptake and membrane potential assays. These findings highlight the potential of PA and US integration as an effective non-thermal antimicrobial strategy. While the present study primarily focused on elucidating the underlying inactivation mechanism, further investigations are warranted to evaluate its applicability to real food matrices and to optimize treatment parameters for large-scale implementation. Additionally, sensory and nutritional assessments will be essential for future validation of this technology in the food industry.

P5-38

Enhanced photodynamic inactivation of foodborne pathogens using an ultrasonic riboflavin mist combined with 405 nm blue light

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This study developed a riboflavin-assisted photodynamic inactivation (PDI) system combining ultrasonic misting with 405 nm blue light to inactivate foodborne pathogens. A riboflavin solution (100 ppm) was ultrasonically nebulized and introduced into a chamber, where mist and blue light were simultaneously applied to enhance photoactivation. The system effectively inactivated *Escherichia coli* O157:H7 and *Listeria monocytogenes* at 40 J/cm^2, reaching the detection limit on selective media and achieving 5- and 4-log reductions on non-selective media, respectively. These results indicate significantly greater inactivation than blue light alone ($p>0.05$). Furthermore, when applied to sliced ham inoculated with *E. coli* O157:H7, the mist-based system showed higher efficacy compared with the immersion method. Notably, no quality deterioration was observed in the treated ham samples. Overall, the ultrasonic mist-blue light system demonstrates a promising non-thermal approach for effective surface decontamination of food products.

P5-39

Inhibition of biofilm formation and surface decontamination of *Salmonella* Typhimurium using 172 nm excimer lamp

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In this research, the synergistic effects of a 172 nm Xe-excimer lamp system (EX), consisting of the excimer lamp and a pump, and citric acid (CA) were used for the disinfection of *Salmonella* Typhimurium in distilled water (DW) and on stainless steel surface. In DW, CA treatment alone achieved a 0.35 log CFU/mL reduction, while EX treatment alone resulted in a 2.51 log CFU/mL decrease after 10 min. The combined CA + EX treatment led to a 5.84 log CFU/mL reduction, demonstrating a synergistic bactericidal effect. On stainless steel surfaces, washing with 0.5% CA achieved a 4.01 log CFU/cm^2 reduction, while EX treatment for 10 min and CA + EX treatment for 4.5 min both reduced bacterial counts below the detection limit (>5 log reduction), showing remarkable effectiveness in surface sterilization. Mechanistic analyses indicated that the combined treatment induced membrane damage and intracellular ROS accumulation, contributing to enhanced microbial inactivation. The CA + EX treatment effectively controlled viable cells within biofilms and caused substantial structural damage to the biofilm matrix on stainless steel surfaces, supported by reduced EPS quantification results. In addition, the treatment reduced the biofilm-forming ability of the cells, as evidenced by crystal violet assay and CLSM analysis. Both biofilm thickness and biomass were markedly decreased, indicating inhibition of biofilm development. Overall, the synergistic CA + EX system effectively inactivated *S.* Typhimurium, disrupted existing biofilms, and inhibited biofilm formation on stainless steel surfaces. These findings suggest that the 172 nm excimer lamp combined with citric acid provides an efficient and eco-friendly disinfection strategy for controlling microbial contamination and biofilm formation on food-contact surfaces.

P5-40

Combined effects of ammonium persulfate, ultrasound, and mild heat on *Staphylococcus aureus* grown under various conditions in buffered peptone water and on orange peel

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This study examined the antimicrobial efficacy of a combined treatment using ammonium persulfate (PS), ultrasound (US), and mild heat (40-60°C) against *Staphylococcus aureus* ATCC 27213 under varying adaptation conditions: non-adapted, pH-adapted, and aridity-adapted. Treatments were evaluated in buffered peptone water (BPW) and on orange peel surfaces. After 6 min, PS-US-mild heat achieved reductions of 2.05, 6.44, and 1.11 log CFU/mL, respectively, in BPW, demonstrating synergistic activity. In pH-adapted cells, PS further intensified oxidative stress already triggered by acidic conditions, resulting in membrane disruption, as verified by TEM and leakage of nucleic acids and proteins. When applied to orange peel washing, the treatment decreased aridity-adapted *S. aureus* by 3.51 log CFU/cm^2 on peel and 3.20 log CFU/mL in wash water, without affecting color or texture. The enhanced antimicrobial performance may be attributed to intrinsic compounds in the peel, such as ascorbic acid and limonene, which can activate PS and contribute additional antimicrobial effects. This method offers potential for managing stress-tolerant pathogens in food processing environments.

P5-41

Advancement of near-infrared heating with naringenin spray: Mechanistic insights into thermal intensity reduction

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This study explored the synergistic potential of naringenin (NG) incorporated into a near-infrared (NIR) heating system to improve microbial safety and quality retention in raw almonds. Conventional thermal pasteurization of nuts often requires high energy input, which can accelerate lipid oxidation and pigment loss. To mitigate these limitations, an NG-assisted NIR treatment was applied at a moderate temperature (50°C) for 120 s to achieve efficient pathogen inactivation. The combined treatment produced more than 4-log reductions of *Escherichia coli* O157:H7, *Salmonella enterica* Typhimurium, *Listeria monocytogenes*, and *Staphylococcus aureus*. Mechanistic analysis suggested that NG enhanced bacterial susceptibility by disrupting membrane integrity and impairing metabolic recovery. Quality evaluations revealed negligible changes in color, phenolic composition, and lipid oxidation levels compared to untreated controls. These findings highlight NG-assisted NIR heating as a promising strategy to achieve microbial safety in raw almonds while maintaining desirable physicochemical properties under reduced thermal intensity.

P5-42

Enhancing microbial safety of sous vide chicken breast using naringenin-infused sauce: A synergistic approach with mild heat treatment

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Sous vide cooking, characterized by low-temperature, long-time processing, often fails to achieve sufficient microbial inactivation, particularly against psychrotrophic spoilage bacteria and yeasts such as *Pseudomonas* spp. and *Candida* spp., which can survive at 70-80°C (Miguel Romeo, 2024). Some guidance documents recommend limited sous vide products are restricted to short-term refrigerated storage (<30 days) due to such microbial concerns. To enhance the microbial safety and extend the applicability of sous vide chicken breast, this study evaluated the synergistic effect of naringenin (NG) when incorporated in various sauce formulations during mild-heat sous vide treatment. Chili sauce containing NG was first subjected to near-infrared (NIR) heating for 120 s, resulting in significant reductions of *E. coli* O157:H7, *S.* Typhimurium, *L. monocytogenes*, and *S. aureus* by 7.33, 7.75, 8.48, and 4.61 log CFU/mL, respectively-demonstrating a clear synergistic bactericidal effect. Subsequently, chicken breast samples were coated with either a sauce containing naringenin, a sauce without naringenin, or left uncoated as a control, then vacuum-packed and cooked sous vide at 60°C. Accelerated storage tests up to two weeks confirmed that the NG-treated samples maintained markedly lower microbial growth compared to controls. These findings indicate that incorporating NG into emulsion-type sauces could serve as a natural and effective strategy to improve microbial safety in low-temperature sous vide meat products, facilitating safer commercialization of minimally processed chicken breast.

P5-43

Host-specific *Salmonella* serotypes and antimicrobial resistance in chicken, porcine, and bovine

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Antimicrobial-resistant *Salmonella*, a major foodborne zoonotic pathogen from livestock, poses a significant public health threat, particularly strains expressing extended-spectrum β-lactamases (ESBL) or quinolone resistance (QNR). Although numerous studies have investigated antimicrobial resistance in *Salmonella* from individual host species, comprehensive comparative analysis across chicken, bovine, and porcine sources remains limited. This study aimed to characterize host-specific and shared serotype resistance patterns by comparing the antimicrobial profiles of *Salmonella* isolates from chicken, bovine, and porcine sources against five key antibiotics and determining the distribution of specific resistance phenotypes (ESBL, QNR). The most significant finding was the widespread resistance to nalidixic acid, observed in 80.25% of all isolates. This rate was significantly higher than the resistance observed for other antimicrobials, such as ciprofloxacin (7.41%), amoxicillin-clavulanic acid (6.17%), cefoxitin (3.70%), and cefotaxime (4.94%). Host-specific resistance was particularly pronounced in certain chicken-derived serotypes. Among *S.* Enteritidis isolates, 16.7% showed quinolone resistance (QNR) and 5.6% were ESBL-producers, while 100% of *S.* Kentucky isolates were QNR-positive. In contrast, neither QNR nor ESBL phenotypes were detected in any bovine isolates. Host-specific traits were further highlighted by cases such as cefoxitin resistance in *S.* Typhimurium from porcine isolates, a trait not found in poultry isolates. This comparative analysis confirmed distinct, host-specific antimicrobial resistance patterns across the three livestock species. Compared to the largely susceptible porcine and bovine isolates, chicken isolates exhibited a greater diversity of resistance mechanisms, such as QNR and ESBL. This host specificity was also evident within the shared *S.* Typhimurium serotype, as cefoxitin resistance was detected exclusively in porcine-derived isolates. These findings underscore the need for differentiated *Salmonella* control and antimicrobial resistance mitigation strategies tailored to each livestock species.

P5-44

Evaluating drying, heating, and fermentation pretreatments for control of ESBL-Producing *Escherichia coli*

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Extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* in poultry manure pose a critical risk to agricultural environments. This study evaluated the efficacy of different manure pretreatment strategies, including drying, heat treatment, lactic acid bacteria (LAB), and *Bacillus subtilis* fermentation, in controlling ESBL-producing *E. coli*. Specific-pathogen-free chicken manure was sterilized at 80°C for 1 h and subsequently inoculated with ESBL-producing *E. coli* at 1.0×10^7 CFU/g. The inoculated manure was then subjected to three treatments: drying at 25°C with slight airflow, heat treatment at 60°C, and fermentation with either live cells of *Bacillus subtilis* or *Lactiplantibacillus plantarum* at 1.0×10^7 CFU/g, which were mixed with the manure and incubated for 7 days, or with their cell-free supernatants. The survival of *E. coli* decreased as water activity (Aw) declined during drying. At 8 h (Aw=0.8878), the bacterial count decreased from 6.09 to 5.41 Log CFU/g. At 12 h (Aw=0.8180), survival further declined to 4.94 Log CFU/g, and at 14 h (Aw= 0.8033), reached 4.35 Log CFU/g. A strong linear correlation was observed between Aw and bacterial counts (R2 = 0.9865). Heat treatment at 60°C completely eliminated ESBL-producing *E. coli* to below the detection limit (<1 Log CFU/g) within 4 h. *Bacillus subtilis* treatments suppressed *E. coli* survival: cell-free supernatants reduced counts from 5.43 to 5.14 Log CFU/g, while live cells decreased counts from 5.41 to 5.17 Log CFU/g. In contrast, *Lactiplantibacillus plantarum* and its cell-free supernatants exhibited limited inhibitory activity under the same conditions, with counts increasing from 5.39 to 5.74 Log CFU/g for cell-free supernatants and from 5.34 to 5.47 Log CFU/g for live cells. These findings indicate that drying and heating reduce bacterial survival and that *B. subtilis*-based treatments, including cell-free supernatants, are effective in suppressing ESBL-producing *E. coli* in manure.

P5-45

Phage endolysin (LysLM3), a promising solution against *Listeria monocytogenes*

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Endolysins, bacteriophage-encoded peptidoglycan hydrolases, have recently emerged as promising alternatives to antimicrobials due to their rapid bactericidal activity, high specificity, and low probability of resistance development. In this study, the complete genome of *L. monocytogenes* phage, vB_LmoS_KFSLM3 was sequenced using the Illumina MiSeq platform, and annotated with RAST and BLASTP. Based on the annotation, a candidate endolysin gene (LysLM3) was selected from the lysis module. The LysLM3 gene, encoding an endolysin, was cloned into the pET28a (+) expression vector, expressed in *E. coli* BL 21 (DE3) using IPTG induction, and then purified using a Ni-NTA superflow column. A phylogeny of LysLM3 gene was performed using MEGA X software and its structural features were predicted using AlphaFold 3 and visualized in PyMOL. The genome of vB_LmoS_KFSLM3 consisted of 39,955 bp and 64 ORFs with G+C content of 37.1%. Among these, ORF12 was identified as an endolysin and annotated as an N-acetylmuramoyl-L-alanine amidase with a predicted molecular weight of approximately 33 kDa. It featured an enzymatically active domain, along with two cell wall-binding domains, and consists of 18% alpha-helix, 30% beta-strand, and 52% others. Additionally, Phylogenetic comparison of related endolysin sequences revealed that the LysLM3 was most similar to the HB17054/phiLM4 clade. Overall, LysLM3 demonstrated novel antimicrobial activity against pathogenic *L. monocytogenes*, highlighting its potential as biocontrol agent for food industry applications.

P5-46

In silico identification of a novel depolymerase gene from *Salmonella* phage vB_SalA_KFSST3 and its genomic safety evaluation for food application

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In our previous study, the *Salmonella* phage vB_SalA_KFSST3 demonstrated strong lytic and antibiofilm activities against *Salmonella* biofilms formed on fresh produce. The present study conducted an in-depth genomic and functional characterization focusing on safety evaluation and depolymerase gene identification to further assess its applicability as an antibiofilm agent in the food industry. For safety evaluation aligned with GRAS-level assessment, the genome of vB_SalA_KFSST3 was sequenced using the Oxford Nanopore PromethION 2 Solo platform. Following de novo assembly, genes related to lysogeny, virulence, antimicrobial resistance, and allergenicity were screened using the ResFinder, VFDB, and PHASTEST databases. Phage lifestyle was predicted using PhageAI, and average nucleotide identity and phylogenetic relationship were determined using FastANI pipeline (v1.33) and the VICTOR platform with the d_0 formula, respectively. The genome of vB_SalA_KFSST3 exhibited a strictly virulent nature, lacking any genes associated with lysogeny, horizontal gene transfer, or pathogenicity. ANI and phylogenetic analyses consistently classified it within the genus *Agtrevirus* of the family *Ackermannviridae*, confirming its genomic features and taxonomic position. To identify a novel putative depolymerase gene, comparative genome analysis with other *Ackermannviridae* phages was performed using the Clinker pipeline. Subsequently, conserved domain analysis was performed through the NCBI Conserved Domain Database and HHpred, and the structure of the putative depolymerase protein was predicted using AlphaFold. In addition to the two tail spike proteins (orf141 and orf142) annotated by RAST, an additional TSP-like gene (orf143) was newly identified adjacent to the TSP cluster. This predicted protein shared <80% amino acid identity with known depolymerases but exhibited a β-helix fold and conserved catalytic residues typical of endoglycosidase-type enzymes. Collectively, these findings highlighted the genetic safety and functional potential of vB_SalA_KFSST3 as a novel depolymerase-encoding phage, supporting its application as an antibiofilm agent in the food industry.

P5-47

Evaluation of the effect of immersion treatment on the reduction of *Listeria monocytogenes* in ready-to-eat pineapple processing

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The consumption of ready-to-eat (RTE) fruits has increased in recent years, making microbial contamination during manufacturing and distribution a major food safety concern. Pineapple, in particular, provides favorable conditions for the growth of *Listeria monocytogenes* due to its high sugar and moisture content, highlighting the need for improved hygiene management technologies. This study investigated microbial contamination during the processing of ready-to-eat pineapple and evaluated the reduction effect on *L. monocytogenes* through immersion treatment using food-grade solutions. Monitoring of the processing line revealed that *L. monocytogenes* was not detected; however, total aerobic bacteria and coliforms were identified, indicating potential cross-contamination. To evaluate the control effect, *L. monocytogenes* (10^2 CFU/g) was artificially inoculated onto pineapple samples, and eight permitted immersion solutions were applied under single (8 types) and combined (11 combinations) conditions. In single treatments, 80% ethanol showed a reduction of approximately 0.6 log CFU/g (100% reduction), and 1.5% organic acid mixture showed about 0.3 log CFU/g reduction (50%). In combined treatments, all 11 combinations resulted in non-detectable levels of *L. monocytogenes*. Notably, the combinations of 60% ethanol-3.0% vitamin C and 60% ethanol-1.0% organic acid effectively controlled *L. monocytogenes*, as well as total aerobic bacteria and coliforms, without compromising product quality in sensory evaluation. These findings demonstrate that immersion treatment can serve as an effective strategy to enhance hygiene and reduce microbial contamination in the processing of ready-to-eat pineapple.

P5-48

Isolation of proteolytic *Bacillus* sp. from traditional fermented foods and their inhibitory effects on foodborne pathogens and biofilm formation

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Traditional Korean fermented foods such as kimchi and jeotgal represent open microbial ecosystems in which diverse microorganisms coexist and influence product quality and safety. This study aimed to isolate proteolytic *Bacillus* strains with antimicrobial activity from kimchi and jeotgal and to evaluate their inhibitory effects on foodborne pathogens and biofilm formation. Screening was performed on tryptic soy agar supplemented with 2% skim milk, and colonies producing clear halos were selected as protease-positive isolates. To exclude *Bacillus cereus* group members, presumptive isolates were examined using MYP and PEMBA media, hemolytic assays, and the API ZYM enzyme profile. Antimicrobial activity was tested against *Escherichia coli*, *Staphylococcus aureus*, *B. cereus*, *Salmonella* enteritidis, and *S.* Typhimurium ATCC 13311. Four *Bacillus* isolates exhibited broad inhibitory spectra, and one strain (*Bacillus* spp. SQ1) showed the strongest antimicrobial and anti-biofilm activity. The cell-free supernatant of *Bacillus* spp. SQ1 was concentrated tenfold and added (0%, 2%, 4%) to tryptic soy broth containing each foodborne pathogen (10^6 CFU/mL). After incubation at 37°C for 48 h, a clear concentration-dependent inhibition was observed. For *B. cereus*, viable counts decreased from 9.28 to 7.04 log CFU/mL, and crystal-violet absorbance (585 nm) decreased from 0.631 to 0.177. Similarly, for *E. coli*, viable counts declined from 9.72 to 7.10 log CFU/mL, and biofilm formation was reduced from 0.814 to 0.111. These reductions correspond to more than 70-80% inhibition compared with untreated controls, indicating strong antimicrobial and biofilm-suppressing effects of the *Bacillus* metabolites. These findings suggest that proteolytic *Bacillus* strains derived from traditional fermented foods may serve as functional starter candidates that enhance both microbial safety and flavor development in protein-rich fermented products such as jeotgal and doenjang. The results provide a foundation for developing microbial resources capable of contributing simultaneously to the hygienic stability and sensory quality of traditional fermented foods.

Keywords: *Bacillus* spp., proteolytic activity, antimicrobial activity, biofilm inhibition, fermented foods, food safety

P5-49

Phenyllactic acid inactivates *Cronobacter sakazakii* through cell membrane destruction, biofilm retardation, and altered gene expression

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Cronobacter sakazakii is a foodborne pathogen of major concern due to its association with powdered infant formula and its ability to form persistent biofilms. Phenyllactic acid (PLA), a phenolic organic acid produced by lactic acid bacteria, has recently gained attention as a natural antimicrobial with broad-spectrum activity against foodborne pathogens by disrupting their cellular and membrane integrity. However, its antimicrobial activity toward *C. sakazakii* has not yet been researched. The objective of this study was to investigate the effect of PLA against *C. sakazakii* biofilm through the cell membrane, biofilm formation, and gene expression. The SDS-PAGE result showed a decrease in the intensity of degraded protein bands after PLA treatment. PLA treatment reduces cell surface hydrophobicity by altering outer membrane proteins and makes the cell less adhesive, thereby preventing the formation of biofilms. PLA induces protein damage, leading to enzyme inactivation and disruption of essential metabolic processes. It decreases cell surface hydrophobicity, thereby impairing bacterial adhesion for biofilm development. PLA also compromises cell wall integrity, increasing permeability and resulting in leakage of intracellular components such as nucleic acids (DNA). Furthermore, PLA treatment collapses the membrane potential. FE-SEM demonstrates pronounced morphological changes, including cell shrinkage, rupture, and lysis. These data provide novel insight into *C. sakazakii* responses to PLA exposure. These mechanisms indicate that PLA exerts a broad spectrum of antibacterial and antibiofilm activities by targeting both structural and functional components of *C. sakazakii*. Understanding these mechanistic insights provides a foundation for developing PLA-based interventions to enhance food safety and mitigate the risks posed by this emerging pathogen.

P6

P6-01

Investigation of mycotoxin contamination in Valentine's chocolates distributed in Seoul

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Climate change has accelerated the spread of fungal diseases in cacao trees in West Africa, resulting in reduced cacao quality and raising concerns about mycotoxin contamination in chocolate. To evaluate the safety of chocolates distributed during the Valentine season, a total of 87 samples were collected and analyzed for five mycotoxins: total aflatoxins (including aflatoxin B1), ochratoxin A, fumonisins, and zearalenone. Samples were extracted with 50% acetonitrile containing 0.1% formic acid, purified using solid-phase cartridges, and quantified by liquid chromatography-tandem mass spectrometry (LC-MS/MS). Mycotoxins were detected in 8 samples (9.2%), with zearalenone showing the highest frequency of occurrence (5 samples). The detected concentrations ranged from 0.8-7.0 μg/kg for total aflatoxins, 5.0-7.4 μg/kg for ochratoxin A, 0.01-0.44 mg/kg for fumonisins, and 23.5-58.0 μg/kg for zearalenone. While aflatoxin levels were within the current regulatory limits, no specific standards for ochratoxin A and zearalenone exist in Korea. These findings suggest that regulatory limits should be established for these mycotoxins and that continuous monitoring is required to ensure consumer safety.

P6-02

Fungal diversity and mycotoxin contamination in stored wheat

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Stored wheat is vulnerable to fungal contamination, which may lead to the accumulation of harmful mycotoxins and pose risks to food safety. This study investigated the fungal diversity and mycotoxin contamination in wheat stored under different conditions, including conventional warehouse (without temperature and humidity control), low-temperature warehouse, silos, and vinyl houses. Fungal communities were assessed using potato dextrose agar (PDA) and dichloran-glycerol 18 agar (DG18) media, and major mycotoxins were quantified. Fusarium species were most frequently detected in conventional warehouses (6.9%), followed by low-temperature warehouses (2.6%), silos (1.8%), and vinyl houses (1.8%). Higher levels of nivalenol, deoxynivalenol, and zearalenone were observed in conventional and low-temperature warehouses compared with silos and vinyl houses. Notably, low-temperature warehouse showed higher contamination levels than silos and vinyl houses, despite temperature control. Lowering temperature alone is not sufficient to control fungal growth and mycotoxin contamination. These findings highlight the need to identify and manage critical factors beyond temperature, particularly humidity, to ensure safer wheat storage.

P6-03

Cytotoxicity analysis of bovine gelatin-based bioink containing *Euterpe oleracea* extract for cultured meat production

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In this study, we investigated the cytotoxicity of bovine gelatin-based bioink containing *Euterpe oleracea* extract. The bioinks were prepared by incorporating the extract at concentrations of 1%, 0.1%, 0.01%, and 0%. pH, gel strength, and viscosity were carried out for physicochemical properties and MTT assay was carried out for cytotoxicity. No significant differences were observed in the physicochemical properties of the bovine gelatin-based bioink according to the concentration of *Euterpe oleracea* extract, indicating its suitability for scaffold fabrication for cell culture. Mouse muscle satellite cells were seeded onto scaffolds prepared using the bioink containing different concentrations of *Euterpe oleracea* extract, and the MTT assay was performed after 72 hours. The scaffolds containing 0.1% and 0.01% extract showed higher absorbance values than the control scaffold (0% extract), indicating enhanced cell viability. Based on these results, it can be concluded that incorporating *Euterpe oleracea* extract at concentrations of 0.1% or lower is appropriate for developing gelatin-based bioinks for cell culture. Furthermore, further investigation into the mechanisms and food safety is warranted to support its potential for industrial application.

P6-04

Assessment of neonicotinoid insecticide residues in leafy and fruit vegetables from Seoul (2022-2024)

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This study investigate the residue levels and distribution characteristics of neonicotinoid insecticides in leafy and fruit vegetables in Seoul over the past three years (2022-2024). A total of 13,107 samples from 55 agricultural commodities were collected and analyzed using the QuEChERS method combined with LC-MS/MS for six compounds: dinotefuran, acetamiprid, imidacloprid, clothianidin, thiamethoxam, and thiacloprid. The results showed that neonicotinoid residues were detected in 12.7% of the samples, accounting for 30.3% of all detected pesticides. The most frequently detected compounds were dinotefuran, imidacloprid, and clothianidin. Annual detection rates were 11.8% in 2022, 13.5% in 2023, and 12.6% in 2024, indicating an increasing trend until 2023 followed by a slight decline in 2024. The detection frequency was higher in fruit vegetables than in leafy vegetables. Among the commodities analyzed with more than 20 samples annually, chili pepper, bell pepper, and korean melon showed higher detection rates, while perilla leaves and young radish were the most affected among leafy vegetables. These findings demonstrate the importance of continuous monitoring and management of neonicotinoid insecticide use to ensure the safety of agricultural products distributed in Seoul.

P6-05

Survey of eight mycotoxins in Jeju-do market foods by LC-MS/MS

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Mycotoxins are toxic secondary metabolites produced by fungi that can cause carcinogenic, immunotoxic, and other adverse health effects. To assess the food safety of products distributed in Jeju-do, a survey of eight mycotoxins (aflatoxin B1, B2, G1, G2, ochratoxin A, fumonisin B1, B2, and zearalenone) was conducted on 242 samples, including nuts, fermented foods, processed products, and agricultural commodities. Mycotoxins were analyzed using the ISOLUTE Myco cartridge clean-up method followed by liquid chromatography-tandem mass spectrometry (LC-MS/MS). Aflatoxins (B1, B2, G1, G2) were not detected in any sample. Ochratoxin A was found in roasted sesame seeds (9.228 μg/kg), and total fumonisins in Job's tears (19.228 and 65.088 μg/kg). Zearalenone was detected in fermented beverages (25.981 μg/kg), white soybeans (15.625 μg/kg), glutinous millet rice (3.821 μg/kg), Job's tears rice (31.814 μg/kg), meju powder (15.976 μg/kg), and millet (10.907 μg/kg). However, all detected levels were below the maximum allowable limits set by the Ministry of Food and Drug Safety (MFDS), indicating that foods distributed in Jeju-do currently pose no major public health risk. This study provides important baseline data for the safety management of mycotoxins in regional food distribution and highlights the need for continuous investigation and monitoring to ensure long-term consumer health protection.

P6-06

Analysis of mycotoxins in wheat using NIRS

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In recent years, due to high temperatures and humidity, climate change, and global warming, Fungi growth in agricultural products is increasing. Therefore, cases of contamination by mycotoxins among agricultural products produced by fungi are increasing. Especially, as the production and distribution of wheat, a major food crop, increases, the incidence of mycotoxin contamination in wheat is on the rise. Analysis technology using NIRS(Near-infrared spectrometer) is gaining attention due to its ability to rapidly analyze components. This is why analysis of mycotoxins in wheat using NIRS is needed to ensure the safety management of wheat. In this study, We compared the absorbance spectrum of wheat samples contaminated with and uncontaminated with mycotoxins using NIRS in the near-infrared wavelength range of 800 nm to 2500 nm. We also analyze absorbance image on the surface of wheat using NIR spectroscope to see the distribution of mycotoxins in wheat. We used LC-MS/MS to quantify the mycotoxins contents of deoxynivalenol and zearalenone in wheat. We analyzed the correlation between absorbance spectrum using NIRS and mycotoxins contents using LC-MS/MS. Differences in the absorbance spectrum wavelength range of 945 nm -1,015 nm were observed depending on the content of the wheat mycotoxin deoxynivalenol. Differences in the absorbance spectrum wavelength range of 1,096 nm-1,191 nm were observed depending on the content of the wheat mycotoxin zearalenone. Deoxynivalenol and zearalenone showed a correlation of 0.9 or higher between their absorbance spectrum and mycotoxins contents. Absorbance spectrum image analysis showed differences on wheat surface between contaminated with and uncontaminated with mycotoxins. This study showed feasibility of analysis of mycotoxins in wheat using NIRS.

P6-07

Biochemical assessment of cicadamide-4 from cicadae periostracum and its cytotoxic effect including acute oral toxicity using an ICR mice model

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This study aimed to investigate Cicadamide-4 from Cicadae Periostracum for proximate composition, uronic acid, sulfated glycosaminoglycan, sialic acid, collagen levels, and chemical components using ultra-performance liquid chromatography-quadrupole-time-of-light mass spectrometry. In addition, we evaluated the cytotoxic effect of the Cicadamide-4 on RAW264.7 macrophages using the cell viability MTT assay. Furthermore, we evaluated acute toxicity of the Cicadamide-4 at different doses (0, 1, 50, 100 and 500 mg/kg) administered orally to both male and female ICR mice for 14 d (five mice per group). After treatment, we evaluated general toxicity, survival rate, body weight changes, mortality, clinical signs, and necropsy findings in the experimental mice based on OECD guidelines. The results suggested that in vitro treatment with the evaluated Cicadamide-4 had no cytotoxic effect in RAW264.7 macrophages. The mice treated in vivo with the Cicadamide-4 at doses of 1-500 mg/kg BW showed no clinical signs, mortality, or necropsy findings, indicating that the LD50 is higher than this dosage. These findings indicate that there were no toxicological abnormalities connected with the Cicadamide-4 treatment in mice. However, further human and animal studies are needed before sufficient safety information is available to justify its use in humans.

P6-08

Development of alternative methods for drug toxicity testing for replacing rodent models

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Drug toxicity testing using mammals, including rodents, results in the sacrifice of numerous animals each year. Although various alternative methods have been developed, a perfect replacement has yet to be identified. In this study, we investigated the potential of silkworms as an alternative model for assessing drug toxicity using different routes of administration. Silkworms were shown to be effective for evaluating percutaneous and oral toxicity, and their applicability as a model for respiratory toxicity was also confirmed. These findings suggest that silkworms can serve as a valuable toxicity testing model due to their capacity for mass rearing and rapid assessment. Future research may establish silkworms as a novel drug testing model, substantially reducing the reliance on mammals. This work was results of a study on the “Glocal University” Project, supported by the Ministry of Education and National Research Foundation of Korea (No. GLOCAL-202504430001). Key words: toxicity, non-mammalian, percutaneous, oral, respiratory

P6-09

Analysis of bioactive components and antioxidant activities of Hwaljingigo

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Hwaljingigo (HGG) is a traditional medicinal formula widely consumed in East Asia, prepared from Rehmannia glutinosa, Panax ginseng, Poria cocos, honey, and other herbal ingredients. In this study, the bioactive compound contents and antioxidant activities of a commercial HGG product were investigated. The total phenolic content (TPC), total flavonoid content (TFC), and total anthocyanin content (TAC) were determined using spectrophotometric methods. HGG showed TPC of 1.83 ± 0.03 mg GAE/mL, TFC of 1.56 ± 0.02 mg QE/mL, and TAC of 5.64 ± 1.00 mg CE/mL. Antioxidant capacity was assessed through multiple in vitro assays, including the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay, the 2,2′-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) radical cation decolorization assay, the ferric reducing antioxidant power (FRAP) assay, and the oxygen radical absorbance capacity (ORAC) assay. HGG exhibited concentration-dependent antioxidant activities across all assays. These findings provide scientific evidence that the health-promoting effects of HGG are closely associated with its phytochemical composition and antioxidant activity. Overall, the results support the potential application of HGG as a multifunctional functional food material with strong antioxidant capacity.

P6-10

Comprehensive *in vitro* evaluation of the functional activities of Hwaljingigo

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Hwaljingigo (HGG) is a medicinal formula traditionally consumed in East Asia, consisting of Rehmannia glutinosa, Panax ginseng, Poria cocos, honey, and other ingredients. This study systematically investigated the multifunctional biological activities of a commercial HGG product using diverse in vitro models. Experimental concentrations were established based on the recommended daily intake (1-3 sachets). Functional evaluations included anti-obesity, anti-obesogen, anti-inflammatory, immune-enhancing, anti-muscle atrophy activities, and skin-protective effects. HGG showed no cytotoxicity in 3T3-L1 adipocytes, C2C12 myoblasts, RAW264.7 macrophages, and HDF keratinocytes. The biological activities were observed in a dose-dependent manner across the tested models. In particular, HGG enhanced nitric oxide (NO) production in immune cells and improved myotube diameter and functional index in dexamethasone-induced muscle atrophy conditions. Therefore, the immune-enhancing and anti-muscle atrophy effects were the most pronounced, highlighting the health-promoting potential of HGG. In conclusion, this study provides scientific evidence validating the multifunctional biological activities of HGG and supports its potential application as a health-promoting product.

P6-11

Estrogen receptor alpha-dependent induction of lipid accumulation in 3T3-L1 adipocyte by clofentezine, clomazone, metconazole

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Phenolic pesticides are potential endocrine disruptors (EDCs) and obesogens. In this study, we investigated the estrogen receptor alpha (ERα)-mediated endocrine disruption effects of eight phenolic pesticides and their potential to induce lipid accumulation in a dose-dependent manner. The effects of ERα agonists were confirmed using the transcriptional activation assay in the hERα -HeLa-9903 cell line, as described in OECD PBTG No. 455. Lipid accumulation was assessed in 3T3-L1 adipocytes, and ERα -dependent lipid accumulation was further confirmed with methyl-piperidino-pyrazole hydrate (MPP), an ERα-selective antagonist. All eight pesticides showed ERα agonistic activity. The three of them (clofentezine, clomazone, and metconazole) significantly induced lipid accumulation, which was suppressed by combination treatment with MPP. These three pesticides induced adipogenic/lipogenic transcription factors associated with lipid accumulation in 3T3-L1 adipocytes, an effect inhibited by the ERα-selective antagonist. Notably, these three pesticides contained a chlorine (Cl) residue in the phenyl group. These findings suggest that this structure may promote lipid accumulation by interfering with ERα-mediated endocrine disruption.

40th 한국식품위생안전성학회
정기학술대회

International Conference on
Food Safety and 40th KoSFoS Annual Meeting

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The Science of Food Safety :
Bridging Research and Application

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40th 한국식품위생안전성학회
정기학술대회

International Conference on
Food Safety and 40th KoSFoS Annual Meeting

Device Booth Exhibition

The Science of Food Safety :
Bridging Research and Application

네오젠코리아

업 체 명	네오젠코리아	대 표 자	손 병 익
주 소	서울 영등포구 국제금융로8길 31 SK증권빌딩 9층 네오젠코리아		
홈 페 이 지	www.neogen.com	E-mail	marketingkr@neogen.com
전 화	1566-4486	팩 스	

회사소개

Neogen은 1982년 미국 미시간 주에 설립된 글로벌 생명과학 기업으로, 식품 안전, 동물 건강, 유전자 분석 분야를 선도하는 솔루션을 제공합니다. 전 세계 140여 개국에 진출해 있으며, 혁신적인 기술력과 신뢰성 있는 제품으로 식품 산업, 농축산업, 생명과학 분야에 필수적인 파트너로 자리하고 있습니다.

1982년 창립 이후 40년 넘게 축적된 전문성을 토대로 식품·동물 안전과 유전체학 영역까지 사업을 확장하였으며, 농장에서 식탁까지 이어지는 전 세계 식량 공급망을 보호하고 있습니다. 또한 2022년 3M 식품안전사업부의 전략적 통합을 기반으로 2021년 매출 기준 식품 안전 분야 세계 1위의 온오프 글로벌 리더입니다.

"농장에서 식탁까지 전 세계 식량 공급을 효율적으로 보호한다"는 사명을 중심에 두고, NEOGENE은 식품 및 동물 안전 솔루션의 개발과 디지털화를 선도하며 급격히 증가하는 인구에게 안전하고 고품질의 식량을 제공하는 데 핵심적 역할을 수행하고 있습니다.

Neogen의 식품 안전 부문은 지표세균·식중독균·알레르겐·곰팡이독소 신속 검출 키트, ATP 위생 모니터링 등을 제공합니다.

전시품목

미생물 검출 솔루션: Petrifilm Plate Reader Advanced, Soleris Next Generation
식중독균 검출 솔루션: MDS (Microbial Detection System)
ATP 기반 위생 모니터링 시스템: LM1 (Luminometer Model 1)

전시품목소개

미생물 검출 솔루션

Petrifilm Plate Reader Advanced와 Soleris Next Generation은 식품 및 환경 시료 내 미생물의 존재를 신속하고 정확하게 검출하는 장비로, 자동화된 판독과 분석이 가능합니다.

식중독균 검출 솔루션 (MDS)

MicrobialDetectionSystem은 병원성 미생물을 검출하는 시스템으로, 식품 안전 검사에서 빠른 결과 제공과 데이터 신뢰성을 보장합니다.

ATP 기반 위생 모니터링 시스템 (LM1)

위생 상태를 실시간으로 평가하는 장비로, 세척 효과 및 표면 청결도를 즉시 확인할 수 있습니다.

㈜세니젠

업 체 명	㈜세니젠	대 표 자	박 정 웅
주 소	경기 안양시 동안구 흥안대로 427번길 16 평촌 디지털 엠파이어 411호		
홈 페 이 지	http://sanigen.kr	E-mail	ssh@sanigen.kr
전 화	1833-8010	팩 스	070-4009-7007

회사소개

㈜세니젠은 No.1 Food Safety Total Solution Provider로서 안전한 식품의 제조, 유통, 판매를 위한 토탈 솔루션을 개발하고 서비스하는 식품 위생 안전 전문기업입니다. 창사 이래 꾸준하고도 과감한 R&D 투자를 통하여 진단/제어 기술을 확보하고 고도화함으로써, 고객 맞춤형 PCR 진단키트, 대량시료에 적합한 NGS(Next Generation Sequencing) 패널, 효능과 안전성을 갖춘 살균 제품을 개발·공급하고 있습니다. 또한, 생물정보학 전문성과 NGS 분석 노하우를 활용하여 식품산업에 최적화된 NGS 분석 서비스도 제공하고 있습니다. 당사는 식품산업 발전에 이바지한 공로를 인정받아 2024년 상반기 최우수 기업연구소로 선정되기도 하였습니다. 식품 안전 혁신기술을 기반으로, 이제 국내는 물론 글로벌식품 안전 전문기업으로의 세계시장을 향해 도약합니다.

전시품목

Genelix™Real-time PCR Detection kit : 생물정보분석 기술을 바탕으로 식품현장에서 빠르고 정확하게 사용할 수 있는 신속 검출 키트. 식품공전에 명시된 모든 식중독균 및 Virus, Vegan, GMO 등 다양한 진단키트를 공급 중.

- ForLabs : 간편하고 위생적으로 실험할 수 있는 Sample Handling 도구. 내구성이 우수하고 스티커 부착으로 사용이 편리한 멸균 샘플 백, 교차오염 방지 및 누수에 강한 특허 디자인의 멸균 희석액, 높은 회수율의 PU Swab 제품 공급 중.
- Geneka™(NGS Analysis Service) : 식품산업에 특화된 고객 맞춤형 NGS 분석서비스 공급.
- GeNext™(NGS Analysis System) : 식품시료의 NGS 분석 전과정에 있어서 일루미나 플랫폼 에 최적화된 솔루션을 제공. 식품안전센터를 위한 대규모 식품시료의 신속분석 및 QC reporting을 위한 솔루션을 제공함으로써, 고객사가 자체적으로 NGS Analysis Laboratory를 운용할 수 있도록 지원.

전시품목소개

Genelix™

Genelix™ Real-time PCR Detection Kit

ForLabs

Simple Bag

ForLabs

Simple Diluent

ForLabs

PU Swab, Squeeze

유전체분석서비스

NGS분석서비스

써모피셔사이언티픽코리아㈜

업 체 명	써모피셔사이언티픽코리아 주식회사	대 표 자	석 수 진
주 소	서울특별시 강남구 광평로 281 수서오피스빌딩 12층		
홈 페 이 지	https://www.thermofisher.com	E-mail	taeik.kim@thermofisher.com
전 화	010-9127-3261	팩 스	

회사소개

써모 피셔 사이언티픽(Thermo Fisher Scientific Inc.)은 전세계 최대 규모의 분석 기자재를 개발하고 공급하는 회사로써 식품안전 & 품질관리를 위한 미생물 분석, 이화학 분석, 이물관리 분석을 위한 토탈 솔루션을 보유하고 있습니다. 당사는 혁신적인 제품, 일련의 품질 보증 솔루션, 그리고 전문 지식을 갖춘 직원이 제공하는 교육을 통해 오늘날 전세계의 까다로운 소비자들이 기대하는 가장 높은 수준의 식품 품질, 안전성, 진위성 표준을 만족하는 식품 공급을 돕고자 합니다. 또한 고객을 도와 세상을 건강하고, 깨끗하며, 안전하게 만든다는 사명감을 바탕으로 당사의 기술 집약적인 글로벌 노하우와 기술력으로 최신 기술을 적용하고 보다 더 빠르고 정확한 정량, 정성이 가능한 식품안전과 품질관리 전반에 대한 분석을 지원해 드리고자 합니다.

전시품목

1) Oxoid & Remel 미생물 배양용 배지
2) QuantStudion5 및 SureTect – Food Pathogen Detection을 위한 RT-PCR 장비 및 키트
3) NGS 종판별 키트 (SGS AllSpecies ID kit)
4) ATCC 표준균주: 미생물 정성 및 정량균주 Culti-loop & Quanti-cults plus
   ⇒ 배지성능검사와 각종 미생물동정장비 및 Kit의 QC용 균주 공급
5) AGS (Atmosphere Generation System) : 혐기성, 미호기성 & CO_2요구성 미생물 배양 환경 조성
6) 다양한 미생물 동정 생화학 키트 : RapID (4시간 만에 미생물 동정이 가능한 kit)

전시품목소개

미생물 배양용 배지

AGS (Atmosphere Generation System)

ATCC 표준균주 (정성 & 정량균주)

미생물 동정 생화학 키트 (RapID)

NGS 종판별 키트(SGS AllSpecies ID kit)

QS5 & SureTect Food Pathogen Detection(RT-PCR)

1) Oxoid & Remel microorganism culture medium
2) QuantStudion5 & SureTect – RT-PCR Instrument and kits for Food Pathogen Detection
3) NGS species identification kit (SGS AllSpecies ID kit)
4) ATCC standard strain: Microbial qualitative and quantitative strain Culti-loop & Quanti-cults plus
   ⇒ Supply various microbial for Growth Promotion Test and QC of dentification equipment or kits.
5) AGS (Atmosphere Generation System): Create an environment for cultivating microorganisms requiring anaerobic, microaerophiles & CO_2
6) Biochemistry kit for identifying various microorganisms: RapID (kit that can identify microorganisms in 4 hours)

㈜비오메리으코리아

업 체 명	㈜비오메리으코리아	대 표 자	김 대 환
주 소	서울 강남구 역삼로 121 유성빌딩 2,7,8,9층		
홈 페 이 지	www.biomerieux.com	E-mail	ml-kr-ind-mkt@biomerieux.com
전 화	02-2188-4729	팩 스	02-553-6264

회사소개

비오메리으는 1963년 진단 솔루션 분야의 전문가들에 의해 설립되어 여러 세대에 걸쳐 미생물 검사 솔루션을 제공해오고 있습니다. 비오메리으는 공중보건 및 안전 을 개선하기 위해 끊임없이 노력하는 글로벌 선구자 로서 식품, 제약 및 코스메틱 분야에서 안전한 제품을 생산할 수 있도록 신속하고 정확한 미생물 검사 솔루션을 제공합니다. 비오메리으의 솔루션을 통해 고객사에서는 안전한 제품을 효율적으로 생산하고 기업의 브랜드 이미지를 보호할 수 있습니다.

전시품목

GENE-UP®, VITEK® COMPACT PRO

전시품목소개

GENE-UP®

병원성 미생물, 부패 미생물 및 바이러스 검출을 위한 Real-time PCR 기반 솔루션

- ✔ 세균, 바이러스 실험 가능
- ✔ DNA 추출 (Lysis)에 96샘플, 5분 소요
- ✔ 증균 – DNA 추출 – PCR 분석 – 결과 확인
- ✔ Real-time PCR : 낮은 수준의 미생물 오염도 효과적으로 검출
  (3단계의 특이도 제공 : Primer, FRET Proboes, Melt Peak)

VITEK® COMPACT PRO

신속 미생물 동정 솔루션

- ✔ 수 시간내 결과 제공 (GN/GP 검사는 2시간 만에 결과 제공)
- ✔ 식품공전 내 '생화학적 확인시험' 에 적용
- ✔ ISO 7218, BAM, FSIS, MLG, 21 CFR Part 11 준수
- ✔ Data management 효율성 및 integrity 증대
- ✔ 시험양에 따라 30 모델 또는 60 모델 선택

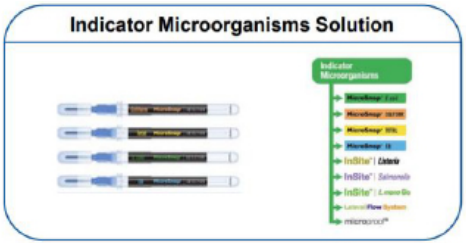
Hygiena

업 체 명	Hygiena	대 표 자	Steven Nason
주 소	941 Avenida Acaso, Camarillo, CA 93012, US		
홈 페 이 지	www.hygiena.com	E-mail	schoi@hygiena.com
전 화	010-8997-7952	팩 스	

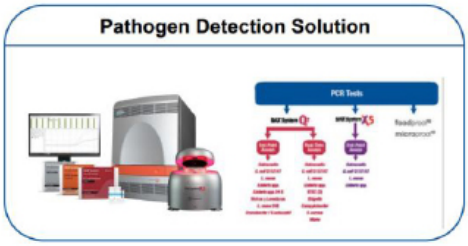
회사소개

Hygiena는 식음료, 의료, 접객서비스, 제약, 퍼스널 케어 등 다양한 산업 분야에 신속한 미생물 검출, 모니터링 및 동정 솔루션을 공급하고 있습니다. 첨단기술과 특허받은 디자인을 활용하여 Hygiena는 업계 최고의 APT 모니터링 시스템, PCR 기반의 식중독균 검출 및 특성화 시스템, 알레르겐 테스트, 환경 채취 도구 등을 제공합니다. Hygiena는 우수한 고객 서비스와 지원을 바탕으로 사용하기 쉽고 신뢰할 수 있는 고품질 혁신 기술을 고객에게 제공한다는 사명에 전념하고 있습니다. 미국 California 주 Camarillo에 본사를 두고 있으며, Wilmington, Delaware, 영국, 스페인, 캐나다, 멕시코, 호주, 브라질, 중국 등 전 세계 여러 지사와 100여개국 180개 이상의 대리점을 통해 Hygiena 브랜드 제품을 판매하고 있습니다.

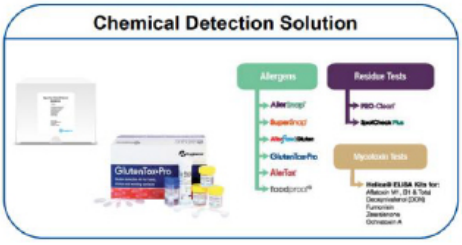
전시품목소개

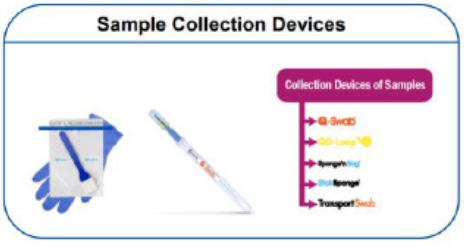


ATP환경모니터링 솔루션을 비롯해 지표세균을 최대 6배 빨리 검출할 수 있는 MicroSnap과 언제 어디서든 결과확인이 가능한 Cloud기반의 SureTrend 소프트웨어



미국을 대표하는 BAX RT-PCR과 여러 타브랜드의 PCR에 호환가능한 foodproof 키트, 그리고 식품시료의 멸균테스트에 적합한 Innovate system





Mycotoxin 및 Allergen 검사 키트와 스펀지, Q swab등의 샘플채취도구

고마바이오텍㈜

업 체 명	고마바이오텍㈜	대 표 자	문 상 훈
주 소	서울시 영등포구 양평로 21길 26 선유도역1차 아이에스비즈타워 19층		
홈 페 이 지	www.komabiotech.co.kr	E-mail	koma@komabiotech.co.kr
전 화	02-579-8787	팩 스	02-578-0742

회사소개

- 고마바이오텍㈜는 Goldstandard Diagnostics의 한국 대리점으로 식품, 사료, 환경에 관련된 안전검사 키트, 기기를 제공합니다.
- Goldstandard Diagnostics는 2022년 12월 Eurofins Technologies에서 리브랜딩 되었습니다.
- Eurofins는 식품, 사료, 환경 검사 분야에서 기술 서비스를 제공하는 글로벌 회사입니다. 전 세계 850여개의 Eurofins 자체 서비스 랩을 보유하고 있으며 Goldstandard Diagnostics에서는 분석에 적용되는 기기, Kit, 숙련도검사 및 CRM 등을 One-stop 솔루션으로 제공하고 있습니다.

전시품목

- 전자동화 ELISA 시스템, 알러젠 Strip Reader, 식품 안전 검사에 필요한 전처리컬럼, PCR/ELISA Kit 및 Lateral Flow Kit

전시품목소개

- 전자동화 ELISA 시스템은 Eurofins Technologies사의 곰팡이독소, 알러젠, 식중독 ELISA Kit와 validation이 완료되었습니다.
- Strip Reader를 통해 기존 Strip 방식의 약점을 보완하여 반정량 결과를 확인할 수 있습니다.
- Goldstandard Diagnostics사의 모든 제품은 각 공정별 요구되는 ISO 기준에 따라 생산되며, AOAC, AFNOR의 국제인증을 받았습니다.

ASANA

업 체 명	ASANA(Amino acid Seasoning Alliance of Northeast Asia)	대 표 자	배 승 규
주 소	서울특별시 영등포구 여의도동 국제금융로2길 7 한주빌딩		
홈 페 이 지	http://www.asanakorea.com	E-mail	asana@asanakorea.com
전 화	02-3775-4251	팩 스	02)3443-1070

업체 소개 및 전시 품목

ASANA는 비영리 학술단체 IGTC의 산하 '동북아시아 아미노산 조미료 협력 기구'입니다. IGTC(International Glutamate Technical Committee, 국제 글루타메이트 기술위원회)는 과학적인 연구를 지원하여 생리학, 생화학, 약물학 그리고 독성학적인 측면에서 glutamate와 관련된 데이터베이스를 넓히고 정확한 정보를 세계 각국에 알리기 위해 1970년에 설립된 비영리 단체입니다. UN, FAO 및 WHO로부터 비정부기구로 인정받은 단체로 유럽, 북미, 남미 그리고 동남아시아 등 세계 각국에 걸쳐 지부를 두고 활동하고 있으며, 증명된 과학적 근거를 바탕으로 올바른 정보의 전달을 위해 노력하고 있습니다.

1. L-글루탐산나트륨이란?

글루탐산나트륨이란 식품 제조·가공 시 맛과 향을 증진시키기 위해 사용되는 식품첨가물입니다. 20세기 초 동경대의 이케다 카쿠나에 교수가 일반적인 4가지 맛 범주에 들어가지 않는 감칠맛을 발견하고 'UMAMI'라고 처음 명명하게 되었고, 이미·이취가 없는 이상적인 형태인 L-글루탐산나트륨의 형태로 음식 맛을 더욱 좋게 만드는 효과적인 수단으로 널리 사용되어 오고 있습니다. 오늘날은 발효를 통해 생산되고 있으며 발효에는 당밀, 사탕수수 또는 타피오카 곡물의 전분 같은 자연의 산물을 사용하고 있습니다.

2. L-글루탐산나트륨에 대한 세계 각국의 안전성 평가

☞ 미국 FDA – 미국연방 규정집에 MSG는 소금, 후추, 베이킹파우더와 함께 '일반적으로 안전한 물질(GRAS:Generally Recognized As Safe)'로 분류되어 있습니다.

☞ FAO/WHO 합동 식품첨가물 전문가 위원회 (JECFA) – 1987년 MSG의 안전성에 대해 재검토한 결과 성인 및 12주 미만의 영유아들에게도 안전성에 아무런 문제가 없다는 결론을 내리고 ADI(일일허용섭취량) 제한을 둘 필요가 없다고 공포하였습니다.

☞ 대한민국 – 국내 식품위생법에도 MSG를 인체에 안전한 식품첨가물로 정하여 사용법 및 사용량에 대해 전혀 규제하지 않고 있으며, 2010년 3월 식품의약품안전처는 보도자료를 통해 MSG의 안전성과 기능성을 재확인하였습니다.

3. L-글루탐산나트륨의 기능성

L-글루탐산나트륨은 요리에 한꼬집만 사용하여도 자연 재료의 맛을 돋우어 주며 감칠맛을 살려줍니다. 소금으로 간을 하기 전에 소량의 글루탐산나트륨을 먼저 사용하면 평소보다 소금을 덜 사용하여도 감칠맛나는 요리를 완성할 수 있습니다. 이는 감칠맛의 짠맛 상승효과 때문으로, 나트륨 섭취를 20~40% 감소시킬 수 있습니다.

㈜코젠바이오텍

업 체 명	㈜코젠바이오텍	대 표 자	남 용 석
주 소	서울특별시 금천구 가산디지털 1로 168 우림라이온스밸리 C동 11층		
홈 페 이 지	https://kogene.co.kr/kr/	E-mail	jin4996@kogene.co.kr
전 화	010-3135-4996	팩 스	02-2026-2155

회사소개

코젠바이오텍은 핵산 자동화 추출시스템부터 결과분석 소프트웨어까지 "분자진단 토털솔루션"을 제공합니다. 식품안전뿐만 아니라 체외진단, 신종감염병, 동물질병 등 유전자분석이 가능한 모든 분야의 2,000종이 넘는 진단시약을 개발하였습니다. 끊임없는 연구개발을 통해 새로운 검사법과 제품을 국내/외 식품업계, 관공서, 연구소에 공급함으로써, 식품의 안전성을 확보하여 인류의 안전하고 건강한 삶에 기여하고자 노력하고 있습니다.

KogeneBiotech is the total solution provider for molecular diagnosis, offering everything from automated nucleic acid extraction system to result analysis software. Our product line covers real-time PCR assay in all fields such as clinical diagnostics, emerging diseases, animal diseases and food safety. We supply our products to the food companies, the government authorities, and the national research institutes. Also, we always continue to assist you to ensure that our products and technology lead to improve the public health and safety.

전시품목

1) Extraction & PCR instrument	2) Pathogen test System	3) Vegan test System	4) Halal test System
			

전시품목소개 – Real-time PCR 기반 분자진단을 위한 토탈 솔루션

1) Extraction & PCR instrument (PowerEXP™ & PowerAmp96™ & PowerAmp16™ Plus)
: PowerEXP™는 마그네틱 비드 방식으로 10~20분 내에 32개의 샘플을 처리하며 샘플 유형에 최적화된 카트리지 타입의 시약과 프로토콜을 함께 제공한다. PowerAmp96™은 보정을 위한 레퍼런스 dye가 불필요하여 6개의 형광 채널 (PowerAmp16™ Plus는 4개의 형광 채널)은 모두 타겟을 검출하는데 사용될 수 있으며 뛰어난 온도 제어로 균일성, 정밀성, 정확성 있는 결과를 도출한다.

2) Pathogen test system (PowerChek™ 20 Pathogen Real-time PCR Kit & PowerPrep™ Pathogen NA Extraction Kit EXP)
: 식품 원재료 및 가공식품, 배양액 및 분변, 직장도말검체와 같은 샘플에서 식중독을 유발하는 미생물을 동시에 검출할 수 있으며 분석에 필요한 시약들이 미리 분주되어 있는 premix 타입이다. 식중독 원인조사 표준시험법으로 효율적인 역학조사에 기여하고 있다.

3) Vegan test system (PowerChek™ Animal Real-time PCR Kit Ver.1.0 & PowerPrep™ Universal DNA Extraction Kit EXP)
: 식품 원재료 및 가공식품, 화장품 및 의약품, 동물 및 가축사료 내 동물(100종 이상) 유래 유전자를 검출 할 수 있어 비건 검사에 활용할 수 있으며 DPC와 IC 사용으로 DNA 추출과 PCR 교차 검증이 가능하다.

4) Halal test system (PowerChek™ Pork Gelatin Real-time PCR Kit & PowerPrep™ Halal DNA Extraction Kit EXP)
: 젤라틴 함유 샘플을 포함한 각종 식품에서 돼지 특이 유전자를 높은 민감도로 검출하여 세계 3대 할랄검증기관 중 하나인 인도네시아 LPPOM MUI의 표준검사법으로 채택되었다.

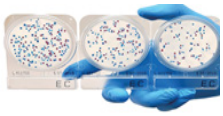
㈜바이오메드

업 체 명	㈜바이오메드	대 표 자	손 현 민
주 소	경기도 성남시 분당구 판교로 744 분당 테크노파크 C동 202호		
홈 페 이 지	www.bio-med.co.kr	E-mail	info@bio-med.co.kr
전 화	031-707-3450 (代)	팩 스	031-707-3451

회사소개

㈜ 바이오메드는 2005년 설립된 이후로 연구소, 식품 및 사료 업체 등에 품질관리, 검사장비, 시약, 검사 키트를 판매해 오고 있습니다. 특히 식품 안전과 위생을 위해 최고의 품질과 최상의 서비스를 제공하며 고객에게 신뢰받는 기업으로 꾸준히 성장해 왔습니다.

전시품목 및 소개

Romer Labs	ELISA: 곡류, 견과류, 곡물, 동물사료에서 곰팡이 독소 및 식품 속 다양한 알러젠을 효소면역 측정법(ELISA)을 이용해 신속하고 정략적으로 검출합니다. STRIP: Lateralflow기술을 이용한 Strip타입으로 식품공전 및 사료 관리법에 따른 곰팡이 독소별 정성검사 및 식품 속 알러젠의 정성검사가 가능합니다. AC(Immunoaffinitycolumns): 다양한 종류의 식품과 사료분야에 적용가능하며 곰팡이독소 검출 전, 신뢰할 수 있는 전처리과정을 위하여 설계된 면역친화성 컬럼입니다.	
TheBioMed-Realtime PCR	Veri-Q PCR 316: 중합효소연쇄반응(Real-time PCR)을 이용하여 다양한 병원성미생물의 정량 검출분석이 가능합니다. ▪ Fast 고속정량분석가능(30분 이내-40Cycle기준) ▪ Low Cost Channel-type의 Plastic Chip사용 ▪ Compact & Mobility: 컴팩트한 사이즈와 4.7kg의 무게로 이동이 편리 ▪ High Performance: Chip사용방식을 통한 높은 민감도와 특이도 ▪ Easy-to-Use: 작동법이 간단하여 누구나 쉽게 사용가능 ▪ 4-Mutiplex PCR (FAM, Cy5, HEX, TEX의 동시분석 PCR)	
NAVIGEN	생배지는 배지 제조과정 없이 바로 실험에 사용가능한 배지로, 사용자가 편리하게 사용할 수 있도록 용도에 따라 다르게 제조 및 포장하여 제공합니다. Broth타입 액체배지는 액상 형태이며, Agar타입(Plate한천배지)은 파우더에 Agar(한천)라는 성분이 들어있는 젤리같은 고체형태를 가지는 배지입니다.	
CompactDry	냉장보관이 불필요한 미생물 검사용 간이배지	
QUANTOM Tx	미생물 세포 카운터(박테리아 카운터) 전배양 없이 표준화 프로토콜로 총균·생균 동시 정량, 분석 40분 내 결과 확인 가능하며, QC 리드타임을 단축하고 데이터 일관성으로 품질 의사결정을 앞당깁니다.	

㈜밀테크

업 체 명	㈜밀테크	대 표 자	이 현 범
주 소	경기도 성남시 분당구 성남대로 331번길 3-9, 백궁프라자 3차 707호		
홈 페 이 지	www.milltech.co.kr	E-mail	info@milltech.co.kr
전 화	02-578-3077, 3078	팩 스	02-578-3079

회사소개

- 1985년 설립하였으며 사료업계와 식품업계에 실험분석기기 공급 및 품질관리 업무에 관한 전반적인 서비스 활동을 하고 있습니다. 더불어 식품 및 사료업계에서 요구하는 기능성 원료에 대한 공급도 하고 있습니다.

전시품목

1) Immunoaffinity Column / VICAM U.S
2) Vertu Touch (Myco quick tester) / VICAM U.S
3) Total Dietary Fiber Analyzers / ANKOM U.S
4) Flex Analyte Extractor(비타민&콜레스테롤/산가수분해/지방추출) / ANKOM U.S

전시품목소개

1) Mycotoxin Tests (Immunoaffinity Column) / VICAM U.S.

Alfatest WB, Ochratest WB, Zearalatest WB DONtest WB, Fumonitest WB, AO (Afala, Ochra), AOZ (Afala, Ochra, Zearala) 6 in 1 (Afla, Ochra, Fumonisin, Zearalalenone, DON, Nivalanol, T-2/HT2)

2) Vertu Touch / VICAM U.S.

AFLA-V ONE, DON-V ONE, FUMO-V ONE, AQUA-VT :
Afla, Ochra,F umo, Zearala, T2/HT2, Glyphosate

3) Total Dietary Fiber Analyzers / ANKOM U.S

식이섬유 분석기로서 분해,침전 과정이 전 자동화 되어 있음.
현재까지 식이섬유에 대한 자동화 분석기로서는 전세계 유일한 기기임.
저항성 전분 실험이 가능하다.

4) FLEX Analyte Extractor (비타민&콜레스테롤 /산가수분해/지방추출) / ANKOM U.S

지용성 비타민 A,D,E 및 콜레스테롤 분석을 자동화 하였음
한번에 4개의 시료가 가능하며 2시간 이내에 비누화 과정, 고체상 추출 및 증발을 자동으로 실행하여 사용자의 작업을 최소화함

워터스코리아

업 체 명	워터스코리아	대 표 자	박 진 모
주 소	경기도 광명시 신기로 20 유플래닛타워 22층		
홈 페 이 지	www.waters.com	E-mail	KS_Inquiry@waters.com
전 화	02-6300-9200	팩 스	02-6300-9204

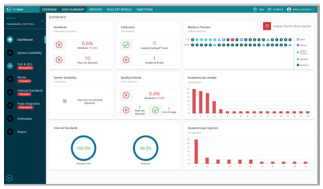
회사소개

Waters는 컬럼 및 시료 전처리 화학물질, 분석 장비, 데이터 관리 소프트웨어를 통합한 식품 검사 시스템을 개발하는 선도 기업입니다. Waters의 종합 솔루션은 식품 분석 실험실이 다양한 화학 물질을 식별하고, 규제 요건을 충족하며, 운영 비용을 절감하고, 생산성을 향상시키며, 가장 중요한 공공의 안전을 확보하는 데 기여합니다.

전시품목

- Sample Preparation: Oasis Prime HLB 샘플 전처리
- ACQUITY UPLC/UHPLC Systems: ACQUITY UPLC Premier Systems
- Quantitation software: waters_connect MS Quan
- Triple Quadrupole Mass Spectrometry: Xevo TQ Absolute XR

전시품목소개

	Sample Preparation: Oasis Prime HLB 샘플 전처리 보다 빠르고 깨끗하며 간단해진 SPE는 여기에서 시작됩니다. Waters Oasis SPE 제품은 광범위한 sorbent와 다양한 형식으로 제공됩니다. Oasis 제품으로 간단하고 신속한 샘플 매트릭스 클린업부터 더 복잡한 샘플 전처리 문제에 이르기까지, 다양한 샘플 전처리 요구 사항을 충족할 수 있습니다.
	ACQUITY UPLC/UHPLC: ACQUITY UPLC Premier Systems MaxPeak Highperformance Surface(HPS) 기술을 적용하여 금속에 민감한 분석물질의 분리 및 검출 성능을 향상시키며, 분석 물질이 검출되지 않을 위험을 최소화하여 결과에 대한 신뢰성과 분석 효율성을 높여줍니다.
	Quantitation Software: waters_connect MS Quan 정밀하고 신속한 질량분석 정량 결과를 제공하여, 식품 및 환경 분석의 효율성과 신뢰성을 획기적으로 향상시키는 통합 데이터 처리 솔루션입니다.
	Triple Quadrupole Mass Spectrometry: Xevo TQ Absolute XR 극한의 감도와 정확도로 복잡한 매트릭스에서도 미량 성분을 정밀하게 검출하는 차세대 초고성능 Tandem Quadrupole 질량분석기입니다. 어려운 음이온화 화합물에 대해서도 더 낮은 정량한계를 달성하고 규제 요구사항을 충족할 수 있습니다. * 응용: PFAS, pesticides, veterinary drugs, natural toxins testing 등

브루커코리아(주)

업 체 명	브루커코리아(주)	대 표 자	GERALD N HERMAN
주 소	서울특별시 송파구 충민로 10, 툴동 5층 D-22호 (문정동, 가든파이브)		
홈 페 이 지	www.bruker.com/microbiology	E-mail	BioTyper.BDAL.KR@bruker.com
전 화	02-403-9934	팩 스	

회사소개

Bruker는 과학장비 및 솔루션 분야의 글로벌 선두 주자로, 다양한 산업 및 응용 분야에 사용되는 고성능 과학 장비를 제조하는 회사입니다. 1960년에 설립되어 다양한 분야에서 세계적으로 활동하고 있으며, 70개 이상의 국가에 사무실과 시설을 운영하고 있습니다. 특히 생명과학, 재료연구, 의약품, 진단 및 응용 시장을 포함한 다양한 분야에서 사용되는 고성능 과학 장비 개발과 제조에 특화되어 있습니다. 주요한 분야로는 질량분석기, 적외선분광기, 핵자기공명(NMR)및 Xray 장비가 있으며, 이를 기반한 다양한 응용 솔루션을 제공하고 있습니다.

전시품목

MALDI Biotyper와 IR Biotyper의 소개 브로셔 및 소모품

전시품목소개

Bruker MALDI Biotyper sirius는 세균, 진균 및 기타 미생물에 대해 정확도 높은 동정결과를 제공하며, 특히 임상진단, 품질관리, 환경모니터링 및 식품안전 등의 분야에서 중요한 역할을 합니다. 미생물동정 분야에서 혁신적인 기술로 각광받고 있으며, 국내/외 실험실 및 기관에서 도입되어 신뢰도 높은 결과를 제공함으로써 다양한 응용 분야에서 활용되고 있습니다.

㈜진시스템

업 체 명	㈜진시스템	대 표 자	서 유 진
주 소	대전광역시 유성구 테크노2로 200-9		
홈 페 이 지	www.genesystem.co.kr	E-mail	dkang@genesystem.co.kr
전 화	042-939-1086	팩 스	

회사소개

㈜진시스템은 식품의 안전성과 품질을 신속하고 정확하게 진단할 수 있는 Real-time PCR 기반 식품안전 진단 장비 및 키트를 개발·제조하는 전문 기업입니다.
저희는 HACCP, 식품공전 등 식품안전 기준에 부합하는 정밀한 검사 솔루션을 제공합니다.
주요 제품은 UF-300/340/400 시리즈는 사용 편의성과 검사 정확도를 가지며, 식중독균 10종(살모넬라, 리스테리아, Ecoli O157 등)에 대해 신속한 검출이 가능합니다.
㈜진시스템은 고객사의 검사 환경과 니즈에 최적화된 솔루션을 제공하며, 식품 안전 확보를 통한 소비자 신뢰 강화와 위생관리 수준 향상에 기여하고자 끊임없이 노력하고 있습니다.

전시품목

검사장비(Real-time PCR) : UF-300/340/400
진단키트 : 식중독균검출키트, TotalPatho(10종 식중독균 동시 검사 키트)

전시품목소개

1). UF 시리즈 Real-time PCR 장비

품 명	소 개	사 진
UF-300	소형 경량 모델로 소량 테스트를 진행하는 사용자에게 적합한 진시스템의 스테디셀러입니다. 40분 내외로 진행되는 검사 시간과 직관적인 UI로 유저의 편의성과 효율성을 높였습니다.	
UF-340	4개의 슬롯으로 각각 다른 식중독균을 동시에 검사 할 수 있는 제품입니다. 한 번에 32테스트를 진행할 수 있어 검사량과 검사 식중독균 종류가 많은 유저에게 적합한 제품입니다.	
UF-400	실험 전 전처리 없이, 핵산 추출부터 실험 결과까지 One-step으로 진행되는 Real-time PCR입니다. 전문 실험실 없이도 현장에서 바로바로 실험을 진행할 수 있다는 장점을 가집니다.	

2) 식중독균 검출 키트

품 명	소 개	사 진
SMARTCHEK® Detection Kit (10종)	식중독의 주요 원인균 10종의 검출 키트로, AOAC, 식품공전 기준에 따라 개발된 키트입니다. 검체의 Primer와 Probe 전용 Bio-chip에 내재되어 있어 보다 쉬운 유저 핸들링으로 실험을 진행할 수 있습니다.	
TotalPatho	Salmonella, Clostridium, E.coli O157 등 10종의 식중독균에 대해 한 번에 테스트로 전부 동시 검출이 가능한 키트입니다.	
Rapi:Direct™ Extraction kit for Foodborne pathogen	증균배양된 시료의 핵산을 추출해주는 키트입니다. 유저의 핸들링을 최소화 하여 초보자도 쉽게 실험을 진행할 수 있도록 돕습니다.	

㈜필코리아테크놀로지

업 체 명	㈜필코리아테크놀로지	대 표 자	박 민 봉
주 소	(08507)서울특별시 금천구 가산디지털1로 168 (가산동) 우림라이온스밸리 B동 102호		
홈 페 이 지	www.philekorea.kr	E-mail	info@philekorea.co.kr
전 화	02-2105-7020	팩 스	02-2105-7025

회사소개

- 필코리아테크놀로지는 2000년에 설립하고, ISO 9001 인증을 받은 생명 과학 전문 기업입니다.
- 필코리아테크놀로지는 기초과학 장비 및 시약부터 최신 기술과 트랜드까지 국내 연구자 분들께 제공해 드리고 있습니다.
- 분자 생물학의 기초 시약인 New England Biolabs, Long-Read sequencing 의 선두기업인 Oxford Nanopore Technologies, 최신 트랜드 중 하나인 Spatial biology 분야의 선구자 Bruker의 한국 대리점입니다.
- 필코리아테크놀로지는 바이오 산업 발전을 위해 지속적인 협력과 성장을 추구하며, 기술과 제품의 우위를 목표로 합니다.

전시품목

Oxford Nanopore Tech, Bruker, NEB

전시품목소개

생명과학 분자생물학 기초연구에 사용하는 시약 및 장비, 줄기세포 배양에 특화된 3D cell culture system부터 최신트랜드 하이테크놀로지인 Single Cell Spatial Biology, Long-Read sequencing system 및 서비스까지 거의 전 분야제품을 제공하고 있습니다.

㈜세스코

업 체 명	㈜세스코	대 표 자	전 찬 혁
주 소	서울특별시 강동구 상일로10길 46		
홈 페 이 지	www.cesco.co.kr	E-mail	
전 화	02-1588-1119	팩 스	

회사소개

1976년 설립한 세스코는 생활환경을 저해하고 각종 질환을 일으킬 수 있는 해충과 바이러스, 박테리아 등의 전염성 유해 세균에 대한 위생 솔루션을 제공해 쾌적한 생활 공간을 만들기 위해 노력해왔으며 약 50여 년간의 노하우를 바탕으로 식품안전 솔루션과 세스코 과학의 환경 가전을 통해 일상의 안심까지 제공하는 글로벌 종합환경위생기업으로 도약했습니다. 현재 해충방제, 바이러스 케어, 식품안전, 공기질 안심 관리, 환경위생 솔루션 사업 등을 영위하고 있으며 전국 90여개 지사와 체계적이고 전문적인 교육을 이수한 2,500여 명의 서비스컨설턴트 등 전국적인 네트워크를 갖추고 40만 고객에게 서비스를 제공하고 있습니다.

전시품목

식품안전솔루션, Testing, Smart IPM 장비, 공기질 솔루션, 환경위생 Chemical, 정수기, 공기청정기 등

㈜피앤지바이오메드

업 체 명	㈜피앤지바이오메드	대 표 자	성 원 기
주 소	경기도 용인시 기흥구 흥덕중앙로 120, 1609호(유타워)		
홈 페 이 지	http://www.pngbiomed.com/	E-mail	strategy@pngbiomed.com
전 화	031-627-2331	팩 스	031-627-2330

회사소개

㈜피앤지바이오메드는 식품안전성 관련 제품의 전문 제조업체로 성장하기 위해서 설립하였으며, 대표이사의 15년간의 축적된 식품안전성 관련 연구개발 경험을 바탕으로 미생물 검사용 필름배지 및 검사 장비의 상품화를 진행하고 있습니다.

전시품목

Petricore(미생물 건조 필름배지)

전시품목소개

식품 미생물 시험에 사용하는 분말형 건조 필름배지를 국내 최초, 글로벌 2번째로 국산화에 성공하였습니다. 현재 정부를 포함해 모든 식품업체가 100% 수입에 의존하고 있었으나 당사의 제품은 3M 제품 대비 동일 성능 확인 및 가격 경쟁력을 가지고 있어 한국을 포함한 전 세계 수요층 확보가 가능합니다.

영인과학(주)

업 체 명	영인과학㈜	대 표 자	김 현 철
주 소	06030 서울시 강남구 압구정로 28길 22 구정빌딩 6층		
홈 페 이 지	www.youngin.com	E-mail	dlmin@youngin.com
전 화	02-519-7376	팩 스	02-519-7400

회사소개

영인과학(주)은 1976년 설립 이후, 질량분석기, 분광분석기, 크로마토그래피, 현미경 등 다양한 과학분석기기를 제공해 왔습니다.
현재 SCIEX, Mettler Toledo, Cytiva 등 글로벌 브랜드와 협력하여 식품, 제약·바이오, 환경, 에너지 분야 연구자들에게 정밀한 분석 솔루션을 공급하고 있으며, 장비 도입부터 응용 지원, 사후 서비스까지 일괄 제공하고 있습니다.
또한 정기적인 세미나와 교육을 통해 최신 분석기술과 응용 사례를 공유하며, 연구자들이 장비를 효율적으로 활용할 수 있도록 지원하고 있습니다.
영인과학은 앞으로도 연구자와 산업계가 필요로 하는 실질적이고 신뢰성 높은 솔루션을 제공하기 위해 최선을 다하겠습니다.

전시품목

건조필름배지/전자저울/pH미터/현미경/질량분석기/GC용 관능검출기 외, 브로셔

SCIEX TripleQuad 5500+ LC-MSMS System-QTRAP Ready

메틀러토레도 LA204 저울

휴코에프에스㈜

업 체 명	휴코에프에스㈜	대 표 자	허 문 종
주 소	서울시 서초구 서운로 13, 2102호(서초동, 중앙로얄오피스텔)		
홈 페 이 지	http://www.hukobiomall.com	E-mail	hukofs@hukobio.com
전 화	02-3473-5421	팩 스	02-3474-7601

회사소개

1994년 설립 이후 Food Safety라는 목표 아래 오직 한길만을 걸어온 식품위생 전문 기업입니다. 식품 안전과 품질관리를 위한 분석, 제어, 모니터링을 지원합니다. 식품 위생 및 식품안전성 증진에 기여하고자 지속적인 제품 개발과 서비스를 제공하기 위해 노력하고 있습니다.

전시품목

HAPS

1) 멸균희석액 : 미생물 희석을 간편하게 도와주는 제품
2) 전면필터와이어멸균백 : 전면필터로 구성된 와이어 멸균백
3) Poultry Rinse bag : 도계, 도축용 멸균 린스백
4) 자동시료균질기 : 시료전처리 균질화 장비

전시품목소개

NEOGEN

1) Sponge Stick : 도축검사용 스펀지 스틱
2) LM1 : 표면오염도 ATP 측정장비

KIKKOMAN

1) Lumitester Smart : 표면오염도 ATP 측정 장비

GOLD STANDARD DIAGNOSTICS

1) Microgen GN-ID, Listeria-ID : 미생물 생화학 동정 키트
2) Microgen Path-Chek Kits : 표면 식중독균 검출 키트

FlavorActiV

관능검사용 센서리 키트

<table>
<tr><th colspan="4">HAPS</th><th>NEOGEN</th></tr>
<tr><td>멸균희석액
  </td><td>전면필터와이어멸균백
  </td><td>Poultry Rinse bag
  </td><td>자동시료균질기
  </td><td>Neogen Sponge Stick
  </td></tr>
<tr><th colspan="2">GOLD STANDARD DIAGNOSTICS</th><th>NEOGEN</th><th>KIKKOMAN</th><th>FlavorActiV</th></tr>
<tr><td>Microgen GN-ID,
Listeria-ID
  </td><td>Microgen Path-Chek Kits
  </td><td>LM1
  </td><td>Lumitester Smart
  </td><td>관능검사용 센서리키트
  </td></tr>
</table>

SCIEX

업 체 명	SCIEX	대 표 자	조셉폭스, 크리스토퍼제임스아피세르노,아메치에케케느와추쿠
주 소	서울시 서초구 매헌로 16, 하이브랜드 리빙관 16층 SCIEX		
홈 페 이 지	https://sciex.com/kr	E-mail	sciexkorea@sciex.com
전 화	080-020-1000	팩 스	02-2155-2150

회사소개

"질량분석기 선도 기업"

SCIEX는 정량 분석과 특성 분석 분야에서 가장 중요한 분석 과제를 해결할 수 있도록 고객을 지원합니다. 혁신적인 기술, 탁월한 신뢰성과 고객 지원을 바탕으로 지난 50년 이상 LC-MS/MS 분야를 선도해오고 있습니다.

1981년 최초의 상업용 Triple Quadrupole 질량분석기를 출시한 이래, SCIEX는 생명을 바꾸는 연구와 결과에 영향을 주는 기술과 솔루션을 지속적으로 개발해 왔습니다.

SCIEX는 미국에 본사를 두었으며, 세계적인 생명 과학 및 기술 혁신 기업인 Danaher의 일원으로서 생명 과학, 바이오제약 및 의약품 산업 시장에서 약물 개발과 생산, 식품 및 환경 안전, 임상 연구에 사용되는 과학기기 장비 및 소프트웨어와 서비스를 제공하는 글로벌 기업입니다.

전시품목

SCIEX 7500+ system, ZenoTOF 7600+ system

전시품목소개

SCIEX 7500+ 시스템은 표적 정량 분석 분야에서 혁신적인 기술을 제공하며, 복잡한 매트릭스에서 오랜 시간 동안(최대 2배) 최고의 감도를 유지할 수 있도록 설계된 Triple Quadrupole입니다. SCIEX 7500+ 시스템을 사용하면 약물 개발, 신종 오염 물질 및 생명과학 연구에서 최고 수준의 감도로 정량 분석을 수행할 수 있습니다.

SCIEX ZenoTOF 7600+ 시스템은 정량 측정의 속도, 깊이 및 확실성을 향상시키기 위해 스캐닝 사중극 차원을 추가한 Zeno Trap 지원이 가능한 QTOF입니다. ZT Scan DIA 기술과 전자 활성화 분해(EAD) 기능을 통해 높은 특이성과 민감도를 제공합니다.

㈜진성유니텍

업 체 명	㈜진성유니텍	대 표 자	전 성 빈
주 소	경기도 고양시 덕양구 통일로140 A동 443호(동산동, 삼송테크노밸리)		
홈 페 이 지	http://jsunitech.com/	E-mail	foods012@jsunitech.com
전 화	02-2219-5157	팩 스	02-2219-5158

회사소개

식품 안전성, 미생물 실험 자동화 장비와, Autoclave, 혐기배양 챔버, Spiral Plater, Lab Blender 등의 실험실 장비, 미생물 배양용 배지, 미생물신속 진단 KIT 곰팡이독소진단 KIT 등을 취급하고 있으며 이들 제품들과 관련하여 식품, 미생물 실험실에 필요한 장치등을 함께 공급하고 있습니다.
또한, 기업부설 연구소에서는 식중독관련 Workshop을 개최하여 실무자들의 실험실무 습득에 도움을 주고 있습니다.

전시품목

1) MALDI-TOF MS System
2) Scan 4000

전시품목소개

1) MALDI-TOF MS System
   - 임상, 약품시험, 식품 및 다양한 연구를 위한 빠르고 정확한 미생물 동정 플랫폼

2) Scan 4000
   - 여러 종류의 Petri dish, media에 적용 가능한 Automatic colony counter & inhibition zone reader

〈MALDI-TOF MS System〉

〈Scan 4000〉

㈜유로사이언스

업 체 명	㈜유로사이언스	대 표 자	이 기 용
주 소	경기도 성남시 중원구 둔촌대로457번길 27 우림라이온스밸리1차 815		
홈 페 이 지	www.euroscience.co.kr	E-mail	euro@euroscience.co.kr
전 화	031-737-2260	팩 스	031-737-2264

회사소개

저희 (주)유로사이언스는 1996년에 설립되어, 지난 30년 이상 현장용, 실험실용 금속 분석 장비에서부터 ICP-OES, XRF, 질량 분석기와 Proteomics 관련 장비 및 각종 자동화 된 전처리 및 샘플러 장비에 이르는 최신의 첨단 기기들을 다양한 산업현장, 대학, 민간 R&D센터, 국가 기관 및 연구기관에 공급하고, 기술 지원하고 있습니다.

전시품목

1) 미네랄 오일(MOSH & MOAH) 자동화 분석 시스템　　2) ICP-MS

전시품목소개

1) 미네랄 오일(MOSH & MOAH) 자동화 분석 시스템

- CHRONECT Workstation MOSH/MOAH는 식품 및 생활 용품의 가공 과정에서 축적되는 미네랄 오일(MOSH, MOAH)을 분석하는 자동화된 시스템입니다.
  LC-GC-FID 기술을 사용하여 MOSH와MOAH를 동시에 분석하며, 자동Epoxidation, Aluminium Oxide Clean-up 정제를 통해 정확한 분석이 가능합니다.

2) ICP-MS Spectrometer (ICP 질량분석기)

- 환경, 식품, 제약, 소비재 검사 분야에 최적화된 고감도·고안정성의 Quadrupole 타입 ICP-MS Spectrometer입니다.
- 고출력 LDMOS 플라즈마 성능과 고 매트릭스 호환성으로 정밀한 분석이 가능하며, 직관적인 소프트웨어와 간편한 유지관리로 실험실의 효율을 향상 시켜 줍니다.

㈜프라임포디아

업 체 명	㈜프라임포디아	대 표 자	오 규 하
주 소	경기도 안양시 동안구 흥안대로 415, 931호 외		
홈 페 이 지	www.prime4dia.com	E-mail	prime4dia@prime4dia.com
전 화	031-478-3105	팩 스	031-478-3108

회사소개

㈜프라임포디아는 알바이오팜 (R-Biopharm), 트릴로지(Trilogy) 국내 공식대리점입니다.

전시품목

식품 검사 시스템 (Enzyme시약, PCR, ELISA, 신속진단키트, Affinity column, 콘트롤 및 스탠다드)

전시품목소개

- 식품 원료, 생산공정, 완제품 단계에서 모두 검사가 가능한 다양한 제품의 포트폴리오 보유
- Enzyme, Vitamin, Mycotoxin, Allergen, GMO, Microbilogy/hygiene control 등을 위한 Enzyme시약, PCR, ELISA, 신속진단키트, Affinity column, 콘트롤 및 스탠다드 등을 보유
- SPC (Solid Phase Column)
- AOAC, Codex method
- 96 well plate reader

에스엘인터내셔널

업 체 명	에스엘인터내셔널	대 표 자	심 수 련
주 소	경기도 고양시 일산동구 강촌로 146, 102동 1704		
홈 페 이 지		E-mail	
전 화	070-4200-4226/010-2971-4226	팩 스	

전시품목

Microgravity_Simulator

전시품목소개

3D Clinostat

3D 클리노스탯은 식물, 미생물, 세포 및 다양한 생체 시료에 대해 중력 영향을 제거하거나 미세중력 환경을 모사하기 위해 설계된 장비입니다. 이 장비는 두 축의 저속 회전을 통해 시료에 작용하는 중력벡터의 방향 을 지속적으로 변화시켜, 시료가 실질적으로 무중력 상태에 놓인 것과 유사한 환경을 제공합니다.

주요 적용 분야:

l 우주 생물학 및 미세중력 연구

l 생명과학 실험(세포배양, 발아, 성장 등) l 우주농업, 생물반응기 개발

l 중력 민감 반응 연구 외

(사)한국건강기능식품협회

업 체 명	(사)한국건강기능식품협회	대 표 자	정 명 수
주 소	경기도 성남시 분당구 대왕판교로 700 코리아바이오파크B동 102호		
홈 페 이 지	https://www.khff.or.kr/	E-mail	maytidug@naver.com
전 화	031-628-2327	팩 스	031-628-2349

회사소개

- 우리 협회는 건강기능식품 산업의 건전한 발전과 국민 건강 향상을 위해 합리적 제도 개선, 건강기능식품 세계화, 산업 활성화, 대국민 홍보, 표시·광고 심의, 법정교육을 포함한 정부위탁사업 등의 주요 사업을 추진하고 있음

전시품목

- 맞춤형 건강기능식품

전시품목소개

- 맞춤형건강기능식품 제도 및 건강기능식품 관리정책 소개

  식약처는 국민의 건강증진과 안전한 건강기능식품 이용을 위해 과학적 근거에 기반한 관리 정책을 지속적으로 추진하고 있습니다. 그중에서도 개인의 건강 상태, 식습관, 복용 중인 의약품 등을 종합적으로 고려하여 전문가의 상담을 통해 가장 적합한 건강기능식품을 조합·제공할 수 있도록 한 맞춤형건강기능식품 제도를 2025.3.19일부터 운영하고 있습니다.

  본 제도는 「건강기능식품에 관한 법률」에 따라 맞춤형건강기능식품판매업으로 신고한 영업소에서, 맞춤형건강기능식품관리사(의사, 약사, 영양사 등 7개직종)의 전문가 상담을 거쳐 개인의 건강상태에 맞는 제품을 선택하고, 이를 위생적이고 안전한 기준에 따라 소분·조합하여 제공하는 제도입니다.

  이를 통해 소비자는 과잉섭취나 부적절한 중복섭취를 예방할 수 있으며, 전문가의 조언을 통해 보다 과학적이고 안전한 맞춤형 건강관리 서비스를 이용할 수 있습니다.

  한편, 건강기능식품은 일상적인 식사로 충분히 섭취하기 어려운 영양소나 인체 기능에 유용한 성분을 사용하여 제조·가공한 식품으로, 반드시 '건강기능식품' 문구 또는 도안(마크)이 표시된 제품만을 선택해야 합니다.

  식약처는 기능성과 안전성을 과학적으로 평가해 인정한 제품만이 해당 표시를 사용할 수 있도록 엄격히 관리하고 있으며, 우수건강기능식품제조기준(GMP)을 적용하여 원료 입고부터 완제품 출하까지 전 과정의 품질을 철저히 관리하고 있습니다.

  현재 식약처는 고시형 기능성 원료 96종과 개별인정형 기능성 원료 395종을 관리하고 있으며, 영업자의 이상사례 보고, 영업자 준수사항 준수 여부 확인, 소비자 교육·홍보 강화 등을 통해 국민이 더욱 신뢰할 수 있는 건강기능식품 유통 환경을 조성하고 있습니다.

  이번 제40회 한국위생안전성학회 학술대회에서는 맞춤형건강기능식품 제도에 대한 이해와 인지도를 높이기 위해 맞춤형건강기능식품 홍보부스를 운영합니다.

  동 홍보 부스에서는 건강기능식품 제도 전반 소개, 맞춤형건강기능식품관리사의 상담 시연, 제도 관련 인지도 조사 및 홍보자료 배포 등을 통해 현장 참여자와 직접 소통하며 제도의 취지를 홍보할 예정입니다.

에스에스바이오팜㈜

업 체 명	에스에스바이오팜㈜	대 표 자	김 옥 희
주 소	충남 천안시 서북구 입장면 홍천당곡길 56-3		
홈 페 이 지	http://www.ssbio.kr/	E-mail	ksh4030001@hanmail.net
전 화	070-7452-7004	팩 스	070-8622-3290

회사소개

에스에스바이오팜(주)(SS Biopharm Co., Ltd.)은 건강기능식품 연구, 제조 및 유통을 전문으로 하는 중소기업으로, 천연물을 기반으로 하여 고품질 건강기능식품을 개발·생산하는 생명과학 기업입니다.
회사는 고객을 최우선으로 생각하는 기업이 되기 위해 노력하며, 세계 속에서 조화를 이루며 인류의 건강한 미래를 위한 새로운 가치를 창출하는 글로벌 헬스케어 기업으로 도약을 꿈꾸고 있습니다.

전시품목

① 세포배양식품 생산을 위한 식용 배지용 기능성 원료 (4종)
:2025년 규제자유특구혁신사업육성사업의 1차년도 결과물로써, 생검 기반 소 세포주를 활용하여 항산화 및 혈청 보완적 생활성 식용 원료들을 최적화하여, 세포배양식품 생산을 위한 배양액 첨가제의 제품화를 검증하고 사업화를 목적으로 개발중인 신소재.
◈SSB-SP001, SSB-SP001, SSB-SBE001, SSB-SBE002

② 에스에스바이오팜(주)의 대표 기능성식품
◈ 요가드 (YOGUARD), 2025년 건강기능식품 대상수상 제품 (배뇨건강부문)
◈ 레드메리베타 , 2025년 건강기능식품 대상수상 제품 (뼈 건강부문)
◈ 올히드솔루션 , 2025년 병입형 신제품. 혈관건강의 모든 것!! 활력개선!!

전시품목소개

		
요가드 (YOGUARD)	레드메리베타	올히드솔루션

경남대학교 산학협력단 / 경남 수산부산물 재활용 규제자유특구 사업화 지원

업 체 명	경남대학교 산학협력단 / 경남 수산부산물 재활용 규제자유특구 사업화 지원	대 표 자	박 은 주
주 소	경남 창원시 마산합포구 경남대학로 7		

특구 개요

- 특구명: 9차 경상남도 수산부산물 재활용 규제자유특구
- 목 적: 폐기 처리되는 참치 부산물(껍질, 뼈 등으로 참치 한 마리 당 60% 차지)을 고부가가치 제품으로 제작하여, 수산업계 고부가가치 신산업 창출
- 위치/면적: 경남 통영시 · 창원시 · 고성군 등/1.84㎢
- 사업자/지정기간: ㈜동원F&B 등 9개 사업자/'24.6.1~'28.12.31 (4년 7개월)

관련법	특례 사항	규제부처
폐기물관리법 §13조 등	[현행] 어류 부산물에 특화된 재활용 및 처리 기준은 부재하며, 사업장 폐기물에 대한 포괄적인 기준만 규정 ⇨ **[특례]** 부패·변질 우려가 높은 **어류 부산물의 특성을 반영한 재활용 및 처리 세부기준** 마련	환경부

실증사업 개요

구분	사업내용
수산부산물 재활용 실증	• 참치부산물 재활용 공정별 기준 수립 • 참치부산물 안전성 확보 실증 • 참치부산물 중간소재화 및 표준공정도 도출
사업화 지원사업	• 실증환경 조성(안전점검위원회 운영, 보험가입 지원, 네트워킹 등) • 특구사업자 수요기반 기업지원(패키지지원, 시험임증지원 등) • 특구사업·법제화(부대조건,법률개정(안)도출) 관리

기대효과

- 어류 부산물의 재활용을 촉진하여 수산업계의 고부가가치화 및 친환경 전환 선도
- 재활용에 따른 제품화 시 연간 약 3,463.84억원의 경제적 효과와 2,778명의 고용유발 효과 기대

중앙대학교 식품안전규제과학과

업 체 명	중앙대학교 식품안전규제과학과	대 표 자	이 희 석
주 소	경기도 안성시 대덕면 서동대로 4726		
홈 페 이 지	http://food.cau.ac.kr	E-mail	
전 화	031-670-3258	팩 스	031-675-3108

회사소개

2021년 중앙대학교는 식품의약품안전처 주관 글로벌 최고 수준의 식품안전 규제과학 전문가 양성을 위한 인재양성사업으로 식품 안전성평가(신소재식품 등) 분야 규제과학 연구를 선도할 석·박사 과정 운영대학으로 선정되었습니다. 식품 안전 규제과학 전공 석·박사 인력을 집중 양성하고, 산업 현장인력의 연구·교육 훈련을 통해 국내·외 규제과학 실무 인력 양성에 기여 할 것입니다.

전시품목 및 소개

- 학과홍보 리플렛
- 학과홍보 포스터

식품의약품안전처

식품의약품안전처
식품의약품안전평가원

KFRI 한국식품연구원

HACCP KAHAS Korea Agency of HACCP Accreditation and Services

식품안전정보원
NATIONAL FOOD SAFETY INFORMATION SERVICE

한국식품산업협회
Korea Food Industry Association

한국식품과학연구원
Korea Advanced Food Research Institute

한국소비자원
Korea Consumer Agency

ThermoFisher SCIENTIFIC

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Sanigen

BIOMÉRIEUX

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경북대학교
KYUNGPOOK NATIONAL UNIVERSITY

이화여자대학교
EWHA WOMANS UNIVERSITY

SyHE 시스템헬스융합전공
SYstem Health & Engineering

daesang DAESANG 대상주식회사

코젠바이오텍

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㈜ 바,이,오,메,드,

MILLTECH

Waters™

BRUKER

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PhileKorea
Specialized in Medical & Bio Science since 2000

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PNG BIOMED
Preparation for the next generation

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JS(주)진성유니텍
Uni-Tech

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EURO SCIENCE CO.,LTD

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UOK IAC 경남대학교 산학협력단
Industry Academic Cooperation Foundation, Kyungnam University

CAU 중앙대학교
CHUNG-ANG UNIVERSITY

Microgiene
주식회사 마이크로진

KOFST

Genelix™

Real-time PCR detection kit

NGS 및 생물정보분석 기술 바탕으로
빠르고 정확한 **신속검출키트**

1 Easy & Simple
- 전 배양 포함하여 12~24시간 내 결과 확인 가능
- Template DNA만 준비하면 결과 확인 가능

2 Fast & Effective
- 각 균주 검출에 최적인 target gene 사용하여 짧은 시간 내에 검출 가능

3 Sensitive
- 아주 극소량의 DNA 농도(0.01ng/㎕)만 있어도 검출 가능

4 Reliable
- 다양한 미생물 중 확인하고자 하는 균주만 특이적으로 검출할 수 있도록 면밀한 검증작업 진행

5 Customizing Service
- 고객맞춤형 키트 제작 서비스

Genelix™ Product

Pathogen
식품 또는 환경 내 존재하는, 식품공전에 명시된 모든 식중독균을 검출할 수 있는 신속검출키트

Virus
아프리카돼지열병 등 바이러스성 전염병 및 식중독 바이러스를 검출할 수 있는 신속검출키트

Vegan / Halal
다양한 식품내에 동물성 성분의 혼입 여부와 특정 동물성 원료의 사용여부 확인 가능 신속검출키트

GMO
다양한 식품내에서 GM 작물의 혼입여부를 신속하게 판단할 수 있는 신속검출키트
국내 수입 콩, 옥수수의 모든 EVENT GMO 검출 가능

Genelix™ Q16

콤팩트형 4채널 Real-time PCR

콤팩트형 Real-time PCR 기기
- 합리적인 가격으로 누구나 쉽게 사용

빠르고 정확한 정밀온도 제어
- 고속 온도제어 시스템으로 빠른 결과값 확인

QR 코드로 편리한 실험 설정
- Real-time PCR Kit 의 QR코드 리딩 후 실험 조건 자동 설정

실시간 그래프 확인
- 실시간으로 실험 데이터(Graph) 모니터 확인 가능

Geneka

NGS 서비스

Whole Genome Sequencing	Hybrid WGS	Metagenome
Short-read sequencing을 이용한 미생물 WGS 분석	Short-read + Long read sequencing을 이용한 미생물 Bacteria WGS 분석	NGS를 이용한 다양한 환경시료 내의 미생물 균총 분석

✓ Whole Genome Sequencing
- Virus, Bacteriophage, Bacteria에서 Whole genome 분석을 위한 NGS 서비스
- Assembly, Annotation 분석결과 제공

✓ Hybrid Whole Genome Sequencing
- Bacteria에서 short-read sequencing과 long-read sequencing 결과를 함께 분석하여 Pacbio와 동등한 수준의 결과를 합리적인 가격으로 제공하는 NGS 서비스
- Assembly, Annotation 분석결과 제공

✓ Metagenome
- Amplicon metagenome : 16S V3-V4, 16S Full length, ITS 등 target 미생물의 특정영역에 대한 PCR 증폭을 이용한 미생물 균총 분석(속 수준)
- Shotgun metagenome : 전체 DNA를 sequencing하여 개별 sequence를 특정 taxonomy에 mapping하는 미생물 균총 분석(종 수준)
- Taxonomy classification, Alpha/Beta diversity 분석결과 제공

✓ Transcriptome Sequencing
- 일정 조건에서 발현되는 RNA의 염기서열을 읽어내는 유전자 발현 분석법
- DEGs, Ontology 분석결과 제공

✓ 기타 서비스
- 기타 동,식물 NGS 분석 서비스 / Raw data를 이용한 customizing BI 분석

(주)세니젠
경기도 안양시 동안구 흥안대로 427번길 16 (관양동) 평촌디지털엠파이어 411호
대표전화 : 1833 8010 FAX : 02 573 3134 info@sanigen.kr www.sanigen.kr

빠르고 경제적으로 환경에서
식중독균 검사가 가능한

EASYSCAN
표면 검사 키트

EASYSCAN
제품 보러가기

- 기존 배지 실험법과 비교하여 **시간 및 비용 절약**
- **1-10 CFU/mL의 균**을 검출할 수 있는 정확도
- 단체급식, 프렌차이즈, 마트, 식품 제조업체 등 **다방면에서 사용 가능**
- 간단한 실험방법으로 **비전문가도 손쉽게 위생검사 가능**
- 20시간 내의 반응도 유효하기 때문에 **빠른 결과 확인**

EASYSCAN

리스테리아	EASYSCAN-LIB	Cat No. 25002SV(10ea/pk)
살모넬라	EASYSCAN-SIB	Cat No. 26002SV(10ea/pk)
대장균/군	EASYSCAN-ECIB	Cat No. 27002SV(10ea/pk)
황색포도상구균	EASYSCAN-SAIB	Cat No. 28002SV(10ea/pk)

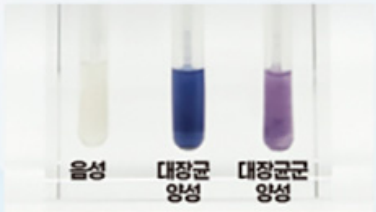
| 결과판독

리스테리아(LIB) / 25002SV

37±1°C, 30~48시간 배양
배지색(노란색) - 음성 / 검정색 - 양성

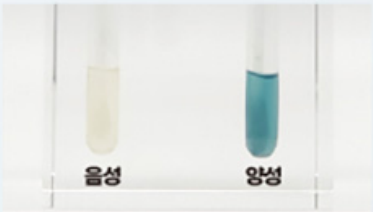
살모넬라(SIB) / 26002SV

37±1°C, 24~48시간 배양
배지색(보라색) - 음성 / 노란색 - 양성



대장균/군(ECIB) / 27002SV

37±1°C, 24~48시간 배양
배지색(무색) - 음성
파란색 - 대장균 양성 / 적자색 - 대장균군 양성



황색포도상구균(SAIB) / 28002SV

37±1°C, 48시간 배양
배지색(노란색) - 음성 / 청록색 - 양성

EASYSCAN-LIB 사용설명서

EASYSCAN-SIB 사용설명서

EASYSCAN-ECIB 사용설명서

EASYSCAN-SAIB 사용설명서

Microgiene 주식회사 마이크로진 T. 031-456-6535 | F. 031-456-6536 | sales@microgiene.com | www.microgiene.com

SSBIO PHARM은 연구개발을 통해 기술개발의 새 장을 열어가겠습니다.
미래형 고기능성 건강기능식품을 비롯해 새로운 개념의 기능성 화장품, 기능성 생활용품 등 전략적이고 창조적인 연구개발에 지속적으로 투자하여 생명공학분야의 21세기를 개척하고 있습니다.

SSBIO PHARM의 개발된 특허등록소재

초음파 비수리 추출분말

- 한국식품연구원에서 기술이전
- 건식업계 최초 초음파 추출시설
- 특허번호(10-1971438)

효능

혈관 염증질환 예방 및 개선

실크펩타이드

- 국내최초 제조에 성공
- 실크 100% 천연 단백질
- 체내 흡수율 90% 이상
- 특허번호(10-1966892)

효능

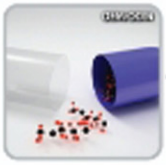
- 혈당수치 감소
- 간 기능 강화 및 숙취해소
- 골다공증 퇴행성 관절 예방
- 피부미용, 스태미너 증강
- 체지방분해와 신체 밸런스 유지

마 카

- 마키농축액 분말
- 국내유일 100% 마이크로 추출물
- 특허번호(10-1785430)
- 특허번호(10-2093006)

효능

- 정력 강화
- 우울증 완화, 뼈 건강
- 여성 건강
- 피부미용
- 혈관건강



요가드

레드메리베타

올히트솔루션

에스에스바이오팜
SSBIO PHARM®

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대표전화 : 1800-3886 팩스 : 070-8622-3290