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Risk Assessment

Retrospective Analysis of Carcinogenicity Assessments within FDA-Notified GRAS Determinations

Khatera Rahmani, Yen-Ching Wu, Paul R. Hanlon. *HET*, July 25: 2024, 43. doi.org/10.1177/0960327124125433. [Article link](#)

Frameworks have been developed to standardize the assessment of carcinogenic potential in the pharmaceutical and agrochemical industries, building upon decades of research. Carcinogenicity is also evaluated during the safety evaluation of food substances, using a comprehensive approach unique to each substance. To better understand these approaches, a retrospective assessment was conducted on the publicly available database of substances notified to the United States Food and Drug Administration (US FDA) as being Generally Recognized As Safe (GRAS). The data contained within these GRAS notifications (GRNs) were reviewed for the methods used to evaluate carcinogenic potential (genotoxicity studies, 2-year bioassays, other pre-clinical animal studies) to identify patterns that could provide an understanding of how this assessment has been conducted for different categories of food substances. While different approaches to the safety evaluation were required to adapt to the unique food substances, the data in all notifications supported the conclusion of safety. The evaluation of food substances for carcinogenic potential must consider all available data, including identifying the need for when more data must be generated to support an evaluation. Due to the complexity of substances used in food, ranging from defined chemical entities to minimally processed agricultural commodities to live microorganisms, the approach to conducting the safety evaluation of food substances must be able to adapt to the most relevant scientifically supported approach. This paper illustrates the data commonly used to support the safety of different types of food substances and proposes an approach familiar to other product sectors.

Foodborne Pathogens

Detection of Foodborne Pathogens in Contaminated Food Using Nanomaterial-Based Electrochemical Biosensors

Ana Yareli Flores-Ramírez, Ramsés Ramón González-Estrada, Martina Alejandra Chacón-López, María de Lourdes García-Magaña, Efigenia Montalvo-González, Alejandra Álvarez-López, Aarón Rodríguez-López, et. al. *Anal Biochem*. 2024 July 2:693:115600. doi: 10.1016/j.ab.2024.115600. [Article link](#)

Foodborne pathogens are a grave concern for the food, medical, environmental, and economic sectors. Their ease of transmission and resistance to treatments, such as antimicrobial agents, make them an important challenge. Food tainted with these pathogens is swiftly rejected, and if ingested, can result in severe illnesses and even fatalities. This review provides an overview of the current status of various pathogens and their metabolites transmitted through food. Despite a plethora of studies on treatments to eradicate and inhibit these pathogens, their indiscriminate use can compromise the sensory properties of food and lead to contamination. Therefore, the study of detection methods such as electrochemical biosensors has been proposed, which are devices with advantages such as simplicity, fast response, and sensitivity. However, these biosensors may also present some limitations. In this regard, it has been reported that nanomaterials with high conductivity, surface-to-volume ratio, and robustness have been observed to improve the detection of foodborne pathogens or their metabolites. Therefore, in this work, we analyze the detection of pathogens transmitted through food and their metabolites using electrochemical biosensors based on nanomaterials.

Foodborne Illness

Unveiling Risks in Healthy Food: Vegetables and Fruits are Linked to the Distribution Chain of Protozoan Parasites

Aida Vafae Eslahi, Simuzer Mamedova, Reghaissia Nassiba, Panagiotis Karanis. *Food Microbiol*. 2024 July 3:123:104592. doi: 10.1016/j.fm.2024.104592. [Article link](#)

Vegetable and fruit contamination is recognized as a significant parasite transmission route. This review presents the current state of vegetables and fruits contamination with food-borne parasitic protozoa worldwide. We consider the methodologies and strategies for detecting parasitic stages developed in the last decade and the contamination data. Asia had the highest number of reports (94 studies), followed by Africa (74 studies). At the country level, with 41 studies, Iran had the most reports among other countries, followed by Nigeria (28 studies). According to the studies included in the current review, 41.22% of vegetables and fruits were contaminated with different species of protozoan parasites. Among different continents, Asia accounted for the highest contamination rate of protozoan parasites (57.12%). *Giardia* spp. (10%) had the highest contamination rate in vegetables and fruits, followed by *Entamoeba coli* (8%), *E. histolytica/dispar* (7%), and *Cryptosporidium* spp. (6%). This study provides essential data for health authorities to develop food safety programs. The presence of protozoan parasites in fruits and vegetables highlights the critical need for maintaining rigorous food safety measures across the entire production and distribution process, particularly in countries that are major producers and distributors of these food items.

Mycotoxins

Recent Advances in Non-Contact Food Decontamination Technologies for Removing Mycotoxins and Fungal Contaminants

Yan Wang, Aiyun Zhou, Bei Yu, Xiulan Sun. *Foods*. 2024 Jul 16;13(14):2244. doi: 10.3390/foods13142244. [Article link](#)

Agricultural food commodities are highly susceptible to contamination by fungi and mycotoxins, which cause great economic losses and threaten public health. New technologies such as gamma ray irradiation, ultraviolet radiation, electron beam irradiation, microwave irradiation, pulsed light, pulsed electric fields, plasma, ozone, etc. can solve the problem of fungal and mycotoxin contamination which cannot be effectively solved by traditional food processing methods. This paper summarizes recent advancements in emerging food decontamination technologies used to control various fungi and their associated toxin contamination in food. It discusses the problems and challenges faced by the various methods currently used to control mycotoxins, looks forward to the new trends in the development of mycotoxin degradation methods in the future food industry, and proposes new research directions.

Heavy Metals

Single-Atom Nanozymes: Emerging Talent for Sensitive Detection of Heavy Metals

Fangqin Han, Chunfang Cheng, Jingyu Zhao, Huixin Wang, Guanhui Zhao, Yong Zhang, et. al. *Colloids Surf B Biointerfaces*. 2024 Jul 14:242:114093. doi: 10.1016/j.colsurfb.2024.114093. [Article link](#)

In recent years, the increasingly severe pollution of heavy metals has posed a significant threat to the environment and human safety. Heavy metal ions are highly non-biodegradable, with a tendency to accumulate through biomagnification. Consequently, accurate detection of heavy metal ions is of paramount importance. As a new type of synthetic nanomaterials, single-atom nanozymes (SANs) boast exceptional enzyme-like properties, setting them apart from natural enzymes. This unique feature affords SANs with a multitude of advantages such as dispersed active sites, low cost and variety of synthetic methods over natural enzymes, making them an enticing prospect for various applications in industrial, medical and biological fields. In this paper, we systematically summarize the synthetic methods and catalytic mechanisms of SANs. We also briefly review the analytical methods for heavy metal ions and present an overall overview of the research progress in recent years on the application of SANs in the detection of environmental heavy metal ions. Eventually, we propose the existing challenges and provide a vision for the future.

Food Packaging

Application of Lactoferrin in Food Packaging: A Comprehensive Review on Opportunities, Advances and Horizons

Milad Tavassoli, Behnam Bahramian, Reza Abedi-Firoozjah, Ali Ehsani, Yuthana Phimolsiripol, Sneha Punia Bangar. *Int J Biol Macromol*. 2024 Jul;273(Pt 2):132969. doi: 10.1016/j.ijbiomac.2024.132969. [Article link](#)

Lactoferrin (LAC) is an iron-binding glycoprotein found in mammalian secretion, such as milk and colostrum, which has several advantageous biological characteristics, such as antioxidant and antimicrobial activity, intestinal iron absorption and

regulation, growth factor activity, and immune response. LAC is an active GRAS food ingredient and can be included in the food packaging/film matrix in both free and encapsulated forms to increase the microbial, mechanical, barrier, and thermal properties of biopolymer films. Additionally, LAC-containing films maintain the quality of fresh food and extend the shelf life of food products. This paper primarily focuses on examining how LAC affects the antimicrobial, antioxidant, physical, mechanical, thermal, and optical properties of packaging films. Moreover, the paper explains the attributes of films incorporating LAC within different matrices, exploring the interaction between LAC and polymers. The potential of LAC-enhanced food packaging technologies is highlighted, showcasing their promising applications in sustainable food packaging.

Chemical Contaminants

Food Process Contaminants: Formation, Occurrence, Risk Assessment and Mitigation Strategies: A Review

Ahmadullah Zahir, Iftikhar Ali Khan, Maazullah Nasim, Mohammad Naeem Azizi, Fidelis Azi. *Food Addit & Contam.* 2024 Jul 22:1-33. doi: 10.1080/19440049.2024.2381210. [Article link](#)

Thermal treatment of food can lead to the formation of potentially harmful chemicals, known as process contaminants. These are adventitious contaminants that are formed in food during processing and preparation. Various food processing techniques, such as heating, drying, grilling, and fermentation, can generate hazardous chemicals such as acrylamide (AA), advanced glycation end products (AGEs), heterocyclic aromatic amines (HAAs), furan, polycyclic aromatic hydrocarbons (PAHs), N-nitroso compounds (NOCs), monochloropropane diols (MCPD) and their esters (MCPDE) which can be detrimental to human health. Despite efforts to prevent the formation of these compounds during processing, eliminating them is often challenging due to their unknown formation mechanisms. It is critical to identify the potential harm to human health in processed food and understand the mechanisms by which harmful compounds form during processing, as prolonged exposure to these toxic compounds can lead to health problems. Various mitigation strategies, such as the use of diverse pre- and post-processing treatments, product reformulation, additives, variable process conditions, and novel integrated processing techniques, have been proposed to control these food hazards. In this review, we summarize the formation and occurrence, the potential for harm to human health produced by process contaminants in food, and potential mitigation strategies to minimize their impact.

Caffeine

Acute Effects of Energy Drink Consumption on Cardiovascular Parameters in Healthy Adults: A Systematic Review and Meta-Analysis of Randomized Clinical Trials

Pedro I B Gualberto, Vinícius V Benvindo, Gustavo Waclawovsky, Luís F Deresz. *Nutr Rev.* 2024, 8,1;82(8):1028-1045. doi: 10.1093/nutrit/nuad112. [Article link](#)

Context: Energy drinks (EDs) are beverages that contain ingredients that may pose a risk to consumers' cardiovascular health. But current evidence is conflicting and warrants further investigation. **Objective:** A systematic review and meta-analysis was conducted on studies that examined the acute effects of ED consumption on systolic blood pressure (SBP), diastolic blood pressure (DBP), resting heart rate, cardiac output (CO), endothelial function, and QT/QTc interval in healthy adults. **Data Sources:** The databases PubMed, EMBASE, Cochrane, LILACS, Web of Science, SportDiscus, and the gray literature were searched to identify randomized controlled trials (RCTs). **Data Extraction:** Two independent evaluators screened 2014 studies and extracted relevant data from those selected for the analysis. A risk of bias assessment was also performed with the RoB 2 tool and a strength of evidence assessment was performed with the Grading of Recommendations Assessment, Development and Evaluation (GRADE). **Data Analysis:** A total of 17 RCTs were included in the meta-analysis. With regard to risk of bias, 11 studies were rated as having "some concerns" and 6 as "high risk of bias." The consumption of EDs increased SBP, DBP, and CO in different time frames. More pronounced effects were seen on SBP at 60-80 minutes (4.71 mmHg; 95% CI: 2.97-6.45; GRADE: moderate), DBP at 120 minutes (4.51 mmHg; 95% CI: 2.60-6.42; GRADE: low), and CO at 30-40 minutes after consumption (0.43 L; 95% CI: 0.08-0.77; GRADE: very low). The effects of ED consumption on resting heart rate and QT/QTc interval were not significant ($P \leq 0.05$). The assessment of endothelial function effects was not performed due to the absence of any RCTs meeting the inclusion criteria. **Conclusions:** Acute consumption of EDs increases SBP, DBP, and CO in healthy adults. However, no alterations were observed in other cardiovascular parameters. The results should be interpreted with caution due to the limited number of studies.

Food Allergens

Systematic Review of the Association Between Short-Chain Fatty Acids and Allergic Diseases

Mari Sasaki, Noor H A Suaini, Jamie Afghani, Kristina N Heye, Liam O'Mahony, Carina Venter, Roger Lauener, et. al. *Allergy*. 2024 Jul;79(7):1789-1811. doi: 10.1111/all.16065. [Article link](#)

We performed a systematic review to investigate the current evidence on the association between allergic diseases and short chain fatty acids (SCFAs), which are microbially produced and suggested as one mechanism on how gut microbiome affects the risk of allergic diseases. Medline, Embase and Web of Science were searched from data inception until September 2022. We identified 37 papers, of which 17 investigated prenatal or early childhood SCFAs and the development of allergic diseases in childhood, and 20 assessed SCFAs in patients with pre-existing allergic diseases. Study design, study populations, outcome definition, analysis method and reporting of the results varied between papers. Overall, there was some evidence showing that the three main SCFAs (acetate, propionate and butyrate) in the first few years of life had a protective effect against allergic diseases, especially for atopic dermatitis, wheeze or asthma and IgE-mediated food allergy in childhood. The association between each SCFA and allergic disease appeared to be different by disease and the age of assessment. Further research that can determine the potentially timing specific effect of each SCFA will be useful to investigate how SCFAs can be used in treatment or in prevention against allergic diseases.

Emerging Science Areas

Emerging Issue – Food Safety Nanotechnology

Bacterial Outer Membrane Vesicle Nanorobot

Songsong Tang, Daitian Tang, Houhong Zhou, Song Wu et. al. *PNAS*, July 15, 2024.121 (30) doi.org/10.1073/pnas.2403460121. [Article link](#)

Autonomous nanorobots represent an advanced tool for precision therapy to improve therapeutic efficacy. However, current nanorobotic designs primarily rely on inorganic materials with compromised biocompatibility and limited biological functions. Here, we introduce enzyme-powered bacterial outer membrane vesicle (OMV) nanorobots. The immobilized urease on the OMV membrane catalyzes the decomposition of bioavailable urea, generating effective propulsion for nanorobots. This OMV nanorobot preserves the unique features of OMVs, including intrinsic biocompatibility, immunogenicity, versatile surface bioengineering for desired biofunctionalities, capability of cargo loading and protection. We present OMV-based nanorobots designed for effective tumor therapy by leveraging the membrane properties of OMVs. These involve surface bioengineering of robotic body with cell-penetrating peptide for tumor targeting and penetration, which is further enhanced by active propulsion of nanorobots. Additionally, OMV nanorobots can effectively safeguard the loaded gene silencing tool, small interfering RNA (siRNA), from enzymatic degradation. Through systematic in vitro and in vivo studies using a rodent model, we demonstrate that these OMV nanorobots substantially enhanced siRNA delivery and immune stimulation, resulting in the utmost effectiveness in tumor suppression when juxtaposed with static groups, particularly evident in the orthotopic bladder tumor model. This OMV nanorobot opens an inspiring avenue to design advanced medical robots with expanded versatility and adaptability, broadening their operation scope in practical biomedical domains.

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August 7, 2024, Washington, DC

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August 23, 2024, Virtual Event

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Low- and No-Calorie Sweeteners and Body Weight: How Systematic Reviews on Low Calorie Sweeteners Produce Disparate Results

September 10, 2024, Virtual Event

This webinar will focus on the research conducted to decipher how systematic review methodologies influence the findings produced when investigating the association between LNCS consumption and body weight.

[Learn more](#)

IAFNS Food Microbiology Research Roundtable

September 11, 2024, Washington, DC

The IAFNS Food Microbiology Committee will host a Research Roundtable to identify research gaps in microbial food safety and define priority research areas to fund.

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Menopause, Cognition and Nutrition: Understanding the Intersection

September 11, 2024, Virtual, Event

Women's health and related knowledge and research gaps have been highlighted as focus grows on incorporating population diversity into research.

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Nutritional Considerations for Anti-Obesity Medications: Evidence-Based Guidance

September 12, 2024, Virtual, Event

This webinar will present recent work translating the clinical experience with 'new' obesity medications into practical nutritional considerations and guidance that can support effective use.

[Learn more](#)

American Association of Family Physicians – FMX 2024

September 24, 2024 – September 28, 2024, Phoenix, AZ

IAFNS-supported researchers will make a presentation before family physicians entitled: 'Live Dietary Microbes: Evidence That Intake Supports Health.'

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