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## Risk Assessment

### Health Risk Assessment of Heavy Metal(loid)s Intake from Beverages in the United States

Hannah T.V. Stoner, Tewodros Rango Godebo, Pornpimol Kodsup Taylor. *Jrnl of Food Compos. & Analysis*, 15 April 2025. doi.org/10.1016/j.jfca.2025.107632. [Article link](#)

Heavy metals in beverages can pose health risks in an exposure dependent manner, however, few studies in the United States have evaluated their metal content. This study determined the concentrations of eight metal(loid)s, Pb, Cd, As, Cr, Ni, Al, Mn, and Zn, in 60 beverages via inductively coupled plasma single bond mass spectrometry (ICPMS). The highest median concentrations ( $\mu\text{g}/\text{kg}$ ) were found in mixed fruit juices for Ni (46.7), Cr (14.8), and As (4.5); tea for Mn (5,300), Al (730), and Pb (1.4); and plant-based milk for Zn (835) and Cd (1.1). Chronic daily intake (CDI) was calculated using the National Health and Nutrition Examination Survey (NHANES). Potential health risks were assessed via Hazard Quotients (HQ), and Hazard Indices (HI) for noncarcinogenic risk and incremental lifetime cancer risk (ILCR) for total As, Cd, Ni, and Pb. About 58-67% of the samples showed no risk (HQ and HI <1). HQ > 1 was found in 20 samples for As, Zn, Ni, and Mn, and HI > 1 in 5 additional samples (n=25), mostly affecting children under 10, with two samples posing risk at all age groups. Significant carcinogenic risk (10<sup>-2</sup> to 10<sup>-4</sup>) across all beverage categories for As, Ni, and Cd were found. This study highlights the need for consumer awareness and policy review.

## Scientific Integrity

### Down the Rabbit Hole: How Digital Media Shapes Public Perceptions of Food Science and Technology Research

Mary Ann Lila, Camille Ryan, Connie Diekman. *Ann. Rev. Food Sci & Tech.* Vol. 16:459-479, April 2025. doi.org/10.1146/annurev-food-111523-121925. [Article link](#)

Professionals and practitioners in food science and technology navigate a minefield of challenges stemming from the convergence of science, scientific inquiry and research, and online mass and social media. Misinterpretations and politicized

debates occur frequently in online media, where food- and diet-related topics have an avid following, and conflicting information or incomplete coverage may occasionally undermine public trust in the integrity of food science research from both academia and industry. Leveraging a broad landscape analysis of scientific and popular lay journal reports, we catalog a series of food science and technology topics that have been popularized in online forums, sometimes at the expense of scientific accuracy. Finally, we detail some guidelines and tools that may assist food science and technology academics, industry professionals, science publishers, and online journalists in rigorously safeguarding the integrity and credibility of research reports that reach the lay consumer through social and online media channels.

## Foodborne Pathogens

### Review of Recent Advances in Aptasensor for the Detection of Pathogenic *Escherichia coli* O157: H7

Meng-Wei Lin, Irwin A. Quintela, Vivian C. H. Wu, Chih-Sheng Lin. *Jrnl of Food Safety*. 30 April 2025. doi.org/10.1111/jfs.70017. [Article link](#)

*Escherichia coli* (E. coli) O157: H7 is a critical pathogen due to its association with severe conditions like hemorrhagic colitis and hemolytic uremic syndrome. The prevalence of this pathogen underscores the urgent need for effective food and environmental safety measures. Among emerging innovations, aptamer-based biosensors (aptasensors) offer increased sensitivity and reduced detection times compared to traditional methods for identifying *E. coli* O157: H7. Aptamers, short single-stranded DNA (ssDNA) or RNA molecules, act as bio-recognition elements, exhibiting high specificity and affinity for foodborne pathogens. This scoping review examines recent advancements in aptasensor technology over the past 5 years, focusing on platforms targeting *E. coli* O157: H7 detection. Key elements such as detection targets, sample types, transducers, sensing mechanisms, fabrication methods, and detection limits were analyzed to identify the strengths and limitations of current aptasensor platforms. The findings indicate that most optical aptasensors, particularly fluorescence-based ones, have been developed for detecting *E. coli* O157: H7 in water, food, and milk samples. Currently developing aptasensors show promise, offering reliable alternatives with improved detection capabilities. Nonetheless, further studies are still needed to validate their sensitivity and specificity to facilitate broader applications. This review explores the latest developments across diverse aptasensor types, including electrochemical, optical, and magnetic approaches, and examines their working principles, advantages, and limitations. It highlights the potential of aptasensors for practical applications in agricultural and environmental samples, emphasizing their role in advancing safety monitoring systems.

## Foodborne Illness

### Updated Assessment of State Food Safety Laws for Norovirus Outbreak Prevention in the United States

Anita K. Kambhampati, E. Rickamer Hoover, Lisa A. Landsman, Beth C. Wittry, Laura G. Brown, Sara A. Mirza. *Jrnl of Food Prot*. Vol. 88, Issue 5, 22 April 2025. doi.org/10.1016/j.jfp.2025.100501. [Article link](#)

Foodborne norovirus outbreaks are often associated with food contamination during preparation by an ill employee. The US Food and Drug Administration's Food Code outlines food safety provisions to prevent illness transmission in food establishments. An updated full version of the Food Code is released every four years; adoption of specific provisions is at the discretion of state governments. Food safety laws of the 50 states and District of Columbia (51 jurisdictions) were assessed for adoption as of March 2020, of four norovirus-related provisions included in the 2017 Food Code: (1) prohibition of barehand contact with ready-to-eat (RTE) food, (2) exclusion of food employees with vomiting or diarrhea, (3) person in charge being a certified food protection manager (CFPM), and (4) written response plan for vomiting or diarrheal events. We compared the frequency of adoption of the 2017 Food Code provisions to a previous assessment of adoption of these provisions in the 2013 Food Code.

## Food Classification

### Beyond Soluble and Insoluble: A Comprehensive Framework for Classifying Dietary Fibre's Health Effects

Christo Opperman, Mahsa Majzoobi, Asgar Farahnaky, Rohan Shah, Thi Thu Hao Van, Vishal Ratanpaul, Ewan W. Blanch, et. al. *Food Res Intl*. Vol. 26, April 2025. doi.org/10.1016/j.foodres.2025.115843. [Article link](#)

Despite evolving definitions, dietary fibre classifications remain simplistic, often reduced to soluble and insoluble types. This binary system overlooks the complexity of fibre structures and their diverse health effects. Indeed, soluble fibre is not just

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soluble but has important qualities such as fermentability, attenuating insulin secretion, and lowering serum cholesterol. However, this limited classification fails to account for dietary fibre diversity and predict their full range of physiological effects. This article proposes a holistic classification framework that accounts for different fibre types and can be used to accurately infer their physiological outcomes. This proposed classification framework comprises of five constituents: backbone structure, water-holding-capacity, structural charge, fibre matrix and fermentation rate. This model more accurately captures the structural and functional diversity of dietary fibres, offering a refined approach to predicting their health benefits.

## Heavy Metals

### Occurrence of Pesticides, Mycotoxins, and Heavy Metals in Distilled Alcoholic Beverages: A Review of Contaminants and Health Risks

Tomislav Rot, Sunčana Gavran, Jurislav Babić, Ante Lončarić. *Foods*, 9 April 2025, 14(8). doi.org/10.3390/foods14081303.

[Article link](#)

Distilled alcoholic beverages may contain pesticides, mycotoxins, and heavy metals originating from raw materials, environmental factors and technological processes. This review paper analyses the existing regulations related to these contaminants, their impact on health and the risk assessment associated with their consumption. Sources of contamination are discussed, including the influence of climatic conditions and emerging environmental risks on the occurrence of contaminants in raw materials, as well as the transfer of all contaminants during the distillation process. Furthermore, analytical detection methods and strategic measures to reduce consumer exposure are reviewed. The results of the review highlight the need for continued research, improvement of control methods and adaptation of regulatory standards in line with new scientific knowledge.

## Food Packaging

### Toxicity of Long-Term Exposure to Low Dose Polystyrene Microplastics and Nanoplastics in Human iPSC-Derived Cardiomyocytes

Jianyong Ma, Drew M. Ladd, Necati Kaval, Hong-Sheng Wang. *Food & Chem Tox.* 29 April 2025, 115489.

doi.org/10.1016/j.fct.2025.115489. [Article link](#)

Microplastics and nanoplastics (MNPs) are widespread environmental pollutants with potential risks to human health including cardiovascular effects. However, the impact of MNPs on the heart, particularly in human-relevant cardiac models, remains poorly understood. In this study, we investigated the long term effects of polystyrene (PS) MNPs-1  $\mu\text{m}$  (PS-1) and 0.05  $\mu\text{m}$  (PS-0.05) in human iPSC-derived cardiomyocytes (hiPSC-CMs). PS MNPs exposure reduced myocyte viability in a time- and dose-dependent manner. At a low dose of 0.1  $\mu\text{g/L}$ , both PS-0.05 and PS-1 suppressed myocyte contractility, reduced  $\text{Ca}^{2+}$  transient amplitude, and altered contraction and  $\text{Ca}^{2+}$  transient dynamics. In hypertrophic hiPSC-CMs, PS-0.05 exposure exacerbated hypertrophy, increasing cell size and proBNP expression, a marker of myocyte hypertrophy. The mechanism of PS MNPs-induced cardiotoxicity likely involved mitochondrial dysfunction, as indicated by decreased mitochondrial membrane potential, increased mitochondrial ROS, and elevated intracellular ROS levels. This is the first study to assess the long term impact of low dose MNPs in human cardiomyocytes, providing crucial insight into the potential cardiac toxicity of MNPs and their implications for human heart health.

## Chemical Contaminants

### Genotoxicity Assessment of Food-Grade Titanium Dioxide

Min Ling, Jie Liang, Zhongming Lyu, Ping Yu, Mingjing Yang, Xinyue Wu, Wei Zhang, Luoding Lu, et. al. *Food & Chem Tox.* 23 April 2025, 115476. doi.org/10.1016/j.fct.2025.115476. [Article link](#)

Food-grade titanium dioxide (E171 in Europe), which contains nanoscale particles (NPs), has been approved and used as a white pigment in various common foods. Concerns are growing over the use of E171 as a safe food additive. The purpose of the present research is to evaluate the genotoxicity of E171 using *in vivo* and *in vitro* testing systems. *In vitro* studies, Chinese hamster lung (V79) fibroblast cells were exposed to E171 at doses of 25, 50, 100, and 200  $\mu\text{g/mL}$ . No gene

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mutations were observed after 24 hours of treatment at any concentration using the hypoxanthine guanine phosphoribosyltransferase (Hprt) gene mutation assay. *In vivo* study, the healthy Kunming mice and SD rats were exposed to E171 through intragastric administration at doses of 250, 500 and 1000 mg/kg body weight every day for 15 days. Genotoxic potential of E171 was evaluated by micronucleus (MN) and comet assays in accordance with the OECD guideline. However, the results showed that E171 did not increase the frequency of bone marrow micronuclei or induce DNA strand breaks in rat liver cells at the doses used in this experiment. Under the conditions described in this report, E171 was concluded to be negative in these *in vivo* and *in vitro* genotoxicity tests. These findings suggest that E171 is not genotoxic, offering valuable data for risk assessment.

## Caffeine

### Caffeine Induces Age-Dependent Increases in Brain Complexity and Criticality During Sleep

Philipp Thölke, Maxine Arcand-Lavigne, Tarek Lajnef, Sonia Frenette, Julie Carrier, Karim Jerbi. *Communications Biology*, Vol. 8, 30 April 2025. doi.org/10.1038/s42003-025-08090-z. [Article link](#)

Caffeine is the most widely consumed psychoactive stimulant worldwide. Yet important gaps persist in understanding its effects on the brain, especially during sleep. We analyzed sleep electroencephalography (EEG) in 40 subjects, contrasting 200 mg of caffeine against a placebo condition, utilizing inferential statistics and machine learning. We found that caffeine ingestion led to an increase in brain complexity, a widespread flattening of the power spectrum's 1/f-like slope, and a reduction in long-range temporal correlations. Being most prominent during non-rapid eye movement (NREM) sleep, these results suggest that caffeine shifts the brain towards a critical regime and more diverse neural dynamics. Interestingly, this was more pronounced in younger adults (20–27 years) compared to middle-aged participants (41–58 years) during rapid eye movement (REM) sleep, while no significant age effects were observed during NREM. Interpreting these data in the light of modeling and empirical work on EEG-derived measures of excitation-inhibition balance suggests that caffeine promotes a shift in brain dynamics towards increased neural excitation and closer proximity to a critical regime, particularly during NREM sleep.

## Food Allergens

### Food Intolerances and Food Allergies: Novel Aspects in a Changing World

Aurelio Seidita, Stella Compagnoni, Mirco Pistone, Antonio Carroccio. *Nutrients*, 17(9) 30 April 2025. doi.org/10.3390/nu17091526. [Article link](#)

Despite the rapid progress that has considerably affected most fields of medicine in recent years, many gray areas still exist in our understanding of allergies/hypersensitivities and intolerances to foods. While these pathologies have been widely described and characterized from a clinical point of view, little is known about their pathogenesis, as their mechanisms are often unclear, especially when the clinical manifestations are predominantly gastroenterological. The Food and Agriculture Organization and the World Health Organization, in an ad hoc expert consultation focusing on immunoglobulin E (IgE)-mediated reactions, have identified eight major categories of food allergens: eggs, milk, peanuts, sesame seeds, flour, fish, and shellfish [2,3]. The reactions to each allergen have different features, making the field of food allergies extremely varied: some, such as egg allergy, tend to improve with age, while others, i.e., fish and seafood allergies, tend to worsen, making their management extremely difficult [4]. The situation is even more complex in the case of hypersensitivities that are not triggered by an IgE-mediated mechanism. Moreover, the objective difficulty of diagnosing and differentiating between food allergies/hypersensitivities and intolerances in some cases should be taken into account. Their clinical presentations are often heterogeneous, embracing a wide spectrum of manifestations: from simple dyspepsia to anaphylaxis and anaphylactic shock [2]. In this scenario, the diagnostic procedures available are often varied, not always standardized and sometimes very long, especially when an elimination diet and a subsequent (double) blind challenge is required [5]. The diagnostic difficulty is mainly linked to non-IgE-mediated reactions. In these cases, diagnostic armamentarium is limited, due to the uncertainties related to the pathogenetic mechanisms, thus making it particularly complex to identify effective and easily repeatable diagnostic biomarkers.

## Emerging Science Areas

*Emerging Science: Genomics and Metagenomics*

### Accelerating the Use of Pathogen Genomics and Metagenomics in Public Health: Proceedings of a Workshop

National Academies of Sciences, Engineering, and Medicine. 2025. Washington, DC: The National Academies Press.  
doi.org/10.17226/29103. [Article link](#)

Advances in genome sequencing technologies, like next-generation sequencing, provide powerful tools that have vastly improved the detection and classification of pathogens and disease outbreaks and support data-driven public health responses. In July 2024, the National Academies Forum on Microbial Threats hosted a public workshop to explore opportunities to advance the use of pathogen genomics and metagenomics data in the U.S. public health system. Speakers considered the application of these technologies to monitoring disease, characterization of emerging pathogens, rapid public health response to outbreaks, and biomedical research.

## Engage with IAFNS

### Application of Continuous Glucose Monitoring (CGM) Devices in Research and for Making Personalized Diet Decisions

May 21, 2025

Virtual Event

- <https://iafns.org/event/application-of-continuous-glucose-monitoring-cgm-devices-in-research-and-for-making-personalized-diet-decisions/>

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