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Editorial: Rapid screening for organic pollutants analysis in food

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Editorial on the Research Topic
Rapid screening for organic pollutants analysis in food

The global population is expected to reach at least 9 billion by the year 2050, requiring up to 70% more food and demanding food production systems and the food chain to become fully sustainable. Within this context, food safety must become an enabler of global food security (Fritsche, 2018). Food safety is closely related to people's health and the stability of the food market. Some of these hazards may include bacterial pathogens (*Salmonella*, *Escherichia coli*, etc.); physical contaminants, and adulterants (glass, metal, animal feces, etc.); naturally occurring toxicants (mycotoxins, alkaloids, lectins, etc.); agrochemical and veterinary drug residues, prions, and aflatoxins (Madilo et al., 2024). Hence, implementing reliable, effective, and rapid screening methods can ensure the accuracy of analytical results, improve the efficiency of analysis, and contribute to strengthening food safety supervision, thus promoting the sustainable development of the food system.

Lincomycin, a natural antibiotic, is widely used by animal and fishery husbandries to prevent infections and treat diseases. It endangers people's health when they eat food containing lincomycin residue, especially the frequent consumption of milk and chicken products containing lincomycin. Zhang et al. prepared lincomycin-imprinted silica nanoparticles according to boronate affinity-based template-immobilized surface imprinting. The prepared lincomycin-imprinted silica nanoparticles exhibited several significant results, such as good specificity, high binding capacity (19.45 mg/g), fast kinetics (6 min), and low binding pH (pH 5.0) toward lincomycin.

Pesticide is indispensable for modern agriculture. However, the improper and excessive use of pesticides results in residue in food and environment, which is a serious problem. First of all, sample pretreatment is an essential procedure in pesticide analysis, as the matrix effect can significantly influence the results. Huang et al. synthesized a covalent organic framework (COF) using 1,2,4,5-tetrakis-(4-formylphenyl)benzene and benzidine to mitigate the matrix effect in vegetable and fruit samples. This COF was then used to develop a solid-phase extraction method. In addition, the COF was used to create a magnetic COF (MCOF) for use in magnetic solid-phase extraction. The

reuse test demonstrated that the synthesized COF and MCOF can be reused up to 15 times. Chen et al. developed a simple and sensitive fluoroimmunoassay (FIA) based on a nanobody-alkaline phosphatase fusion protein (VHHjd8-ALP) and blue-emissive carbon dots (bCDs) for the rapid detection of fenitrothion. Compared with the p-nitrophenylphosphate-based one-step conventional indirect competitive enzyme-linked immunoassay (icELISA), the developed FIA showed an 11-fold sensitivity improvement. Furthermore, the analysis period of FIA only takes ~55 min, which was obviously faster than that of the conventional icELISA.

Malachite green, a triphenylmethane dye, is used in the aquaculture industry as a disinfectant and insect repellent due to its potent bactericidal and pesticidal properties. However, its use poses potential environmental and health risks. Wu et al. analyzed and designed two haptens using computer simulation. Serum data confirmed the feasibility of introducing an arm at the dimethylamine group. Subsequently, a highly selective monoclonal antibody strain was successfully prepared based on the hapten.

Ma et al. reported an effective electrochemical sensor for simultaneous detection of ascorbic acid and dopamine by using Co-modified MCM-41 as the electrocatalytic material. And this work has important implications for the construction of methods for detecting low-molecule organic pollutants in food.

Millet is one of the major coarse grain crops in China. Its geographical origin and Fusarium fungal contamination with ergosterol and deoxynivalenol have a direct impact on food quality. Six hundred millet samples were collected from 12 production areas in China, and traditional algorithms such as random forest and support vector machine were selected to compare with the deep learning models for the prediction of millet geographical origin and toxin content. Nie et al. firstly develops a deep learning model (wavelet transformation-attention mechanism long short-term memory, WT-ALSTM) by combining hyperspectral imaging to achieve the best prediction effect, the wavelet transformation algorithm effectively eliminates noise in the spectral data, while the attention mechanism module improves the interpretability of the prediction model by selecting spectral feature bands.

Rapid assessment and prevention of diseases caused by foodborne pathogens is one of the existing food safety regulatory issues faced by various countries, and it has received wide attention from all sectors of society. Dong et al. summarized the recent advances in foodborne pathogen detection using photoelectrochemical biosensors from photoactive material to sensing strategy.

Per- and polyfluoroalkyl substances (PFAS) are a group of persistent organic pollutants which pose significant risks to human health and the environment. Senovilla-Herrero et al. comprehensively examines the implications of new legislation concerning PFAS for food sustainability.

Phthalic acid esters (PAEs) are often added to plastics to enhance elasticity, transparency, durability and prolong service life as a kind of plasticizer. However, it is easy to be released into the environment and enter the human body from various potential sources. Zhang et al. introduced the recent advancements and trends in optical sensors for detection of PAEs represented by colorimetric sensors, fluorescence sensors and surface-enhanced Raman scattering platform.

This Research Topic will provide an overview of the present scenario on food safety and potential adaptation in response to the global food safety.

Author contributions

XD: Conceptualization, Investigation, Writing – original draft, Writing – review & editing. SG: Writing – review & editing. LL: Writing – review & editing. XL: Conceptualization, Writing – review & editing. DH: Writing – review & editing. YZ: Conceptualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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