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EDITORIAL

Food safety analysis 2.0

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Issue 22 of *Anal. Bioanal. Chem.* in Sept. 2018 consisted of 32 papers in a topical collection on food safety analysis, and to avoid a repetitive overview of the topic, please refer to its introduction [1]. Similarly, one of the publications in that issue presented an overview of the trends and research needs on the topic, describing the importance and relative growth in analyses using a variety of techniques to detect microbial pathogens, pesticides, veterinary drugs, mycotoxins, toxic metals, allergens, environmental contaminants, radionuclides, marine toxins, emerging pollutants, food additives, and other adulterants in all kinds of foods and feeds [2]. The topical collection included papers covering nearly all of those aspects in food safety analysis, and almost exactly 5 years later, it is satisfying to see that overall, each paper has averaged 1.0 accesses online per day and 5.0 citations per year. Analysis of micro-/nano-plastics has shown to be a particularly hot topic, constituting half of the top ten most cited papers in *Anal. Bioanal. Chem.* from 2018, including a research article in the previous topical collection [3]. The time has come to follow-up on the success of the first special issue on food safety analysis by presenting its sequel.

The COVID-19 pandemic was the most significant event since the previous issue, and its aftermath is still reverberating in a variety of ways. For example, Fig. 1 indicates its impact on publications in the field of analytical chemistry. Note how the number of publications in the Web of Science category of "chemistry, analytical" rose at an even steeper exponential pace in 2020–2022 than years prior. Similarly, the percentage of papers involving analytical chemistry relative to the category of "chemistry" also rose from 11.8% in 2019 to 12.8% in the years to follow. This is still rather distant from the apex of 14.5% in 1995, but it reversed the downward trend in the overall percentage of analytical chemistry publications that had been occurring up to that point.

With respect to food analysis within the category of analytical chemistry, the percentage of papers had been steadily rising until 2020 when it reached 9.9% before it leveled off since then. For comparison, papers listing "environment" followed a similar pattern, hovering at 17.6% since 2020. During that that time, the analytical community increased its attention on COVID-related research, which went from 0% of analytical publications in 2019 to 0.5%, 1.8%, 1.9%, and 1.5% in 2020 to 2023, respectively. Despite this, the topic of food safety analysis continued its upward trend, apexing at 3.2% of publications in the category of analytical chemistry in 2022 and holding steady thus far in 2023.

This second topical collection on food safety analysis in *Anal. Bioanal. Chem.* serves to further emphasize the importance of the topic. Food safety is a fundamental need for life, and ideally, humans would be trusted to follow the moral imperative set into laws designed to protect our ecosystem and produce safe food for consumption. However, human nature and past transgressions have demonstrated that testing is needed to verify good agricultural and food safety practices.

To meet that need, analytical chemists worldwide continue to develop and implement effective analytical methods to help ensure a safe food supply in the most efficient manner that technology and resources allow. Current state-of-the-art tools for analysis tend to be lab-based, very expensive, and complicated. A better food safety system would involve fast, portable, easy, and cheap techniques. Unfortunately, technology for the "tricorder" from Star Trek does not yet exist, if it ever will, but that does not stop those in the food community from asking for one. Nor does it stop analytical chemists from the worthy goal of trying to build one, but those scientists must always be realistic about what the results would mean even if they are successful [4]. Similarly, analysis of emerging nontargeted and unknown contaminants has become a major thrust in the analytical food safety field, but toxicology and risk assessment must be known with respect to newly identified chemicals in foods before any regulatory actions should be taken. Lastly, analytical

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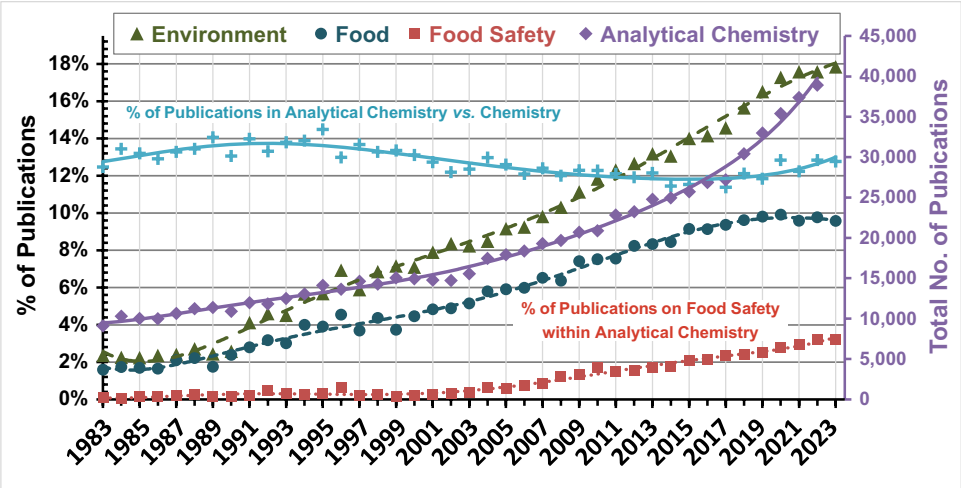

Fig. 1 Trend in the number of publications (right axis) in the Web of Science core collection under the category of analytical chemistry relative to chemistry (left axis) and % of publications in an all fields search on October 24, 2023, of environment, food, and food safety within the analytical chemistry category

chemists must recognize that extensively validated methods yielding real-world benefits in scope, performance, and/or cost will always prevail in practice.

Declarations

Disclaimer The opinions expressed in this article are the author's own and do not reflect the view of the USDA.

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Steven J. Lehotay is a lead scientist with the USDA Agricultural Research Service, which he joined after graduating with a PhD in chemistry from the University of Florida in 1992. His research concerns many types of analytical techniques applied in novel and useful ways to address all aspects in the analysis of pesticides, veterinary drugs, and other contaminants in food. According to the Stanford c-score indicator, Dr. Lehotay resides among the top 0.125% of published analytical chemists. His numerous honors include the AOAC International Harvey W. Wiley Award, the ACS-AGRO Award for Innovation in Chemistry of Agriculture, and the USDA Secretary's Honor Award.