



Editorial

Tool Box for Product Safety: Modern Chromatography and Mass Spectrometry

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Modern chromatography coupled with mass spectrometry is a powerful analytical tool to analyze and characterize regulated products based on the physical separation through chromatography and atomic/molecular characterization of the separated analytes. Gas chromatography mass spectrometry (GC-MS) and liquid chromatography mass spectrometry (LC-MS) are particularly applicable to the measurement of complex mixtures, assisted with proper pre-sample treatment. Particularly, LC-MS can be used as a screening, confirmation, and quantification tool for hundreds, or even thousands, of chemical components of the target matrices in one analysis. Advantages of LC-MS over other techniques, such as many traditional wet chemistry and biochemistry methods (i.e. gravimetric analysis, volumetric analysis) include selectivity, sensitivity, and high throughput.

This issue focuses on several studies examining nutritional components and contaminants in food and dietary supplements. Casey et al., in “Quantitative and Qualitative Analysis of Mitragynine in Kratom (Mitragyna Speciosa) by GC-MS, LC-MS/MS, and UPLC-PDA,” describes characterization of alkaloid components from a plant with psychoactive medicinal qualities, Mitragyna speciose (common name, kratom), which has the effect of uplifting mood at low doses and inducing euphoric effects at high doses. As the pharmacological effects of kratom are not well studied, quantitative analytical methods are important to further explore the safety and toxicology effects of kratom.

Tran et al., “Method Validation for the Analysis of Multiple Weight Loss Drugs in Dietary Supplement Materials by LC-MS/MS,” reports on the characterization of multiple weight loss drugs in dietary supplements. The US Food and Drug Administration regulates dietary supplements under the umbrella category of food rather than as drugs. However, it had been reported that prescription medications were often added illegally to over-the-counter dietary supplements, with the potential for serious health effects among the large population using weight loss supplements. In this study, Tran et al tested eleven weight loss drugs at the limit of quantification of 10 ng/mL.

Narong et al. utilized LC-MS in “Direct Determination of Glyphosate, Glufosinate, and AMPA in Milk by Liquid Chromatography/Tandem Mass Spectrometry” to analyze glyphosate, a broad-spectrum herbicide used in agriculture, as well as its metabolites. The European Union regulates the maximum residue level of this herbicide in milk. A study entitled “Development and Single-Lab Validation of an UHPLC-APCI-MS/MS Method for vitamin K1 in Infant Formulas and Other Nutritional Formulas” by Lee et al., quantifies vitamin K in infant formulas and other samples utilizing the LC-MS platform and distinguishes the trans-vitamin K1 and cis-vitamin K1, offering an additional tool to identify the biological inactive isomer.

With a myriad of food and supplement options, nutrition includes not only basic food, but extends to functional food, medical food, dietary supplements, and other manufactured and processed food products, such as pre-prepared meal. Although legislation is not harmonized globally, regulatory legislative framework usually drives what analytes will be tested and how reliable analytical methods should be developed. Although food safety regulations vary between countries and political subdivisions within a country, they are typically based on qualitative and quantitative information about contaminants, hazards, and other health concerns. Liquid chromatography and mass spectrometry platforms have discovered the new applications in product safety testing, averting from the traditional medical and pharmaceutical field.

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