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’Sherlock’ to the global food supply

Mass spectrometry has a proven track record of enabling food testing labs to identify and quantify foreign substances

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Challenges in food testing today are due to surge in development of new formulations. These formulations have multiple nutrients, vitamins and minerals, many of them at trace levels. The challenge is to accurately analyse each nutrient in the presence of the other. This requires careful selection of sensitive analytical techniques that estimate the desired nutrient without interference from other nutrients in the formulation.

The second major challenge is to eliminate matrix interference and extract the desired nutrients effectively without deactivation or deterioration to ensure accurate results.

The biggest challenge in the food analytical scenario is to develop sensitive, robust, reproducible, accurate methods of analysis which are at par with international test methods and work well for the new food on the shelf.

Mass spectrometry has a long and proven track record of enabling food testing labs to identify and quantify foreign substances in food. Recent advances in the integration of chromatographic separation techniques with tandem mass spectrometry bring a very high level of sensitivity and selectivity to food testing, particularly for the specific detection and identification of contaminants in the presence of other chemicals in a complex matrix.

In recent years, the utilisation of liquid chromatography-mass spectrometry (LC-MS) has grown rapidly and is now widely recognised as an ideal, highly specific and extremely sensitive technique for testing food products with superior accuracy and higher throughput than other methods such as LC/ultraviolet (LC/UV), LC/fluorescence, or microbiological and enzyme-linked immunosorbent assay methods. LC-MS is used commonly for food analysis for vital nutrients like Vitamin B3, Vitamin B2 (Riboflavin), Vitamin B6 (Pyridoxine), Vitamin D, Vitamin E (Tocopherol), Carotenoids, Flavonoids, Phospholipids, Polyphenols.

Recent advances in mass spectrometry systems have significantly advanced both quantitative

and qualitative analysis. The ability to quantify contaminants and obtain identification confirmation in a single run enables new levels of productivity. New levels of sensitivity and specificity allow lower levels of contaminants to be monitored and quantified with simplified sample preparation. Also, advances in high-resolution LC-MS systems, complimented by new software tools, provide unique capabilities to screen for unexpected contaminants.

Outbreak investigations and routine screening play a central role in combating food borne illness. Together, these efforts help identify new contaminants, new food vehicles and unsuspected holes in the food safety net. They also help deepen the scientific understanding of how contamination occurs at specific points in the food supply chain, identify any likelihood that it may occur again, and plan ways to reduce or prevent it.

The number of components that must be monitored on the farm-to-table pathway will continue to increase, while allowable levels of contamination will continue to decrease. Food safety technologies will have to continue to advance their capacity to screen for more contaminants in less time and in easy-to-use formats. There will also be more requirements for general unknown screening or for identifying and measuring unexpected contaminants. This will require assays with high throughput, high sensitivity and advanced tools to identify unknown or unexpected contaminants.

LC-MS plays an important role in detecting threats to the food supply and in deepening our understanding of potentially harmful contaminants. As new technology advances are made, this versatile platform will continue to play a greater role in protecting the global food supply.

About the author

Dr Deepa Bhajekar is Managing Director of Mumbai bassed MicroChem Silliker, a joint venture between MicroChem Laboatories and Silliker group to provide food testing and allied services.

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