

Metrological traceability in process analytical technologies and point-of-need technologies for food safety and quality

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Traditional techniques for food analysis are based on off-line laboratory methods that are expensive and time-consuming and often require qualified personnel. Despite the high standards of accuracy and metrological traceability, these well-established methods do not facilitate real-time process monitoring and timely on-site decision-making as required for food safety and quality control.

The future of food testing includes rapid, cost-effective, portable, and simple methods for both qualitative screening and quantification of food contaminants, as well as real-time measurement in production lines. Automatization through process analytical technologies (PAT) is an increasing trend in the food industry to achieve improved product quality, safety, and consistency, reduced production cycle times, minimal product waste or reworks, and the possibility for real-time product release.

Novel methods of analysis for point-of-need (PON) screening could greatly improve food testing by allowing non-experts, such as consumers, to test in situ food products using portable instruments (1), smartphones, or even visual naked-eye inspections, or farmers and small producers to monitor products in the field.

Considering the growing interest in real-time analysis and PAT systems for process control in the food industry, as well as the trend towards the development of smart devices for PON analysis of food products, we critically pointed out the importance of demonstrating metrological traceability and reliability of the measurement results in real-life conditions, a challenge not easily met with the analytical tools of PAT and the analytical methods for PON testing (2). The need for rapid and cost-effective analysis should not outweigh the demand for reliable measurements for food quality and safety control.

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