

Strengthening India's Food Safety Ecosystem through Advanced Analytical Testing

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Nandakumar Kalathil, Country General Manager, Agilent India

As India strengthens its position as a global food manufacturing and export hub, food safety compliance is becoming increasingly complex. Tightening international regulations, stringent maximum residue limits (MRLs), and growing concerns around emerging contaminants such as PFAS, MOSH/MOAH and microplastics are placing greater emphasis on sensitive, reliable and science-led analytical testing.

For Indian food manufacturers and exporters, meeting global standards is increasingly moving beyond basic regulatory compliance towards proactive quality assurance, traceability and risk management across the supply chain. Advanced technologies such as chromatography and mass spectrometry are playing a critical role in enabling the detection and quantification of contaminants and residues at increasingly lower levels, while supporting reproducibility and audit readiness.

Against this backdrop, Nandakumar Kalathil, Country General Manager, Agilent India, shares his perspective with NUFFOODS Spectrum on India's preparedness to meet evolving global food safety requirements, the industry's awareness and testing capabilities for emerging contaminants, and the role of advanced analytical infrastructure in

strengthening export competitiveness. He also discusses how Indian food businesses are addressing packaging-related contamination and migration risks, and the strategic investments needed to build a more resilient, transparent and globally trusted food safety ecosystem.

residue standards globally. In your view, how prepared are Indian food manufacturers and exporters to meet these evolving international compliance requirements?

India's food export ecosystem is undergoing a structural shift toward stronger, globally aligned compliance frameworks. With international markets tightening limits on contaminants and residues, the ability to detect and quantify at ultra-low levels is no longer optional—it is foundational.

Many leading manufacturers and testing laboratories are increasingly moving toward basic compliance toward integrated, end-to-end quality assurance, embedding analytical testing across the supply chain—from raw materials to finished products systems, with analytical testing embedded across the value chain—from raw materials to finished products. This reflects a move beyond compliance to proactive, system-driven quality.

What is notable is the adoption of scalable, regulation-ready analytical workflows that are designed to support consistent and reproducible performance across batches and geographies—critical for global market access.

Industry platforms and forums, including initiatives such as the Agilent Food Safety Conclave, are playing an increasing role in enabling alignment between regulators, scientists, and stakeholders, supporting India's transition from compliance-driven participation toward credibility-led competitiveness. Ultimately, this shift is central to positioning India as a science-led food ecosystem, where trust—not just compliance—defines success.

Emerging contaminants such as PFAS, MOSH/MOAH, and microplastics are becoming major concerns across global food supply chains. How significant is the awareness gap regarding these risks within India's food industry today?

Emerging contaminants such as PFAS, MOSH/MOAH, and microplastics are becoming central to global food safety discussions due to their persistence and increasing regulatory scrutiny.

In India, awareness is evolving, with varying levels of maturity across different segments of the industry, but the challenge is less about recognition and more about capability readiness and the availability of standardized testing approaches. These contaminants often originate from multiple pathways, including environmental exposure and packaging, requiring specialized, high-sensitivity analytical methods.

Globally, there is a growing emphasis on anticipatory compliance approaches—preparing for future thresholds rather than reacting to them. This presents India with an opportunity to take a more proactive role.

Strengthening awareness must be complemented by investments in detection capabilities and method standardization, and knowledge exchange, ensuring exporters stay ahead of emerging risks.

What does an effective pesticide residue and mycotoxin monitoring program look like for large-scale food manufacturers and exporters operating in India?

An effective program goes beyond routine testing to a fully integrated, risk-based analytical strategy. Key elements include:

- Multi-residue methods for broad-spectrum screening
- Methods designed to support detection at levels aligned with global MRL requirements
- Complementary GC/MS and LC/MS techniques for confirmation
- Digitally enabled workflows for reproducibility and audit readiness

Equally important is risk-based sampling, guided by sourcing patterns, seasonality, and geography.

Across India, adoption is being observed, particularly among export-oriented organizations and export-driven sectors, reflecting a shift toward globally benchmarked testing ecosystems. The focus is shifting from testing as a checkpoint to quality assurance as a continuous system—important for supporting consistency, traceability, and audit readiness.

With regulations tightening across markets such as the EU and the US, how important is advanced analytical testing infrastructure in strengthening India's position as a trusted global food exporter?

Advanced analytical infrastructure plays an important role in strengthening India's position as a trusted global supplier.

In markets such as the EU and US, compliance requires not just meeting thresholds but demonstrating repeatability, traceability, and scientific rigor.

Technologies such as chromatography and mass spectrometry support precise detection and characterization at ultra-low levels, supporting this shift toward assurance-driven compliance.

Their growing adoption in India supports transparency and helps build stakeholder confidence across export markets. The next step is integration—linking instrumentation, data, and regulatory intelligence into a connected ecosystem. This cohesion is critical to move beyond incremental progress and build a unified narrative of scientific credibility.

Many food companies are now being asked to evaluate packaging-related contaminants and migration risks. How are Indian food businesses approaching this challenge, and what role can technology play in addressing it?

Packaging-related contamination is an emerging priority area, driven by tighter regulations on food contact materials and migration risks.

Many Indian companies are beginning to integrate packaging risk assessment into core quality frameworks, recognizing that contamination pathways extend beyond ingredients. This reflects a more holistic approach to food safety.

The challenge is compounded by contaminants such as PFAS and mineral oil hydrocarbons, which require targeted, high-sensitivity analysis.

Addressing this requires integrated testing across packaging, processing, and product systems. Food safety and packaging safety are no longer separate considerations—they are part of the same risk ecosystem. Over time, packaging safety is likely to become an increasingly important pillar of overall food safety.

Looking ahead, what key investments or strategic shifts do you believe India's food industry must prioritize to build a more resilient, transparent, and globally competitive food safety ecosystem?

To move from fragmented compliance to a globally trusted food safety ecosystem, key priority areas may include:

- Transition to assurance-led systems focused on consistency and audit readiness
- Scaled adoption of advanced analytical technologies
- Investment in lab capacity and digital traceability
- Stronger alignment between regulators, industry, and scientific institutions

India has an opportunity not only to meet international expectations but also to shape future food safety narratives through science and transparency.

At the same time, while strengthening export readiness is critical, there is an equally important need to build robust domestic frameworks for emerging contaminants. Developing science-based guidelines, monitoring systems, and risk assessment approaches for contaminants such as microplastics, PFAS, and mineral oil hydrocarbons will be essential to safeguard public health and align domestic practices with global benchmarks.

Industry platforms and knowledge-sharing forums, including initiatives such as the Agilent Food Safety Conclave, contribute to dialogue and alignment across stakeholders. Going forward, a clear and consistent narrative will be key to positioning India as a science-led, globally trusted food ecosystem.