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Researchers develop a faster test that detects ochratoxin A near white wine’s legal limit

The label-free method uses selective paper-enhanced infrared spectroscopy to screen contamination with less laboratory complexity.

Monday, June 15, 2026



A study published in the Journal of Hazardous Materials describes a new way to detect ochratoxin A, a regulated mycotoxin, in white wine at concentrations close to the legal limit, a step that could help wineries and testing laboratories speed up screening while maintaining compliance and consumer safety.

Ochratoxin A, often called OTA, is a contaminant that can appear in several foods and beverages, including wine. It is regulated in many countries because of its nephrotoxic and carcinogenic effects. Detecting it at very low levels has remained difficult, especially in white wine, where the chemical complexity of the liquid can interfere with analysis.

According to the study, the researchers developed an approach that combines solvent-based enrichment with selective paper-enhanced infrared spectroscopy, or PEIR. The process starts by extracting OTA from the wine into a solvent so the compound becomes more concentrated. The enriched sample is then placed on a functionalized cellulose paper substrate designed to selectively adsorb the toxin and enhance its spectral signal. Infrared spectroscopy is then used to identify characteristic OTA absorption bands on the paper.

The researchers reported that the method was able to detect OTA at or below the maximum allowable level for white wine, showing suitability around 2 µg/kg, which is the legal threshold referenced in the study context. They also said the technique works without complex chromatographic separation, a feature that may reduce both analysis time and laboratory burden compared with more elaborate testing workflows.

The paper presents the method as a label-free approach, meaning it does not rely on additional molecular tags or markers to identify the toxin. Instead, it uses the infrared signature of OTA itself after enrichment and selective capture on paper. In practical terms, that could make the procedure simpler for routine use if it performs consistently outside research settings.

The authors said the method requires only minimal sample preparation and offers rapid analysis times. They also described it as a cost-effective and reliable alternative for routine screening in the wine industry. That matters for the beverage sector because faster and simpler testing tools could improve surveillance of a tightly regulated

contaminant in wine, support quality control in production and storage, and potentially reduce delays in deciding whether batches meet legal standards.

For producers, importers and laboratories, OTA testing is not only a food safety issue but also a trade issue. A method that can identify contamination near the legal limit may help detect problems earlier in the supply chain. In white wine, where low-level contaminants can be harder to isolate because of the matrix, any improvement in sensitivity without adding major technical complexity could be useful for routine monitoring.

The study does not suggest replacing established regulatory methods immediately, but it points to an analytical direction that may broaden options for screening. Infrared-based systems are generally valued for speed, and pairing them with a selective enrichment step appears to address one of their main limits in complex beverages: distinguishing trace contaminants from background signals.

The work adds to broader efforts to improve contaminant detection in drinks with methods that are faster and less resource-intensive than conventional laboratory techniques. In wine, where producers face pressure to meet safety rules while controlling costs, tools that can detect OTA near legal thresholds may become increasingly relevant if they are validated for wider commercial use.