

Safe Food. Open Markets.

Building African testing capacity for pesticides, mycotoxins, heavy metals and authenticity — together.

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AVP Gas Phase Division

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Director, Global Food Segment
Agilent Technologies



Food safety is now a trade instrument

\$93B

of African agricultural exports a year
ride on pesticide, mycotoxin and heavy
metal compliance

Africa Agriculture Trade Monitor, 2023

1,286

EU RASFF notifications on African-origin
food for pesticide residues, mycotoxins or
heavy metals

RASFF Window, Aug 2020 – Aug 2026

56%

of African notifications* were border
rejections, versus 30% of RASFF
notifications overall

RASFF Window, Aug 2020 – Aug 2026

It is not mycotoxins alone — pesticide residues drive most African rejections, with heavy metals and authenticity fraud the growing fronts.

Sources: EU RASFF Window export (30,000 notifications, Aug 2020 – Aug 2026) | [EU RASFF Portal](#)

*African-origin breakdown: 935 pesticide residues, 270 mycotoxins, 81 heavy metals. Adulteration is logged separately, so the 1,286 total is unchanged.

What actually stops a shipment at the border



Pesticide residues

The single largest rejection category for African fruit and vegetables. Chlorpyrifos recurs year after year. EU limits keep tightening, and each new limit is a new testing requirement.



Mycotoxins

Aflatoxin in maize, groundnut and spices. Invisible, heat-stable, and driven by climate. It also blocks intra-African trade — Kenya has banned maize from neighbours.



Heavy metals

Cadmium, lead and arsenic in cocoa, cereals, fish and spices. Increasingly enforced in both EU and US markets, and hardest to test without accredited capability.



Authenticity

Food fraud and false labelling: Sudan dyes in West African palm oil, adulterated honey, unproven origin claims. Weak traceability makes provenance the next border test.

Sources: [EU RASFF Portal](#) | [FAO Regional Office for Africa \(AFRAF 2023\)](#)

WHY LOCALIZE FOOD CONTROL ANALYSIS IN AFRICA?

From overseas dependency to resilient in-country capability

1 Faster Turnaround Time

2 Lower Total Cost of Analysis

3 Stronger Regulatory Control

4 Improved Export Competitiveness

5 Local Scientific Expertise

6 Food Authenticity & Fraud Prevention

7 Sustainable Regional Capacity

Test before release, and the result is prevention

A release policy turns laboratory capacity into an enforceable border control.



Prevents non-compliant exports

Release only on a passing result — fewer incidents, rejections and recalls.



Protects market access

Importing markets trust your controls, so exporters keep access.



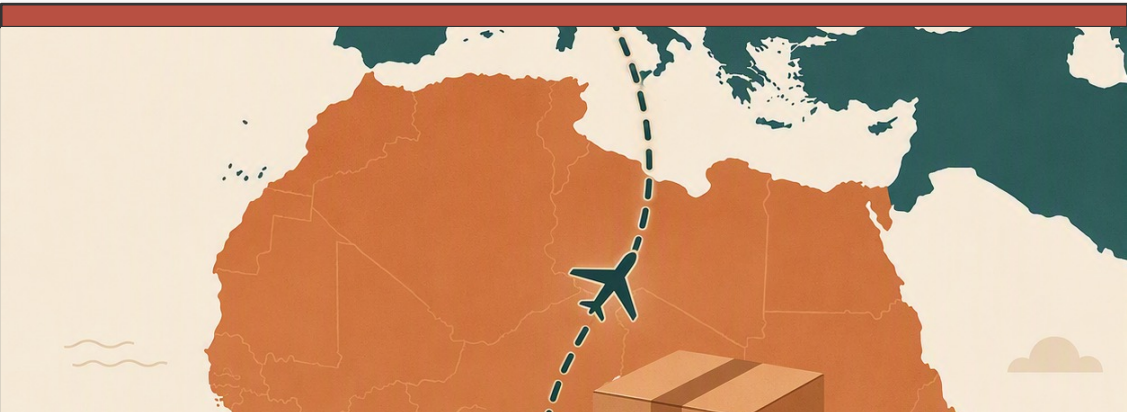
Builds prevention intelligence

Results trace back to farms and supply chains, so risks surface early.

Sources: EU RASFF Portal | FAO Regional Office for Africa (AFRAF 2023) | WHO Alliance for Food Safety

Bring the Lab to the Sample

Food testing capacity on the African continent cuts both cost and turnaround time



TODAY

Ship to Europe

Samples flown from origin to EU labs



FUTURE

Test In-Region

Analysis performed where food is produced



Relative cost and turnaround, illustrative

How India built its testing capacity

Six decades of accredited in-country labs whose results export markets, and India's own customs, now accept.



Sources: Ministry of Commerce (EIC) | NABL | Dose-Response 5(2), 2007 | APEDA GrapeNet, Peanut.Net | PIB, 29 Jul 2022 | Lok Sabha USQ 2911, 2023 | EIC LiFE portal | CBIC Circular 28/2026

India moved export testing home

From EU port holds on grapes to accredited Indian labs and testing before export certificates are issued.



Sources: ICAR-NRC Grapes (NRL) | APEDA GrapeNet; Grape Export Procedures 2025; Trade Notice QMC/GEN/049/2003 | PIB / MoFPI, 11 Feb 2022 | ICAR-NRCG, CropLife India 2023

AREA 01

Pesticide Residues

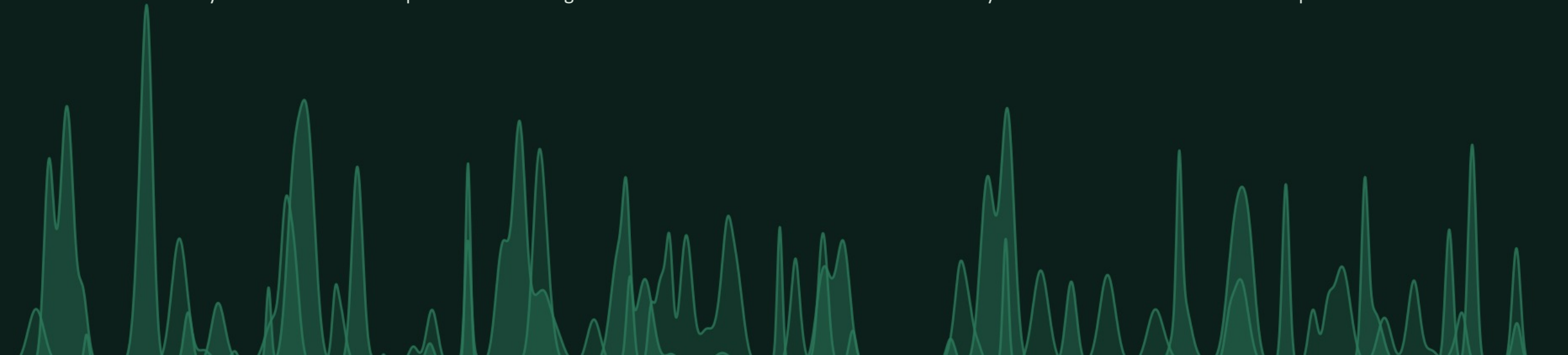
Multi-residue screening against divergent global MRLs

PEST-01

A 25-country contract lab scales export MRL screening

PEST-02

MRL-level sensitivity in avocado and tea from a bench-space-constrained lab



A 25-country contract lab scales export MRL screening

AGQ Labs (Dr. Ramon Bouza Deano, Director of Laboratories; Dr. Jose Antonio Moreno, Chromatography Application Specialist) | Seville, Spain; operations in 25 countries incl. USA, South Africa | 2025 (lab expansion); video n.d.

MATRIX Fruit, vegetables, oils, cereals, nuts, dried fruit, wine

PROBLEM

AGQ Labs serves agro-food exporters who must simultaneously satisfy divergent MRL schedules across major international markets. A shipment that clears one market can fail another, exposing growers to rejection, commercial penalties and reputational damage. The lab must sustain throughput, reproducibility and profitability at global scale.

SOLUTION

Agilent GC columns, supplies and instrumentation underpin AGQ's gas and liquid chromatography residue screens, which run as an ISO 17025 accredited service. AGQ markets a 576-pesticide screen and reports results interpreted against the MRLs of the main international markets.

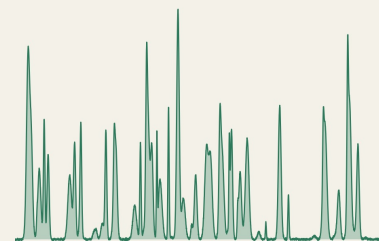
OUTCOME

AGQ's laboratory leadership publicly describe Agilent GC columns, supplies and instruments as helping their labs perform, produce and profit for global clients. The lab delivers MRL-referenced reports that let growers set optimal harvest schedules and pest control plans and avoid rejected consignments. AGQ opened a new Yakima Valley, Washington lab in 2025 to shorten turnaround for Pacific Northwest producers.

HEADLINE RESULT

576

pesticide screen,
ISO 17025 accredited



Illustrative motif, not case data

REGULATORY DRIVER

EC 396/2005, EC 1107/2009; ISO 17025; IAS

SOURCE

AGQ Labs Performs, Produces and Profits with Agilent GC Columns; AGQ Labs USA Pesticide Residue Testing

Customer story video + public lab service pages + announcement

MRL-level sensitivity in avocado and tea from a bench-space-constrained lab

Agilent Technologies, distributed via Chemass | Europe | n.d. (Ultivo era, post-2017)

MATRIX Avocado (high fat), black tea (high polyphenol)

PROBLEM

Smaller routine laboratories need to quantify pesticides below MRLs in genuinely difficult matrices, but cannot give up the floor space or maintenance budget that a full-size triple quadrupole demands.

SOLUTION

A UHPLC/MS/MS multiresidue method using an Agilent 1290 Infinity II UHPLC with Jet Stream ionization, coupled to the compact Agilent Ultivo triple quadrupole LC/MS, which uses a Cyclone Ion Guide and Vortex Collision cell to preserve sensitivity in a reduced footprint.

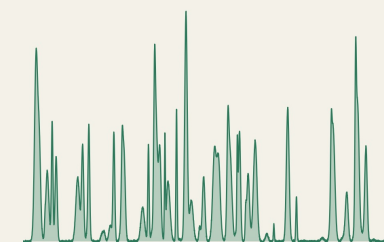
OUTCOME

More than 250 pesticides and metabolites determined. Most compounds were accurately quantified below maximum residue limits in avocado and black tea with excellent precision, making the platform a fit-for-purpose choice for routine residue testing where footprint and ease of maintenance matter.

HEADLINE RESULT

250+

pesticides and metabolites
below MRLs



Illustrative motif, not case data

REGULATORY DRIVER

EU maximum residue limits

SOURCE

Multiresidue Pesticides Screening and Quantitation in Complex Food Matrices Using an Agilent Ultivo QQQ LC/MS

Application note summary, distributor technical library

AREA 02

Mycotoxins

Regulated panels, emerging threats and market surveillance

MYCO-01

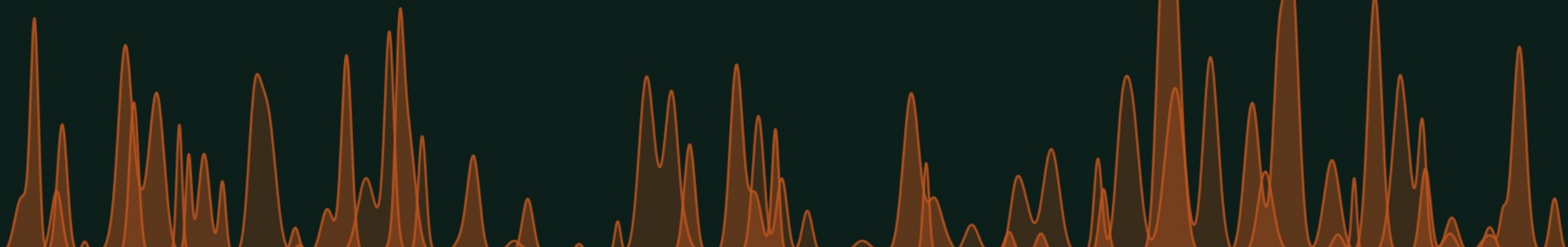
China's national grain authority standardises 16-mycotoxin cereal testing

MYCO-IND

Botswana market survey finds aflatoxin B1 over the legal limit in maize

MYCO-02

Building Southeast Asian capability against emerging mycotoxin threats



China's national grain authority standardises 16-mycotoxin cereal testing

Academy of State Administration of Grain (Ye Jin, Wu Yu, Wang Songxue) with Agilent Technologies | China, validated inter-laboratory worldwide | c. 2017 (foundational)

MATRIX Wheat and maize

PROBLEM

More than 400 mycotoxins occur in nature and a wide range are found in grain, including aflatoxins, ochratoxin A, zearalenone, deoxynivalenol, fumonisins and T-2 toxin. National authorities needed one rapid, accurate and cost-effective method that other laboratories could actually reproduce.

SOLUTION

An Agilent triple quadrupole LC/MS with Jet Stream electrospray ionization and an Agilent Eclipse Plus C18 column (2.1 x 100 mm, 1.8 micron). Crushed samples were extracted with acetonitrile/water/acetic acid (70:29:1) and 14 carbon-13 labelled mycotoxins were used as internal standards. The method was packaged and distributed as a downloadable e-Method.

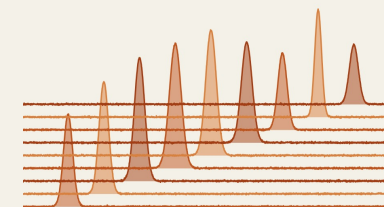
OUTCOME

Linearity with regression coefficients above 0.996. Recoveries of all 16 mycotoxins in wheat and maize were essentially within 85 to 120% at three levels, with replicate RSDs of 0.7 to 8.2%. A FAPAS positive proficiency sample agreed with assigned values. Inter-laboratory validation of the e-Method on different Agilent LC/MS models in laboratories worldwide confirmed transferability.

HEADLINE RESULT

16

mycotoxins, validated
across labs worldwide



Illustrative motif, not case data

REGULATORY DRIVER

Chinese national grain standards; FAPAS proficiency scheme

SOURCE

Simultaneous determination of 16 mycotoxins in cereals by Agilent LC/MS e-Method (5991-7862EN)

Application note with inter-laboratory validation

Botswana market survey finds aflatoxin B1 over the legal limit in maize

University of Botswana, Laboratory of Analytical Chemistry, with Botswana National Veterinary Laboratory (Mbisana, Rebagamang, Mogopodi, Chibua) | Gaborone, Botswana | 2023

MATRIX Maize and sorghum

PROBLEM

Drought, high temperatures and pre-harvest rainfall drive mycotoxin formation in grain. Where maize and sorghum are staples, populations face real dietary exposure, but sensitive simultaneous multi-toxin methods are not universally available.

SOLUTION

A QuEChERS-LC-MS/MS method for ten mycotoxins in maize and sorghum, with extraction optimised to maximise recovery and minimise matrix effects using small volumes of organic solvent. Validated against Commission Implementing Regulation (EU) 2021/808, EC 1881/2006 and EC 401/2006.

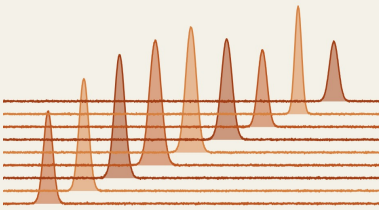
OUTCOME

Recoveries of 80.77 to 109.83% with CVs below 15%, R-squared above 0.98 and LOQs of 0.53 to 89.28 micrograms/kg. Applied to 10 maize and 10 sorghum market samples, half carried detectable mycotoxins and two maize samples exceeded the maximum permitted aflatoxin B1 level, at 2.55 and 4.07 micrograms/kg.

HEADLINE RESULT

2 of 20

market samples over the legal aflatoxin B1 limit



Vendor-neutral: instrument make not stated in source

REGULATORY DRIVER

EU 2021/808; EC 1881/2006; EC 401/2006

SOURCE

QuEChERS-LC-MS/MS method for multiple mycotoxins in maize and sorghum from Botswana

Peer-reviewed journal article (Frontiers in Fungal Biology)

Building Southeast Asian capability against emerging mycotoxin threats

International Joint Research Center on Food Security (IJC-FOODSEC), Thammasat University - Dr. Awanwee Petchkongkaew, with Agilent Technologies | Thailand / Southeast Asia | c. 2023-2024

MATRIX Regional food commodities

PROBLEM

Emerging mycotoxins in the Southeast Asian food supply are under-characterised. Regional laboratories need both high-throughput, highly sensitive analytical methods and the trained personnel to run and interpret them.

SOLUTION

An ongoing Agilent collaboration with Dr. Awanwee Petchkongkaew, Co-Founding Director of IJC-FOODSEC and Lecturer at Thammasat University, focused on high-throughput, highly sensitive detection methods. Agilent supports the programme with advanced instrumentation and by training laboratory personnel to raise analytical skill levels.

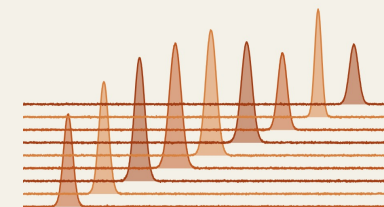
OUTCOME

Regional analytical capability for emerging mycotoxins and food contaminants has been established and is being expanded. Dr. Awanwee plans to broaden the mycotoxin and emerging-contaminant work to further drive food safety improvement alongside Agilent.

HEADLINE RESULT

Capability

methods + instrumentation
+ personnel training



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REGULATORY DRIVER

Regional and export food safety requirements

SOURCE

Collaborating to combat the Emerging Mycotoxin Food Threat with Agilent Technologies

Trade press feature, The Analytical Scientist

AREA 03

Heavy Metals

Trace and ultratrace elements against tightening action levels

METAL-01

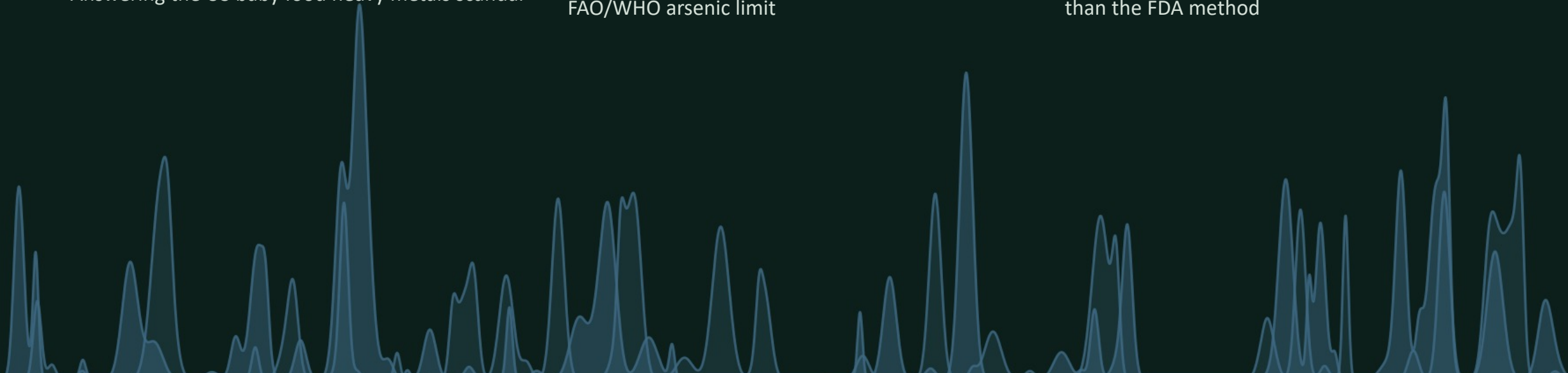
Answering the US baby food heavy metals scandal

METAL-IND

A third of Malaysian commercial rice over the
FAO/WHO arsenic limit

METAL-02

Inorganic arsenic in infant rice cereal, 10x faster
than the FDA method



Answering the US baby food heavy metals scandal

Agilent Technologies (Jenny Nelson) with CEM Corporation (Hasty, Harris, Anderson) | United States | 2021-2022

MATRIX Infant and toddler foods; NIST baby food composite SRM

PROBLEM

A February 2021 US House of Representatives investigative committee report showed many baby foods sold in US supermarkets contained unacceptably high concentrations of arsenic, cadmium, lead and mercury. The proposed Baby Food Safety Act 2021 sets action levels as low as 2 ppb for mercury and 5 ppb for cadmium and lead in non-cereal foods. Plant-based foods can also contain rare earth elements that interfere with arsenic and selenium measurement.

SOLUTION

An Agilent 7850 ICP-MS with an ORS4 collision cell run in a single helium mode, UHMI aerosol dilution for high-matrix samples, and an Agilent SPS 4 autosampler. Samples were prepared by CEM microwave acid digestion. Inorganic arsenic speciation used HPLC-ICP-MS. REE Correction in the ICP-MS MassHunter method wizard applied a half-mass real-time correction for arsenic and selenium.

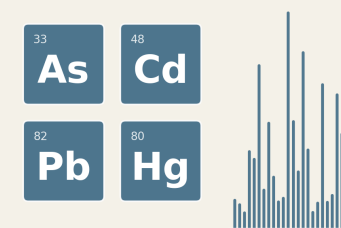
OUTCOME

Eleven infant food samples, three food standard reference materials and QC samples were analysed. A NIST baby food composite SRM prepared in duplicate and analysed twice, plus sample spike recoveries, demonstrated accuracy at the proposed action levels. A single helium-mode cell condition removed all common matrix-based polyatomic interferences.

HEADLINE RESULT

2 ppb

proposed mercury action level, met by method



Illustrative motif, not case data

REGULATORY DRIVER

Baby Food Safety Act 2021; FDA Closer to Zero; FDA EAM

SOURCE

Analysis of Inorganic Arsenic, Cadmium, Lead, and Mercury in Baby Foods by ICP-MS (5994-3713EN / 5994-3714EN)

Application note and application brief

A third of Malaysian commercial rice over the FAO/WHO arsenic limit

Universiti Putra Malaysia, Faculty of Forestry and Environment (Navaretnam, Hassan, Mohd Isa, Aris, Looi) | Malaysia | 2023

MATRIX Commercial rice: basmati, glutinous, brown, local white, fragrant

PROBLEM

Rice is the dominant staple across Southeast Asia and accumulates toxic metals from soil and irrigation water. Consumers and regulators need to know the actual contamination status of rice already on retail shelves, not just what a method can theoretically detect.

SOLUTION

45 commercial rice samples across five rice types were digested by the USEPA 3050B acid digestion method and analysed by inductively coupled plasma mass spectrometry for arsenic, cadmium, nickel, iron, selenium, copper, chromium and cobalt, followed by a full human health risk assessment.

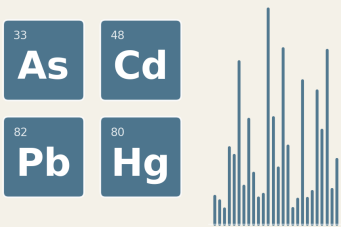
OUTCOME

33% of rice samples exceeded the FAO/WHO recommended limit for arsenic, while none exceeded it for cadmium. Arsenic drove 63% of the non-carcinogenic hazard index, followed by chromium at 34%. Carcinogenic risk to adults was above 10^{-4} for As, Cr, Cd and Ni, with cancer risk per element 5 to 8 times the upper acceptable limit for an environmental carcinogen.

HEADLINE RESULT

33%

of retail rice samples over the FAO/WHO arsenic limit



Vendor-neutral: instrument make not stated in source

REGULATORY DRIVER

FAO/WHO recommended limits; USEPA 3050B

SOURCE

Metal(loid) Analysis of Commercial Rice from Malaysia using ICP-MS: Potential Health Risk Evaluation

Peer-reviewed journal article (*Environmental Science and Pollution Research*)

Inorganic arsenic in infant rice cereal, 10x faster than the FDA method

UC Davis Food Safety and Measurement Facility and Dept. of Viticulture and Enology (Courtney K. Tanabe, Susan E. Ebeler) with Agilent (Jenny Nelson) | United States | c. 2019 (foundational)

MATRIX Infant rice cereal

PROBLEM

Rice plants are especially efficient at accumulating arsenic because flooded paddies ease uptake, and inorganic arsenic is a Class 1 carcinogen. FDA has proposed a 100 ppb action limit for infant rice cereal, matching the EU limit for rice used in infant food. The established FDA EAM Section 4.11 speciation method is too slow for industry screening.

SOLUTION

Agilent LC-ICP-QQQ (HPLC coupled to triple quadrupole ICP-MS). Rather than resolving each inorganic species separately, arsenite As(III) was deliberately oxidised to arsenate As(V) with hydrogen peroxide before analysis, so all inorganic arsenic was measured as a single As(V) peak, separated from the organic species MMA and DMA.

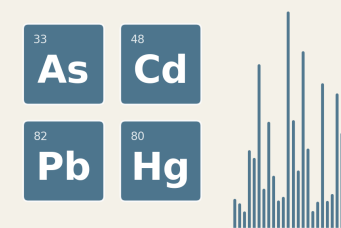
OUTCOME

Routine inorganic arsenic determination in under two minutes, roughly ten times faster than current FDA arsenic speciation methods. This gives the food industry a rapid, reliable screening route against existing and future regulations. The same fast HPLC-ICP-QQQ approach has also been applied to arsenic speciation in wine.

HEADLINE RESULT

<2 min

per sample, ~10x faster
than FDA speciation



Illustrative motif, not case data

REGULATORY DRIVER

US FDA 100 ppb proposed action level; EU 100 ppb for infant rice; Codex; China 150 ppb

SOURCE

Fast Analysis of Arsenic Species in Infant Rice Cereals using LC-ICP-QQQ (5991-9488EN)

Application note authored with university research facility

AREA 04

Authenticity

Chemical fingerprints that verify origin and expose adulteration

AUTH-01

Mapping where the world's soybeans really come from

AUTH-02

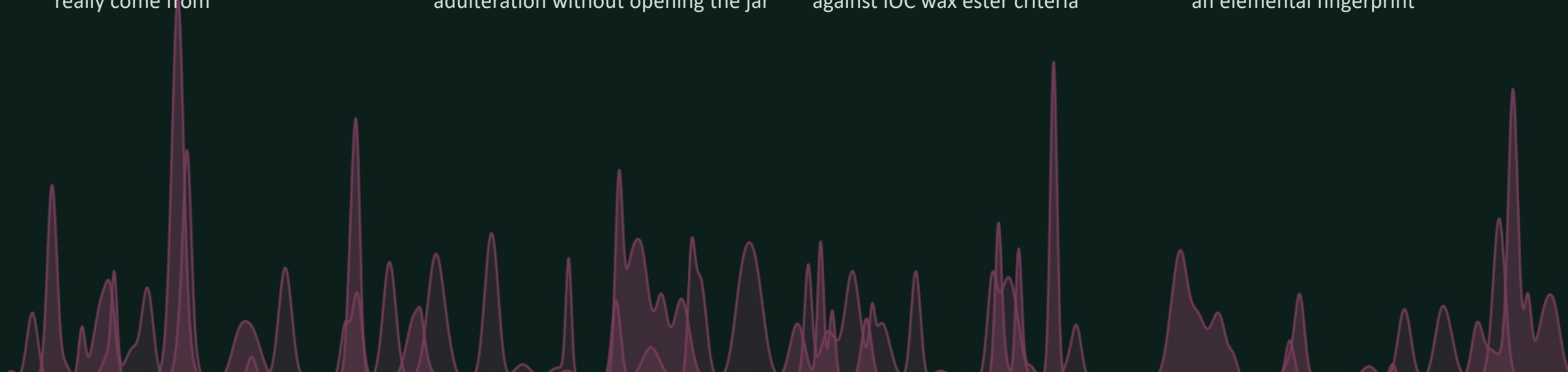
Screening honey for syrup adulteration without opening the jar

AUTH-03

Classifying extra virgin olive oil against IOC wax ester criteria

AUTH-04

Proving Darjeeling is Darjeeling with an elemental fingerprint



Mapping where the world's soybeans really come from

Queen's University Belfast (Prof. Christopher T. Elliott, Aparicio-Muriana, Hong, Chilaka, Quinn, Birse) with Agilent (Woods, De Leoz) | Seven producer countries | 2025

MATRIX Soybeans and soybean meal (422 samples)

PROBLEM

Soybean is one of the world's most important traded commodities, and misrepresenting its geographic origin undermines supply chain transparency. Buyers and regulators need an independent way to verify origin claims for trade, tariff and sustainability compliance, including links to deforestation.

SOLUTION

Elemental fingerprinting on an Agilent 7850 ICP-MS, with Agilent Mass Profiler Professional chemometrics. 422 samples were collected from Brazil, the United States, Argentina, China, India, Paraguay and Canada, together over 95% of global production, and classified with an OPLS-DA multivariate model.

OUTCOME

The model classified country of origin with 98.5% accuracy, with Ni, Na, Mo, Ba, Co, Cr, Cd, Sr, Se, K and Ca as the key discriminating elements. It also separated regions within Brazil and the US, and early comparisons found elemental differences between meal from deforested and non-deforested areas of Brazil.

HEADLINE RESULT

98.5%

origin classification accuracy
across 7 producer countries



Illustrative motif, not case data

REGULATORY DRIVER

Origin verification for trade and tariff controls; sustainability and deforestation-free sourcing requirements

SOURCE

Mapping the global origins of soybean: a study using ICP-MS and chemometrics (npj Science of Food, 2025)

Peer-reviewed paper, plus Agilent application note 5994-8404EN

Screening honey for syrup adulteration without opening the jar

Cranfield University Central Laser Facility research team; technology commercialised in the Agilent Resolve handheld Raman spectrometer | United Kingdom / EU import monitoring | January 2025

MATRIX Honey (17 natural UK honey types)

PROBLEM

A 2023 European Commission Joint Research Centre report found 46% of 147 honey samples tested were suspected of adulteration, up from 14% in 2015-17, with adulterants shifting from corn and cane syrups to rice and sugar beet syrups that standard stable carbon isotope ratio analysis detects poorly. The World Beekeeping Awards removed its honey category for 2025 because adequate testing at the congress was impossible.

SOLUTION

Spatially offset Raman spectroscopy (SORS) combined with machine learning, applied through the container so the jar is never opened. SORS, developed at the Central Laser Facility, is the technology behind Agilent's handheld through-barrier Raman spectrometers such as the Agilent Resolve.

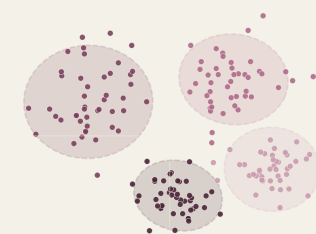
OUTCOME

Published in the journal *Foods*, the best-performing Random Forest algorithm classified samples by adulterant type and level with only 1% of pure honeys misclassified as adulterated and under 3.5% of adulterated samples misclassified as pure. The next stage tests the Resolve SORS engine with these algorithms to make the method portable and field-deployable.

HEADLINE RESULT

1% / <3.5%

false positive /
false negative rate



Illustrative motif, not case data

REGULATORY DRIVER

EU Honey Directive 2001/110/EC; EC JRC coordinated action

SOURCE

SORS in the Fight Against Fake Honey

Peer-reviewed research in Foods; EC JRC report; Agilent announcement

Classifying extra virgin olive oil against IOC wax ester criteria

University of Campinas (UNICAMP) Food Engineering Faculty (Ingrid Franco de Oliveira, Renato Grimaldi) with Agilent Technologies Brasil (Kumi Shiota Ozawa) | Campinas, Brazil | c. 2015 (foundational, still reference method)

MATRIX Extra virgin olive oil

PROBLEM

The health reputation and high cost of extra virgin olive oil have driven increases in adulteration with lower-cost seed oils or olive-pomace oil. Brazil's MAPA Normative Instruction No. 1 requires classification against International Olive Council Doc. No. 28 criteria, where EVOO must sit at or below 250 mg/kg wax esters. Manually resolving the many chromatographic peaks involved is laborious.

SOLUTION

Capillary GC measurement of wax ester distribution and fatty acid methyl and ethyl esters (FAME and FAEE), with Agilent OpenLAB software handling the large number of chromatographic peaks and automatically calculating the key group coefficients used as markers of authenticity and purity.

OUTCOME

The method detects fraudulent mixtures of extra virgin olive oil with lower-quality virgin, ordinary, lampante, deodorised or pomace oils. Automating the group-coefficient calculation made routine IOC- and MAPA-compliant classification practical for commercial laboratories.

HEADLINE RESULT

250

mg/kg wax ester
EVOO threshold



Illustrative motif, not case data

REGULATORY DRIVER

IOC Doc. No. 28; Brazil MAPA Normative Instruction No. 1

SOURCE

Adulterants in Olive Oil by Capillary GC and Agilent OpenLAB (5991-6030EN)

Application note authored with university food engineering faculty

Proving Darjeeling is Darjeeling with an elemental fingerprint

Tea Research Association, Kolkata (Bappaditya Kanrar) with Agilent Technologies (Dr. Vinay Jain, Shuofei Dong) | India (Assam, West Bengal, Tripura, Kangra, Nilgiri) | 2022

MATRIX Tea (*Camellia sinensis*)

PROBLEM

Darjeeling carries the highest market value of Indian teas and is grown only in West Bengal, where demand routinely exceeds what the region can produce. That makes it a prime target for substitution, adulteration and mislabelling, and a consumer cannot verify origin or quality from the packet.

SOLUTION

Multi-element profiling by Agilent 7850 ICP-MS after microwave acid digestion, using the ORS4 cell in helium collision mode with kinetic energy discrimination, combined with Agilent Mass Profiler Professional chemometrics. Principal component analysis was followed by linear discriminant analysis (LDA) and support vector machine (SVM) classification models.

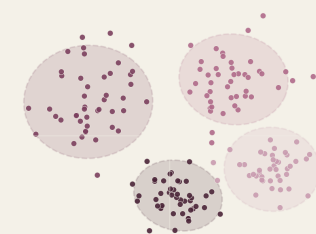
OUTCOME

150 tea samples from eight Indian regions were profiled across 68 measured elements. PCA identified 18 elements carrying significant variance, which drove the classification models. LDA and SVM successfully predicted the geographic origin of 24 unknown tea samples with high accuracy. Internal standard recovery stayed stable across 280 analyses over 11 hours.

HEADLINE RESULT

24

blind samples, origin
predicted with high accuracy



Illustrative motif, not case data

REGULATORY DRIVER

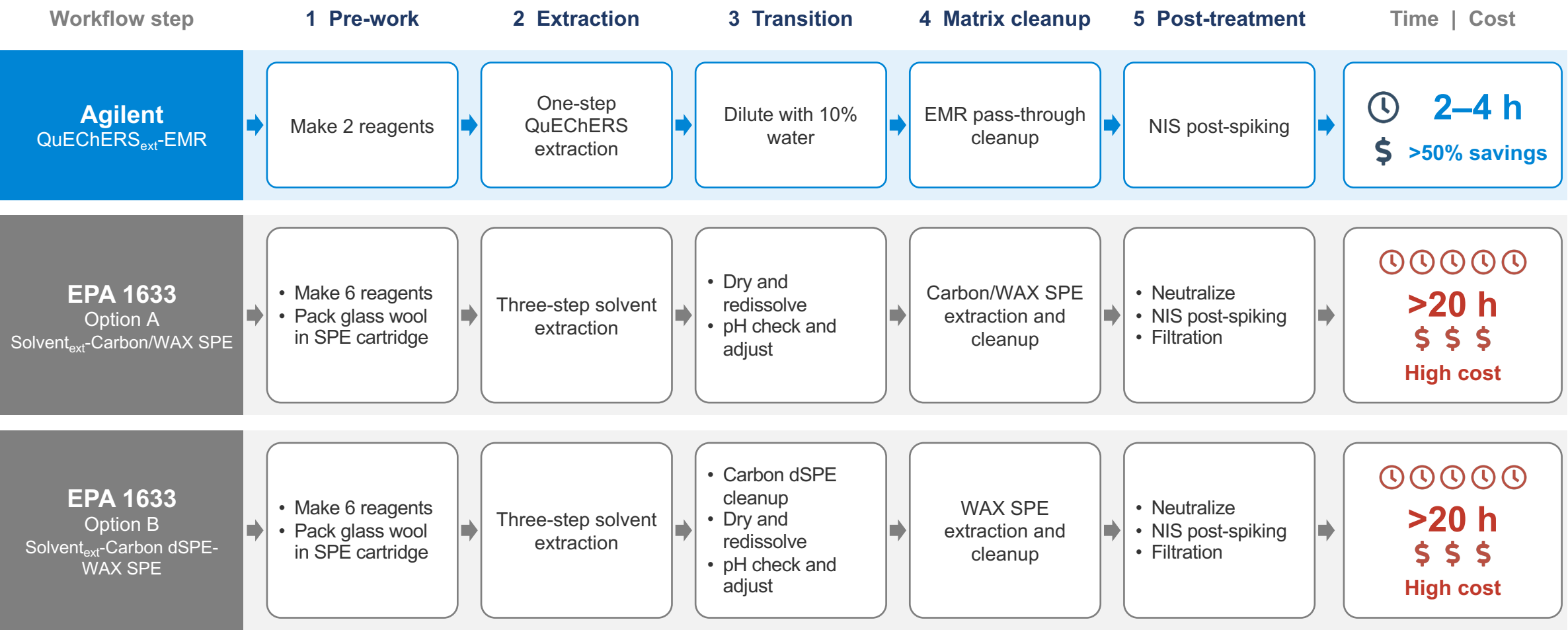
Geographical indication protection; food fraud enforcement

SOURCE

Authenticating Geographical Origin of Tea Using Elemental Profiling (5994-4583EN)

App note with tea research institute; related peer-reviewed paper

Fish Tissue Prep: Agilent vs. EPA 1633



Same EPA 1633 PFAS targets, simpler path: 2 reagents instead of 6, one-step extraction, and 2–4 h instead of >20 h.

Thank you for your attention

01



Share your feedback

Your feedback on today's content is welcome. Tell us what resonated, what was missing, and where your laboratories need the most support.

02



Partner with us

We are looking for interest in partnerships that drive improvements in testing capability and capacity across the continent.

03



Build the network

Build a network with us and our partners to share methods, training and experience, from distributors to academic and regulatory peers.

Let's build Africa's food testing capacity, together.



Agilent

Trusted Answers