Agilent sample preparation techniques for chemists

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Who We Are

A global, collaborative team, serving vital industries in 6 key markets

Pharma and Biopharma

Food Safety

Chemicals and Advanced Materials

Environmental and Forensics

Diagnostics and Clinical

Academia and Government

Committed to

Accelerating the **advancement of science**

Providing **complete, integrated solutions**

Championing **your success**

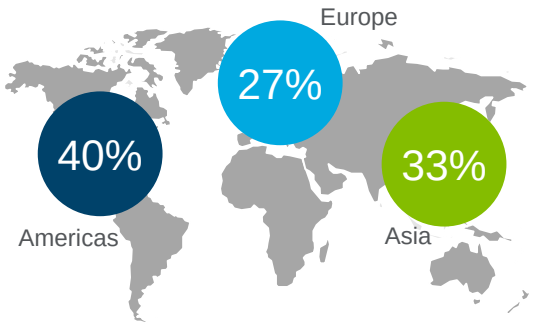
A **Growth** Company
Financial Snapshot

Leadership in large and growing end-markets

$65B[(1)]

TAM in six end markets

Agilent revenue by geography[(2)]

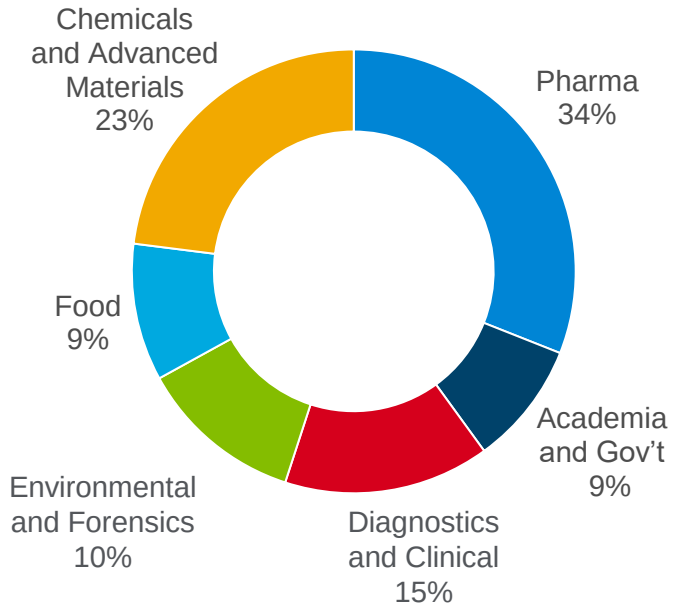


Attractive and recurring revenue base

265,000

labs using Agilent solutions

Agilent revenue by market[(2)]



Q4 FY24 & FY24 Financial Results[(3)]

Q4 FY24 Revenue

$1.70B

-.3% core [(3)(4)]

Non-GAAP Earnings Per Share

$1.46

6% YoY [(3)(4)]

FY24 Financial Results

Revenue

$6.51B

-4.7% core [(3)(4)]

Non-GAAP Earnings Per Share

$5.29

-3% YoY [(3)]

(1) Total Available Market. Market size per Company estimates
(2) Based on FY24 revenue
(3) See reconciliations to the GAAP equivalent for Q4 FY24 and FY24
(4) Core growth is reported growth adjusted for the effects of acquisitions and FX

Our **Customer** Focus

Delivering **scientific, operational, and economic value** for labs around the world

Easy-to-use, reliable instrumentation

Innovative analytical workflows

Increased speed and higher throughput

Expert support

Budget-conscious, integrated solutions

Instruments and tools

Consumables, supplies and parts

Services, consulting and operational expertise

Software and informatics

Our collaborators with sample preparation in Finland

Bravo automatic liquid handling robots

Home > Products > Automated Liquid Handling > Automated Liquid Handling Platforms > Bravo Automated Liquid Handling Platform

Automated Liquid Handling Platforms

Bravo Automated Liquid Handling Platform

The Agilent Bravo is a flexible liquid handling platform that automates your sample preparation for screening applications such as compound management, cell-based assays, and genomic assays. With this robotic liquid handling system, time is freed up and consistent data are achieved across samples and users.

The compact liquid handler can be easily placed on a small bench and fits in a flow hood. With more than 60 accessories ranging from thermal cycler to shaker, the system can be tailored to automate most sample preparation protocols. Automating your sample prep protocol has never been easier with the included VWorks control software that allows users to create and run flexible liquid handling protocols quickly.

PRODUCT DETAILS | RELATED PRODUCTS

Bravo automated liquid handling platform

Agilent own sample preparation products:

Sample Preparation | Agilent

Ensure Confident Results with Sample Preparation

Sample preparation, or sample prep, is an essential part of chromatographic and spectroscopic analyses. The purpose of sample prep is to convert the sample into a form suitable for analysis without significant loss of target compounds. Proper sample preparation removes potentially interfering contamination, which extends the lifetime of your chromatography column and other instrument components.

Agilent's suite of sample preparation products ensure you have the right product for your needs. Our purification and filtration products provide quick and reliable results for repeated analyses and are ideal for busy, high-throughput laboratories. Pre-packaged QuEChERS extraction and dispersive solid phase extraction (dSPE) kits are ideal for food samples and accommodate AOAC and EN methodologies. We also offer a full portfolio of solid supported liquid extraction (SLE), solid phase extraction (SPE), and solid phase microextraction (SPME) products in various chemistries and formats to achieve excellent performance and ensure samples are free of interferences,

Agilent Latest Sample Prep. Solutions to Address Three Challenging Food Applications

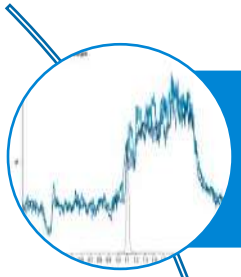
Jussi Laiho
Julius Nokelainen
Shi-Fen Xu
Agilent

2025

DE27865756

Agilent
Trusted Answers

Analytical Focus in the Lab



Remove interferences

Accurate and consistent data

Keep the instruments running

Process as many samples for as little cost as possible

What's your pain?

PFAS contamination from my consumables

I need to automate my sample prep

Sample Prep!

Trying to juggle too many sample prep products and/or methods

Cost

Managing inventory for all my sample prep products

Hitting low-level LOQs for PFAS targets

Dirty systems - downtime

Long extraction times

Poor data quality or challenging data analysis

Method complexity or expertise needed

Limited laboratory equipment available

Learning all the protocols for each of my sample prep methods

Technique vs. Matrix Interference/Challenge

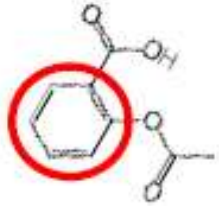
	Dilute & Shoot	LLE	SLE	MSPD	QuEChERS	Silica SPE	Polymer SPE
Particulates	🔴	🔴	🔴	🟡	🟡	🟢	🟢
Proteins	🔴	🟡	🟡	🟡	🟢	🟢	🟢
Lipids	🔴	🔴	🔴	🟢	🟡	🟢	🟢
Oligomeric Surfactants	🔴	🔴	🔴	🔴	🟡	🟡	🟢
Pigments	🔴	🔴	🔴	🟡	🟢	🟢	🟢
Salts	🔴	🟢	🟢	🔴	🟡	🟢	🟢
Concentration	🔴	🔴	🔴	🟡	🟡	🟢	🟢

Source:
KB005934: What is the best Sample Preparation technique based on the type of interference(s) you need to remove? | Agilent

Solid Phase Extraction – SPE

Works with sorbent comparable to LC phases to isolate analytes of interest or interfering compounds

Bond Elut C8

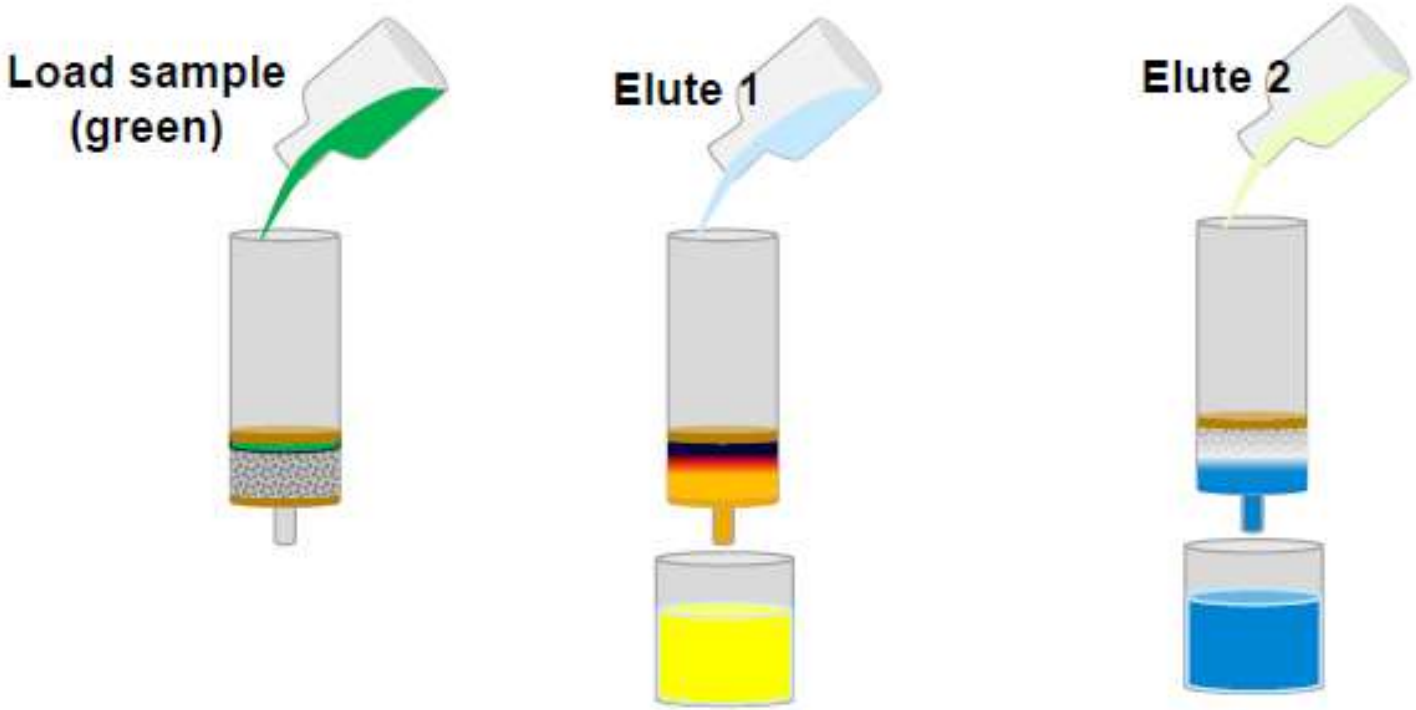


- Isolate analytes of interest
- Remove interferences
- Concentrate analytes

Solid Phase Extraction – SPE

Very similar to LC, also referred to as digital LC:

- Analytes are either ON or OFF the cartridge



Agilent Sample Preparation Solutions

Filtration

Syringe Filters Premium :

PTFE, Nylon, PES, Regenerated Cellulose, Cellulose Acetate, Glass Microfiber (GF), GF/PTFE, GF/Nylon

Diameters = 4mm, 15mm, 25mm

Porosities = 0.2µm and 0.45µm

100 pieces/pack

Certified Filters

Econofilters :

PVDF, PTFE, Nylon, PES, Polypropylene, Regenerated Cellulose

Diameters = 15mm, 25mm

Porosities = 0.2µm et 0.45µm

1000 pieces/pack

Removal of particles & Avoid clogging of columns

Liquid-Liquid/ Supported Liquid Extraction (LLE/SLE)

Chem Elut & Hydromatrix:

Extraction supported liquid with a hydrophile sorbent – diatomaceous earth

Found in cartridge, plate or

ChemElut S:

Synthetic Sorbent SLE

- ✓ Large scale-up synthesis
- ✓ Shorten granulometry distribution
- ✓ Reliable Supplier
- ✓ Controlled Production
- ✓ Less Toxicity

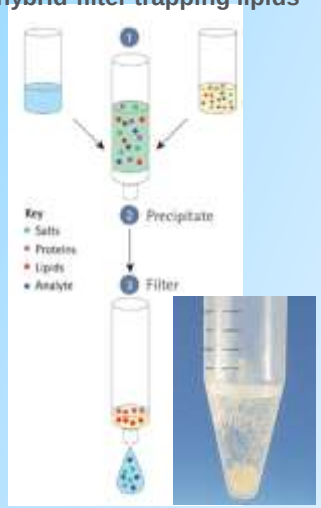
Removal of organic acids, salts and proteins

Proteins Precipitation

Captiva ND & EMR Lipids:

Proteins Precipitation directly in the Captiva Microplate.

Captiva EMR Lipids = hybrid filter trapping lipids



Removal of organic acids, proteins (and lipids with Captiva ND Lipids)

Solid Phase Extraction (SPE)

Bond Elut Portfolio:

SPE Polymerics or silica, Reverse Phase, Normal Phase, Ion Exchange, Mixed Mode, Specific Phases

Cartridges (60ml to >1ml), 96-well microplate, accessories and vacuum systems

Compatible formats for automation

New Carbon S Phase hybrid material with carbon which allow removal of pigments with no interaction with planar pesticides.

New BondElut PFAs Wax Phase for a better extraction of PFAs with an ultraclean & controlled material

Removal of organic acids, proteins, lipids, salts, pigments, and other type of interferents

QuEChERS

Bond Elut Portfolio:

Extraction method

Quick, Easy & Simple

Developed for pesticides in food, vegetables – more matrices possible

Methods in 2 steps:

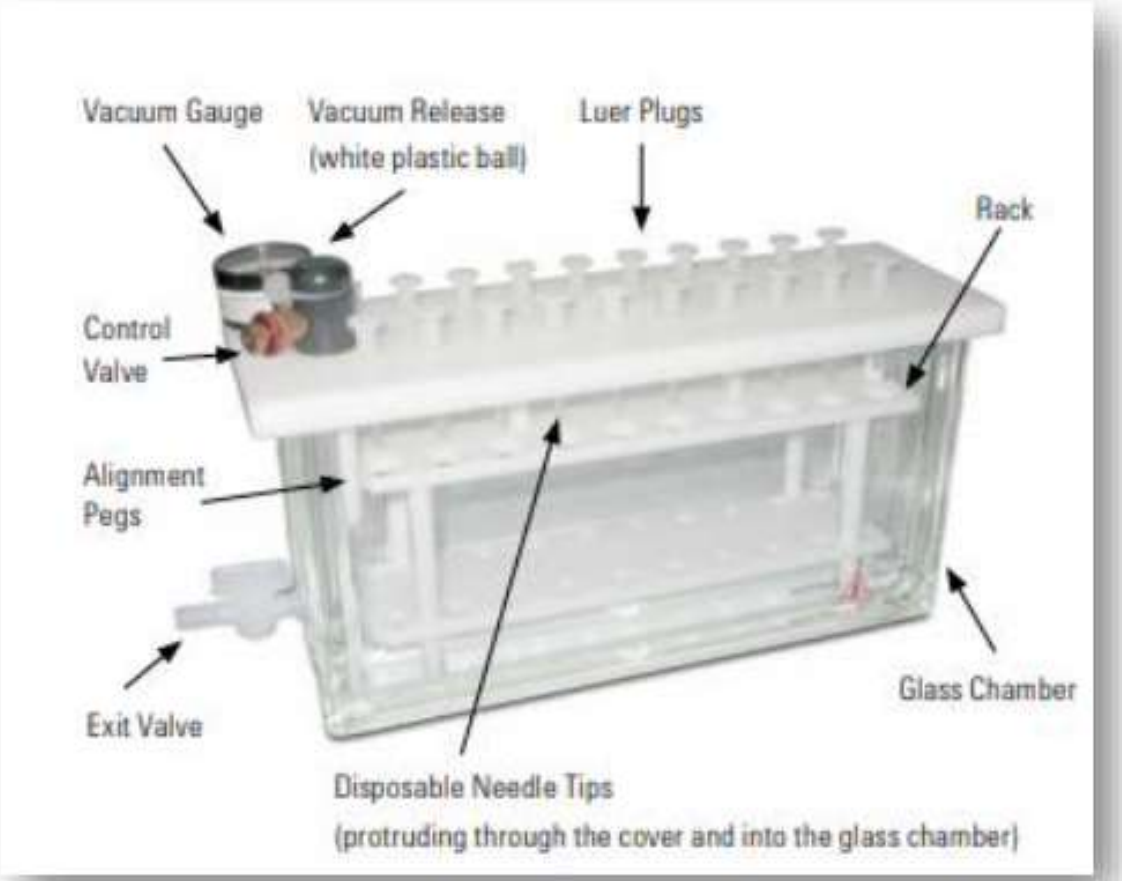
1-Extraction

2-SPE Dispersive

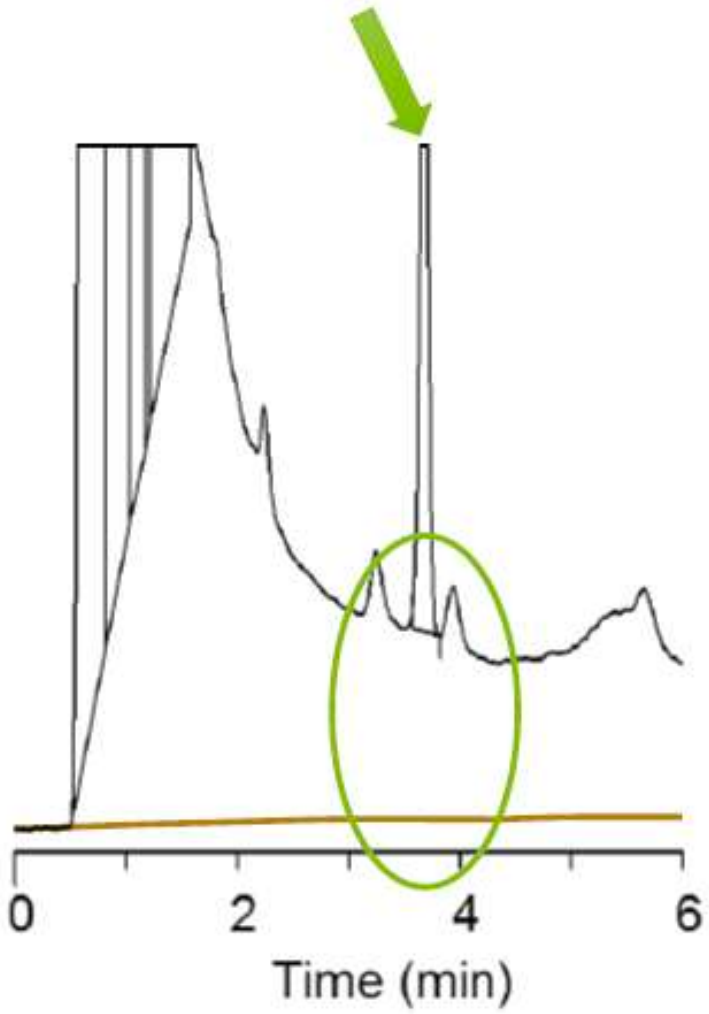
Kits to choose based on matrix to be extracted and the method followed (AOAC or EN)

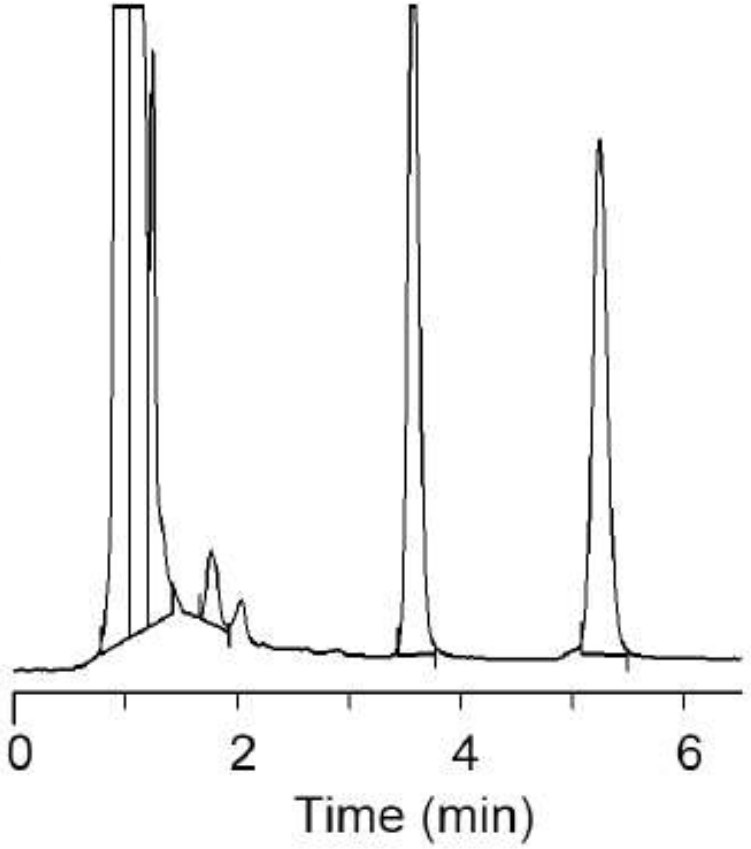
Removal of organic acids, pigments & fatty acids

How Cartridges and Plates are Processed



Improve data by removal of interfering compounds





Examples

Product and Portfolio Overview - examples

Three Products to Address Three Challenging Food Applications

Captiva EMR PFAS Food I and II

Target Customer:

- Food safety lab performing PFAS analysis in food matrices

Provides:

- Simplified Workflow
- Automation friendly cartridge
- PFAS cleanliness
- Effective matrix removal
- Improved analyte recoveries
- Supports ultralow LOQ requirements

Captiva EMR Mycotoxins

Target Customer:

- Food safety lab performing multiclass mycotoxin analysis in dry plant-origin food and animal feed

Provides:

- Simplified workflow
- Automation friendly cartridge
- Improved matrix removal compared to USDA SIDA method
- Higher recoveries compared to SPE + dSPE methods

Captiva EMR–Lipid HF

Target Customer:

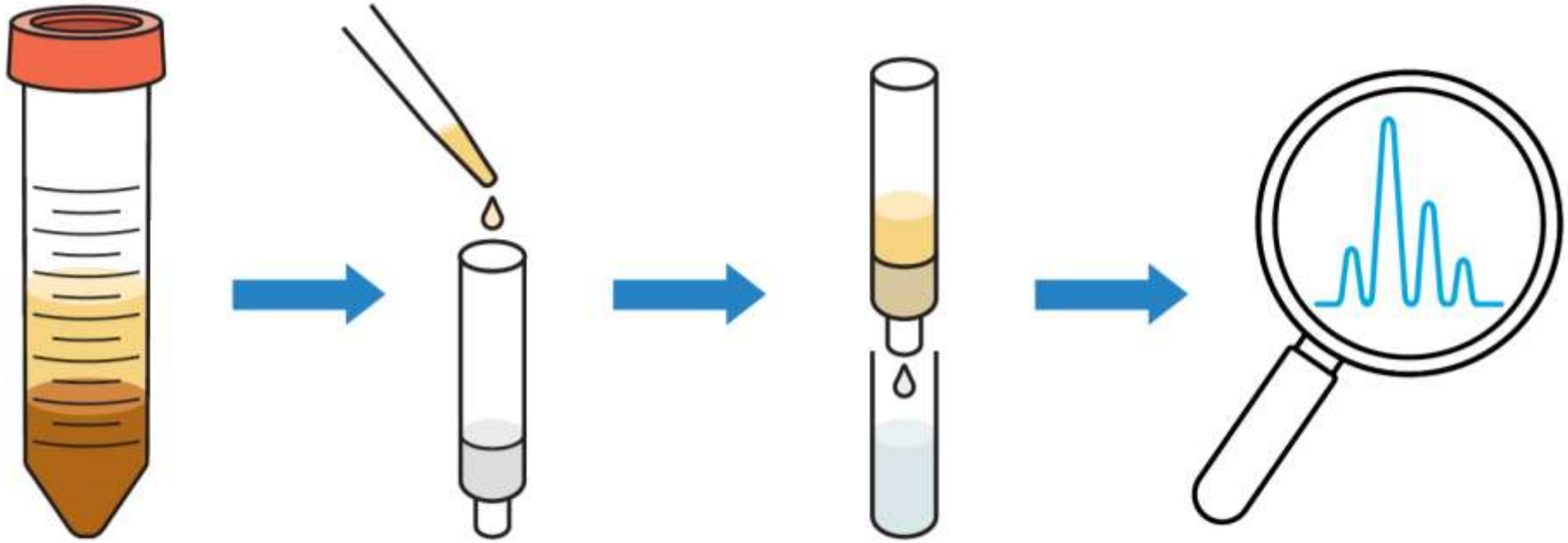
- Food safety lab performing contaminant analysis who need improved product useability for complex matrices like meat, fish, and oil

Provides:

- Carefree, walkaway gravity elution (vacuum or positive pressure is not needed)
- Equivalent recoveries/RSDs to Captiva EMR-Lipid

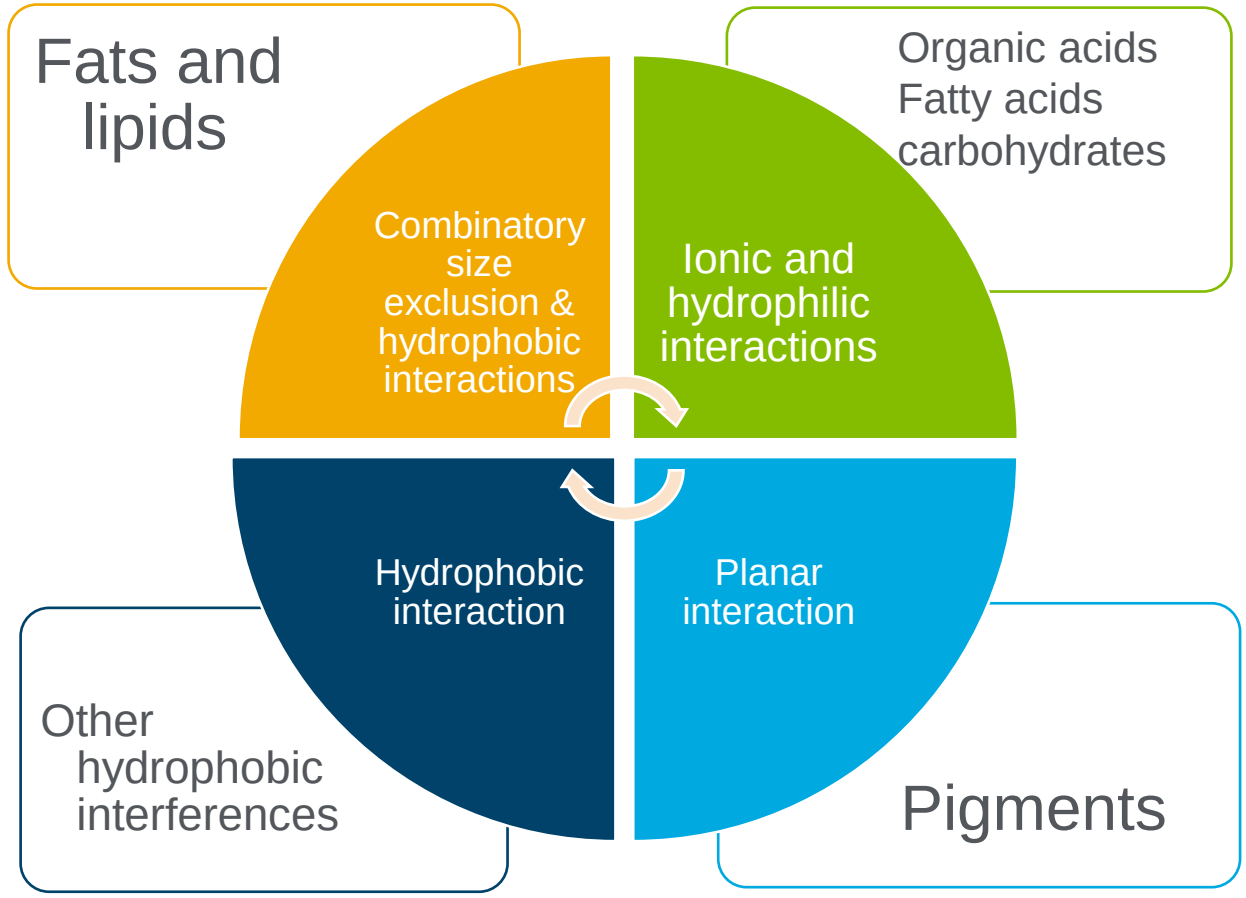
If customers are satisfied with traditional Captiva EMR-Lipid, no need to switch.

Typical EMR mixed-mode passthrough cleanup protocol

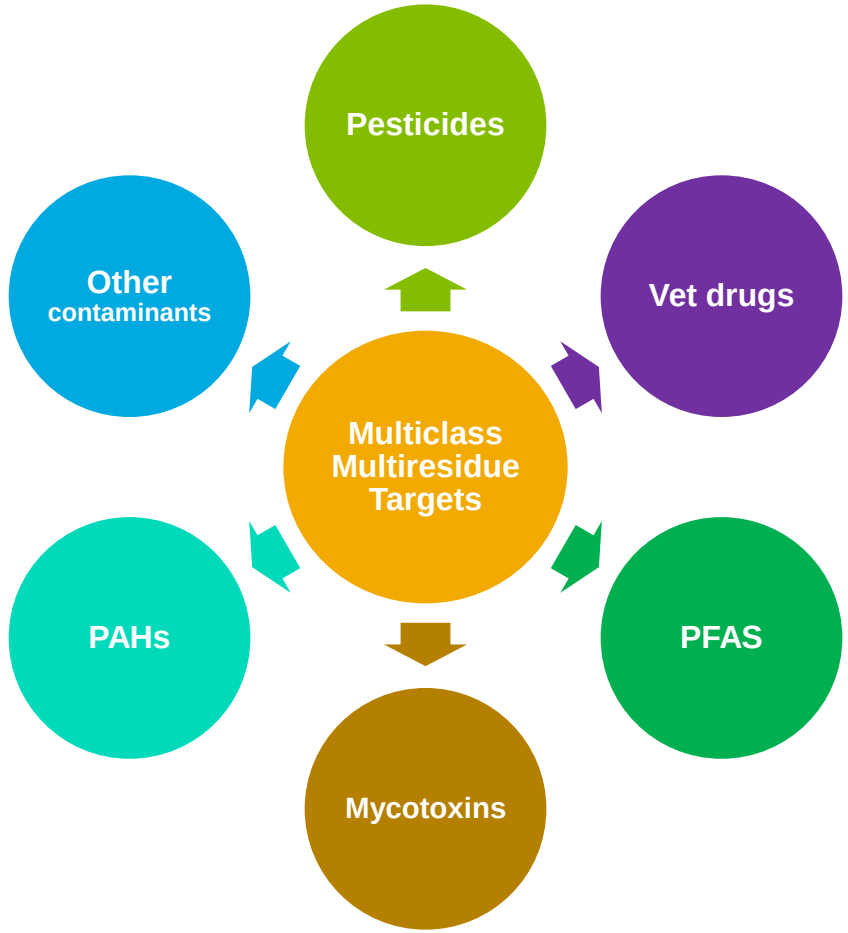


Enhanced Matrix Removal (EMR) Mixed-mode Passthrough Cleanup

Retain Matrix Co-extractives for Removal



Does Not Retain Targets for Recovery



Enhanced Matrix Removal (EMR) Mixed-mode Passthrough Cleanup

Food safety testing applications	• Multiclass, multiresidue targets • Large variety and high complexity of sample matrices
Matrix-based chemical filtration mechanism	• Retain the unwanted matrix interferences • Allow targets passthrough
Blended sorbents using optimized formula	• Agilent proprietary sorbents • Optimized formula for the best-balanced targets recovery & matrix removal
Cartridge based format	• Simplified passthrough cleanup workflow • Various formats for flexibility
Typical food sample extraction methods	• QuEChERS extraction • Solvent extraction

Captiva EMR PFAS Food I and II

Captiva EMR PFAS Food I and II

Captiva EMR PFAS Food I

- ✓ **Designed for fresh produce and processed plant-origin food samples**

- ✓ Used after QuEChERS extraction
- ✓ Removes sugars, salts, organic acids, pigments and other hydrophilic & hydrophobic interferences from food matrices

- ✓ **Two formats** provide flexibility for pricing and loading volume preferences.
  - ✓ Always recommend the 340 mg first.
  - ✓ The 680 mg may be preferred by customers who need to load more sample to collect more eluent for post-concentration.

Captiva EMR PFAS Food I,
6 mL, 340 mg
p/n 5610-2230

Captiva EMR PFAS Food I,
6 mL, 680 mg
p/n 5610-2231

Captiva EMR PFAS Food II

- ✓ **Designed for animal origin food and complex dry food samples**

- ✓ Used after QuEChERS extraction
- ✓ Removes sugars, salts, organic acids, **fats and lipids**, pigments and other hydrophobic interferences from food matrices.

- ✓ **One format** for generic use in multiple, complex matrices

Captiva EMR PFAS Food II,
6 mL, 750 mg
p/n 5610-2232

Features, Advantages, Benefits

Captiva EMR PFAS Food

Captiva EMR PFAS Food I: For fresh produce and other fresh processed food matrices

Captiva EMR PFAS Food II: For animal origin food, dry plant origin food, and other complex food matrices

Features	Advantages	Benefits
Simple EMR Passthrough clean-up methodology	• Simplified procedure • Less steps – this also means less risk for contamination • Less training/expertise needed	• Time savings • Labor savings • $$ savings • Employee satisfaction
Unique sorbents and formulations which can accommodate a variety of food types	• Flexibility Choose which product works for a particular matrix, but with a universal method approach • One vendor for all extractions	• Ease of Procurement
High Volume Recovery	• Allows easier sample concentration (10x fold or higher) which is critical for low-level PFAS quantitation • Simplifies data analysis	• Less re-runs • Less instrument downtime • Time savings • Cost savings
Matrix Removal Efficiency	• Improved data quality • Less ion suppression/matrix effects • Cleaner systems	• Instrument uptime • Time Savings • Lab Productivity
Certificate of Analysis includes PFAS cleanliness specification	• Mitigation of Risk • Confidence in product • Reduced lot to lot verification	• Time savings • $$ savings • Ease of mind

Regulation Landscape

Regulation, Method, Recommendation	# of PFAS Analytes	Food Matrix Tested
EU 2023/915 *	4	egg, seafood, fish meat and meat, edible offal
EU 2022/1431	4 + 24	egg, seafood, fish meat and meat, edible offal, produce, food for infants and young children, fish oil, milk
EURL POPS	4	egg, seafood, fish meat and meat, edible offal, produce, food for infants and young children, fish oil, milk, feed
AOAC SMPR 2023.003	30	egg, seafood, fish meat and meat, edible offal, produce, food for infants and young children, fish oil, milk, feed dairy and plant-based protein powders, coffee
FDA Method C-010.03	30	egg, lettuce, chocolate milk, salmon, bread,, clam, blueberry, feed
USDA CLG - PFAS 2.04	16	bovine, porcine, poultry, and *Siluriformes* muscle, bovine plasma
China GB5009.253	2	animal-derived food
US Maine	1	milk, beef, fish tissue

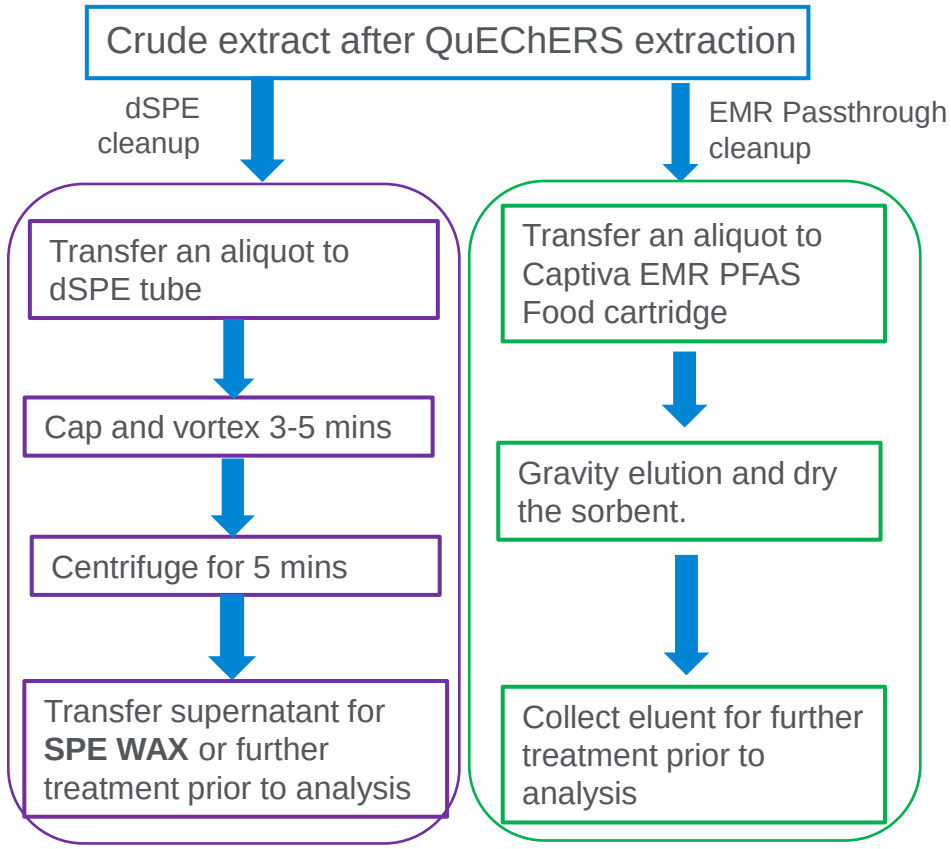
* *enforced regulation*

Competitive Landscape

Captiva EMR PFAS Food

Most common methodology utilizes
QuEChERS extraction + QuEChERS dSPE + SPE

Step #	Products Required (Traditional Methdology)
1	QuEChERS extraction
2	QuEChERS dSPE cleanup
3 (optional)	SPE – WAX chemistry

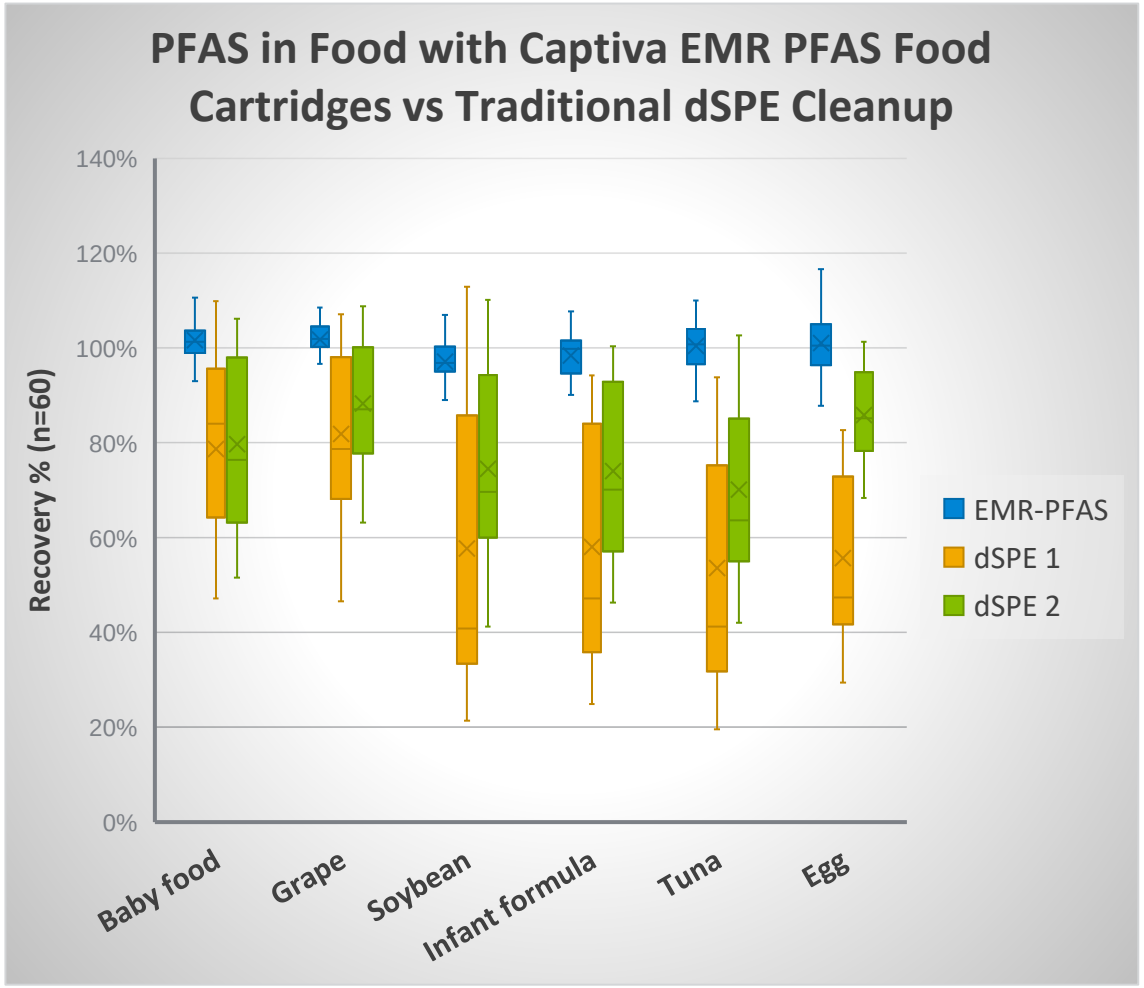


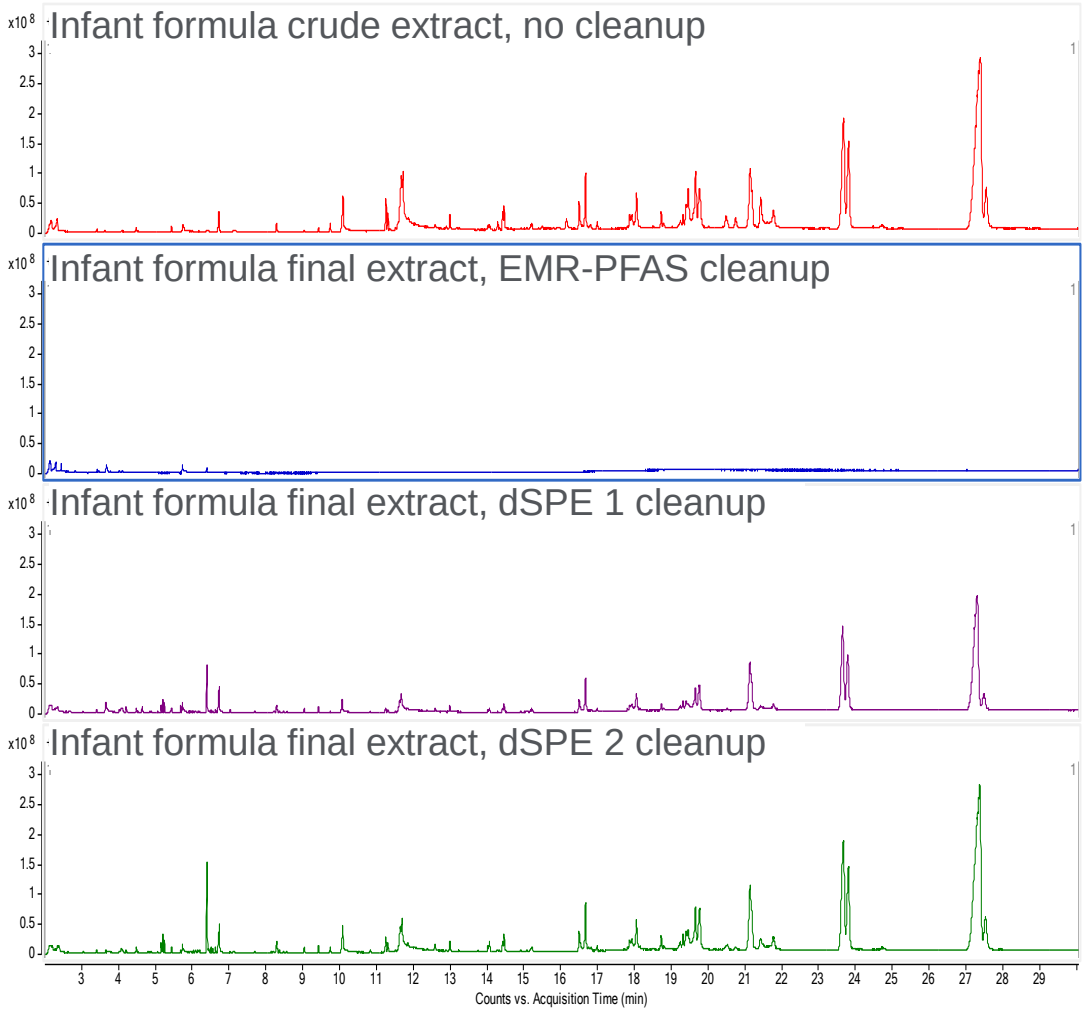
Sample volume recovery: ~ 50%

Sample volume recovery: >90%

Captiva EMR PFAS Food v. traditional dSPE

Improved Recovery + Improved Matrix Removal





Product Selection

Captiva EMR PFAS Food

Type I

Perfect Choice for:

- Fruits
- Vegetables
- Baby food
- Beverages
- Juices

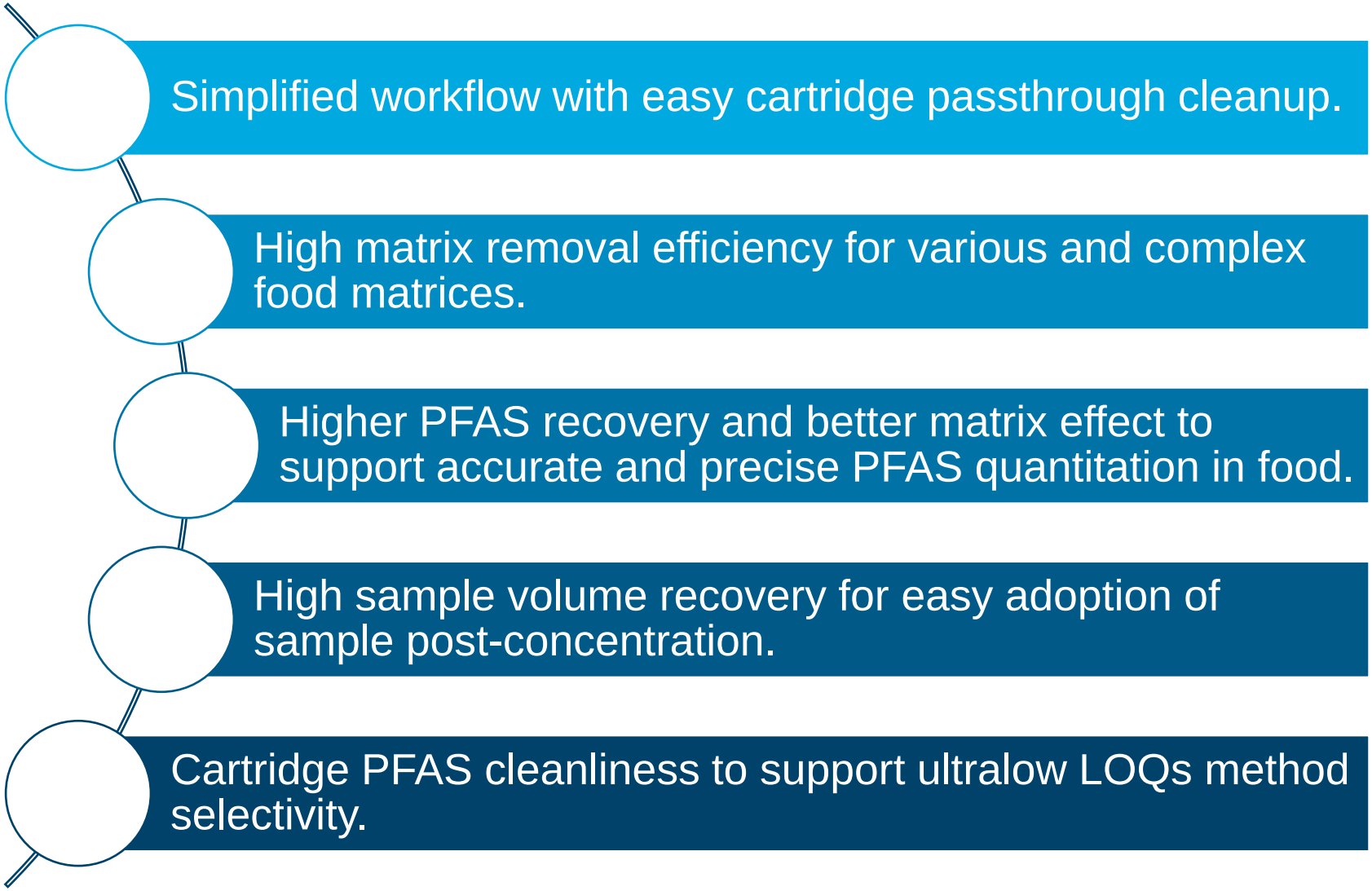
Type II

Perfect Choice for:

- Milk
- Egg
- Infant Formula
- Meat
- Fish and Seafood
- Animal Feed
- Edible Offal
- Edible Oils

Key Takeaways

Captiva EMR PFAS Food



Captiva EMR Mycotoxins

Captiva EMR Mycotoxins cartridges

- Specifically designed for Mycotoxin analysis in food and feed samples
- Blended sorbents with optimized formula providing balanced mycotoxins recovery and matrix removal
- Designed for dry plant-origin feed and food
- Used after QuEChERS extraction
- Removes sugars, salts, fat and lipids, organic acids, pigments and other hydrophilic & hydrophobic interferences from food matrix
- Two formats provide flexibility for pricing and loading volume preferences
  - ✓ Always recommend the 3 mL cartridge first.
  - ✓ The 6 mL cartridge may be preferred by customers who need to load more sample to collect more eluent for post-concentration.

Captiva EMR Mycotoxins
3 mL
p/n 5610-2233

Captiva EMR Mycotoxins
6 mL
p/n 5610-2234

Features, Advantages, Benefits

Captiva EMR Mycotoxins

Captiva EMR Mycotoxins: 3 mL cartridges, 300 mg (Recommend First)

Captiva EMR Mycotoxins: 6 mL cartridges, 600 mg

Features	Advantages	Benefits
Simple EMR Passthrough clean-up methodology	• Simplified procedure • Less training/expertise needed	• Time savings • Labor savings • $$ savings • Employee satisfaction
Matrix Removal Efficiency	• Improved data quality • Less ion suppression/matrix effects • Cleaner systems	• Instrument uptime • Time Savings • Lab Productivity • Cost savings from instrument maintenance/supplies
Improved multiclass mycotoxin recovery	• No need to have different methods or products for multiclass analysis • Improved data quality	• Less re-runs • Ease of procurement

How to choose between Captiva EMR Mycotoxins and Captiva EMR-Lipid

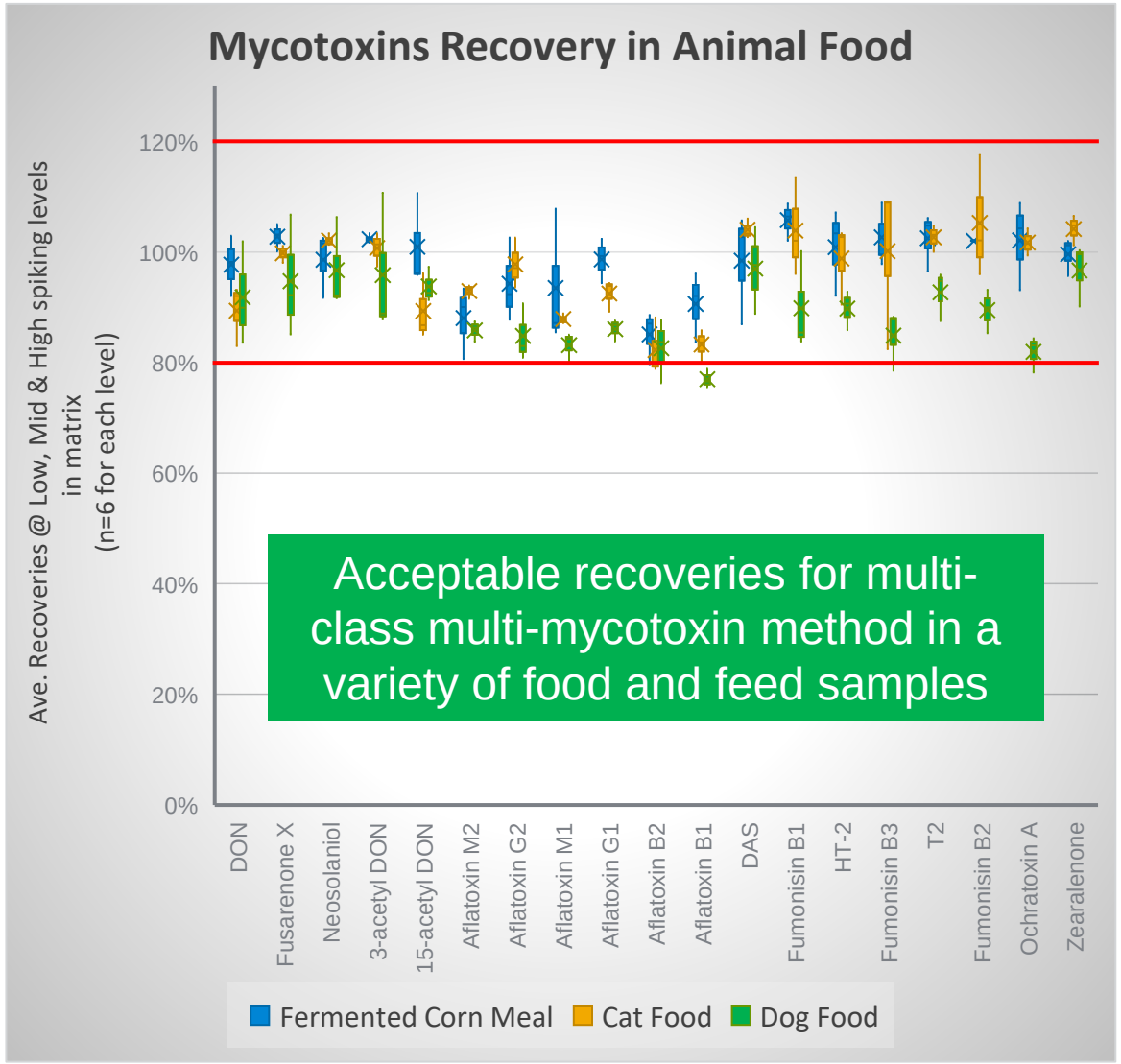
Captiva EMR-Lipid or Captiva EMR-Lipid HF

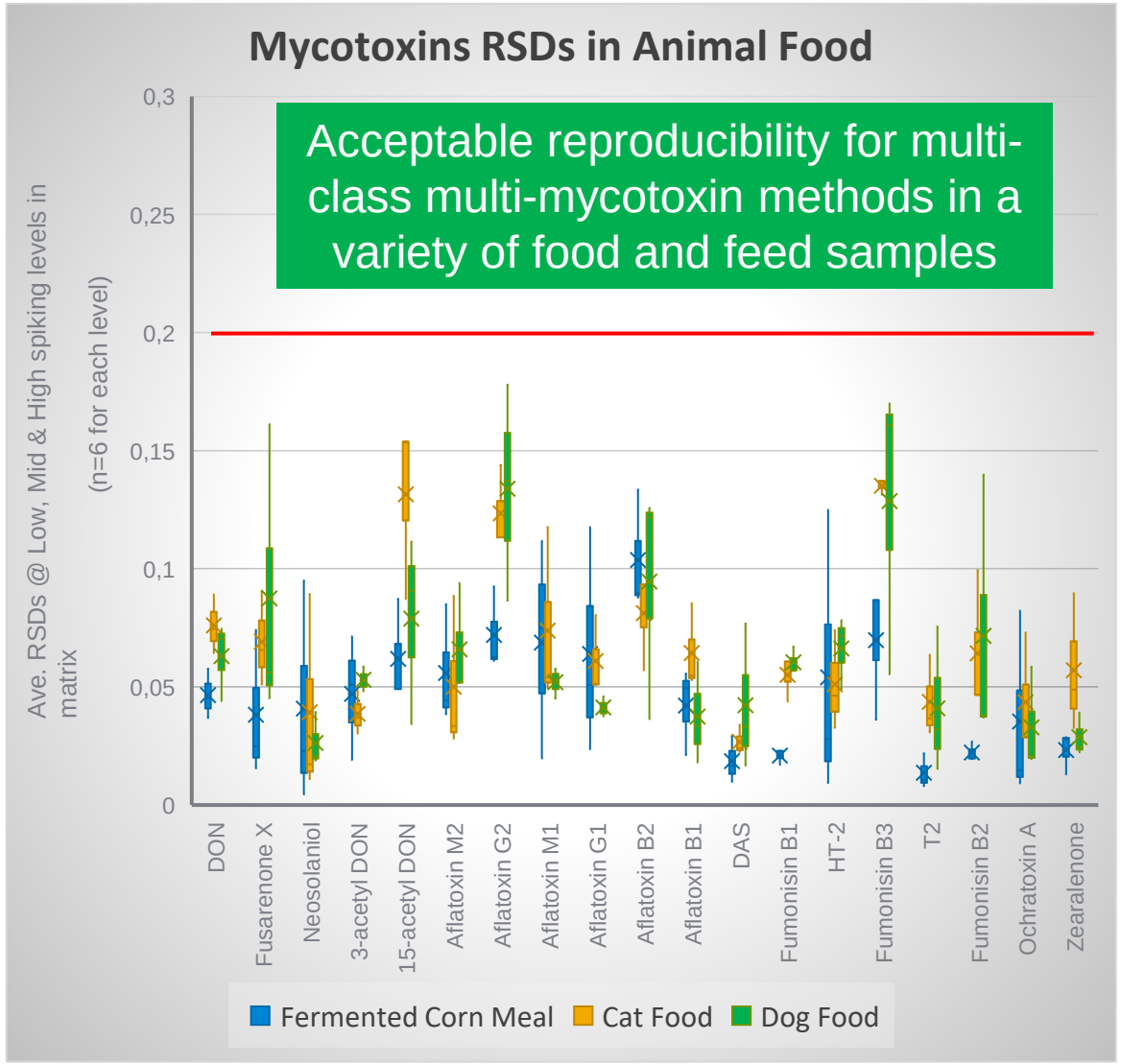
- Recommended for:
  - Pure fatty matrices
    - Cheese
    - Dairy
    - Infant Formula
- Not recommended for :
  - Complex matrices that contain a variety of interferences (pigment etc.)

Captiva EMR Mycotoxins

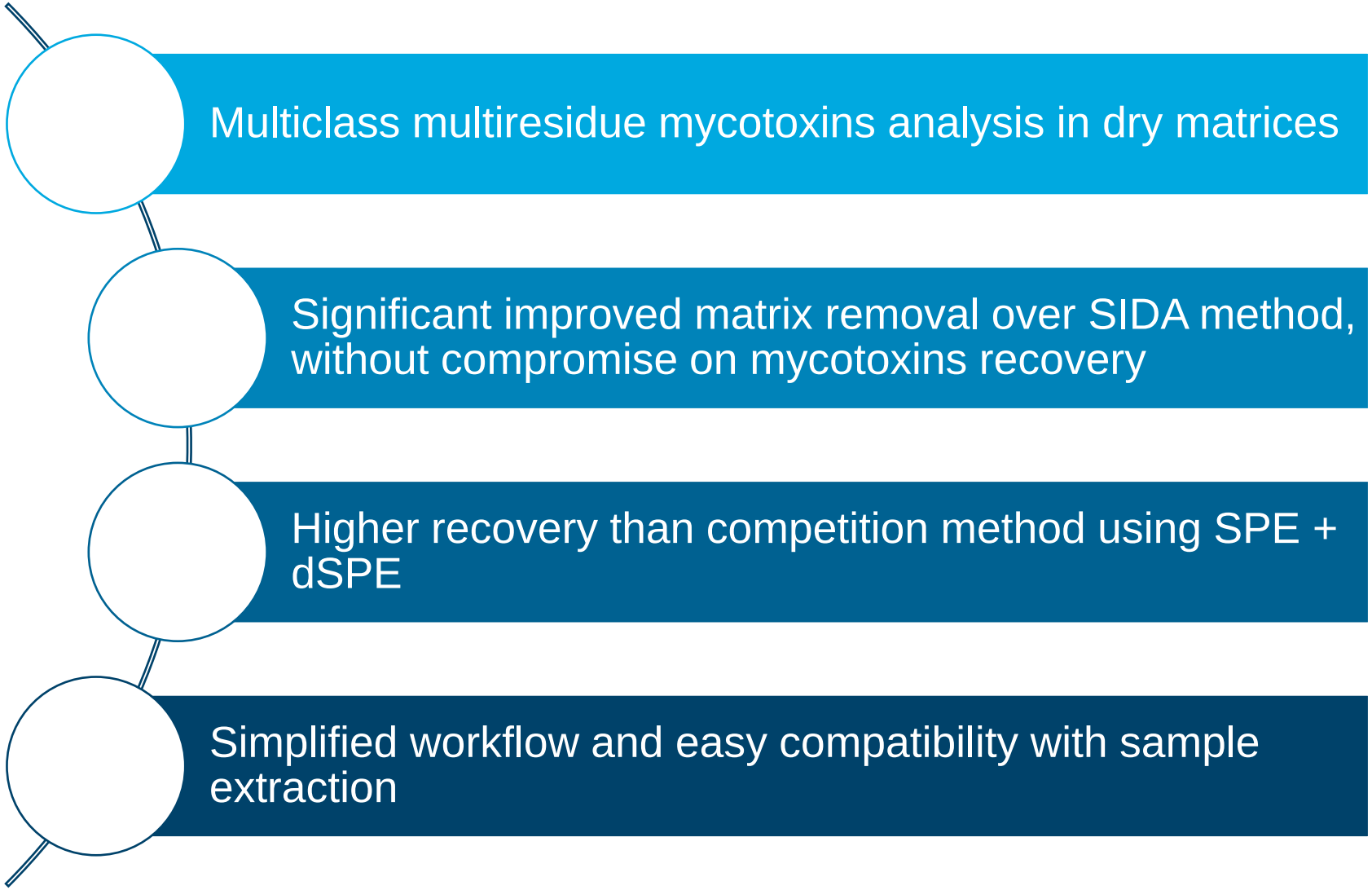
- Recommended for:
  - Pet Food
  - Animal Feed
  - Grain
  - Complex samples that contain a variety of interferences (pigment etc.)

Method Performance Evaluation – Recovery and Reproducibility





Captiva EMR Mycotoxins Product Features and Differentiations



Captiva EMR-Lipid HF

Captiva EMR-Lipid HF cartridges

- **Improved useability compared to Captiva EMR-Lipid for complex matrices like meat, fish, oil**
- **Walkaway, carefree gravity elution**
- **Position if laboratory equipment, like a vacuum manifold or PPM, is unavailable**
- Equivalent recoveries and matrix removal as Captiva EMR-Lipid cartridges
- Suitable for animal-origin fatty foods, oils etc.
- Used after solvent extraction or QuEChERS extraction, depending on applications
- Removes fat, lipids, and some other hydrophobic interferences from fatty food matrix
- Two formats provide flexible sample crude extract loading volume preferences, same as current Captiva EMR-Lipid cartridges

Captiva EMR-Lipid HF
3 mL
p/n 5610-2235

Captiva EMR-Lipid HF
6 mL
p/n 5610-2236

Regional Focus: Gr. China

Features, Advantages, Benefits

Captiva EMR-Lipid HF

Captiva EMR-Lipid HF: 3 mL cartridges, 300 mg

Captiva EMR-Lipid HF: 6 mL cartridges, 600 mg

Features	Advantages	Benefits
Simple EMR Passthrough clean-up methodology	• Simplified procedure • Less training/expertise needed	• Time savings • Labor savings • $$ savings • Employee satisfaction
Matrix Removal Efficiency	• Improved data quality • Less ion suppression/matrix effects • Cleaner systems	• Instrument uptime • Time Savings • Lab Productivity
Gravity Flow Elution	• Walkaway, carefree elution • No need for a vacuum or positive pressure manifold • No babysitting cartridges	• Lab productivity • Employee satisfaction • Time Savings

Please Remember

Captiva EMR-Lipid ≠ Captiva EMR

Use the proper nomenclature

Competitive Landscape

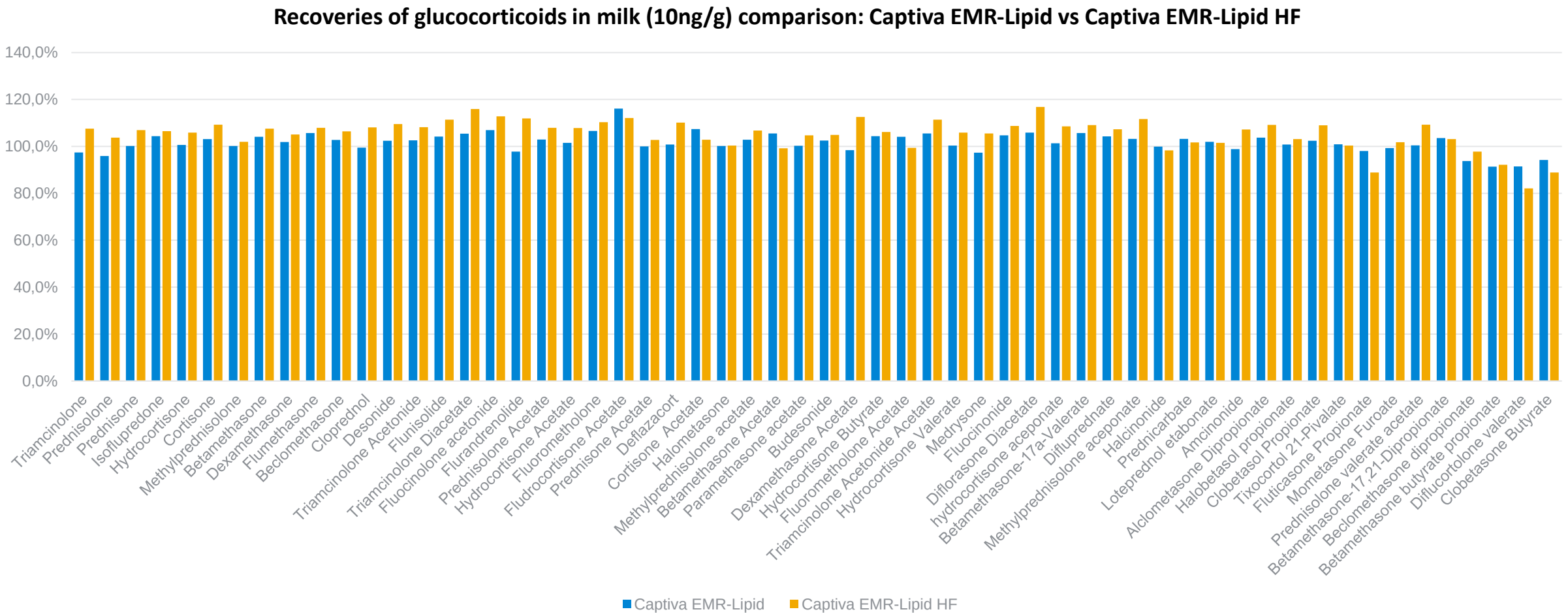
Captiva EMR-Lipid HF

Sample matrix	Captiva EMR-Lipid HF	Commercially Available Cartridge #1	Commercially Available Cartridge #2
Beef	18 - 22 min	45 - 47 min	38 - 46 min
Pork	20 - 24 min	41- 45 min	32 - 47 min
Bovine kidney	19 - 24 min	48 - 51 min	31 - 54 min
Salmon	15 - 20 min	36 - 40 min	19 - 26 min
Egg	11 - 15 min	23 - 25 min	34 - 37 min
Infant formula	12 -14 min	15 - 17 min	10 - 12 min
Chocolate	12 - 14 min	30 - 73 min	20 - 74 min
Peanut oil	13 - 17 min	19 - 22 min	74 - 76 min
Pumpkin seed oil	20 - 25 min	23 - 25 min	> 90 min

Elution times based on gravity elution

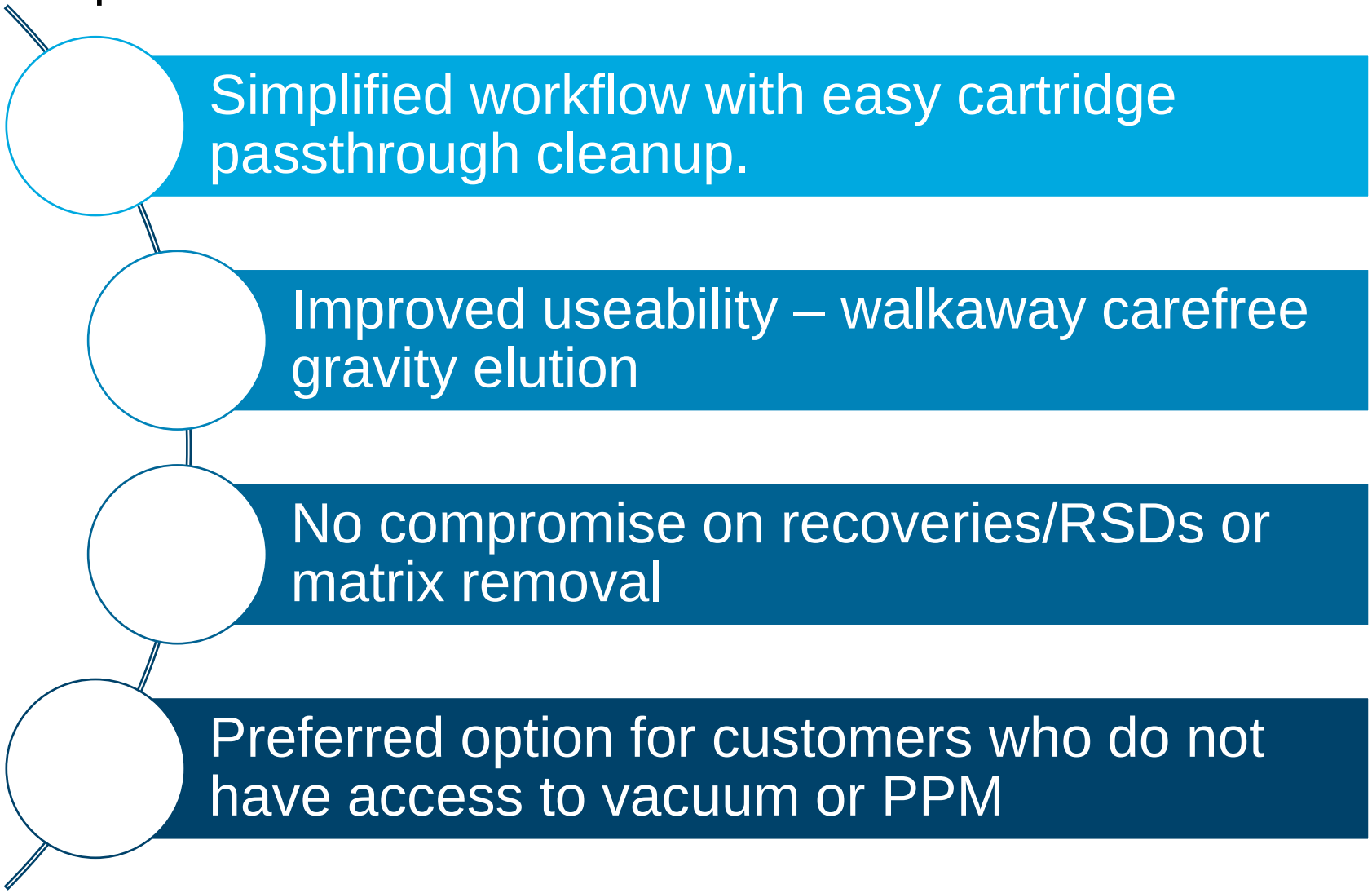
Captiva EMR-Lipid v. Captiva EMR-Lipid HF

Equivalent recoveries with both products



Key Takeaways

Captiva EMR-Lipid HF



Captiva EMR Solutions for Food Safety Analysis

PFAS in food

- Captiva EMR PFAS Food I
- Captiva EMR PFAS Food II

Pesticides in food

- Captiva EMR w/ Carbon S
- Captiva EMR-Lipid HF
- Captiva EMR-Lipid

Vet Drugs in food

- Captiva EMR-Lipid HF
- Captiva EMR-Lipid

Mycotoxins in feed and food

- Captiva EMR Mycotoxins
- Captiva EMR-Lipid
- Captiva EMR-Lipid HF

PAHs in food

- Captiva EMR-LPD
- Captiva EMR-Lipid
- Captiva EMR-Lipid HF

Who are the end users?

- ✓ Food Safety and Animal Feed Laboratories
- ✓ Contract Testing Laboratories
- ✓ Analyzing:
  - ✓ PFAS
  - ✓ Mycotoxins
  - ✓ Vet Drugs
  - ✓ Pesticides

Marketing Collateral and Resources

PFAS in Food and Feed Analysis
Brochure: 5994-7443EN

Available now

- **Product Pages:**
  - ✓ NEW Captiva EMR PFAS Food
  - ✓ NEW Captiva EMR Mycotoxins
  - ✓ UPDATED Captiva EMR-Lipid and EMR-Lipid HF

Application Notes

Pub Number	Application Title	Hero SPP Products
5994-7366EN	Determination of 30 Per- and Polyfluoroalkyl Substances in Infant Formula, Milk and Eggs	Captiva EMR PFAS Food II (PN: 5610-2232)
5994-7367EN	Determination of 30 Per and Polyfluoroalkyl Substances (PFAS) in Baby Food	Captiva EMR PFAS Food I (PN: 5610-2230)
5994-7368EN	Determination of 30 Per- and Polyfluoroalkyl Substances in Beef, Tuna and Shrimp	Captiva EMR PFAS Food II (PN: 5610-2232)
5994-7369EN	Determination of 30 Per and Polyfluoroalkyl Substances in Fruits, Vegetables and Juices	Captiva EMR PFAS Food I (PN: 5610-2230)
5994-7370EN	Determination of 30 Per- and Polyfluoroalkyl Substances in Bovine Kidney	Captiva EMR PFAS Food II (PN: 5610-2232)
5994-7371EN	Determination of 30 Per- and Polyfluoroalkyl Substances in Dry Soybeans	Captiva EMR PFAS Food II (PN: 5610-2232)
5994-7372EN	Determination of 58 Glucocorticoids in Milk	Captiva EMR-Lipid HF (PN: 2610-2236)
5994-7373EN	Determination of Multiclass Multiresidue Mycotoxins in Dry Corn Kernels and Soybeans	Captiva EMR Mycotoxins, 3 mL (PN: 5610-2233)
5994-7471EN	Determination of Multiclass Multiresidue Mycotoxins in Pet Food	Captiva EMR Mycotoxins, 6 mL (PN: 5610-2234)


Application Note
Food & Beverage Testing
Agilent
Determination of 30 Per- and Polyfluoroalkyl Substances (PFAS) in Baby Food
Using Captiva EMR PFAS Food I passthrough cleanup and LC/MS/MS detection
Authors
Abstract

Agilent

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