THOMSON INSTRUMENT COMPANY Solutions ™ At Work

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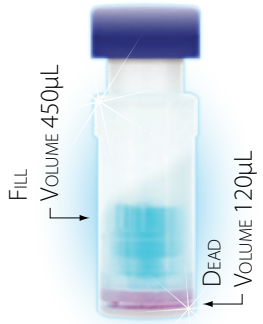
Filter Vial CATALOG APPLICATION NOTES

Standard Filter Vial Patented



Standard For Most Samples

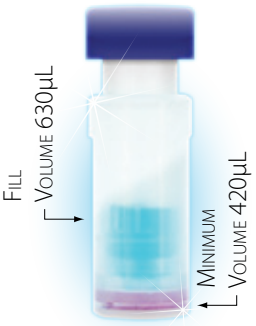
nano Filter Vial Patented

When Every µL Counts

eXtreme/FV Patented

For Particulate Laden Samples

eXtractor3D/FV Patented



Multi-Mode Filtration

Filter Vial | nano Filter Vial | eXtreme/FV | eXtractor3D/FV

THOMSON MADE IN USA

Local Distributor

Original release 2014
version 1.5.2

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Website htslabs.com

Filter Vials have the following patents:
US 7,790,117, 8,211,384, 8,383,006, 8,322,539, 8,728,329, EU Patent 2268252, EP2268252B1, Japanese Patent 5491489, Singapore Patent 164909, Worldwide Patents Pending

For up-to-date patent and trademark information please see htslabs.com.

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Table of Contents

Filter Vial Overview

Thomson SINGLE StEP® Filter Vials (patented) are a single system which replaces HPLC Vials, HPLC Caps, Syringes, & Syringe Filters for the filtration of samples. In 15 seconds, Thomson Filter Vials allow for sample preparation of unfiltered samples to filtered samples in an autosampler-ready vial. The Filter Vial consists of two parts: a filter vial shell and a plunger which includes a filter on one end and a vial cap on the other end. Samples are filtered by pipetting the sample into the filter vial shell, inserting the plunger into the shell, and then pushing the plunger into the shell.

Thomson Filter Vials simplify general filtration by replacing syringes & syringe filters, microcentrifuge spin columns, and/or liquid-liquid extractions.

Applications for Thomson Filter Vials include all sample types to be analyzed by HPLC, UHPLC, LC-MS, and GC-MS.

Filter Vial

Max Fill Vol.	*450 µL*
Dead Vol.	*120 µL*

Standard Filter Vials (120µL Dead Volume)

Thomson Standard Filter Vials(patented) can be used for samples containing less than 10% solid particulates. The filter vial consists of two parts: a filter vial shell and a plunger which includes a single layer filter on one end and a vial cap on the other end.

Applications for Thomson Standard Filter Vials include filtration of catalysts from organic and medicinal chemistry synthesis reactions, saccharide analysis in corn syrup, and in-vial protein precipitation.

eXtreme|FV®

Max Fill Vol.	*450 µL*
Dead Vol.	*120 µL*

eXtreme|FV® (Multi-Layered Filtration)

Thomson eXtreme|FV® (patented) offer multi-layer filtration for viscous samples and samples containing up to 30% solid particulates. The filter vial consists of two parts: a filter vial shell and a plunger which includes a multi-layer filter on one end and a vial cap on the other end.

eXtreme|FV® allows for compounds to be separated from the matrix, which results in both a higher signal-to-noise ratio and peaks that are more differentiated.

Prior to the introduction of the eXtreme|FV®, many samples containing high levels of particulates were "filtered" by using an SPE step in the method. This method is easily amendable: simply replace the SPE step with a rapid and lower cost eXtreme|FV®step.

Applications for Thomson eXtreme|FV® include filtration of cell and cell debris from cell culture; pesticide analysis in food, tissue, soil, and water; and toxicology analysis in blood and urine.

nano|Filter Vial®

Max Fill Vol.	*450 µL*
Min Fill Vol.	*10 µL (for 2 µL injection)*

nano|Filter Vials® (10µL Minimum Volume)

Thomson nano|Filter Vials® offer a very low dead volume, allowing one to filter as little as 10µL of sample with enough remaining filtrate to make a 2µL injection. The filter vial consists of two parts: a filter vial shell with mating bottom surface and a plunger which includes a filter on one end and a screw cap vial on the other end.

Applications include in-vial evaporation; re-suspension for sample concentration and buffer/solvent change; and analysis of enzymes, peptides, DNA, RNA, synthesis reaction intermediates, finished products, saliva, and samples in low volumes.

Max Fill Vol.	*630 µL*
Min Fill Vol.	*420 µL*

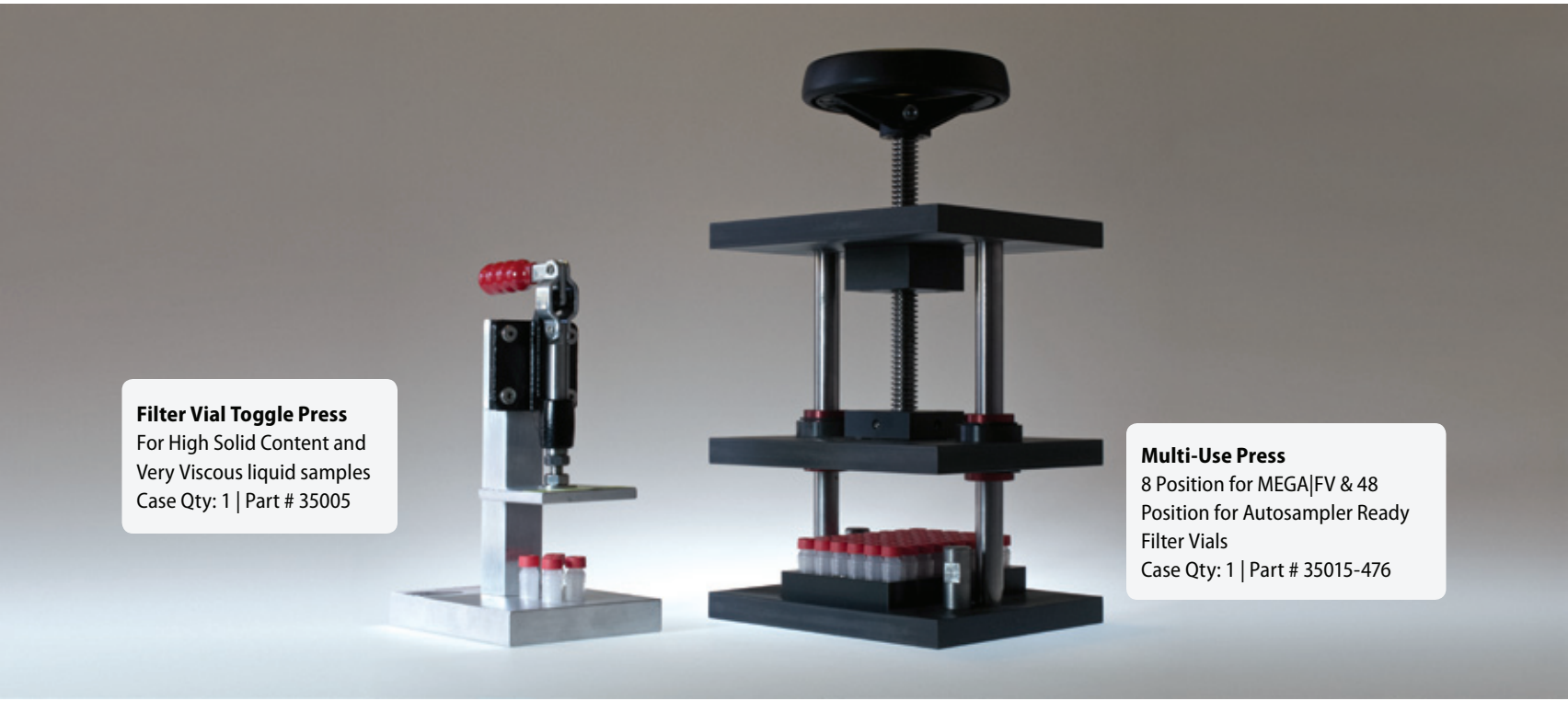
eXtractor3D|FV® (Multi-Mode Filtration)

Thomson eXtractor3D|FV® Filter Vials (patented) offer filtration with increased volume enabling multiple extraction techniques with different resins/sorbents or solids/large particulates (greater than 35%) to autosampler ready vials. eXtractor3D|FV® is a product uniquely designed for the addition of resins/sorbents, QuEChERS dispersive salts, pills, or special resins in the standard autosampler ready vial. The filter vial consists of two parts: a filter vial shell and a plunger which includes a multi-layer filter on one end and a screw cap on the other end.

Large solids/large particulates can be placed within the eXtractor 3D® where multiple extraction techniques occur. Prior to the introduction of the eXtractor3D|FV®, samples required multiple steps using SPE, or other methods to remove interfering analytes and co-eluting compounds. SPE or Quechers can now be completed with multi-depth filtration without risk of solids compromising the autosampler. Pills and other large solids can be broken down for complete testing using the eXtractor3D|FV®. eXtractor3D|FV® allows for compounds to be separated from the matrix with the addition of resins/sorbents, resulting in both a higher signal-to-noise ratio and peaks that are more differentiated.

Accessories

The Thomson Filter Vial Press enables high solid content and viscous liquids to be easily filtered through vials. Some fermentation cultures that reach over 100 OD or particulate laden samples may require the toggle press.



Filter Vial Toggle Press
For High Solid Content and Very Viscous liquid samples
Case Qty: 1 | Part # 35005

Multi-Use Press
8 Position for MEGA|FV & 48 Position for Autosampler Ready Filter Vials
Case Qty: 1 | Part # 35015-476

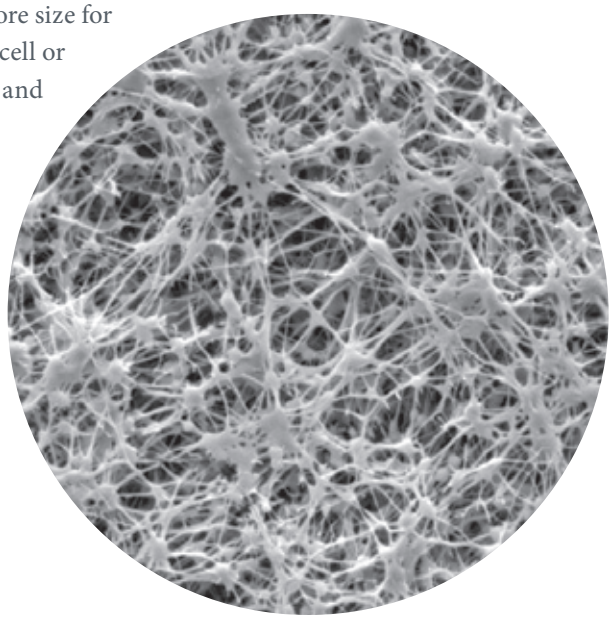
Filter Vial Membrane Material

The recommended membrane for sample filtration is based on the percentage of organic solvent in the sample and the amount of protein binding.

	Aqueous	Organic	Low Protein Binding
PTFE		✓	
PVDF	✓	✓	✓
Nylon	✓	✓	
PES	✓	✓	✓

Filter Vial Membrane Pore Size

The recommended membrane pore size for sample filtration is based on the cell or cell debris content of the sample and the particle size of the packing material in the chromatography column used to analyze the sample. If the sample contains cells or cellular debris, then a 0.2µm pore size membrane is recommended to maintain system sterility.



	Cells or Cell Debris in Sample	Chromatography Column Particle Size <3m	Chromatography Column Particle Size >3m
0.2µm Pore Size	●	●	
0.45µm Pore Size			●

Application Selection

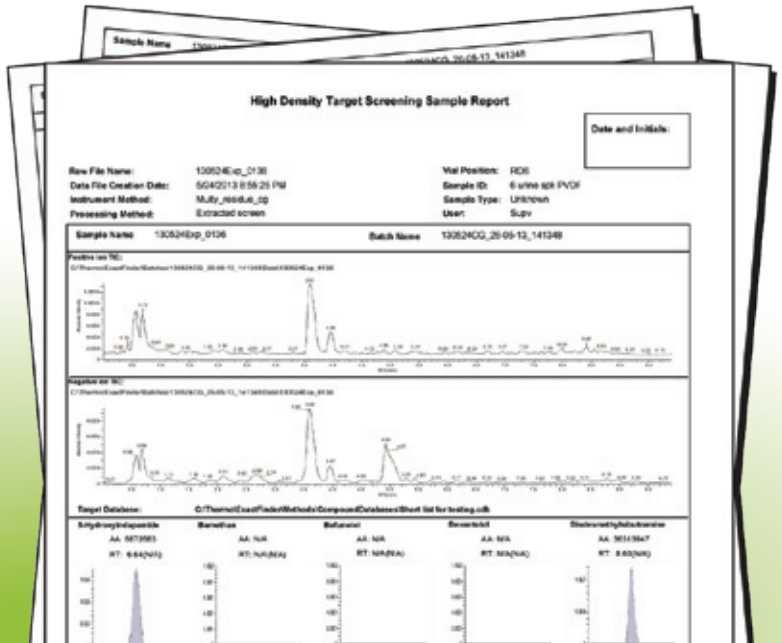
See our Technical Library for more Applications
htslabs.com

	nano|FV™	nano|FV™ Pre-Slit Cap	Standard Filter Vial	Low Evap|Filter Vial	eXtreme|FV®	eXtractor3D|FV®
10µL-100µL	●	●				
120µL-450µL			●	●	●	
UPLC Compatible	●	●	●	●	●	●
GCMS Compatible	●			●		●
≤ 30% Solids					●	●
Viscous		●			●	●
Replacement for SPE					●	●
General Liquids < 10% solids	●	●	●	●	●	●
Cell Fermentation	●	●	●	●	●	●
Particulate Removal	●	●	●	●	●	●
Automation Compatible	●	●	●	●	●	●
Small Molecules	●	●	●	●	●	●
Food & Supplements			●	●	●	●
Toxicology	●	●	●	●	●	●
Pesticides	●	●	●	●	●	●
Environmental	●	●	●	●	●	●
Sterile Testing	●					

Application & General Information

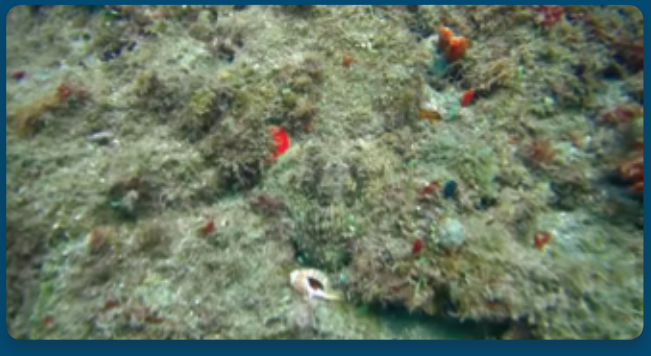
- General Information
- Application notes
- Published Works
- FAQ's
- Videos

htslabs.com/techcenter/techlibrary.php



Reduce Your Signal-to-Noise Ratio

For more targeted & accurate peaks



Matrix Effects & Ion Suppression:
Hidden gems are not obvious in LCMS

Remove the Matrix:
All of a sudden a Glimpse of the Rare Creature at the bottom of the Sea

Strong Signal; Noise Lessened:
Blue Creature now appears at the bottom

Don't Lose your Elusive Octopus:
Because the Matrix causes High background Noise

Confirm Correctly

Octopus images courtesy Jukin Video

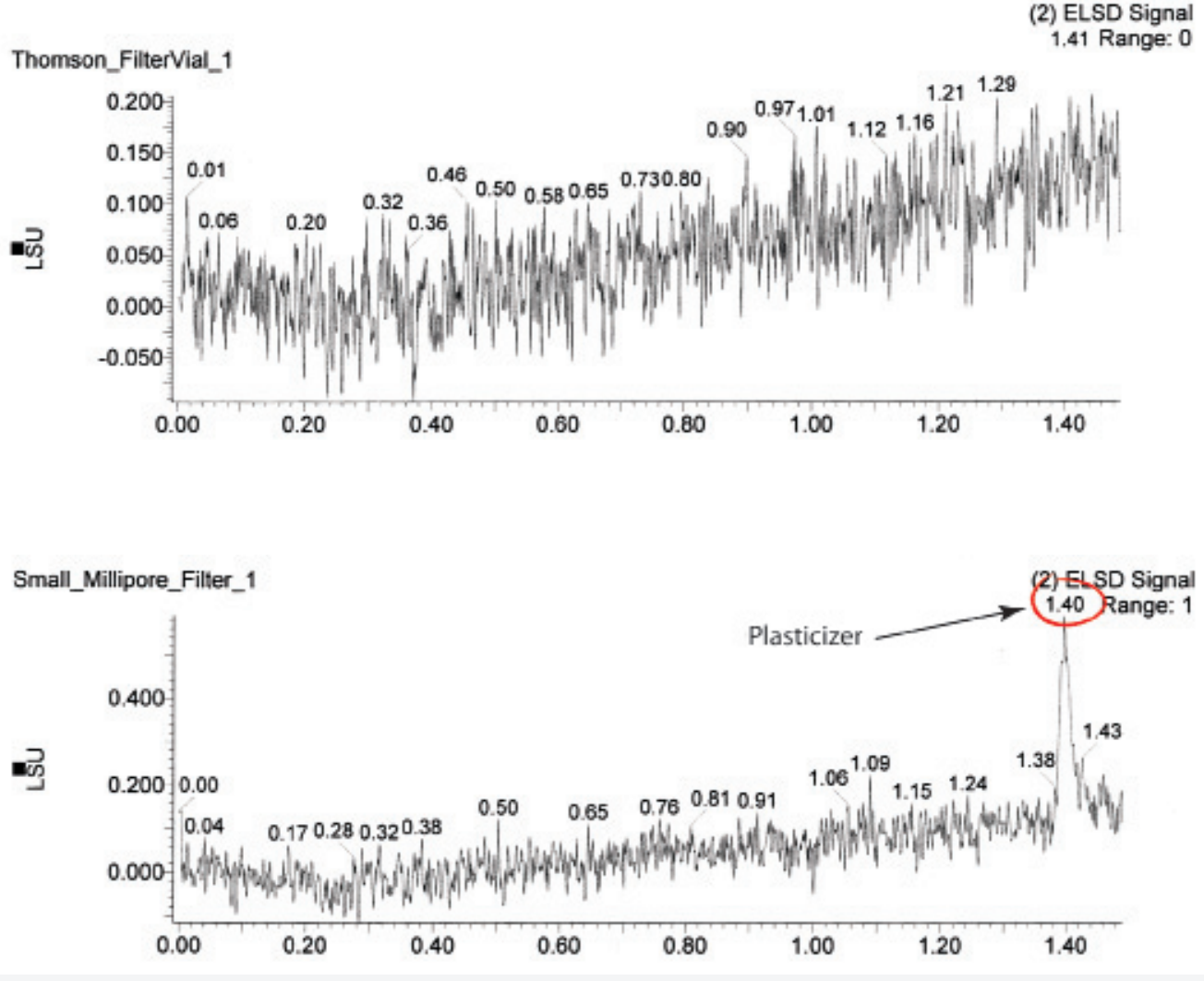
Filter Vial Plasticizer Content

Compared to Syringe Filters

Thomson Filter Vials are manufactured without the use of plasticizers or mold release agents, making them LC/MS clean. Testing with ELSD, PDA, and MS detection by Takeda Pharmaceutical showed no leaching from Thomson Standard Filter Vial with a 0.45um, PTFE membrane compared to signicant leaching from Millipore Millex-FH® Filter, 0.45M, hydrophobic PTFE, 4mm. Method: A. Water B. ACN 45-90% with .05% TFA Ballistic Gradient over 1.4 minutes using Waters® Acquity® UPLC Thomson Filter Vial (patented) Part # 35540-500 Filter Vial 0.45M hydrophobic PTFE, w/ Pre-Slit Cap Millipore Syringe Filter Part #:SLFHR04NL Millex-FH® Filter, 0.45M, hydrophobic PTFE, 4mm, non-sterile

Plasticizers

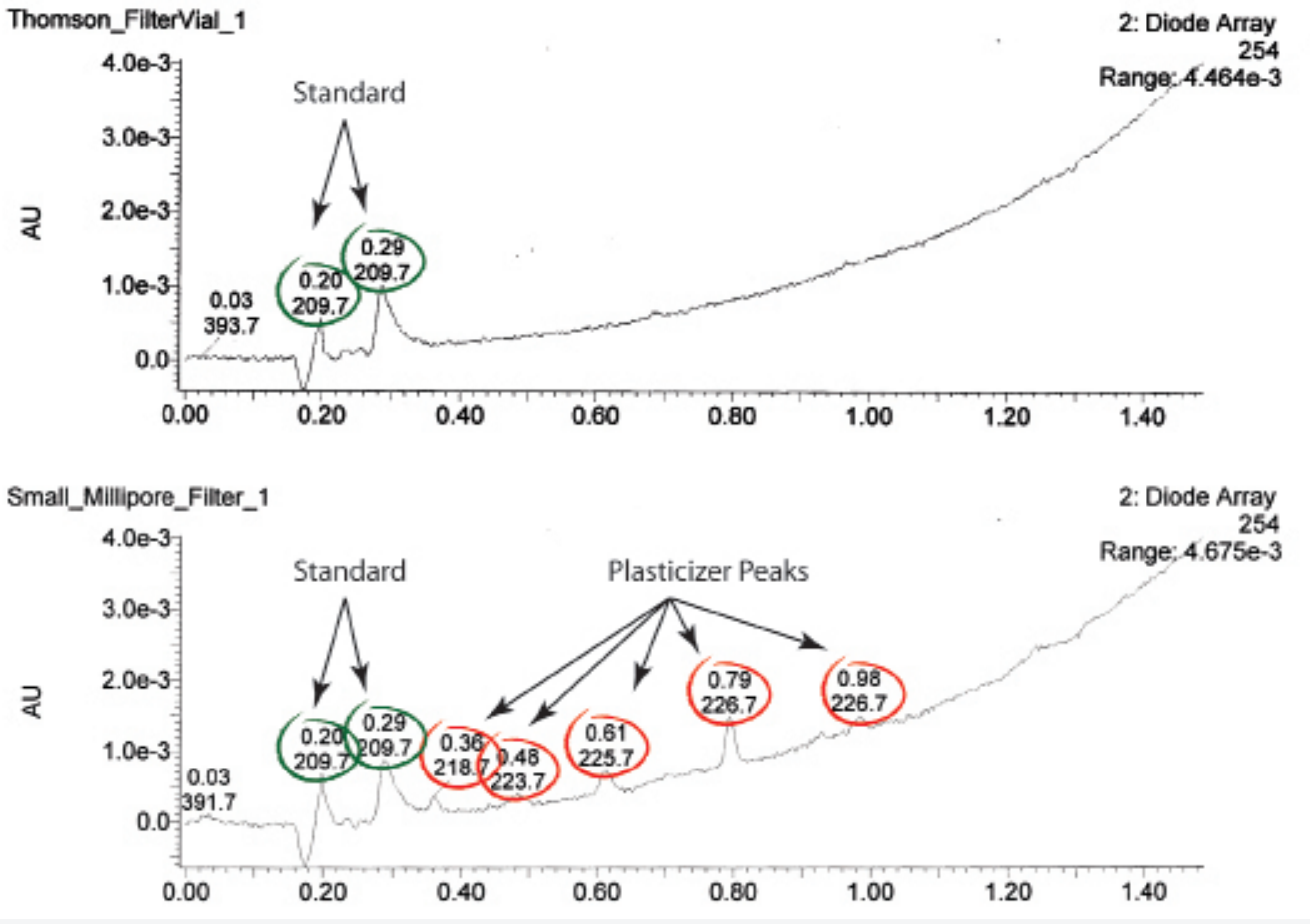
Testing by Takeda Pharmaceutical Company Limited® UPLC - ELSD



Method: A. Water B. ACN 45-90% with 0.05% TFA Ballistic Gradient over 1.4 minutes using Waters® Acquity® UPLC; Thomson Filter Vial (patented) Part#: 35540-500, 0.45µm hydrophobic PTFE, w/ Pre-Slit Cap, Millipore Syringe Filter Part #:SLFHR04NL Millex-FH® Filter, 0.45µm, hydrophobic PTFE, 4mm, non-sterile.

Plasticizers

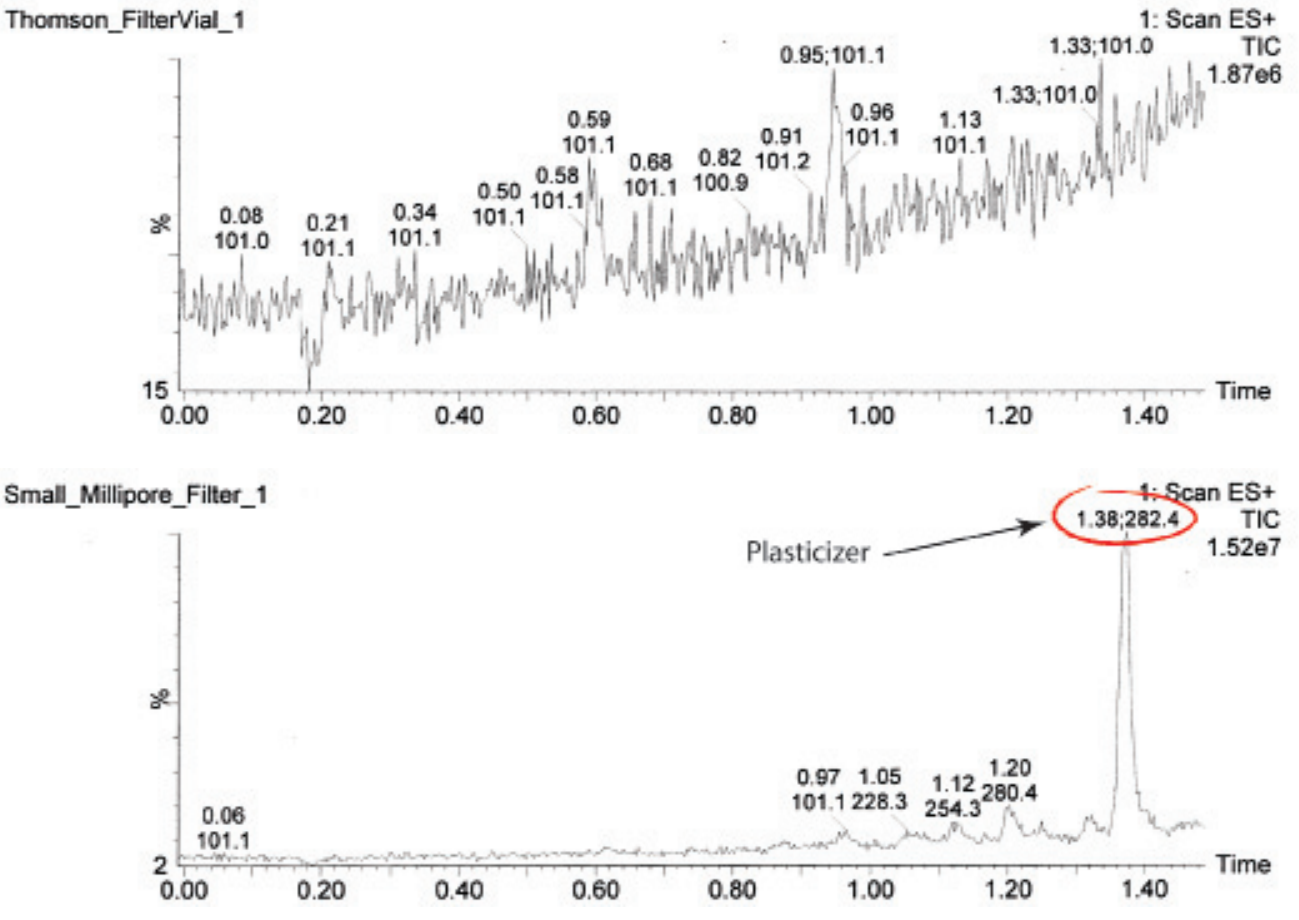
Testing by Takeda Pharmaceutical Company Limited® UPLC-DAD



Method: A. Water B. ACN 45-90% with 0.05% TFA Ballistic Gradient over 1.4 minutes using Waters® Acquity® UPLC; Thomson Filter Vial (patented) Part#: 35540-500, 0.45 µm hydrophobic PTFE, w/ Pre-Slit Cap; Millipore Syringe Filter Part #:SLFHR04NL Millex-FH® Filter, 0.45 µm, hydrophobic PTFE, 4 mm, non-sterile.

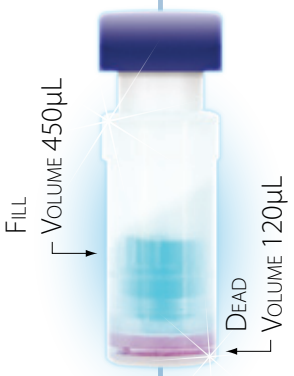
Plasticizers

Testing by Takeda Pharmaceutical Company Limited® UPLC-Mass Spectrum Data



Method: A. Water B. ACN 45-90% with .05% TFA Ballistic Gradient over 1.4 minutes using Waters® Acquity® UPLC; Thomson Filter Vial (patented), Part#: 35540-500, 0.45 µm hydrophobic PTFE, w/ Pre-Slit Cap; Millipore Syringe Filter Part #:SLFHR04NL Millex-FH® Filter, 0.45 µm, hydrophobic PTFE, 4 mm, non-sterile.

Standard Filter Vial



Standard For Most Samples

Standard Filter Vial *(120µL Dead Volume)*

Thomson Standard Filter Vials (patented) can be used for samples containing less than 10% solid particulates. The filter vial consists of two parts: a filter vial shell and a plunger which includes a single layer filter on one end and a vial cap on the other end.

Applications for Thomson Standard Filter Vials include filtration of catalysts from organic and medicinal chemistry synthesis reactions, saccharide analysis in corn syrup, and in-vial protein precipitation.

Filter Vial *(Pre-Slit Cap)*

.2µm PTFE
Part No. 35530

.45µm PTFE
Part No. 35540

.2µm PVDF
Part No. 35531

.45µm PVDF
Part No. 35541

.2µm NYLON
Part No. 35538

.45µm NYLON
Part No. 35539

.2µm PES
Part No. 35535

Available in Quantities of 200 or 500

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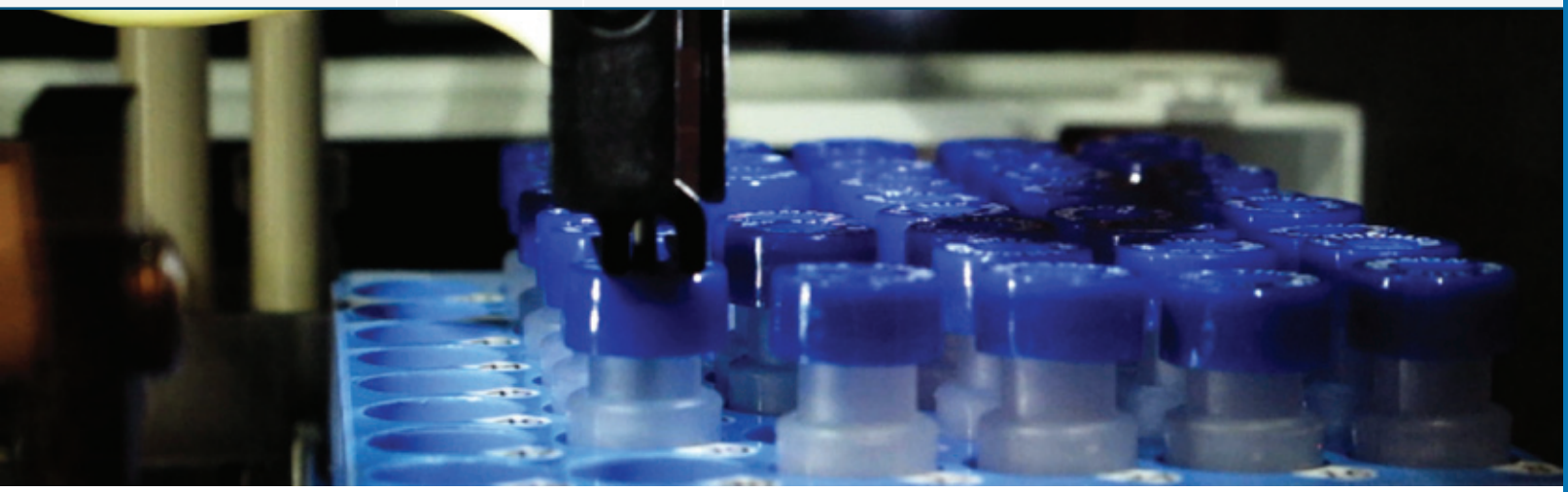
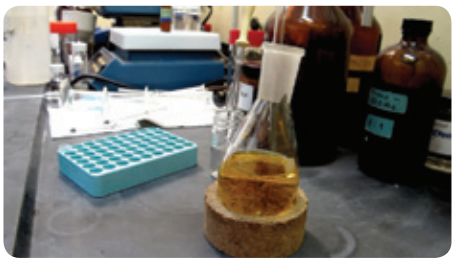
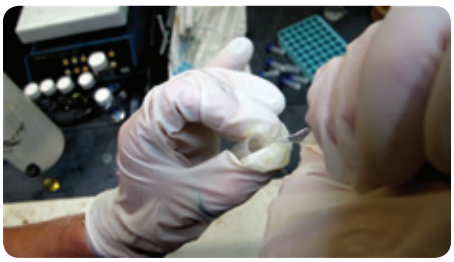
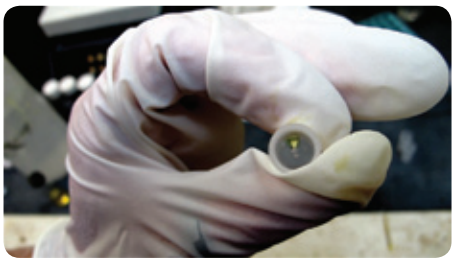
SINGLE StEP® Filter Vials Open Access LCMS

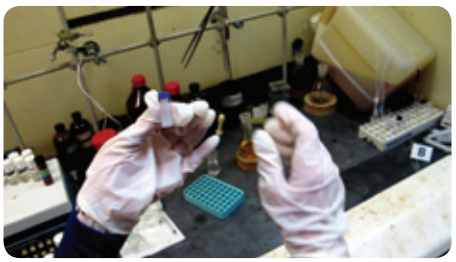
Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	35540	Eliminate instrument downtime

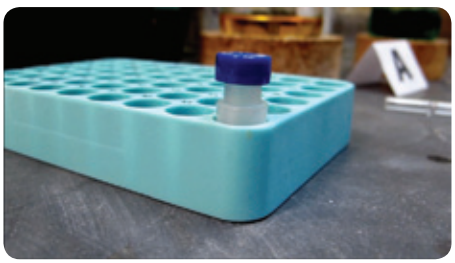


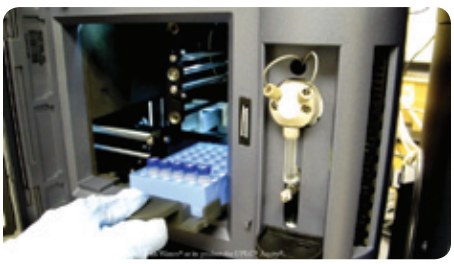


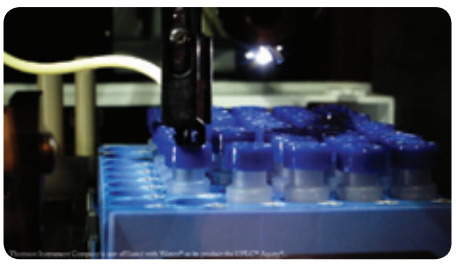












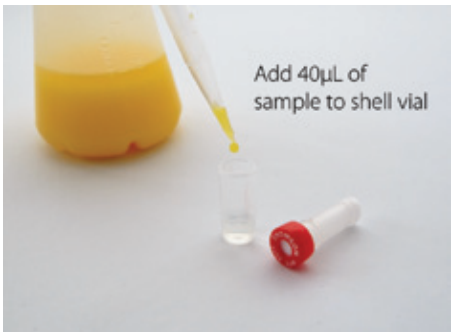
"We've been pounding our walk up systems for over a year without a single clog."

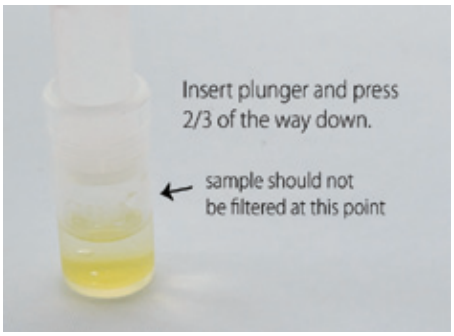
-Justin
University of Arizona

Thomson Instrument Company is not affiliated with Waters®, its product the ACQUITY UPLC®, or The University of Arizona.

Protein Precipitation with Filter Vials

Membrane	Pore Size	Part #	Benefit
PVDF	.02µm	35531	Easy one step protein precipitation to injection





Vortex Sample 20-40 seconds

Protein Crash

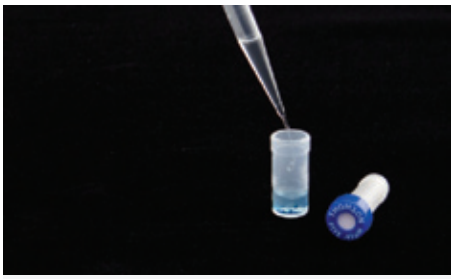
Recommended PVDF 0.2 µm Filter Vial

Part#: 35531-200 or 35531-500

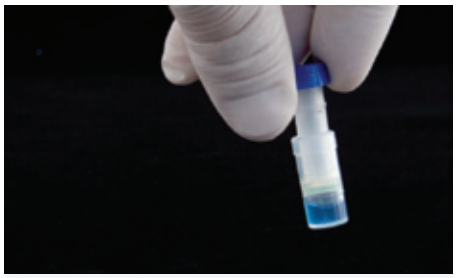
How to Mass Spec Your TLC Spots Using Filter Vials

Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	35540	Simply remove TLC spot and inject.

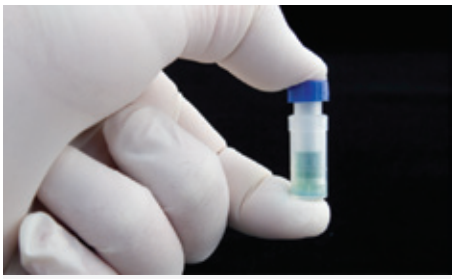
1. After eluting analytical TLC plates, scrape off desired spots into Thomson Shell Vial



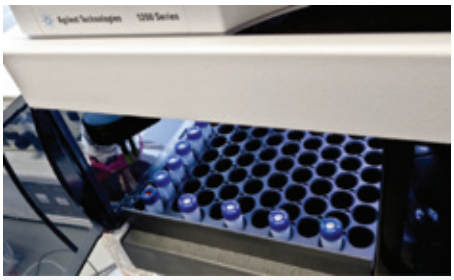
2. Add 0.4 mL EtOAc to Shell Vial



3. Next, insert Plunger, press half way down, and shake or swirl to extract compound from silica gel.



4. Press down plunger completely to filter sample



5. Same Filter Vial straight to Mass Spec

Thomson Instrument Company is not affiliated with Agilent technologies® or their products.

Corn Syrup Analysis E-61

Analytical Methods of the Member Companies of the Corn Refiners Association, Inc.

Membrane	Pore Size	Part #	Benefit
PVDF	.045µm	35541	Save money & time, using Thomson Filter Vials

Saccharides Analysis by HPLC

The method is applicable to all corn syrup, including those containing fructose, corn syrups, and starch hydrolyzates prepared by acid and/or enzymes conversion. The individual sugars are separated by molecular exclusion and ligand exchange. The eluted sugars are detected using a differential refractometer.

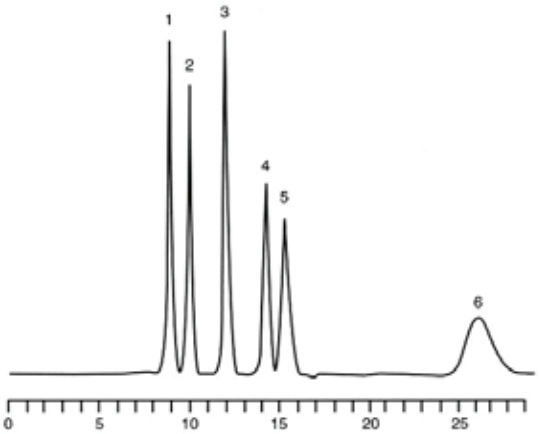
Equipment:

HPLC

- Temperature Controlled Column Oven – 85oC
- Refractometer Detector – attenuation 8x
- Column
  - Cation Exchange Column – Biorad Aminex HPX-87C or equivalent
  - Guard Column
- Flow Rate 0.5 mL/minute
- Injection 10-20uL

Sample Prep

- 1.0-2.0mg solid sugar in 20mL of H2O
- Heat in steam bath until all sugars are dissolved
- Cool and dilute to 100mL volume
- Mix



Customers conducting the CRA E-61 test prefer Thomson PVDF .45µm Filter Vials to the standard syringe filter method, for Cost Savings & Speed of use.

Thomson PVDF Filter Vial 0.45 µm
35541-200 & 35541-500

Thomson Instrument Company is not affiliated with Corn Refiners Association, Inc. and this system is not sanctioned by Corn Refiners Association, Inc., although some analysts are using Filter Vials in the Field for this purpose.

The Determination of Hexavalent Chromium in Water by Ion Exchange Chromatography

Inductively Coupled Plasma Mass Spectrometry (IC-ICP-MS)

Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	35540	No pre-cleaning of autosampler vials needed

Introduction

This method utilizes a hyphenated technique, i.e. ion exchange chromatography (IC) coupled to an inductively coupled plasma mass spectrometry (ICP-MS) to determine Cr(VI) in treated drinking water, surface water, and ground water. Samples are collected and preserved at a pH > 9 condition, and then injected directly into an anion exchange column. Cr(VI) is separated from other possible Cr species and other metals by the anion exchange functioning group inside the column. The column eluent is introduced directly into the sample introduction interface and the ionization source of the ICP-MS. Chromium chromatographic peak is identified and quantified by the mass spectrometry with external calibration.

Labware Cleaning Procedure:

It is critical to pre-clean and dry labware in a clean flow bench in order to minimize contamination.

- Place tubes and caps into 10% Nitric Acid (made from reagent grade) acid bath for at least 24 hours.
- Transfer tubes and caps into a DI Water bath to soak for at least 24 hours.
- Remove tubes and caps, rinse with DI Water at least three times.
- Remove as much water as possible and place inside a Class 10 Vertical Laminar Flow Metal Free Hood and let dry.

Sample Requirements:

- Sample must be preserved to achieve pH > 9 with Ultra Pure Concentrated Ammonium Hydroxide.
- Sample is collected in a 15mL amber high density polyethylene (HDPE) bottle with a plastic cap.
- Samples are stored at < 8 °C for up to 30 days, provided that the sample containers are sealed properly and stored in an acid fume free environment. However, it is recommended that samples be analyzed as soon as possible upon receipt.

Sample Preparation:

Check sample pH using a pH testing strip by transferring a small volume of sample to prevent cross contamination. If the pH is > 9, sample is ready for IC-ICP-MS analysis | **Note:** $r^2 > 0.995$ for the calibration curve

- Label the Thomson 0.45µm PTFE Filter Vials (35540-500).
- Pipette 0.5mL of the sample into the filter vial shell.
- Partially insert the filter vial plunger into the filter vial shell.
- Place filter vials in the Thomson Toggle Press and press the lever to filter the samples (can press up to 5 vials each time).
- Load the filter vials into the Varian autosampler.
- Include Calibration Standards ***(0.05µg/L, 0.1µg/L, 0.5µg/L, 1.0µg/L) and QC Standards (DI Water Blank, Tap Water Blank, Tap Water Spiked)*** for every 20 samples analyzed.

Filter Vial

Equipment:

LC-MS:

- Varian ProStar 210 HPLC
- Varian 820MS ICP-MS
- Pump Rate (rpm): 20
- Stablization delay(s): 0
- Skimmer Gas Source: H2
- Skimmer Flow: 30

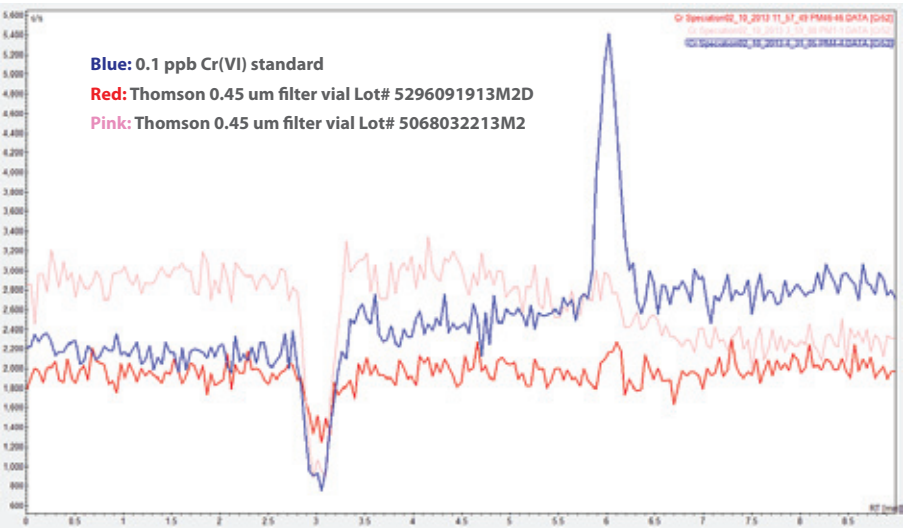
Column:

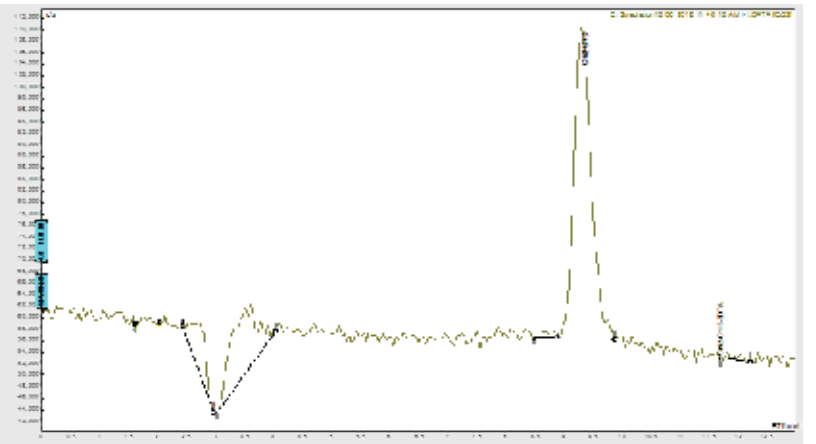
- Hamilton PRP-X100 Anion Exchange Column & Guard Column

Mobile Phase:

- A: 100mM/L Ammonium Nitrate, pH ≥ 9. pH adjust with 16N Nitric Acid
- B: DI Water, pH ≥ 9, pH adjust with Ultra Pure Ammonium Hydroxide

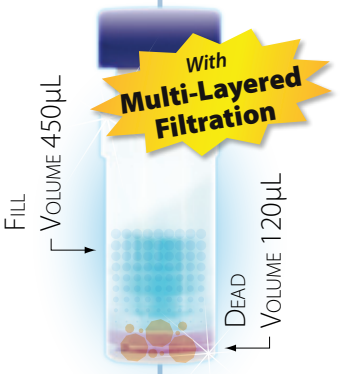
Time	Flow (mL/min)	%A	%B
Pre-run	1.0	80	20
9.0	1.0	80	20





2 ml amber glass vial, un-cleaned.

eXtreme|FV®



For Particulate Laden Samples

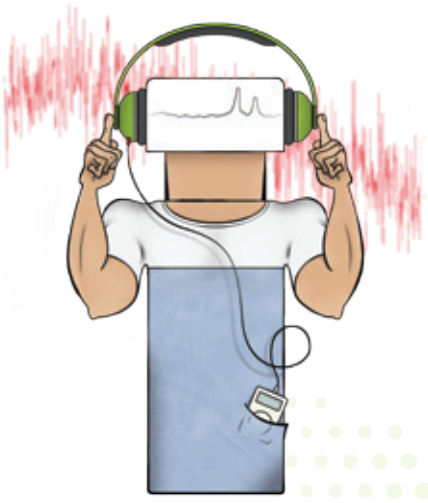
eXtreme|FV® *(Multi-Layered Filtration)*

Thomson eXtreme|FV® (patented) offers multi-layer filtration for viscous samples and samples containing up to 30% solid particulates. The filter vial consists of two parts: a filter vial shell and a plunger which includes a multi-layer filter on one end and a vial cap on the other end.

eXtreme|FV® allows for compounds to be separated from the matrix, resulting in both a higher signal-to-noise ratio and peaks that are more differentiated.

Prior to the introduction of the eXtreme|FV®, many samples containing high levels of particulates were "filtered" by using an SPE step in the method. These methods are readily amendable to the replacement of the SPE step using a rapid and lower cost eXtreme|FV® step.

Applications for Thomson eXtreme|FV® include filtration of cell and cell debris from cell culture; pesticide analysis in food, tissue, soil, and water; and toxicology analysis in blood and urine.



eXtreme|FV *(Pre-Slit Cap)*

.2µm PTFE
Part No. 85530

.45µm PTFE
Part No. 85540

.2µm PVDF
Part No. 85531

.45µm PVDF
Part No. 85541

.2µm NYLON
Part No. 85538

.45µm NYLON
Part No. 85539

.2µm PES
Part No. 85535

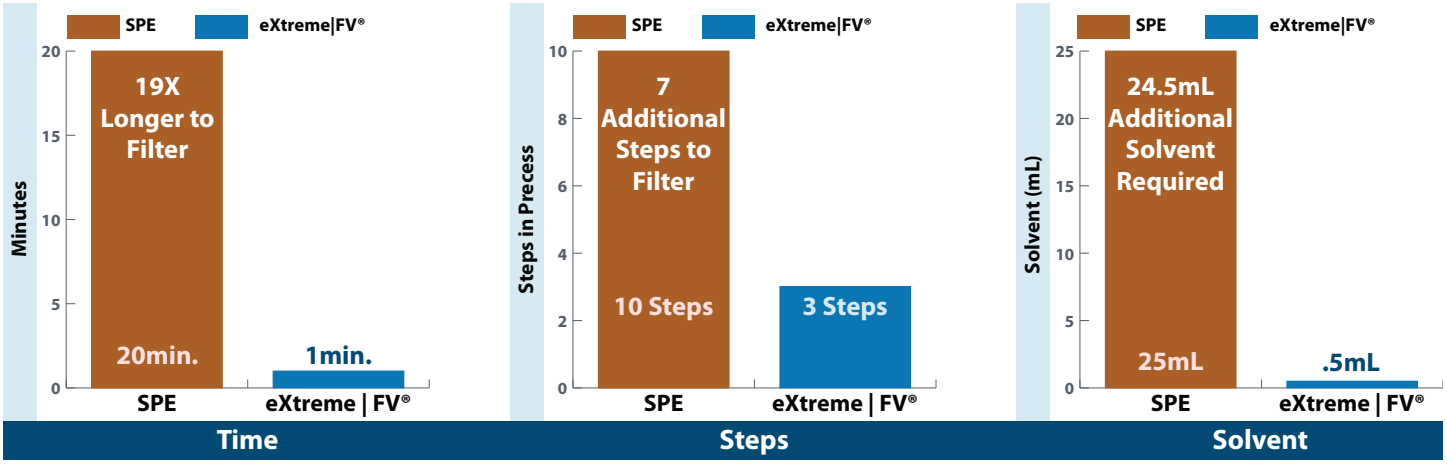
Available in Quantities of 200 or 500

Improved Sample Preparation Methods for Athlete Doping Analysis of Common Compounds in Urine by LCMS

Membrane	Pore Size	Part #	Benefit
PVDF	0.2µm	85531	Reduces solvent. Reduces time. No expensive equipment needed

Authors : Dr. Catrin Goebel[2], Lisa Wanders[1], Sam Ellis[1]
Thomson Instrument Company[1]
Australian Sports Drug Testing Laboratory in the National Measurement Institute Department of Industry[2]

SPE -vs- eXtreme|FV®



Abstract

Anti-doping testing by urine analysis requires fast and robust screening methods with repeatable sample preparation. Since every sample has to be screened, methods are designed to be sufficiently sensitive and specific to identify all suspect samples. One must be careful to minimize false suspects. Ensuring samples are spiked with internal standards accordingly will help verify that samples are being extracted and tested correctly and with accurate uniformity.

The Australian Sports Drug Testing Laboratory, our collaborators, have invested time in determining a limited number of comprehensive screening methods. These methods, using Thomson's eXtreme|FV®s (patented), comply with the World Anti-Doping Agency's (WADA) Prohibited List.

In exploring new methods labs have looked at both detection and sample prep as routes to quicker and more accurate analysis. Liquid chromatography coupled with mass spectrometry detection is prevalent, superseding many of the gas chromatographic coupled with mass spectrometry methods because of the simpler sample preparation. Specifically, the anti-doping testing shown below consisted of sample preparation without the initial use of cumbersome traditional SPE methods, and instead consisted of the comparison of filtration techniques. Filter plates versus Thomson eXtreme|FV®s (patented) were tested to determine which product allowed for a method of simple and quick urine analysis while complying with the WADA's guidelines.

Experiment

The experiments were performed at the National Measurement Institute (Australia) in the Sports Drug Testing Laboratory.

The 11.8 minute run time for the instrumental analysis meets the requirements of the WADA Technical Document- Minimum Required Performance Level (TD2013MRPL). This document details the analysis of a large number of analytes from the classes on the WADA Prohibited List, while meeting sensitivity requirements. The analytes included compounds in the following classes: anabolic agents, B2-agonists, hormone antagonists and modulators, diuretics, stimulants, narcotics, glucocorticoids, B-blockers, etc.

Full Method:

A comparison between sample preparation using filter plates sourced from several different manufactures and Thomson eXtreme|FV®s (patented) PVDF 0.2µm (Part#: 85531-500) was conducted. The preparation with the Thomson eXtreme|FV®s were automated using a Tecan robotics platform for liquid dispensing in the Thomson 48 position rack (Part#: 35010-RACK), and 48 position press (Part#: 35010).

Direct Urine Preparation:

1. Label each eXtreme|FV® with sample/quality control sample information.
2. Pipette 200 µL of each sample into labeled eXtreme|FV®.
3. Add 200 µL of the Mefruside Internal Standard (300 ng/mL in 0.5% formic acid) to each filter vial cup.
4. Place the eXtreme|FV® tops onto each vial and press shut.

Equipment

LCHRMS System:

UPLC coupled to High Resolution Mass Spectrometry with an electrospray source in full scan mode. Data acquisition in both positive and negative polarity modes within a single 11.8 min chromatographic run.

- Column: C18, 2.1mm × 50mm, 1.7µm
- Column Temperature: 30 °C
- Flow rate: 300 µL/min

Mobile Phase:

- A: 0.3% aqueous Formic Acid in Water
- B: 0.3% Formic Acid in Acetonitrile

Gradient:

Time	A%	B%
0.00	95	5
0.50	95	5
3.50	80	20
5.50	75	25
7.00	43	57
8.00	10	90
8.60	10	90
8.80	95	5

Injection volume: 10µL

Sample tray temperature: 18°C

Column Temperature: 30°C

Method run time: 11.8 minutes

Gas: UHP Nitrogen

Conclusions

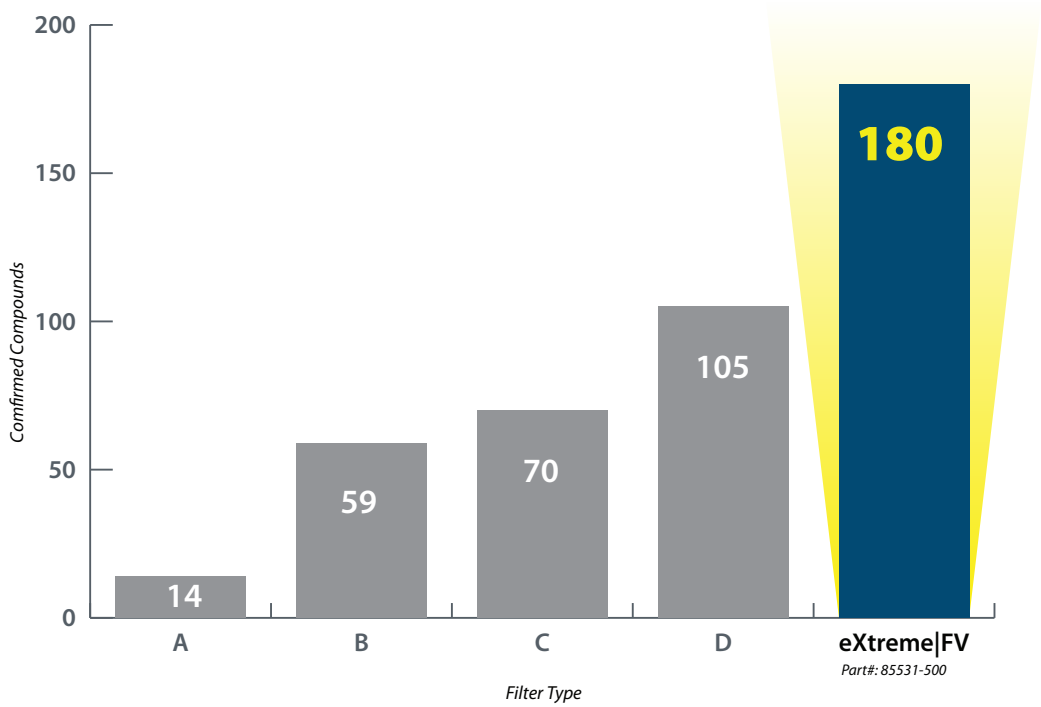
The Thomson eXtreme|FV®s (patented) PVDF 0.2µm (85531-500) performed the best in compound extraction and identification while allowing the end user to follow the WADA validated method. The elimination of SPE steps from laboratory methods is a large time saver, and enables urine-direct-injection solely using Thomson eXtreme|FV®s for filtration. Together the Thomson 48 position Filter Vial Press and automation-enabled 48 position rack equaled timing of filter plate methodology but provided the best extraction and identification of all filter types. A total of 180 compounds can be identified through the screening analysis with the Thomson eXtreme|FV®s (patented) PVDF 0.2µm (85531-500).

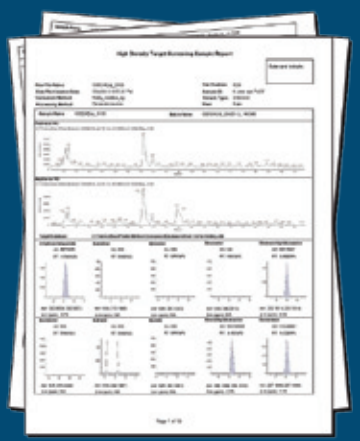
The method presented is being used for the analysis of athletes' urine samples for banned substances at the Australian Sports Drug Testing Laboratory.

Acknowledgments

We would like to thank Dr. Catrin Goebel, Director of Australian Sports Drug Testing Laboratory in the National Measurement Institute, Department of Industry (a WADA accredited laboratory in Australia) for her extensive testing. Dr. Goebel is also an Executive member of World Association of Anti-Doping Scientist.

Comparison of Filter Types

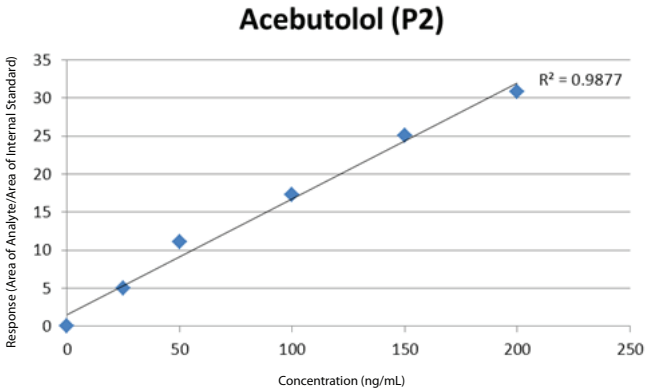


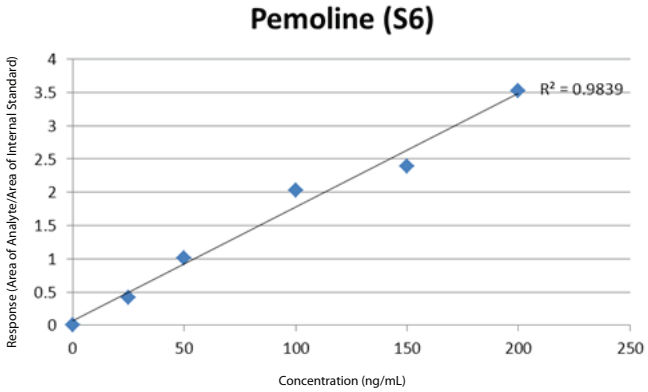


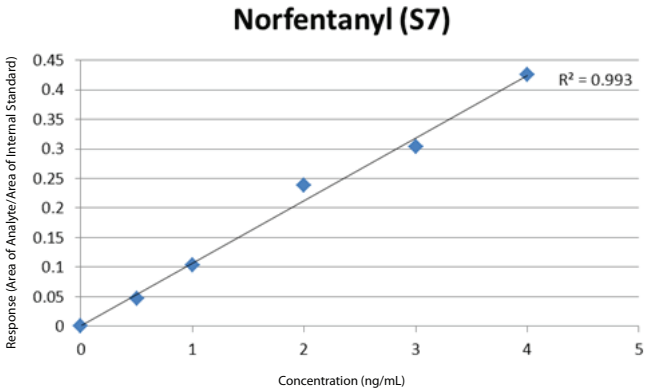
To View All Chromatograms

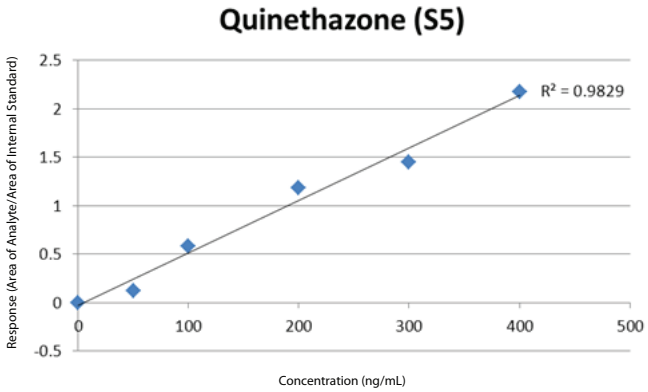
Visit http://bit.ly/wada-data

Linearity of The Analysis Method Was Assessed Over a Range From 25% To 200% Of MRPL With R2 Generally Being Greater Than 0.98



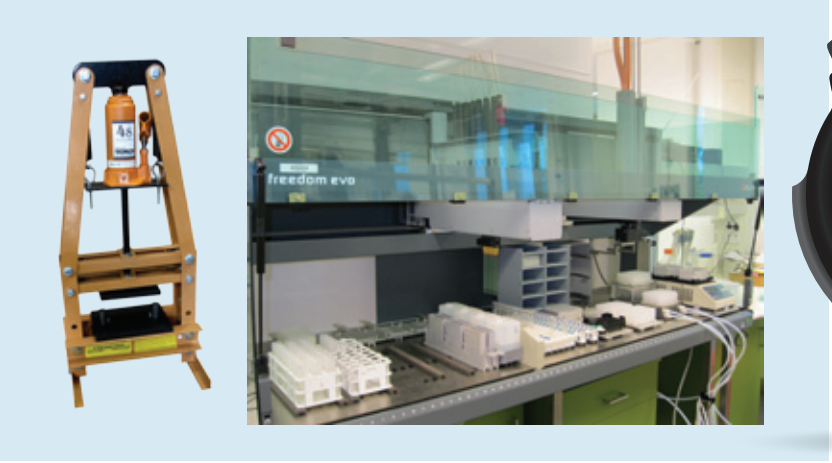






Time is Equal

With automation our customers are utilizing Filter Vials at the same speed filter plates were used in the past.



Confirmed Compounds (124)

Compound Name	Compound Name
5-Hydroxyindapamide	Hydrochlorothiazide
Bisdesmethylsibutramine	Mefruside metabolite 2
Desmethylsibutramine	Indapamide
Exemestane	Metolazone
Mefruside (+)	Polythiazide
Mefruside (-)	Torasemide
epitestosterone glucuronide	Triamterene
epitestosteronea	Xipamide
AICAR	Caffeine
GW1516	Cis-4-Methylaminorex
Atenolol	Cotinine (Nicotine metab)
Bisoprolol	MBDB
Esmolol	Methoxyamphetamine
Metipranolol	Methylenedioxyethylamphetamine
Nadolol	Adrafinil
Nadoxolol	Amiphenazole
Oxprenolol	Amphetamine
Clenbuterol	Benzoylecgonine
Gestrinone	Benzylpiperazine
Methyldienolone	Carphedon
Methyltrienolone	Cathine
Metribolone	Crotethamide
Tetrahydrogestrinone	Cyclazodone
Tibolone	Ephedrine
Zilpaterol	Phenylpropanolamine
Hydroxystanozolol	Pseudoepherine
Hydroxystanozolol	Etamivan
Bambuterol	Etilefrine
Formoterol	Fenetylline
Salbutamol	Hydroxy mesocarb
Salmeterol	Isometheptene
Terbutaline	Methylenedioxyamphetamine (MDA)
Andarine	Methylenedioxymethylamphetamine(MDMA)
Exemestane metabolite	Methylphenidate
Aminoglutethimide	Modafinil
Raloxifene	Modafinil Acid (metabolite)
Fulvestrant	Nikethamide
GW1516 (501516)	Oxilofrine
Methazolamide	Pemoline
Piretanide	Pentetrazol
Quinethazone	Phenmetrazine
Spironolactone	Pholedrine
Trichlormethiazide	p-Hydroxy amphetamine
Acetazolamide	Ritalinic Acid
Althiazide	nor-Selegiline
Amiloride	Methylecgonine

Compound Name	Compound Name
Bendroflumethiazide	Codeine
Benzthiazide	Hydromorphone
Bumetanide	Morphine
Canrenone	JWH018 N-(5-hydroxypentyl) metabolite
Chlorexolone	JWH073 N-butanoic acid metabolite
Chlorothiazide	Budesonide
Chlorthalidone	Cortisol
Clopamide	Cortisone
Probenecid	Flumethasone
Cyclopenthiazide	Fluticasone propionate metabolite
Cyclothiazide	Methylprednisolone
Dichlorphenamide	16a-OH-Prednisolone
Epitizide	Prednisolone
Eplenerone	Sildenafil
Etacrynic acid (frag?)	Tadalafil
Furosemide	Vardenafil

Improved Method for the Analysis of a Pain Management Supplemental Panel in Urine using eXtreme|FV®s by LC-MS/MS

Membrane	Pore Size	Part #	Benefit
PVDF	0.2µm	85531	Reduces solvent. Reduces time. No expensive equipment needed

Nadine Koenig1, Crystal Xander1, Melanie Stauffer1, Dean Fritch2.

1 Health Network Laboratories, Allentown, PA. | 2 Analytical Associates, East Greenville, PA

Introduction:

This improved sample preparation method allows for the quantitative measurement of pain management drugs in urine. The urine samples were diluted and filtered using Thompson eXtreme|FV®, followed by LC/MS/MS analysis. The most critical aspects of reliable urine analysis are the reduction of interferences from the sample matrix and analyte recovery. Traditionally, SPE, SLE and centrifugation have been used to reduce matrix interference prior to MS analysis. However, these techniques are time consuming, adversely impact recovery, require expensive consumables and lab equipment and use large amounts of solvent. Thomson eXtreme|FV® (patented) offers multi-layer filtration for viscous samples and samples containing up to 30% solid particulates. The filter vial consists of two parts: a filter vial outer shell and a plunger, which includes the multi-layer filter on one end and a vial cap on the other end.

Equipment:

- ABI 4500 Mass Spectrometer
- Shimadzu Prominence HPLC equipped with:
  - Autosampler: SIL-20AC HT
  - Pumps A, B: LC-20AD
  - Communication Bus Module: CBM-20A
  - Column Oven: CTO-20A
  - Degasser: DGU-20A5R
  - Column: Ultra Biphenyl Columns (5µm 50 x 2.1 mm) - Restek
  - Flow Rate: 0.5 mL/min
  - Injection Volume: 15µL
  - Mobile Phases:
    - A: 0.1% Formic Acid in HPLC Water
    - B: 0.1% Formic Acid in Methanol
- Eppendorf Mix Mate
- Thomson eXtreme|FV® 0.2µm PVDF Filter Vials (p/n 85531)
- Thomson 48 position Vial Filter Press (p/n 35010)

Improved Sample Preparation:

1. Place 400 µL of 20% MeOH / 80%Water / 0.1% Formic Acid in each of the outer shells of the Thomson Filter Vials.
2. Add 25µL of Standard/Control/Patient Sample + 10µL of Internal Standard.
3. Place Thomson Filter Plunger on top of the Thomson vial, Thomson vials –eXtreme/FV® 0.2µm PVDF, w/Pre-Slit Red Cap #85531.
4. Press filter plunger down approximately ¼ of the way into each of the Thomson vials.
5. Vortex for 30-40 seconds.
6. Slowly press filter plunger the rest of the way down using the Vial Filter Press.
7. Extracts are ready for LC/MS/MS analysis using the Shimadzu / ABI 4500.
8. Inject 15µL.

Results:

This improved sample preparation method allows for the quantitative measurement of the following pain management drugs in urine, Table 1. The improved method utilizes the Thomson eXtreme|FV® for sample clean-up, significantly reducing the cost and time of per-sample analysis. This method was validated for all 17 drugs in the supplemental pain management panel over 3 days. See Table 1 for the complete list of drugs in the panel. The 6 point calibration curve for Gabapentin in urine on Day 1 can be seen in fig 1. The R2 was > 0.99. LC-MS/MS spectrum of the 17 drugs of interest in Table 1 can be seen in Fig 1. Please click here for the data for the complete 3 day validation of Gabapentin.

Drugs analyzed as part of the Pain Management Supplemental Panel in urine.

Amitriptyline	Cyclobenzaprine	Desipramine	Ritalinic Acid	Tramadol
Nortriptyline	Duloxetine	Meperidine	Pregabalin	
Carisoprodol	Gabapentin	Normeperidine	Tapentadol	
Meprobamate	Imipramine	Methylphenidate	Tapentadol-O-Sulfate	

Table 1. Drugs analyzed as part of the Pain Management Supplemental Panel in urine.

Fig 1. Gabapentin 6 point calibration curve in urine.

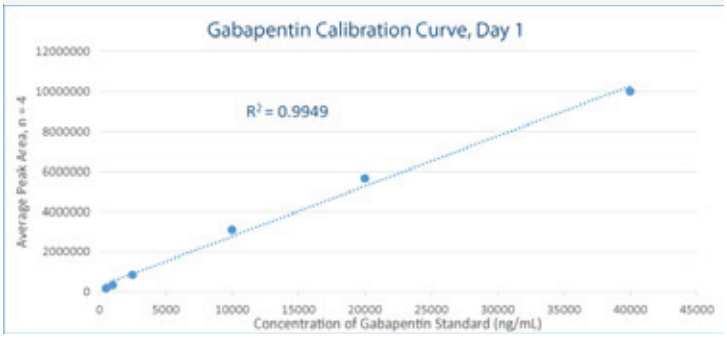
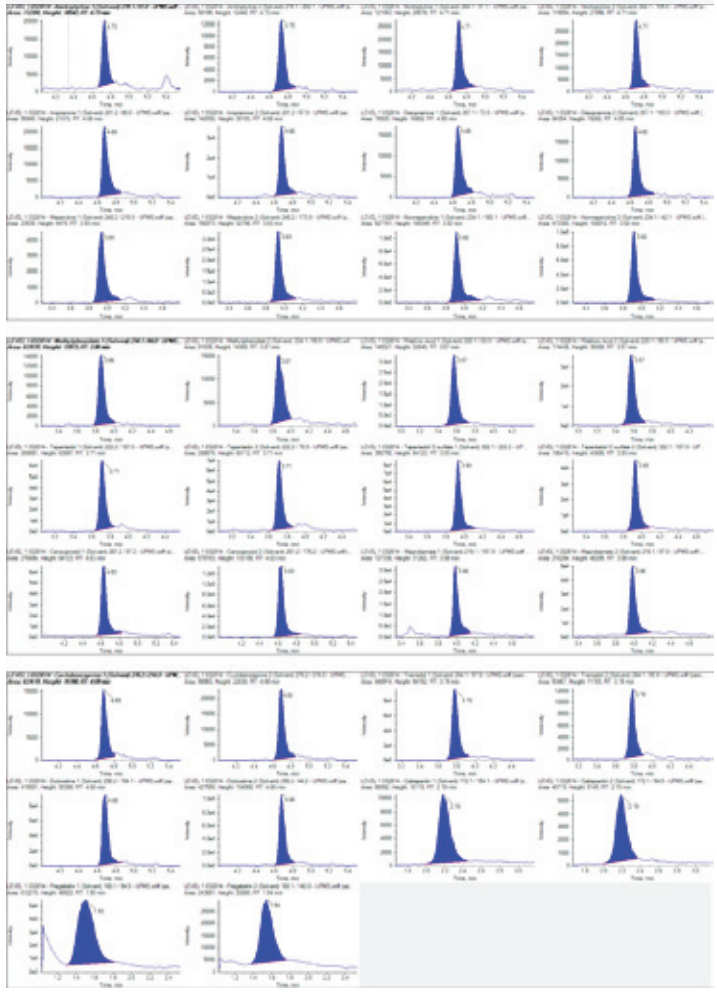
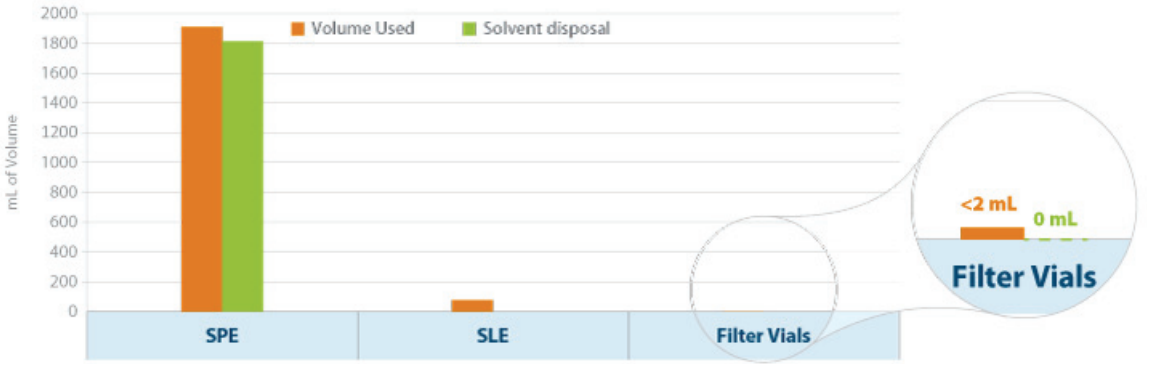


Fig 2. Mass spectrum of the 17 drugs included in the Supplemental Pain Management Panel in Urine.



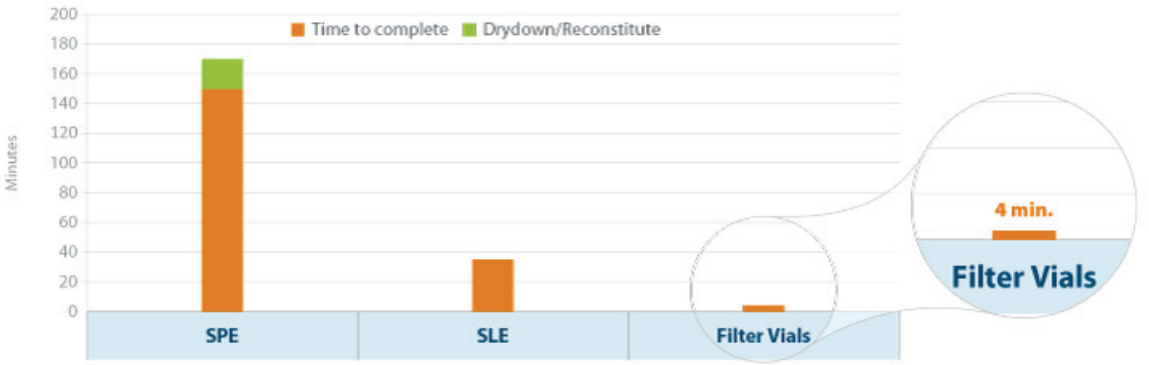
Solvent Usage & Disposal for 96 Samples

Method	# of Samples	Volume Solvent used	Solvent Disposal
SPE	96	1920 mL	1824 mL
SLE	96	76.8 mL	0 mL (it gets dried down)
Filter Vial	96	<2 mL	0 mL



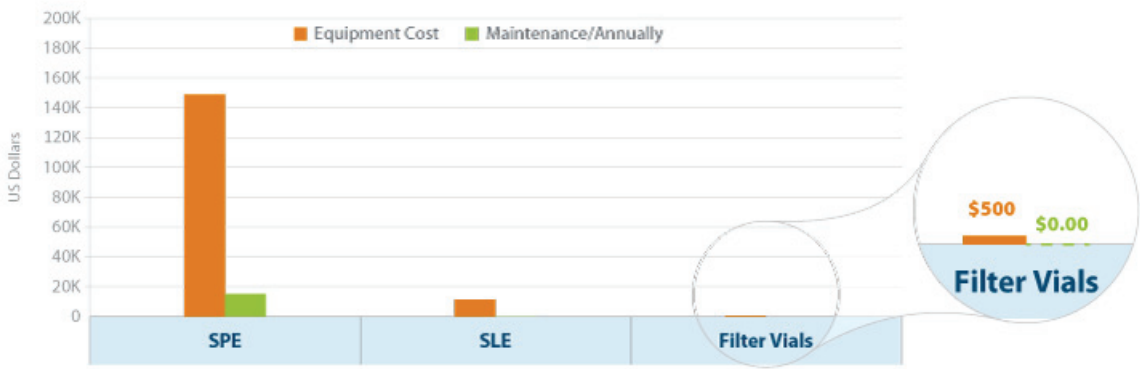
Time (Labor) Cost for 96 Samples

Method	# of Samples	Time to complete
SPE	96	50 min. + 20 min. dry down/reconstitute
SLE	96	35 min.
Filter Vial	96	4 min.



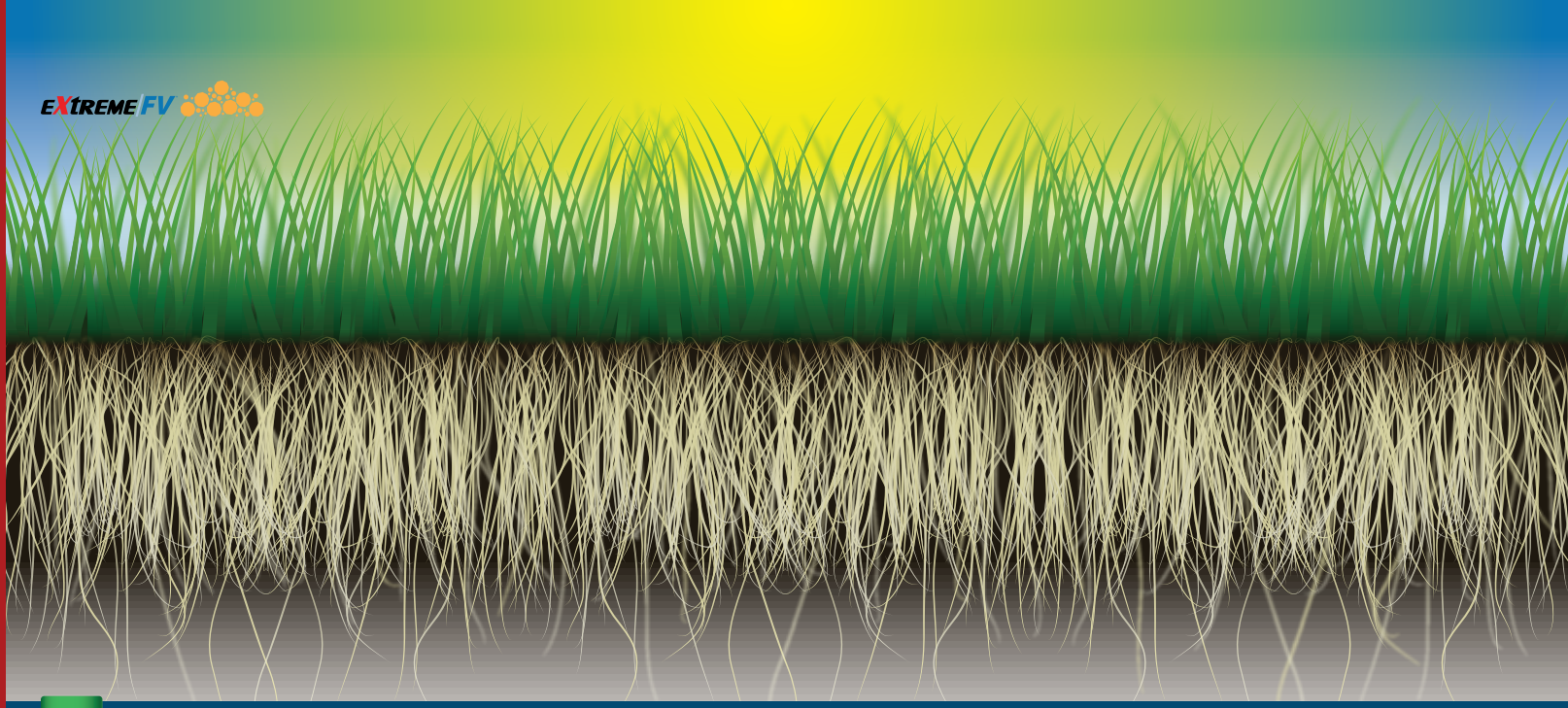
Equipment Cost

Method	# of Samples	Equipment Cost	Maintenance/Annually
SPE	96	~$150,000.00	$15,000.00
SLE	96	~$11,400.00	~$100.00
Filter Vial	96	$500.00	$0.00



Conclusion:

This validated method alleviates the need for sample clean-up by SPE or SLE, thereby reducing the sample preparation time, solvent usage, and equipment required. Samples are filtered by pipetting the sample into the filter vial shell, inserting the plunger into the shell, and then pushing the plunger into the shell. The filtration process from sample pipetting to autosampler ready only requires 15 seconds. Benefits to the use of Thomson eXtreme|FV® include lower cost, faster sample preparation time, and less use of and disposal of organic solvents.



Pesticide Applications: Soil | Vegetation

Membrane	Pore Size	Part #	Benefit
PTFE	0.2µm	85530	One step, less cost, less waste

Vegetation & Soil Application

1. Samples are extracted using 20g of homogeneous, ground sample.
2. Sample clean-up was achieved using Thomson eXtreme|FV®s (PTFE .2µm & PVDF .2µm).

The following compounds were seen in both soil and vegetation:

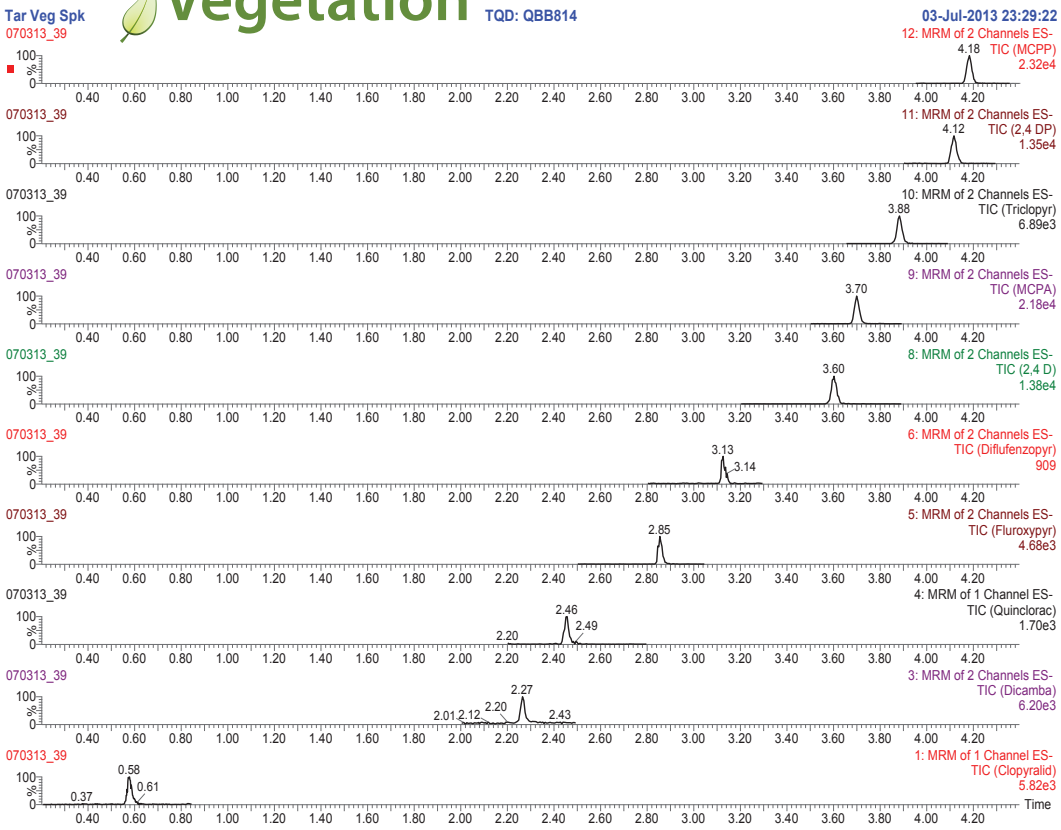
MCPP	Quinclorac
Clopyralid	Fluroxypyr
Aminopyralid	MCPA
Picloram	Diflufenzopyr
Dicamba	

Equipment:

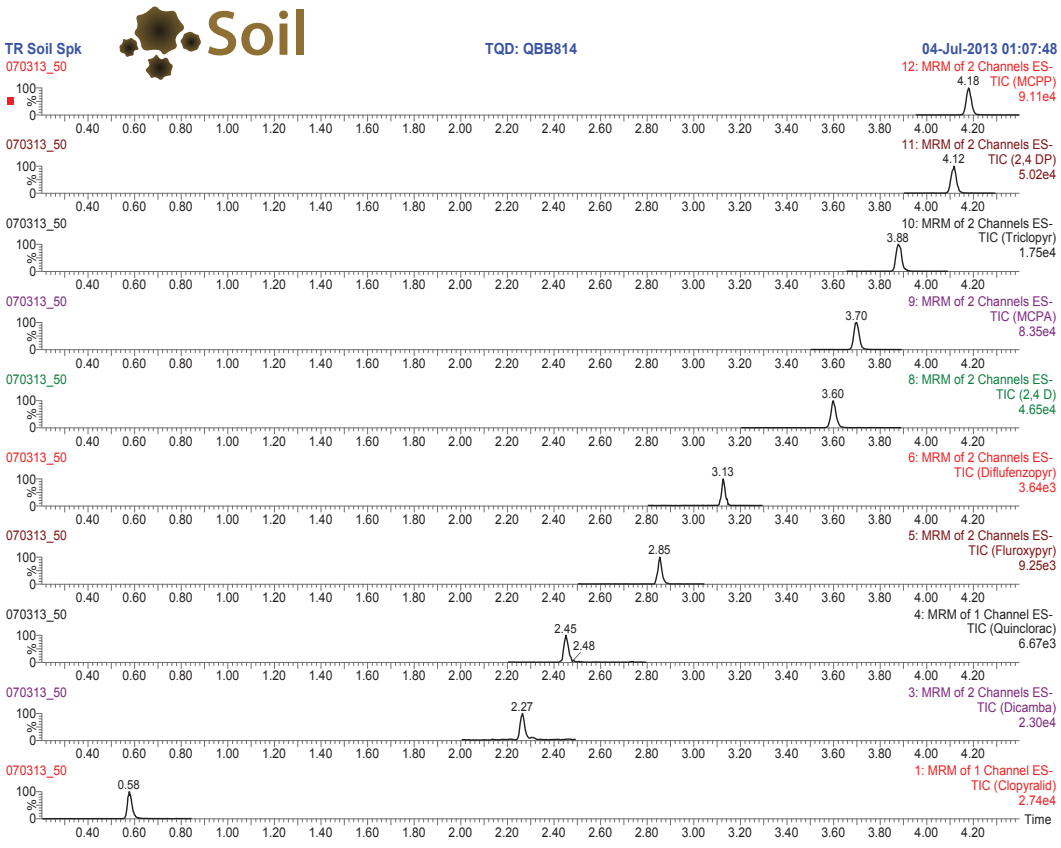
- System: UHPLC/MS/MS
- HPLC Column: Zorbax Rx C8, 150 x 2.1 mm id
- HPLC Guard Column: Agilent Eclipse XDB-C8, 2.1 x 12.5mm, 5 micron
- Column Temp: 35°C
- Autosampler Temp: 15°C
- Injection Volume: 10µl
- Run Time: 8 min
- Method
  - Solvent A : 0.15% Glacial Acid in Water
  - Solvent B: 0.15% Glacial Acid in ACN
    - Gradient

Time (min)	Flow Rate (ml/min)	%A	%B
Initial	0.8	95	5
1	0.8	95	5
2	0.8	80	20
3	0.8	70	30
4	0.8	60	40
5	0.8	50	50
5.5	0.8	5	95
6.5	0.8	5	95
7	0.8	95	5

Vegetation



Soil



eXtreme|FV® vs SPE for the Analysis of Pesticides in Orange Juice by GC/MS

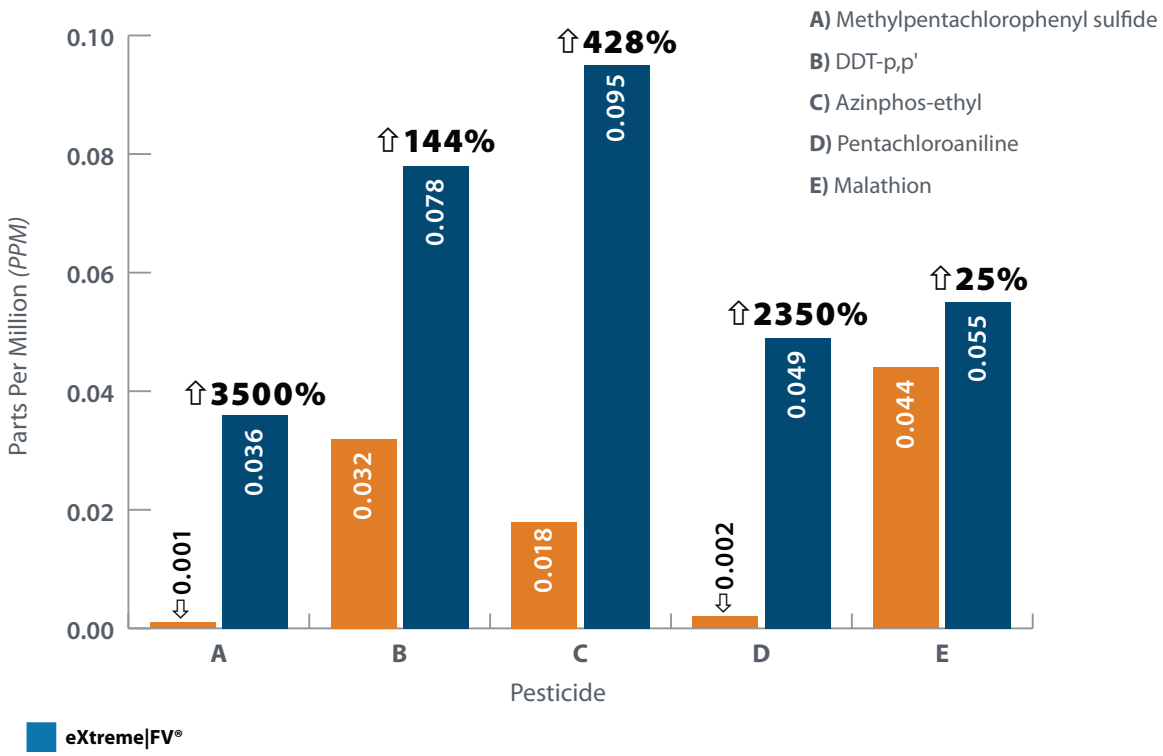
Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	85540	Increase signal-to-noise ratio

MICRO QUALITY LABS INC.

Authors: Uday Sathe[1], Karine Aylozyan[1], Lisa Wanders[2], Joe Machamer[2], & Sam Ellis[2]
Micro Quality Labs[1] | Thomson Instrument Company[2]

SPE -vs- eXtreme|FV®

Comparison of spiked pesticide recoveries



Abstract

Pesticides act as toxins when found in sufficient quantities as residues in food. This is of particular importance for orange juice because it is consumed in high quantities by children. Sensitive, rapid, and cost effective analytical methods are required in order to reduce the risk to consumers.

Solid Phase Extraction (SPE) is a common sample preparation technique used prior to GC or LC analysis of pesticides in food. Typically, SPE is used to concentrate analytes, reduce interference from co-eluting molecules or to clean up/"filter" sample particulates. Drawbacks to the use of SPE include cost, sample preparation time, large sample volumes, use and disposal of organic solvents, and potentially poor recoveries. The continuing development of higher sensitivity instrumentation and improved filtration devices has led many labs to investigate whether methods can be adapted to eliminate the SPE step.

Thomson eXtreme® Filter Vials offer multi-layer filtration for viscous samples and samples containing up to 30% solid particulates. Filtration time from unfiltered sample transfer to filtered sample in an autosampler ready vial is only 15 seconds. The filter vial

consists of two parts: a filter vial shell and a plunger which includes the multi-layer filter on one end and a vial cap on the other end. Samples are filtered by pipetting the sample into the filter vial shell, inserting the plunger into the shell, and then pushing the plunger into the shell.

Prior to the introduction of the eXtreme|FV®s, many samples containing high levels of particulates were only "filtered" by using an SPE step in the method. These methods are readily amendable to the replacement of the SPE step with a much faster and lower cost eXtreme|FV® step.

Experiment

Samples were prepared and analyzed at Micro Quality Labs, Burbank, CA.

Sample Preparation:

1. Spike 10mL of commercially available High Pulp Orange Juice with 1mL of 1 ppm pesticide standard mix in a 40mL vial.
2. Add one pack (approximately 6g) of Restek Extraction Salts (Restek catalog #26236) to the spiked orange juice.
3. Extract the spiked orange juice with 4 x 25mL portions of methylene chloride.
4. Concentrate to dryness using a Turbovap II concentrator.
5. Dissolve the residue in approximately 10mL of acetonitrile.
6. Vortex and sonicate the re-suspended residue with frequent swirling.
7. Split the re-suspended residue into two 5mL portions.
8. Dilute each 5mL portion with acetonitrile to 10mL using a volumetric flask.
9. Label one flask "for SPE" and the other "for Thomson eXtreme|FV®".

SPE Cleanup Prior to Analysis - Restek 6mL Combo SPE Cartridge

1. Wash one Restek 6mL Combo SPE Cartridge (packed with 200mg CarboPrep 200 and 400mg PSA Restek catalog #26127) with acetonitrile.
2. Add the 10mL portion of the re-suspended residue from the flask labeled "for SPE" to the SPE cartridge.
3. Elute the sample from the cartridge with 50mL of acetonitrile.
4. Concentrate the eluted sample to 10mL using a Turbovap II concentrator.

Thomson eXtreme|FV® Cleanup Prior to Analysis

1. Add 400µL of the re-suspended residue from the flask labeled "for Thomson eXtreme|FV®" to the shell of one Thomson eXtreme|FV® 0.45µm, PTFE (Thomson Part Number 85540-500).
2. Insert plunger completely.

Analysis

Samples were analyzed utilizing an Agilent Technologies® GC/MS, 7000 Triple Quad system equipped with a 7890A GC system and 7693 auto sampler.

Compound/SAMPLE NAME	Avg. PPM SPE+ ROUTINE Syringe FILTER	Avg. PPM EXTREME FV PTFE (W/O SPE)
Alachlor	0.043	0.053
Aldrin	0.025	0.032
Azinphos-ethyl	0.018	0.095
Azinphos-methyl	0.023	0.115
BHC-alpha (benzene hexachloride)	0.026	0.033
BHC-beta	0.054	0.073
BHC-delta	0.062	0.081
BHC-gamma (Lindane, gamma HCH)	0.032	0.043
Bromophos-ethyl	0.025	0.057
Bromopropylate	0.063	0.076
Carbophenothion	0.051	0.071
Chlordane-cis (alpha)	0.04	0.052
Chlordane-oxy	0.034	0.042
Chlordane-trans (gamma)	0.039	0.049
Chlorfenvinphos	0.061	0.071
Chlorpyrifos	0.035	0.047
Chlorpyrifos-methyl	0.035	0.046
Cyfluthrin I	0.082	0.113
Cyhalothrin (lambda)	0.076	0.091
Cypermethrin I (Zeta)	0.082	0.117
Cypermethrin II {CAS # 52315-07-8}	0.08	0.113
Cypermethrin III (Beta)	0.058	0.104
Cypermethrin IV {CAS # 52315-07-8}	0.07	0.097
DCPA (Dacthal, Chlorthal-dimethyl)	0.04	0.048
DDD-o,p'	0.052	0.06
DDD-p,p'	0.056	0.066
DDE-o,p'	0.043	0.039
DDE-p,p'	0.045	0.057
DDT-o,p'	0.035	0.065
DDT-p,p'	0.032	0.078
Deltamethrin	0.053	0.102
Diazinon	0.028	0.035
Dicofol	0.033	0.028
Dieldrin	0.041	0.052
Dimethoate	0.061	0.077
Endosulfan I (alpha isomer)	0.041	0.076
Endosulfan II (beta isomer)	0.053	0.065
Endosulfan sulfate	0.061	0.074
Endrin	0.045	0.058
Ethion	0.057	0.069
Etrimfos	0.03	0.038
Fenchlorphos oxon	0.047	0.061
Fenitrothion	0.041	0.053
Fenpropathrin	0.068	0.078

Compound/SAMPLE NAME	Avg. PPM SPE+ ROUTINE Syringe FILTER	Avg. PPM EXTREME FV PTFE (W/O SPE)
Fensulfothion	0.1	0.117
Fenthion	0.041	0.05
Fenthion sulfone	0.081	0.107
Fenthion sulfoxide	0.106	0.134
Fenvalerate I	0.076	0.106
Fenvalerate II {CAS # 51630-58-1}	0.055	0.073
Fluvalinate-tau I	0.078	0.082
Fluvalinate-tau II {CAS # 102851-06-9}	0.058	0.084
Fonofos	0.023	0.028
Heptachlor	0.022	0.029
Heptachlor endo-epoxide (isomer A)	0.039	0.048
Heptachlor exo-epoxide (isomer B)	0.037	0.045
Hexachlorobenzene	0	0.019
Malaoxon (metabolite of Malathion)	0.07	0.086
Malathion	0.044	0.055
Mecarbam	0.052	0.062
Methidathion	0.063	0.08
Methylpentachlorophenyl sulfide	0.001	0.036
Mirex	0.042	0.056
Octachlorodipropyl ether (S421)	0.021	0.047
Omethoate	0.052	0.061
Paraoxon	0.071	0.08
Parathion	0.039	0.049
Parathion-methyl	0.035	0.045
Pendimethalin	0.038	0.048
Pentachloroaniline	0.002	0.049
Pentachloroanisole	0.017	0.021
Permethrin I	0.068	0.097
Permethrin II (trans)	0.071	0.115
Phosalone	0.005	0.089
Phosmet	0.031	0.104
Piperonyl butoxide	0.117	0.105
Pirimiphos-ethyl	0.044	0.053
Pirimiphos-methyl	0.04	0.05
Procymidone	0.064	0.082
Profenofos	0.058	0.071
Prothiofos	0.033	0.06
Quinalphos	0.042	0.061
Quintozene	0.02	0.028
Ronnel (Fenchlorphos)	0.031	0.04
Tecnazene (TCNB)	0.011	0.014
Tetradifon	0.062	0.077
Vinclozolin	0.043	0.052

eXtreme|FV

GCMS Data (links to PDF)

Without Internal Spike

SPE w/ Filtration| http://bit.ly/spe-spike
eXtreme|FV® 85540 | http://bit.ly/extreme-no-spike

With Internal Spike

USP 36 <561> with 0.1 PPM | http://bit.ly/usp-spike
eXtreme|FV® with 0.1 PPM | http://bit.ly/extreme-with-spike

Conclusions

The Thomson eXtreme 0.45µm, PTFE Filter Vials patented (Part#: 85540-500) yielded 26% higher recoveries on average when tested with 87 common pesticides. In the cases highlighted in the results table, greater than 428% recovery increases were seen. In the case of Hexachlorobenzene, no pesticide was detected in the sample prepared by SPE and 0.019 ppm was detected in the sample prepared with the eXtreme|FV®. The use of Thomson eXtreme 0.45µm, PTFE Filter Vials as a substitute for SPE conforms to USP Method 561.

The results show Thomson eXtreme|FV®s offer a viable alternative with higher recovery and less preparation time compared to SPE for the preparation of juices prior to pesticide analysis.

Time = Money

To process 6 samples	Traditional SPE or GPC	QuEChERS with SPE clean-up	QuECHERS with Thomson Filter Vial clean-up*	Thomson Filter Vial Benefits
Estimated (minutes)	120	20	10	1
Solvent used (mL)	90	10-15	5	0.5
Chlorinated waste (mL)	30	none	none	none
Specialized equipment	Separatory funnels, water bath, evaporator, etc.	Vacuum pump, vacuum manifold	none	none

*Significant time & money savings because lengthy wash steps are eliminated!

THOMSON

Antibody Analysis with eXtreme|FV®

Membrane	Pore Size	Part #	Benefit
PES	0.2µm	85535	Direct antibody analysis from Optimum Growth® Flask or bioreactor

HPLC Column and Method

Column

Poros® Protein A by Applied Biosystem® 2-1001-00 Column

Method

A Solvent: PBS pH 7.4

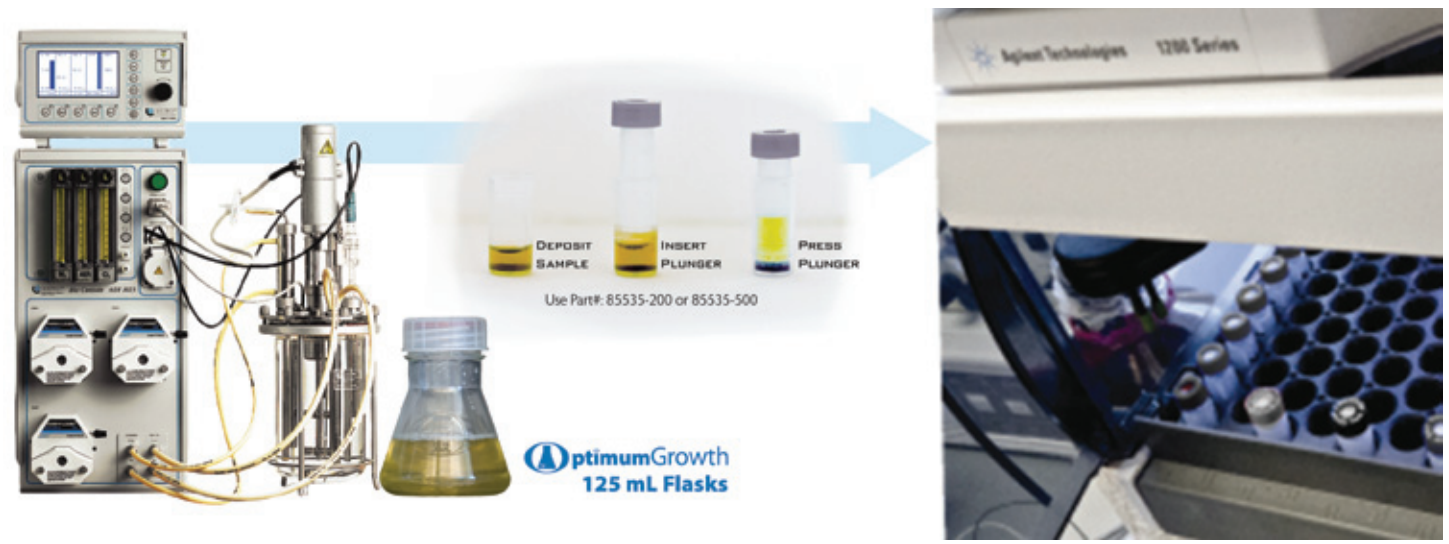
B Solvent: 150 milimolar Sodium Cloride pH 2.2

Isocratic 6 minute run on an Agilent® 1200

Filter Vials Allow

- Real Time Monitoring
- Quantify Antibodies
- Ideal For Timepoints
- Accurate On The Fly Adjustments
- Fits In Standard Autosampler

Note: may need press.



Analysis of Nitrosamines in Tobacco

Membrane	Pore Size	Part #	Benefit
PVDF	.045µm	85541	Less prep time, faster results

Prep:

1. 0.25g of unburned/smokeless tobacco sample
2. Extracted with 100mM ammonium acetate solution, filtered with eXtreme|FV® PVDF 0.45 µm

Equipment:

HPLC:

Injection Volume: 5 µL
Column: Waters Xterra MS C18, 50x4.6mm, 5µm
Aqueous phase: 5mM ammonium acetate in HPLC water
Organic Phase: 5mM ammonium acetate in 95/5 acetonitrile/water.

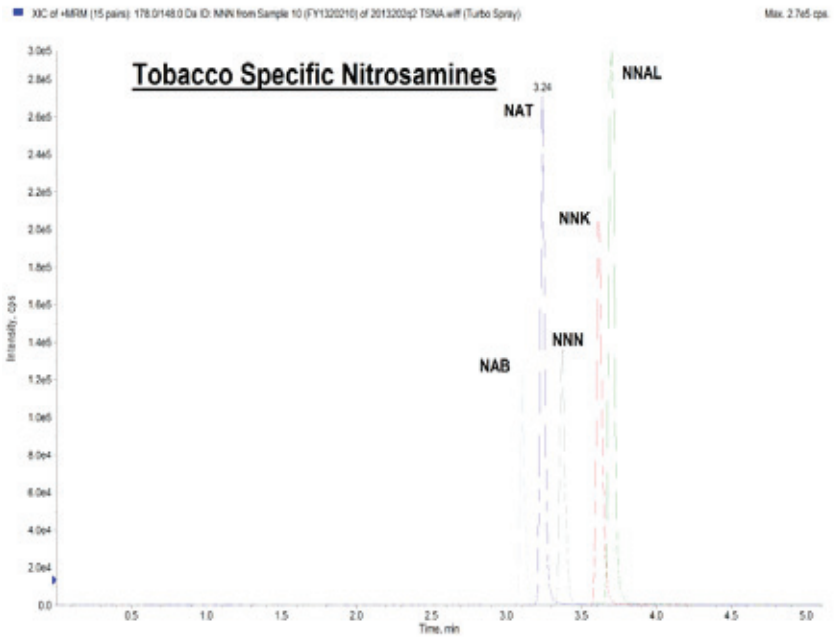
Gradient:

Time [min]	Organic %
0	5
1	5
2	35
5	35
6	5
8	5

Flow rate: 1mL/min

Temperature: 60°C

Detection: MS/MS



Analyte	Ion pair Q1/Q3 (amu)
N-Nitrosoanabasine (NAB)	192/162
N-Nitrosoanatabine (NAT)	190/160
N-Nitrosonornicotine (NNK)	208/122
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNN)	178/148
4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL)	210/180

Supplement Analysis Of Huperzine A by HPLC

.45 µM eXtreme|FV® Nylon

Membrane	Pore Size	Part #	Benefit
NYLON	.045µm	85539	Reduce background matrix, reducing ion suppression

Introduction

This method investigates whether the extraction of Huperzine A from the Chinese Club Moss, Huperzia serrata, can be improved. The existing method for the extraction of Huperzine A requires centrifugation followed by a liquid-liquid extraction. The improved method will simplify the process by only using the autosampler ready Thomson eXtreme|FV®, 0.45µM Nylon membrane.

Huperzine A Summary

1. Samples are extracted with 10mM HCl (aqueous).
2. Non-soluble plant parts or excipients are filtered out using a 0.45µm Nylon filter.
3. Samples are injected onto the HPLC System.

Experimental

Existing Sample Preparation:

- Weight the Chinese Club Moss plant matter into a centrifuge tube.
- Add 10 mM HCl (aq.).
- Vortex.
- Centrifuge for 10 minutes to separate solid materials from Huperzine A.
- Remove top layer.
- Filter using a syringe and syringe filter with a 0.45µm nylon membrane.

Improved Sample Preparation:

- Weight the Chinese Club Moss plant matter into the outer shell of the eXtreme|FV®.
- Add 10mM HCl (aq.).
- Partially depress the eXtreme|FV® plunger with a 0.45µm nylon filter.
- Vortex and completely depress the eXtreme|FV® plunger.
- Inject Sample onto HPLC system.

Results:

The chromatograms in fig 2 and fig 3 show the HPLC analysis of Huperzine A extracted from the Chinese Club Moss. The chromatograms show that the improved sample preparation method using the Thomson eXtreme|FV®, 0.45µm nylon membrane provides an alternative to centrifugation and liquid-liquid extraction for the extraction and clean-up of plant materials potency analysis.

Conclusions:

The results clearly show that the Thomson eXtreme|FV®s offer an alternative to centrifuging and liquid-liquid extraction. The Thomson eXtreme|FV®s provide a more reproducible way to prepare samples for potency analysis by alleviating the guess work involved in a liquid-liquid extraction. Future testing will involve evaluating other botanicals for potency analysis.

Fig 1: Chromatogram of Huperzine A extracted from the Chinese Club Moss, Huperzia serrata

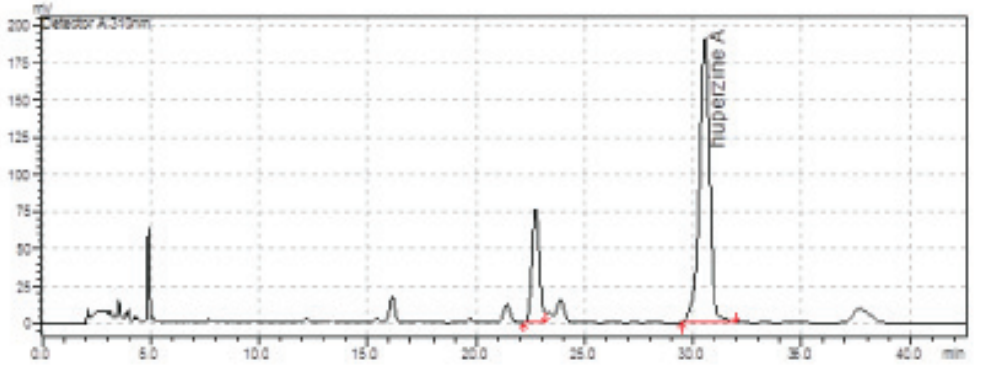


Fig 2: Chromatogram of Huperzine A extracted from a Club Moss Powdered Extract

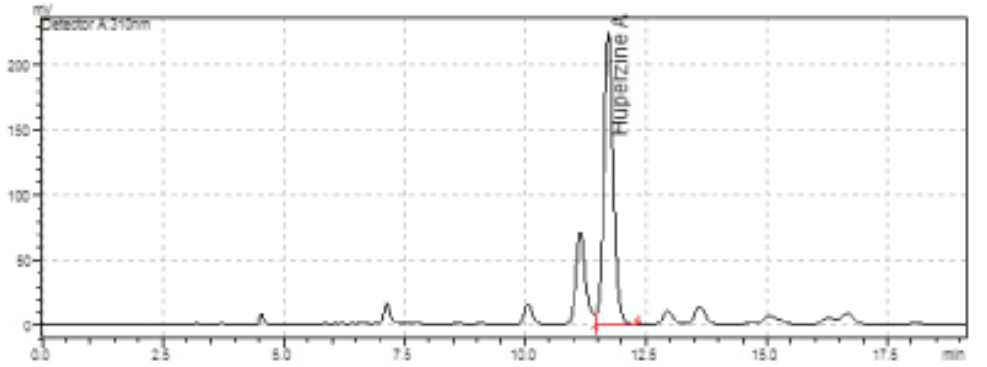


Fig 3: Prev. Method, Chromatogram of Huperzine A extracted from Chinese Club Moss, Huperzia serrata

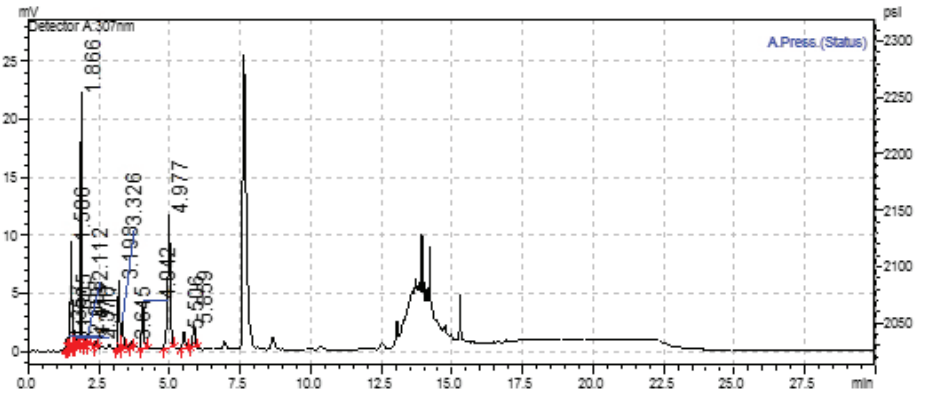
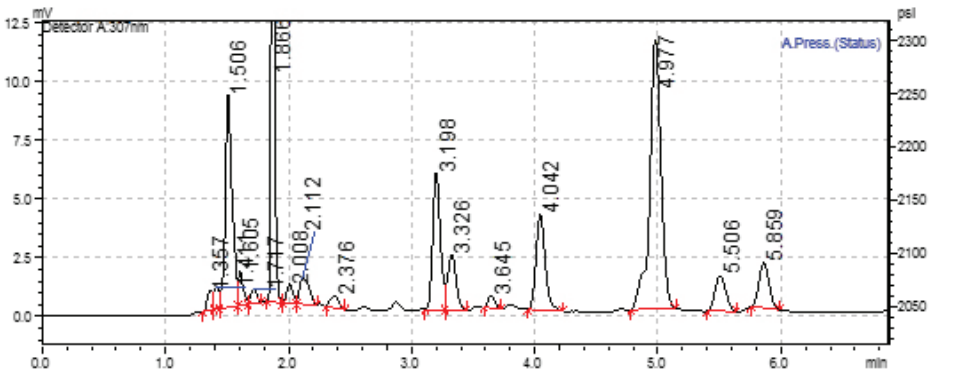


Fig 4: Prev. Method, Chromatogram of Huperzine A extracted from a Club Moss Powdered Extract



Expedited Vitamin C Sample Preparation Through the Use of eXtreme|FV® Technology

Membrane	Pore Size	Part #	Benefit
PVDF	0.2µm	85531	Saves money & time using Thomson Filter Vials

Heidi Evenocheck, John Habel, Xun Yan

Analytical Sciences, Amway, 7575 Street E, Ada, MI 49355. Expedited Vitamin C sample preparation through the use of vial filtration technology. Poster presented as part of 128th Annual AOAC Meeting and Expo, Boca Rotan, FL, 7-10 September 2014.

Abstract:

At Amway, Vitamin C Analysis is routinely performed for large numbers of samples. With large batches of samples for preparation and processing, each step in sample prep becomes very costly in terms of analyst time. Thomson EXtreme|FV®s reduce a multi-step filtration and vial transfer process to a single step. We compared results from traditional sample preparation employing syringes, syringe filters, and HPLC autosampler vials with the results using only the Thomson Filter Vial product.

Introduction:

As a common marker for nutritional products, Vitamin C analysis is routinely performed for large numbers of samples. Large batches of samples are prepared for each instrument run. Each step in the sample prep becomes a time-limiting step, with these large batches. Which translates to a larger cost in analyst time and consumables. Any reduction in time or materials can be realized as a cost savings to the lab performing the analysis.

The final steps of sample prep require the analyst to filter the sample into an HPLC autosampler vial employing a syringe and syringe filter. This is a costly step in terms of time and materials that adds little value to the final result. Any gains made at this step of the procedure can reduce the time and cost associated with Vitamin C analysis. Autosampler vials with an integrated PVDF filter are now available. The use of these vials in place of the current procedure allows several samples to be filtered at one time, reducing the time required to complete this step. The vials are also cheaper than buying a syringe, filter, and vial separately, resulting in a material cost savings in addition to the time reduction.

Method

Materials:

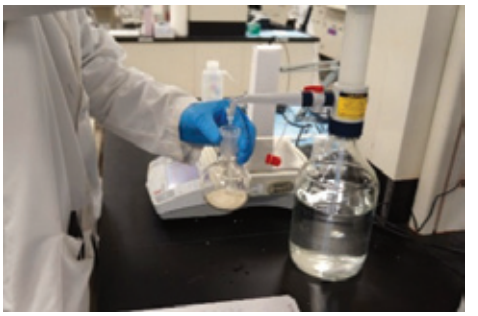
- Thomson eXtreme|FV® (0.20µm PVDF, p/n 85531)
- Thomson 48 Position Toggle Press
- Laboratory glassware and pipettes
- Extraction Solution: 1.2% HPO3 with 10% Methanol
- DHAA Reduction Solution: 5mM TCEP, pH=2.5
- HPLC Column: Agilent Zorbax SB-Aq, 5µ, 4.6x150

Instrument Method:

- Isocratic 0.1% ortho-Phosphoric Acid
- Run-Time: 10 minutes
- Flow Rate: 0.6 mL/minutes
- Agilent HPLC with PDA detection
- Wave Length: 245nm

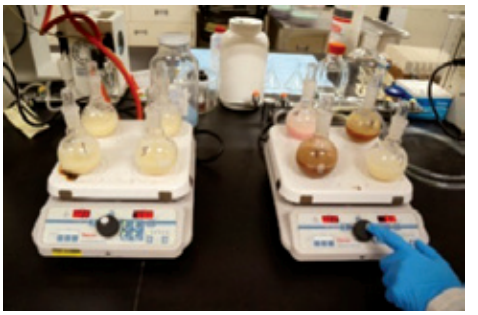
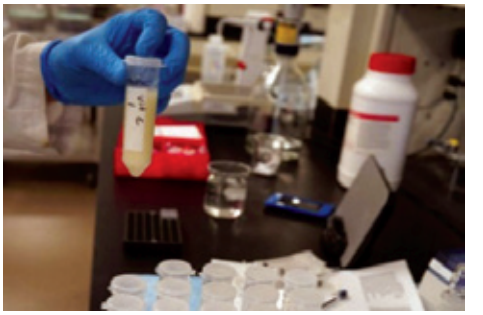
Sample Preparation:

Step 1:

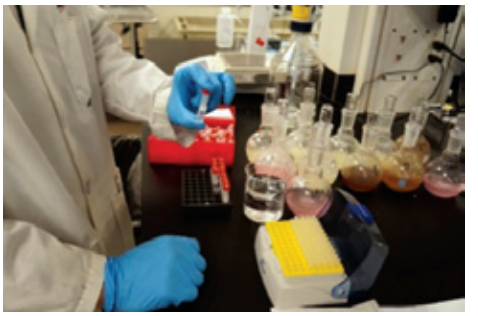

1. Samples are weighed into round bottom flasks.
2. Extraction solution is added to the flasks
3. Sample flasks with extraction solution are weighed again.

Step 2:

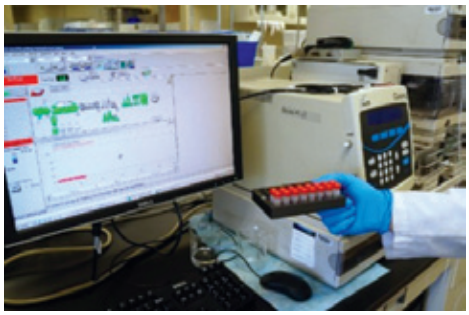
1. Chloroform is added to flask remove fats from solution.
2. Samples are then stirred for half an hour for extraction.
3. Depending on solution thickness, samples may be centrifuged to separate

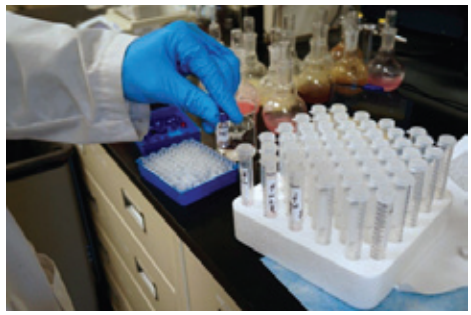
Step 3:


1. 100 µL of sample is pipette into 0.2 µm filter auto sampler vial. Then 400 µL of extraction solution is added. Total volume 0.5 mL.
2. The vials are capped with filter caps and then placed in the vial press plate.
3. Once all samples have been capped they are pressed and filtered simultaneously. Once complete they are ready for analysis.

Step 4:





1. All samples are run on HPLC instrument with a set method for analysis.
2. Traditional sample prep method samples were diluted and centrifuged in 15 mL centrifuge tubes and then were filtered through syringe filters into auto sampler vials.
3. Samples were then capped and injected following a sequence on the HPLC.

Results:

Table 1 depicts a single sample processed using the original method, syringe and syringe filter, compared to the same sample diluted and filtrated using Thompson Filter Vials. Data for the two filtration methods were tested for equivalence using TOST. Analysis was performed using the rtost function of the equivalence package. For this test, samples are tested against the null hypothesis that the mean value for the filtration methods are different. Using a sigma value of 0.05 and epsilon corresponding to a 5% difference between the means gives a p-value = 0.00272. At this p-value, we conclude that the sample means are equivalent.

Based on the statistical testing, we have found there is no significant difference between the two filtration methods – syringe with filter and the Thomson Filter vial.

Sample Filtration	Rep 1|2	Rep 3|4	Rep 5|6	Mean	Std. Dev.	% RSD
Syringe w/ Filter	67.92 | 69.81	69.93 | 70.31	69.57 | 70.30	69.64	0.89	1.28
Thomson Filter Vial	68.92 | 68.20	70.01 | 70.79	70.41 | 71.15	69.91	1.14	1.63

Table 1. Syringe Filtration compared to Filter Vial

Conclusion:

- No significant difference was found in the sample results between the two filtration methods.
- The Thomson eXtreme|FV® can be used in place of traditional syringe and filter technique to save time and cost associated with sample preparation.

Screening and Quantitation of 250 Pesticides in Apple Juice using the eXtreme|FV® by LC/MS/MS

Membrane	Pore Size	Part #	Benefit
PVDF	0.2µm	85531	Simple Sample 1, 2 Prep

Z.Yang, L. Maljers, Bruker, Chemical & Applied Markets (CAM) Division. "Screening and Quantitation of 250 Pesticides in Fruit Juices with Positive/Negative Switching LC/MS/MS." Poster presented as part of NACRW-FPRW Conference, St. Petersburg, FL., 20-23 July 2014.

Introduction:

A study is conducted using the Bruker EVOQ for the analysis of 250 pesticides in apple juice using only one method in store-bought juice and simple sample preparation using the Thomson eXtreme|FV®s in a dilute-and-shoot approach without sample enrichment. LC-MS/MS operated in Multiple Reaction Monitoring (MRM) mode with dual scan Electrospray Ionization (ESI) is widely used for polar, semi-volatile, and thermally labile pesticides in food testing. The Bruker EVOQ Elite LC-Triple Quadrupole System provides fast positive/negative switching, allowing for simultaneous determination of positive and negative co-eluting compounds numbering in the hundreds. Simple sample preparation is explored using Thomson eXtreme|FV®s for sample clean-up instead of lengthy alternatives like SPE or centrifugation followed by liquid-liquid extraction.

Equipment:

- EVOQ Elite Triple Quadrupole Mass Spectrometer
- Bruker UHPLC
- CTC Autosampler
- Source: HESI
- Spray Voltage Positive: 4000V
- Spray Voltage Negative: 4000V
- Column: YMC-Pack ODS-AQ 3µm
- Column Temperature: 40°C
- Injection Volume: 30µL
- Mobile Phase:
  - Mobile Phase A: 5mM Ammonium Fluoride in Water
  - Mobile Phase B: Methanol
    - Gradient:

Time	%A	%B	Flow (µL/min)
0.00	90	10	400
0.20	90	10	400
2.00	30	70	400
10.0	0	100	400
15.0	0	100	400
15.1	90	10	500
17.5	90	10	500
18.0	90	10	400

Sample Preparation:

1. Pipette 50µL of store-bought apple juice and 450µL of solvent (10% Methanol/ 90% Water) directly into the outer shell of Thomson eXtreme|FV®, 0.2µm PVDF.
2. Partially depress the eXtreme|FV® plunger and vortex.
3. Depress the completely and load onto the autosampler.

Results:

Fig 1. Chromatogram of a 0.01ppb standard solution containing the compounds listed in Table 1 This is equivalent to 0.1ppb in juice.

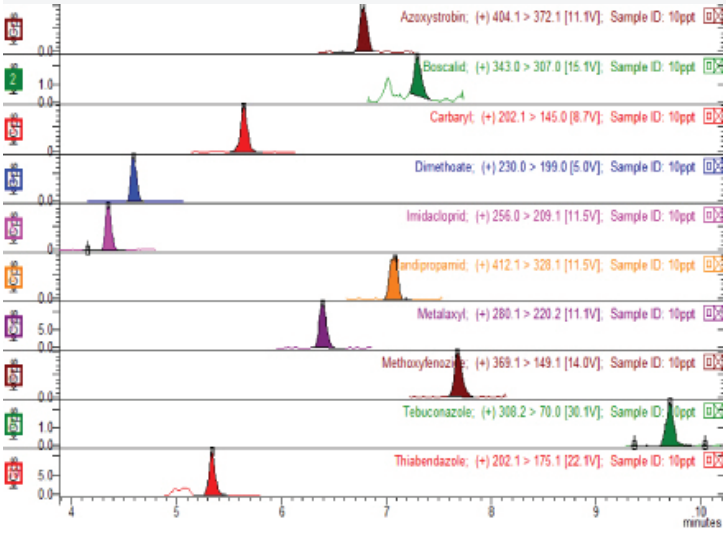


Fig 2. Calibration curve of negative pesticide Fipronil (left top) and positive pesticide Cyazofamid (left bottom), and their co-eluting plots (right).

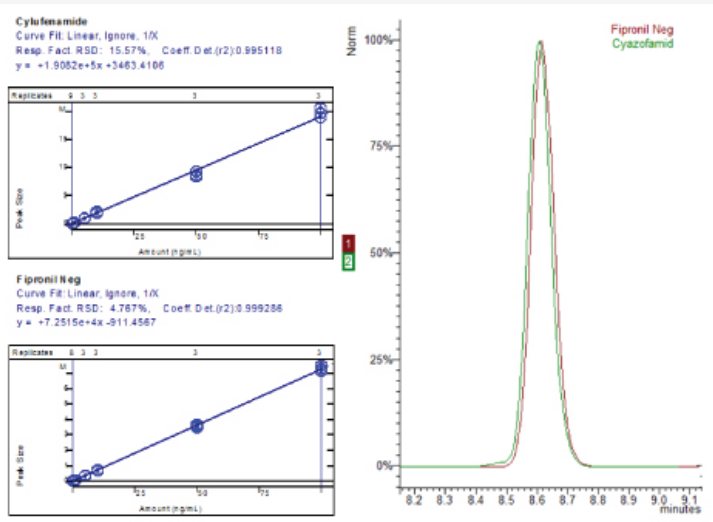
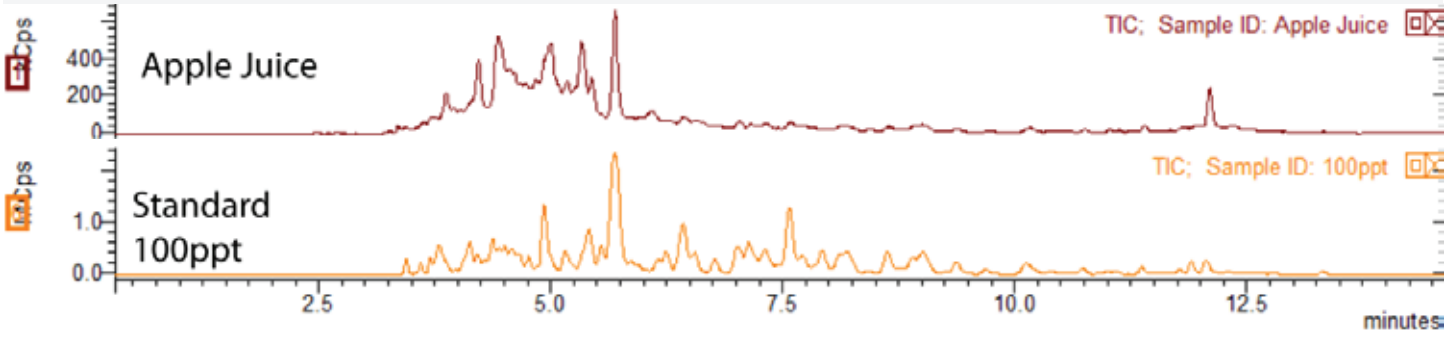


Fig 3. TIC of apple juice and Pesticide Standard Mix (see Index 1.)



Fruit juice: Apple juice

Pesticide	µg/L(ppb)
Azoxystrobin	ND
Boscalid	ND
Carbaryl	ND
Carbofuran	ND
Dimethoate	ND
Imidacloprid	ND
Mandipropamid	ND
Metalaxyl	ND
Methoxyfenozide	ND
Tebuconazole	ND
Thiabendazole	1.8

Table 1. Test results for the store-bought apple juice. ND is not detected, < 0.1ppb

List of Pesticides Screened

1-Naphthol	Clothianidin	Fenuron	Metaflumizone	Prothioconazole
2,3,5_trimethacarb	Cyanazine	Fipronil Neg	Metalaxyl	Pymetrozine
2,4-D	Cyazofamid	Flonicamid	Metconazole	Pyracarbolid
2,6 dichlorbenzamide	Cycluron	Fluazinam	Methabenzthiazuron	Pyraclostrobin
3-Hydroxycarbofuran	Cyflumetofen	Flubendiamide	Methamidophos	Pyridaben
Acephate	Cylufenamide	Fludioxinil Neg	Methiocarb	Pyrimethanil
Acetamiprid	Cymoxanil	Flufenacet	Methiocarb sulfoxide	Pyriproxyfen
Acibenzolar-S	Cyproconazole Isomer 1	Flufenoxuron	Methomyl	Quinoxyfen
Alanycarb	Cyproconazole Isomer 2	Fluometuron peak1	Methoprotryne	Rotenone
Aldicarb	Cyprodinil	Fluometuron peak2	Methoxyfenozide	Secbumeton isomer 1
Aldicarb sulfone	Cyromazine	Fluoxastrobin	Metobromuron	Secbumeton Isomer 2
Aldicarb sulfoxide	Desmedipham	Fluquinconazole	Metolachlor	Siduron
Ametryn	Dichloroprop-P isomer 1	Flusilazole	Metribuzin	Simazine
Aminocarb	Dichloroprop-P isomer 2	Flutolanil	Mevinphos Isomer 1	Simetryn
Amitraz	Diclobutrazol	Flutriafol	Mevinphos Isomer 2	Spinetoram
Atrazine	Dicrotophos	Forchlorfenuron	Mevinphos Isomer 3	Spinosad (Spinosyn A)
Avermectin B1a	Diethofencarb	Formetanate HCl	Mexacarbate	Spinosad (Spinosyn D)
Avermectin B1b	Difenoconazole Isomer 1 & 2	Fuberidazole	MGK peak1	Spirodiclofen
Azoxystrobin	Diflubenzuron	Furalaxyl	MGK peak2	Spiromesifen
Benalaxyl	Dimethoate	Furathiocarb	Monocrotophos	Spirotetramat
Bendiocarb	Dimethomorph Isomer 1	Halofenozide	Monolinuron	Spiroxamine Isomer 1 & 2
Benfuracarb	Dimethomorph Isomer 2	Hexaconazole	Moxidectin	Sulfentrazone
Bentazone	Dimoxystrobin	Hexaflumuron Neg	Myclobutanil	Tebuconazole
Benzoximate	Diniconazole	Hexazinone	Neburon	Tebufenozide
Bifenazate	Dinotefuran	Hexythiazox	Nitenpyram	Tebufenpyrad
Bitertanol	Dioxacarb	Hydramethylnon m8	Novaluron	Tebuthiuron
Boscalid	Diuron peak 1	Hydroprene	Nuarimol	Teflubenzuron M3 neg

Index 1. List of Pesticides Screened

List of Pesticides Screened

Bromucanozole Isomer 1	Diuron peak 2	Hydroxy Atrazine	Omethoate	Temephos
Bromucanozole Isomer 2	Doramectin	Imazalil	Oxadixyl	Terbumeton peak1
Bupirimate	Emamectin-benzoate b1a	Imidacloprid	Oxamyl	Terbumeton peak2
Buprofezin	Emamectin-benzoate b1b	Indoxacarb	Paclitaxel	Terbutryn
Butafenacil	Epoxiconazole	Ipconazole Isomer 1	Paclobutrazol	Tetraconazole
Butocarboxim	Eprinomectin	Ipconazole Isomer 2	Penconazole	Thiabendazole
Butoxycarboxim	Etaconazole Isomer 1 and 2	Iprovalicarb Isomer 1 & 2	Pencycuron (Monceren)	Thiacloprid
Butralin	Ethiofencarb	Isocarbophos	Pendimethalin	Thiamethoxam
Carbamazepine	Ethiprole	Isoprocarb	Phenmedipham	Thidiazuron
Carbaryl	Ethirimol	Isoproturon	Picoxystrobin	Thiobencarb
Carbendazim	Ethofumesate pos NH4	Isopyrozam	Piperonyl butoxide	Thiodicarb
Carbetamide	Etoxazole	Ivermectin	Pirimicarb	Thiofanox
Carbofuran	Famoxadone	Kresoxim	Prochloraz	Thiophanate
Carboxin	Fenamidone	Linuron	Prohexadione	Triadimefon
Carboxine	Fenarimol	Lufenuron Neg	Promecarb	Triadimenol
Carfentrazone-ethyl	Fenazaquin	Lufenuron pos	Prometon	Trichlorfon
Chlorantraniliprole	Fenbuconazole	Mandipropamid	Prometryne	Tricyclazole
Chlorfluazuron	Fenbutatin oxide	MCPA	Propamocarb	Trifloxystrobin
Chlorotoluron	Fenhexamid	Mecoprop	Propargite	Triflumizole
Chloroxuron	Fenobucarb	Mefenacet	Propham	Triflumuron
Clethodim Isomer 1	Fenoxycarb	Mepanipyrim	Propiconazole Isomer 1 & 2	Triticonazole
Clethodim Isomer 2	Fenpropimorph	Mepronil	Propoxur	Vamidothion
Clofentezine	Fenpyroximate	Mesotrione Neg	Propyzamide	Zoxamide

Index 1. List of Pesticides Screened

Conclusion:

- The calibration on triplicate injections showed excellent linearity and response factor RSD over 3 orders, range using the Thomson eXtreme|FV® for sample preparation.
- Good linearity, sensitivity and response factor, RSD for positive and negative co-eluting pesticides.
- A total of 3 pesticides were detected in the store-bought apple juice.

Screening and Quantitation of 250 Pesticides in Grape Juice using the eXtreme|FV® by LC/MS/MS

Membrane	Pore Size	Part #	Benefit
PVDF	0.2µm	85531	Simple Sample 1, 2 Prep

Z.Yang, L. Maljers, Bruker, Chemical & Applied Markets (CAM) Division. "Screening and Quantitation of 250 Pesticides in Fruit Juices with Positive/Negative Switching LC/MS/MS." Poster presented as part of NACRW-FPRW Conference, St. Petersburg, FL., 20-23 July 2014.

Introduction:

A study is conducted using the Bruker EVOQ for the analysis of 250 pesticides in grape juice using only one method in store-bought juice and simple sample preparation using the Thomson eXtreme|FV®s in a dilute-and-shoot approach without sample enrichment. LC-MS/MS operated in Multiple Reaction Monitoring (MRM) mode with dual scan Electrospray Ionization (ESI) is widely used for polar, semi-volatile, and thermally labile pesticides in food testing. The Bruker EVOQ Elite LC-Triple Quadrupole System provides fast positive/negative switching, allowing for simultaneous determination of positive and negative co-eluting compounds numbering in the hundreds. Simple sample preparation is explored using Thomson eXtreme|FV®s for sample clean-up instead of lengthy alternatives like SPE or centrifugation followed by liquid-liquid extraction.

Equipment:

- EVOQ Elite Triple Quadrupole Mass Spectrometer
- Bruker UHPLC
- CTC Autosampler
- Source: HESI
- Spray Voltage Positive: 4000V
- Spray Voltage Negative: 4000V
- Column: YMC-Pack ODS-AQ 3µm
- Column Temperature: 40°C
- Injection Volume: 30µL
- Mobile Phase:
  - Mobile Phase A: 5mM Ammonium Fluoride in Water
  - Mobile Phase B: Methanol
    - Gradient:

Time	%A	%B	Flow (µL/min)
0.00	90	10	400
0.20	90	10	400
2.00	30	70	400
10.0	0	100	400
15.0	0	100	400
15.1	90	10	500
17.5	90	10	500
18.0	90	10	400

Sample Preparation:

1. Pipette 50µL of store-bought apple juice and 450µL of solvent (10% Methanol/ 90% Water) directly into the outer shell of Thomson eXtreme|FV®, 0.2µm PVDF.
2. Partially depress the eXtreme|FV® plunger and vortex.
3. Depress the completely and load onto the autosampler.

Results:

Fig 1. Chromatogram of a 0.01ppb standard solution containing the compounds listed in Table 1 This is equivalent to 0.1ppb in juice.

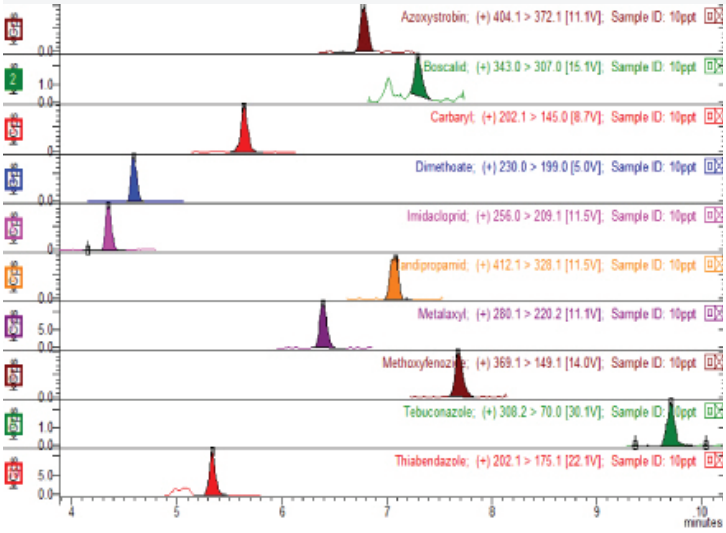


Fig 2. Calibration curve of negative pesticide Fipronil (left top) and positive pesticide Cyazofamid (left bottom), and their co-eluting plots (right).

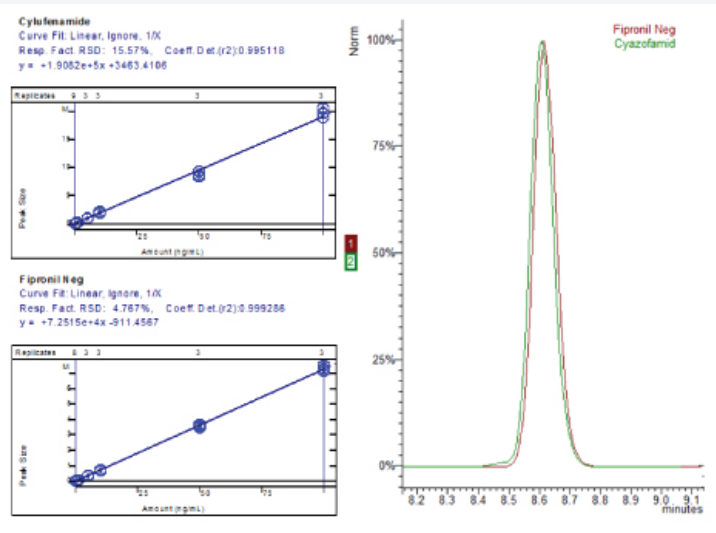
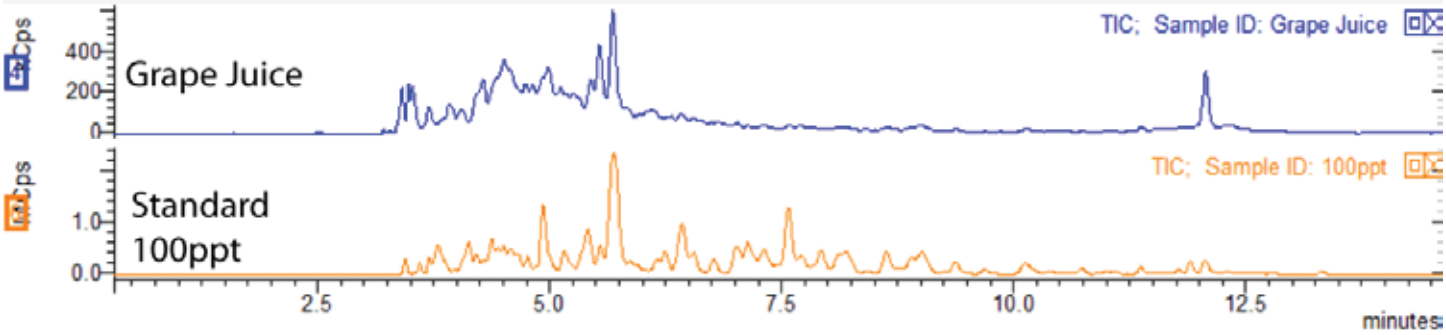


Fig 3. TIC of apple juice and Pesticide Standard Mix (see Index 1.)



Fruit juice: Grape juice

Pesticide	µg/L(ppb)
Azoxystrobin	ND
Boscalid	ND
Carbaryl	ND
Carbofuran	ND
Dimethoate	ND
Imidacloprid	ND
Mandipropamid	ND
Metalaxyl	ND
Methoxyfenozide	ND
Tebuconazole	ND
Thiabendazole	ND

Table 1. Test results for the store-boughtgrape juice. ND is not detected, < 0.1ppb

List of Pesticides Screened

1-Naphthol	Clothianidin	Fenuron	Metaflumizone	Prothioconazole
2,3,5_trimethacarb	Cyanazine	Fipronil Neg	Metalaxyl	Pymetrozine
2,4-D	Cyazofamid	Flonicamid	Metconazole	Pyracarbolid
2,6 dichlorbenzamide	Cycluron	Fluazinam	Methabenzthiazuron	Pyraclostrobin
3-Hydroxycarbofuran	Cyflumetofen	Flubendiamide	Methamidophos	Pyridaben
Acephate	Cylufenamide	Fludioxinil Neg	Methiocarb	Pyrimethanil
Acetamiprid	Cymoxanil	Flufenacet	Methiocarb sulfoxide	Pyriproxyfen
Acibenzolar-S	Cyproconazole Isomer 1	Flufenoxuron	Methomyl	Quinoxyfen
Alanycarb	Cyproconazole Isomer 2	Fluometuron peak1	Methoprotryne	Rotenone
Aldicarb	Cyprodinil	Fluometuron peak2	Methoxyfenozide	Secbumeton isomer 1
Aldicarb sulfone	Cyromazine	Fluoxastrobin	Metobromuron	Secbumeton Isomer 2
Aldicarb sulfoxide	Desmedipham	Fluquinconazole	Metolachlor	Siduron
Ametryn	Dichloroprop-P isomer 1	Flusilazole	Metribuzin	Simazine
Aminocarb	Dichloroprop-P isomer 2	Flutolanil	Mevinphos Isomer 1	Simetryn
Amitraz	Diclobutrazol	Flutriafol	Mevinphos Isomer 2	Spinetoram
Atrazine	Dicrotophos	Forchlorfenuron	Mevinphos Isomer 3	Spinosad (Spinosyn A)
Avermectin B1a	Diethofencarb	Formetanate HCl	Mexacarbate	Spinosad (Spinosyn D)
Avermectin B1b	Difenoconazole Isomer 1 & 2	Fuberidazole	MGK peak1	Spirodiclofen
Azoxystrobin	Diflubenzuron	Furalaxyl	MGK peak2	Spiromesifen
Benalaxyl	Dimethoate	Furathiocarb	Monocrotophos	Spirotetramat
Bendiocarb	Dimethomorph Isomer 1	Halofenozide	Monolinuron	Spiroxamine Isomer 1 & 2
Benfuracarb	Dimethomorph Isomer 2	Hexaconazole	Moxidectin	Sulfentrazone
Bentazone	Dimoxystrobin	Hexaflumuron Neg	Myclobutanil	Tebuconazole
Benzoximate	Diniconazole	Hexazinone	Neburon	Tebufenozide
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Butocarboxim	Eprinomectin	Ipconazole Isomer 2	Penconazole	Thiabendazole
Butoxycarboxim	Etaconazole Isomer 1 and 2	Iprovalicarb Isomer 1 & 2	Pencycuron (Monceren)	Thiacloprid
Butralin	Ethiofencarb	Isocarbophos	Pendimethalin	Thiamethoxam
Carbamazepine	Ethiprole	Isoprocarb	Phenmedipham	Thidiazuron
Carbaryl	Ethirimol	Isoproturon	Picoxystrobin	Thiobencarb
Carbendazim	Ethofumesate pos NH4	Isopyrozam	Piperonyl butoxide	Thiodicarb
Carbetamide	Etoxazole	Ivermectin	Pirimicarb	Thiofanox
Carbofuran	Famoxadone	Kresoxim	Prochloraz	Thiophanate
Carboxin	Fenamidone	Linuron	Prohexadione	Triadimefon
Carboxine	Fenarimol	Lufenuron Neg	Promecarb	Triadimenol
Carfentrazone-ethyl	Fenazaquin	Lufenuron pos	Prometon	Trichlorfon
Chlorantraniliprole	Fenbuconazole	Mandipropamid	Prometryne	Tricyclazole
Chlorfluazuron	Fenbutatin oxide	MCPA	Propamocarb	Trifloxystrobin
Chlorotoluron	Fenhexamid	Mecoprop	Propargite	Triflumizole
Chloroxuron	Fenobucarb	Mefenacet	Propham	Triflumuron
Clethodim Isomer 1	Fenoxycarb	Mepanipyrim	Propiconazole Isomer 1 & 2	Triticonazole
Clethodim Isomer 2	Fenpropimorph	Mepronil	Propoxur	Vamidothion
Clofentezine	Fenpyroximate	Mesotrione Neg	Propyzamide	Zoxamide

Index 1. List of Pesticides Screened

Conclusion:

- The calibration on triplicate injections showed excellent linearity and response factor RSD over 3 orders, range using the Thomson eXtreme|FV® for sample preparation.
- Good linearity, sensitivity and response factor, RSD for positive and negative co-eluting pesticides.
- A total of 3 pesticides were detected in the store-bought grape juice.

Routine Targeted Quantitation & Identification of Pesticide Residues in Spinach using the eXtreme|FV® by LC-MS/MS

Membrane	Pore Size	Part #	Benefit
PVDF	.045µm	85541	Simple Sample 1, 2 Prep

A. Schreiber, AB SCIEX, Concord, ON, Canada; J. Jasak, AB SCIEX, Darmstadt, Germany. "Routine Targeted Quantitation and Identification of Pesticide Residues using Triple Quadrupole LC-MS/MS and Advanced Scheduling of MRM Transitions" Poster presented as part of NACRW-FPRW Conference, St. Petersburg, FL., 20-23 July 2014.

Introduction:

LC-MS/MS is a powerful analytical tool capable of screening samples for numerous compounds. MRM is typically used because of its excellent sensitivity, selectivity, and speed. Using QuEChERS for extraction, eXtreme|FV®s for clean-up, and UHPLC combined with core-shell particles columns provides good resolution and excellent peak shape, making it possible to detect hundreds of pesticides of a wide variety of compound classes and chemical properties in each sample. The new AB SCIEX Triple Quad™ 3500 with a Turbo V™ source and Curtain Gas™ interface supplies exceptional robustness and ruggedness. The advanced eQ™ electronics and the curved LINAC® collision cell were designed for unparalleled speed of MRM detection and fast polarity switching for comprehensive multi-component analysis. The method combines QuEChers for extraction, Thomson eXtreme|FV®s for clean-up, and the Sciex Scheduled MRM Pro Algorithm for identification of pesticides in fruit and vegetables analysis.

Equipment:

- AB Sciex Triple Quad™ 3500 with Turbo V™ source and Electrospray Ionization Positive Polarity
- Column: Phenomenex Kinetex™ Biphenyl 2.6µm column
- Mobile Phase: Fast gradient of Water/Methanol with 5mM Ammonium Formate
  - Flow rate: 0.5mL/min

Step	Time(min)	A(%)	B(%)
0	0.0	90	10
1	0.5	90	10
2	2.0	70	30
3	9.0	40	60
4	11.0	20	80
5	12.0	5	95
6	15.0	5	95
7	16.0	90	10
8	20.0	90	10

Sample Preparation:

1. Store-bought spinach is extracted using dispersive SPE following the European Standard Method 15662
2. SCIEX iDQuant™ standards kit are used for Pesticide Analysis
3. Extracts are diluted and filtered 5x with water in Thomson eXtreme|FV®, 0.45µm PVDF membrane

Results:

Fig 1. Sensitivity of selected pesticides detected at a concentration of 5ng/mL using the Triple Quad™ 3500 system (click image for larger)

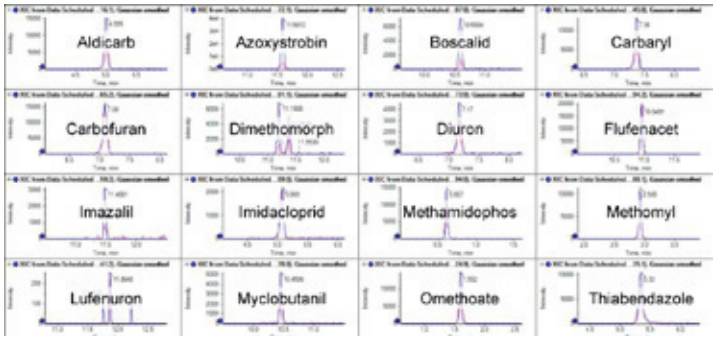


Fig 2. Sensitivity comparison of a 10 ng/mL standard analyzed using the API 3200™ system (top) and Triple Quad™ 3500 system (bottom) with an average sensitivity gain of 3x (click image for larger)

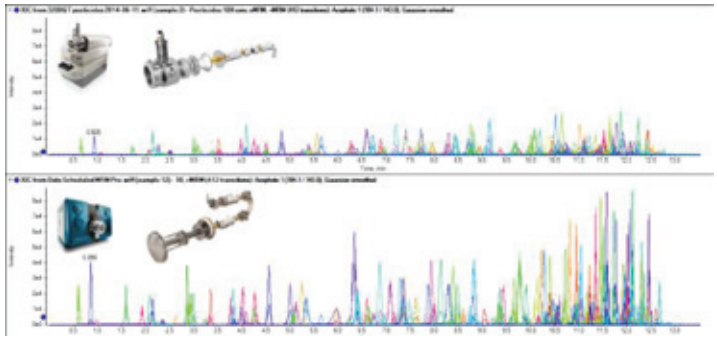
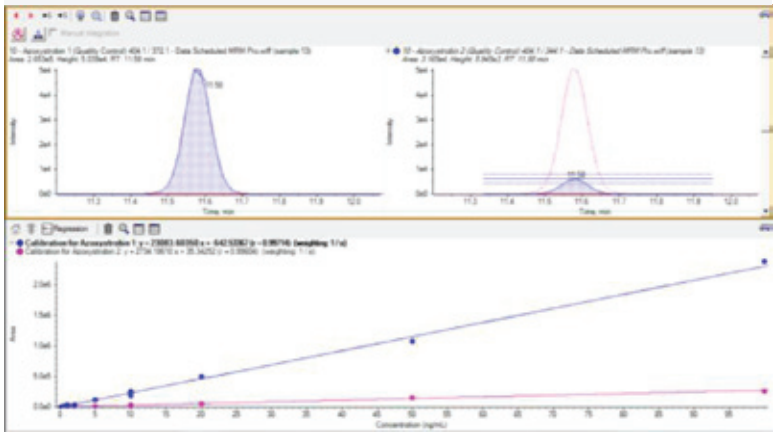


Fig 3. Calibration line of Azoxystrobin from 0.1 to 100 ng/mL (top) and quantifier-qualifier ratio for compound identification (bottom).



Sample	Pesticide	Concentration(µg/kg)	MRM Ratio(Expected Ratio)
Spinach	Boscalid	12.3	0.264 (0.242)
	Dimethomorph	53.7	0.537 (0.541)
	Fenamidone	755	0.749 (0.672)
	Imidacloprid	217	0.907 (0.993)
	Propamocarb	3.1	0.260 (0.336)
	Thiabendazole	3.6	0.917 (0.820)

Table 1. Pesticides that were found in store-bought spinach

Conclusion:

The AB Sciex Triple Quad 3500 was used for pesticide residue identification and quantification in store-bought fruit and vegetables. The method combines QuEChers extraction, Thomson eXtreme|FV®s, Phenomenex Kintex Biphenyl Column, and the Sciex Scheduled MRM Pro Algorithm. An average gain in sensitivity of 3x was observed, with most pesticides having an LOD of < 1ng/mL.

Routine Targeted Quantitation & Identification of Pesticide Residues in Carrot using the eXtreme|FV® by LC-MS/MS

Membrane	Pore Size	Part #	Benefit
PVDF	.045µm	85541	Simple Sample 1, 2 Prep

A. Schreiber, AB SCIEX, Concord, ON, Canada; J. Jasak, AB SCIEX, Darmstadt, Germany. "Routine Targeted Quantitation and Identification of Pesticide Residues using Triple Quadrupole LC-MS/MS and Advanced Scheduling of MRM Transitions" Poster presented as part of NACRW-FPRW Conference, St. Petersburg, FL., 20-23 July 2014.

Introduction:

LC-MS/MS is a powerful analytical tool capable of screening samples for numerous compounds. MRM is typically used because of its excellent sensitivity, selectivity, and speed. Using QuEChERS for extraction, eXtreme|FV®s for clean-up, and UHPLC combined with core-shell particles columns provides good resolution and excellent peak shape, making it possible to detect hundreds of pesticides of a wide variety of compound classes and chemical properties in each sample. The new AB SCIEX Triple Quad™ 3500 with a Turbo V™ source and Curtain Gas™ interface supplies exceptional robustness and ruggedness. The advanced eQ™ electronics and the curved LINAC® collision cell were designed for unparalleled speed of MRM detection and fast polarity switching for comprehensive multi-component analysis. The method combines QuEChers for extraction, Thomson eXtreme|FV®s for clean-up, and the Sciex Scheduled MRM Pro Algorithm for identification of pesticides in fruit and vegetables analysis.

Equipment:

- AB Sciex Triple Quad™ 3500 with Turbo V™ source and Electrospray Ionization Positive Polarity
- Column: Phenomenex Kinetex™ Biphenyl 2.6µm column
- Mobile Phase: Fast gradient of Water/Methanol with 5mM Ammonium Formate
  - Flow rate: 0.5mL/min

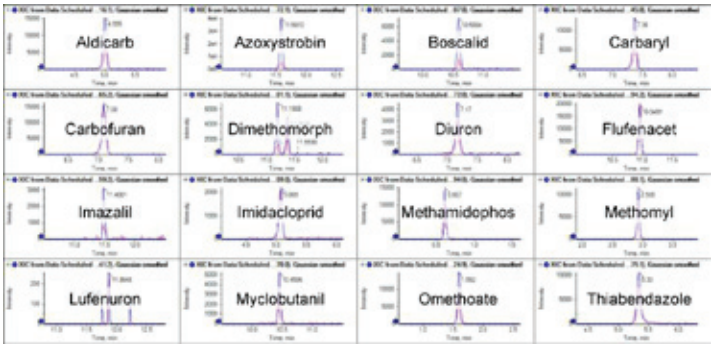
Step	Time(min)	A(%)	B(%)
0	0.0	90	10
1	0.5	90	10
2	2.0	70	30
3	9.0	40	60
4	11.0	20	80
5	12.0	5	95
6	15.0	5	95
7	16.0	90	10
8	20.0	90	10

Sample Preparation:

1. Store-bought spinach is extracted using dispersive SPE following the European Standard Method 15662
2. SCIEX iDQuant™ standards kit is used for Pesticide Analysis
3. Extracts are diluted and filtered 5x with water in Thomson eXtreme|FV®, 0.45µm PVDF membrane

Results:

Fig 1. Sensitivity of selected pesticides detected at a concentration of 5ng/mL using the Triple Quad™ 3500 system (click image for larger)



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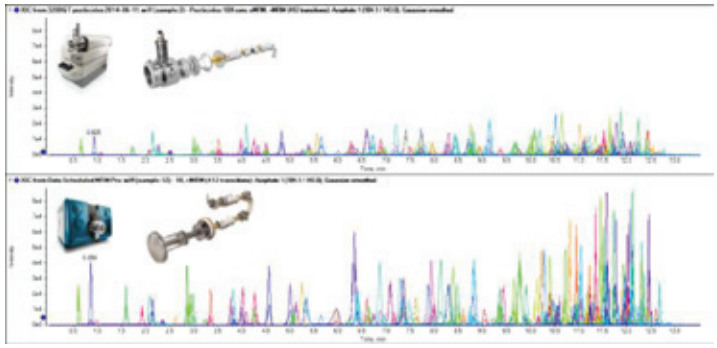

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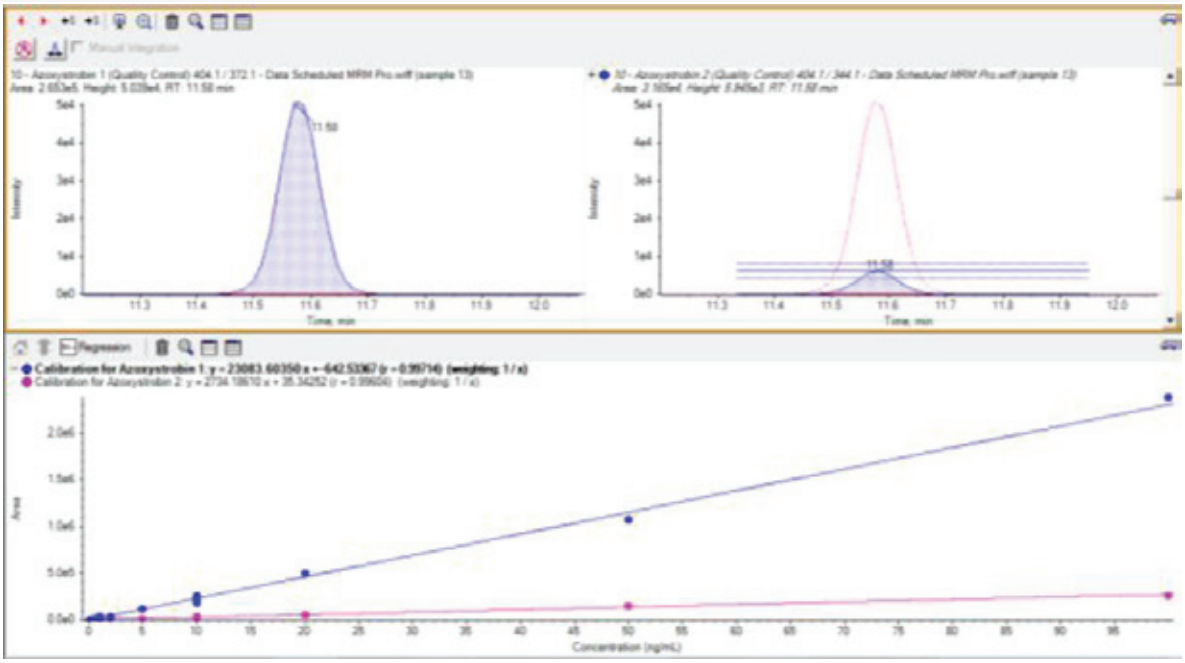


Sample	Pesticide	Concentration(µg/kg)	MRM Ratio(Expected Ratio)
Carrot	Linuron	14.3	0.613 (0.742)
	Thiabendazole	5.3	0.995 (0.820)

Table 1. Pesticides that were found in store-bought spinach

Conclusion:

The AB Sciex Triple Quad 3500 was used for pesticide residue identification and quantification in store-bought fruit and vegetables. The method combines QuEChers extraction, Thomson eXtreme|FV®s, Phenomenex Kintex Biphenyl Column, and the Sciex Scheduled MRM Pro Algorithm. An average gain in sensitivity of 3x was observed, with most pesticides having an LOD of < 1ng/mL.

Tea Analysis with eXtreme|FV® by GC-MS

Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	85540	Modified QuEChERS - fast, easy, low cost, less solvent

Introduction:

This method investigates whether SPE is required for the analysis of pesticides in green tea leaves using GC-MS. To simplify the comparison, the method utilizes an existing validated ISO method for the analysis of pesticides in food and natural products. The method is comprised of two sections: first, the extraction of the pesticides from the sample; second, the sample clean-up required for GC/MS.

Experimental

Sample Preparation for Green Tea Leaves:

- Current method uses a salt extraction followed by SPE clean-up.
- Improved method uses a salt extraction followed by Thomson eXtreme|FV® clean-up.
- One large sample is extracted and then split in half. Half the sample goes through SPE and the other half through the eXtreme|FV®.
- 2.0g of commercially available Green Tea is spiked with 0.2mL of 1.0 ppm pesticide standard mix containing 87 pesticides in a 40mL vial for a final concentration of 0.050 ppm.

SPE Cleanup Prior to Analysis - 6 mL Combo SPE Cartridge

1. Wash one 6 mL Combo SPE Cartridge (packed with 200 mg CarboPrep 200 and 400mg PSA) with acetonitrile.
2. Add the 10mL portion of the re-suspended residue from the flask labeled "for SPE" to the SPE cartridge.
3. Elute the sample from the cartridge with 50mL of acetonitrile.
4. Concentrate the eluted sample to 10mL using a Turbovap II concentrator.
5. Filter sample with a syringe and syringe filter, PTFE 0.45µm and elute into autosampler vial

Thomson eXtreme|FV® Cleanup Prior to Analysis

1. Add 400µL of the re-suspended residue from the flask labeled "for Thomson eXtreme|FV® to the shell of one Thomson eXtreme|FV® 0.45µm.
2. Insert plunger completely.

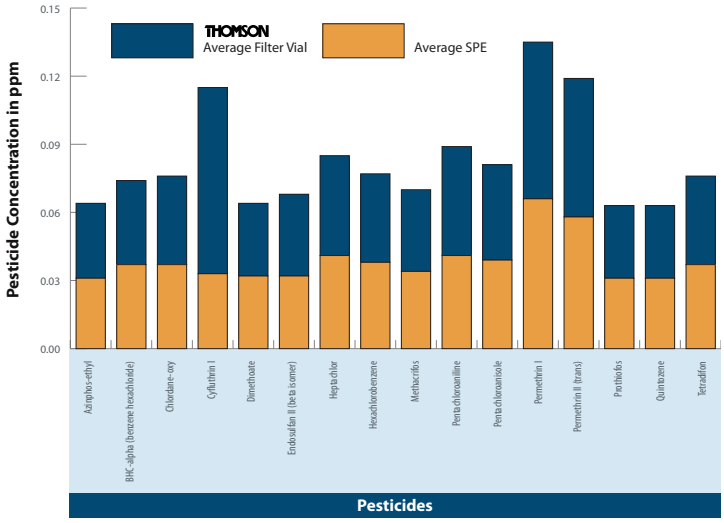
Equipment Conditions

Samples were analyzed utilizing an Agilent Technologies GC/MS, 7000 Triple Quad system equipped with a 7890A GC system and 7693 auto sampler.

Results

The results for the green tea can be seen in Table 1, Pesticides in Green Tea Comparison of SPE to eXtreme|FV®s and Fig. 1, Pesticides in Green Tea Comparison of SPE to eXtreme|FV®s, below, shows the recoveries for both clean-up methods: SPE and syringe filter (PTFE 0.45µm) and Thomson eXtreme® Filter Vial. The results show Thomson eXtreme® Filter Vials offer a viable alternative with higher recovery and less preparation time compared to SPE for the sample clean-up of tea leaves and for the clean-up of samples prior to pesticide analysis.

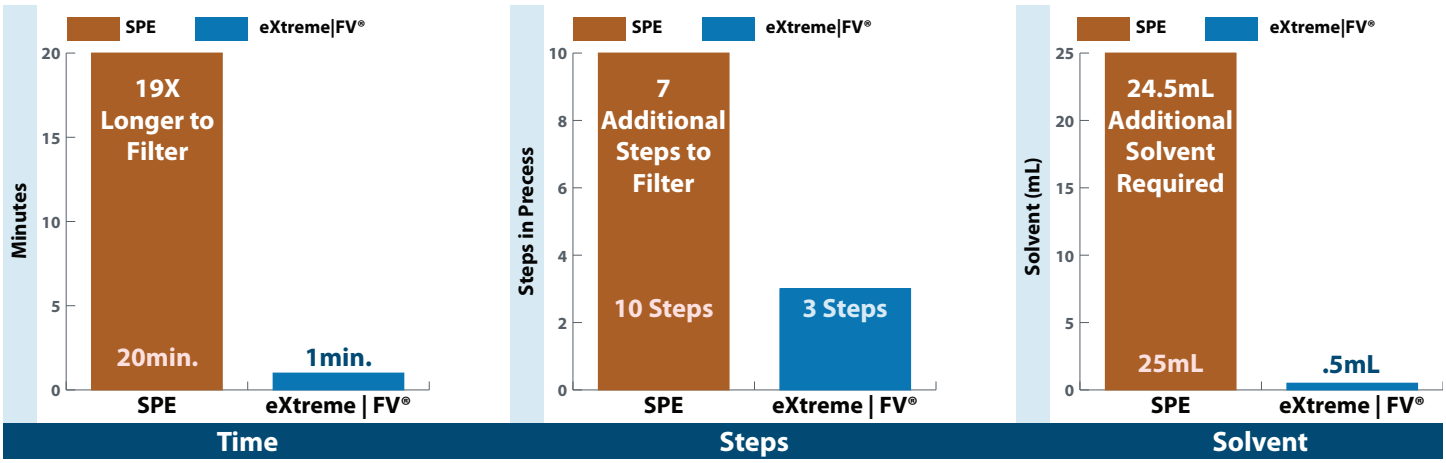
Fig 1. Pesticides in Green Tea Comparison of SPE to eXtreme|FV®s.



Compound/Sample Name	SPE Clean-up Average ppm	eXtreme|FV® Clean-up Average ppm
Azinphos-ethyl	0.031	0.033
BHC-alpha (benzene hexachloride)	0.037	0.037
Chlordane-oxy	0.037	0.039
Cyfluthrin I	0.033	0.082
Dimethoate	0.032	0.032
Endosulfan II (beta isomer)	0.032	0.036
Heptachlor	0.041	0.044
Hexachlorobenzene	0.038	0.039
Methacrifos	0.034	0.036
Pentachloroaniline	0.041	0.048
Pentachloroanisole	0.039	0.042
Permethrin I	0.066	0.069
Permethrin II (trans)	0.058	0.61
Prothiofos	0.031	0.032
Quintozene	0.031	0.032
Tetradifon	0.037	0.039

Table 1. Pesticides in Green Tea Comparison of SPE to eXtreme|FV®s.

SPE -vs- eXtreme|FV®



Conclusion:

The results clearly show Thomson eXtreme|FV®s, 0.45µm, PTFE Filter Vials patented (Thomson # 85540-500) offer a viable alternative with equivalent recovery and significantly less preparation time and solvent usage compared to sample clean-up with SPE for the preparation of green tea samples prior to pesticide analysis. Future testing is required to further streamline this method by re-evaluating the extraction procedure, specifically the need for the concentration/re-suspension steps.

nano|Filter Vial®

When Every µL Counts

nano|Filter Vials® *(10µL Dead Volume)*

Thomson nano|Filter Vials® offer a very low dead volume allowing one to filter as little as 10µL of sample with enough remaining filtrate to make a 2µL injection. The filter vial consists of two parts: a filter vial shell with mating bottom surface and a plunger which includes a filter on one end and a screw cap vial on the other end.

Applications include the analysis of enzymes, peptides, DNA, RNA, synthesis reaction intermediates, finished products, saliva, samples available in low volumes, in-vial evaporation and re-suspension for sample concentration and buffer/solvent change.

nano|Filter Vial

.2µm PTFE
Part No. 15530
Part No. 25530 *(Pre-Slit Cap)*

.45µm PTFE
Part No. 15540
Part No. 25530 *(Pre-Slit Cap)*

.2µm PVDF
Part No. 15531
Part No. 25530 *(Pre-Slit Cap)*

.45µm PVDF
Part No. 15541
Part No. 25530 *(Pre-Slit Cap)*

.2µm NYLON
Part No. 15538
Part No. 25530 *(Pre-Slit Cap)*

.2µm PES
Part No. 15535
Part No. 25535 *(Pre-Slit Cap)*

Available in Quantities of 200 or 500

THOMSON

10 µL Filtration

with 2 µL Injection

Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	15540	Less sample waste, no sample loss due to transfer, maintain sample integrity.

Open Access LCMS - ZQ12 - FRENICA1

File:FRENICA1_ZQ12-1087-1
Notes:DEPTH 2 -10uL
Time:16:18:04
Method:C:\MassLynx\09_LC-C8-BroadRange-ApH.olp

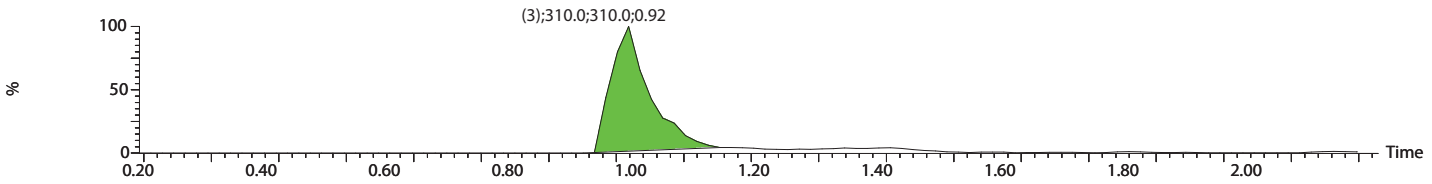
Printed: Mon Oct 03 16:21:39 2011

Submitter:FRENICA1
TA-Project:AS
Date:03-Oct-2011
Instrument:ZQ12

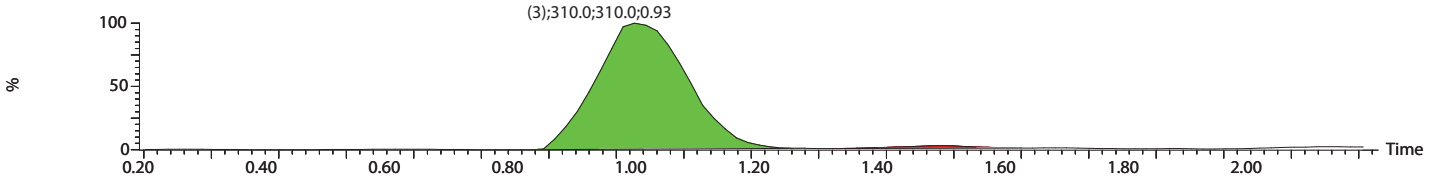
ID:MICRO VIAL
Vial:1:44
Sample: 1

Sample Report:

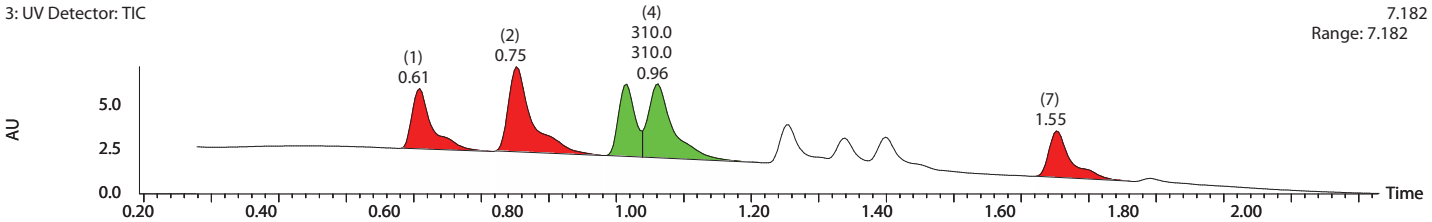
1: MS ES+ :311.008+332.99+352.034 1.2e+007



2: MS ES- :308.992+369.013 9.8e+004



3: UV Detector: TIC 7.182
Range: 7.182



Peak Number	Time	Area %
1	0.61	16.61
2	0.75	27.61
3	0.92	16.36
4	0.96	25.32
7	1.55	14.11

When every uL counts...

Open Access LCMS - ZQ12 - FRENICA1 Page 1

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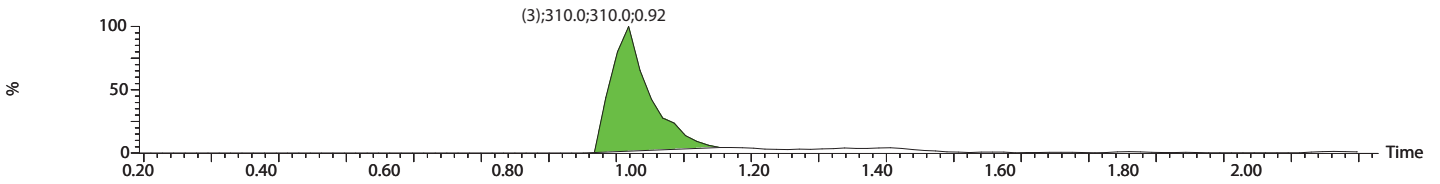
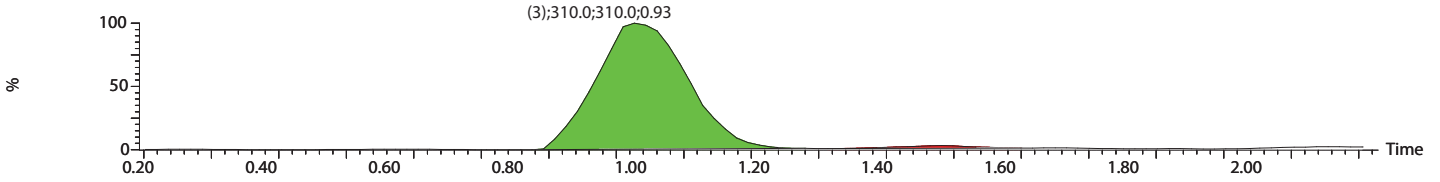


2: MS ES- :308.992+369.013 9.8e+004



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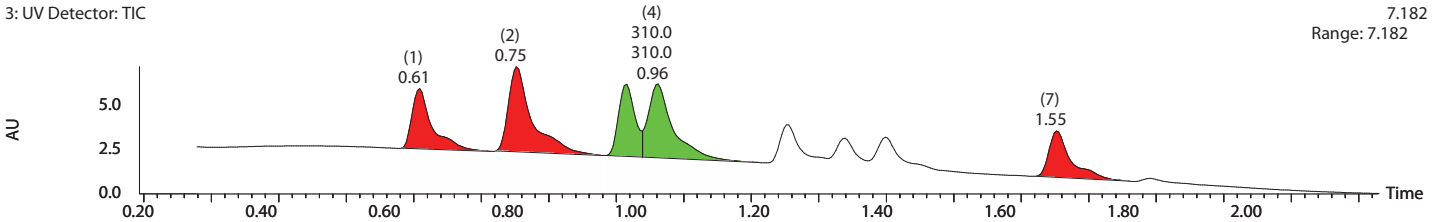

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7	1.55	14.11

Analysis of Sinapoylmalate in the *Arabidopsis thaliana* Leaf by Using the nano|Filter Vial™

Sinapoylmalate is a major UV protectant in *Arabidopsis thaliana*

Membrane	Pore Size	Part #	Benefit
PTFE	.045µm	15540	Quick, easy, small sample volume

Data provided by Jing-Ke Weng, Ph.D.
Member, Whitehead Institute for Biomedical Research
Assistant Professor of Biology, Massachusetts Institute of Technology

- Grind Leaf tissue under liquid nitrogen.
- Extract with 80% MeOH (1mL MeOH to 200mg fresh weight leaves).
- Centrifuge.
- Filter with 0.2um PTFE nano|Filter Vial™.
- Analyze by UHPLC - Orbitrap Mass Spec.

Equipment

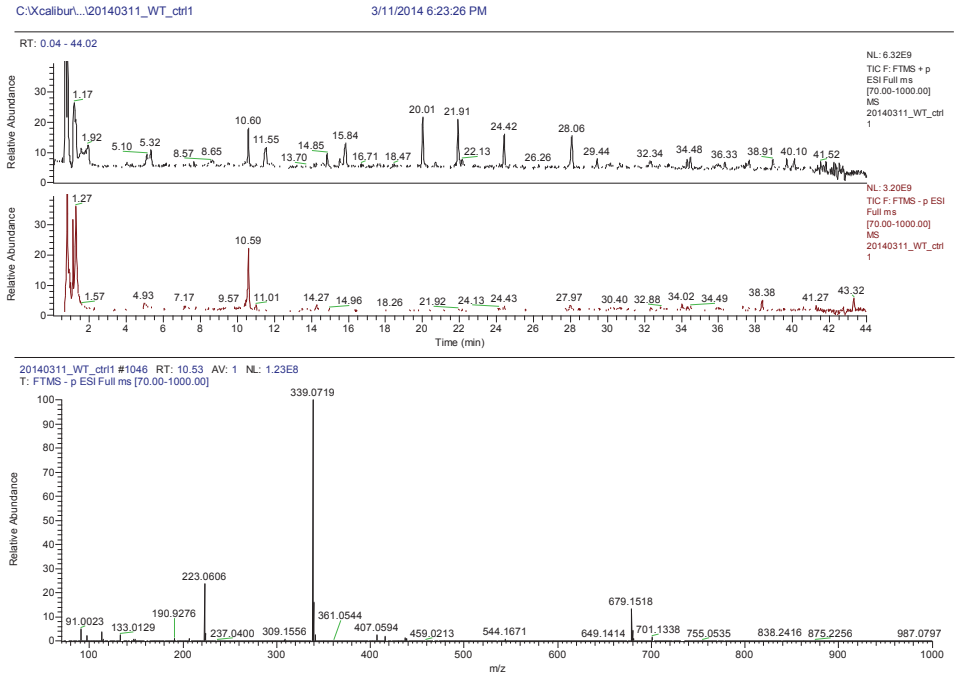
HPLC Column: Phenomenex Kinetex 2.6u C18 150x3.0

Mobile Phase

Solvent A: H2O + 0.1%formic acid
Solvent B: acetonitrile + 0.1%formic acid

Gradient:

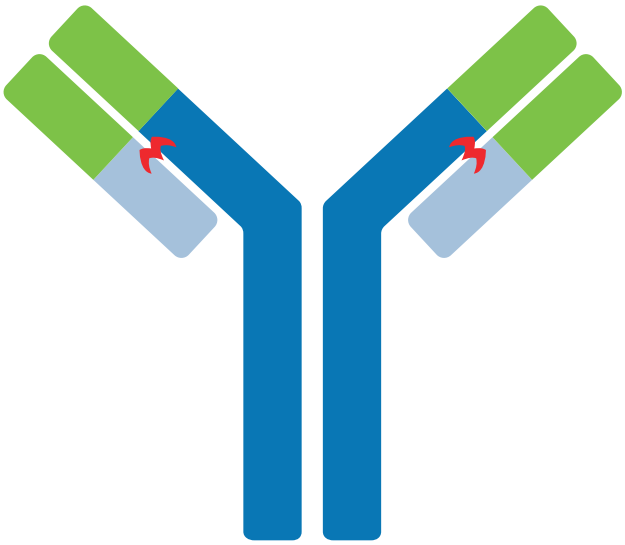
time	%A	%B
2min	95	5%
40min	20	80%
40.1min	5	95%
44min	5	95%
44.1min	95	5%
48min	95	5%



Aggregation Determination using nano|Filter Vials® by SEC

Membrane	Pore Size	Part #	Benefit
PES	0.2µm	25540	Maintain sample integrity, less time, ease of use

The aggregation of protein therapeutics has become a major concern for the pharmaceutical industry and regulatory agencies. Protein aggregates can cause an adverse immune response and are typically monitored throughout the formulation and production of bio-therapeutics. Monitoring aggregates helps to minimize risks from therapeutic proteins in clinical applications by optimizing early formulations to reduce aggregation during production, storage, handling, and shipping.



Antibodies are clarified using Thomson nano|Filter Vials®, 0.2 µm PES Membrane (Part#: 15535-200 or 500) and analyzed for purity using SEC (Size Exclusion Chromatography). 10 µL of purified antibody was placed into the nano|Filter Vials® and 2 µL was injected onto the HPLC. Fig. 1 & 2 show a chromatogram of mAb1 with low abundance multimers. Fig. 3 & 4 show a chromatogram of mAb2 with dissociated antibody fragments.

Method & Sample Preparation

Method:

- Agilent 1260 Infinity HPLC
- Column: 4.6x300 mm Bio-SEC3
- Buffer: 1x PBS (Phosphate Buffered Saline)
- Flow Rate: 0.2 mL/min
- Injection: 2 µL

Sample Prep:

- 10 µL of purified antibody
- Thomson nano|Filter Vials®, 0.2 µm PES Membrane

Thomson nano|Filter Vials®, 0.2 µm PES Membrane Part#: 15535-200 (qty 200) | 15535-500 (qty 500)

Chromatograms

Fig 1: Chromatogram of Antibody mAb1

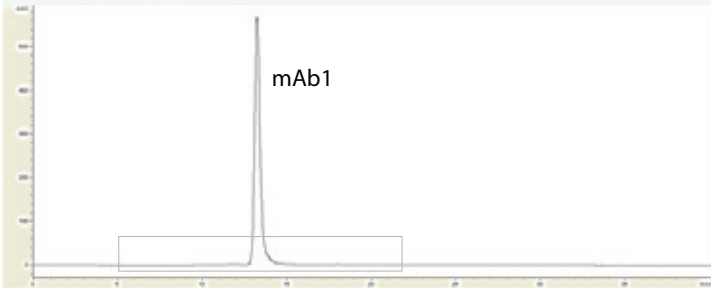


Fig 2: Chromatogram of Antibody mAb2

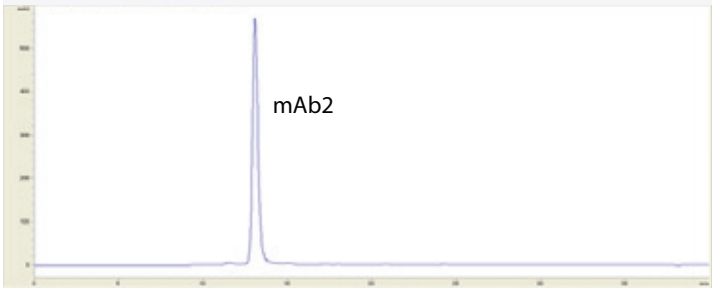


Fig 3: Zoomed in version of the chromatogram in Fig. 2 of Antibody mAb1 to better visualize low abundance dimer.

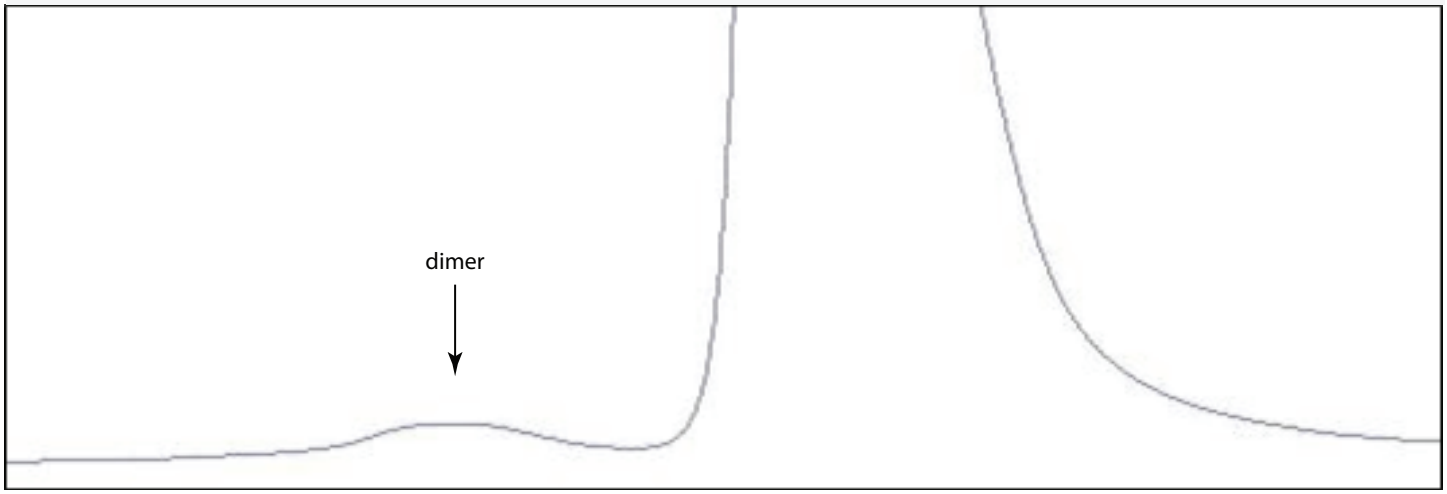
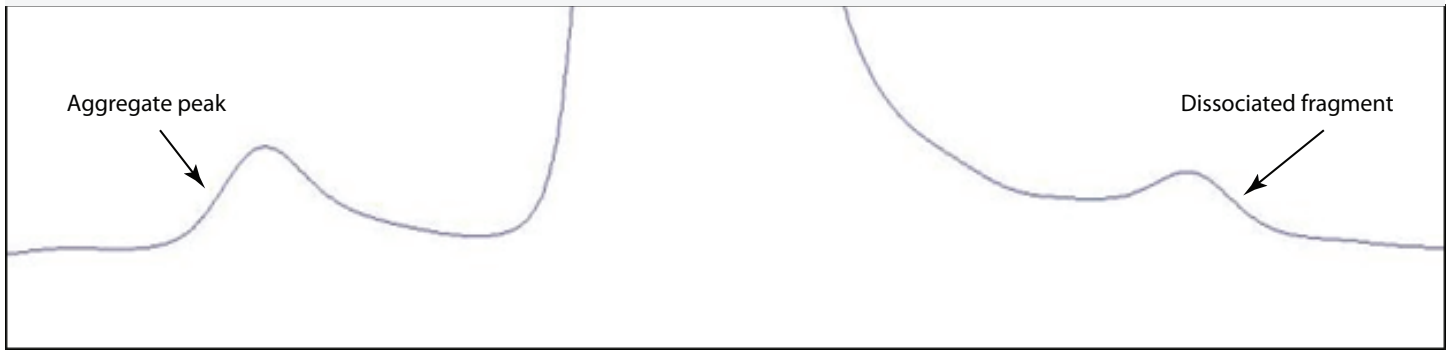
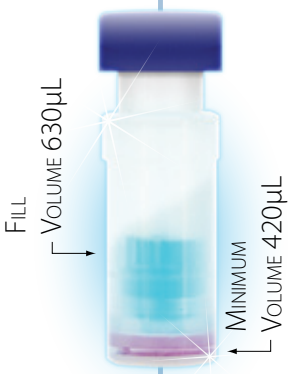


Fig 4: Zoomed in version of the chromatogram in Fig. 3 of Antibody mAb2 to better visualize aggregate peak.



eXTRACTOR3D|FV®

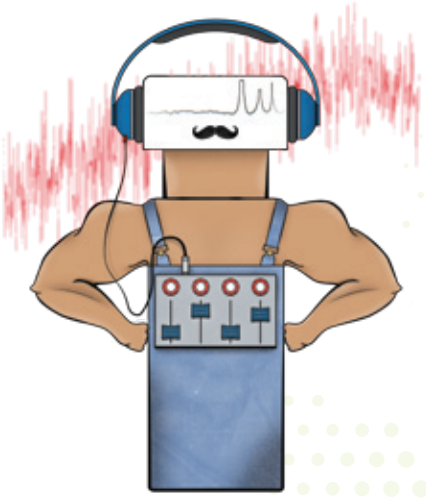


Multi-Mode Filtration

eXtractor3D|FV® *(Multi-Mode Filtration)*

Thomson eXtractor3D|FV® Filter Vials (patented) offer filtration with increased volume, enabling multiple extraction techniques with different resins/sorbents or solids/large particulates (greater than 35%) to autosampler ready vials. eXtractor3D|FV® is a product uniquely designed for the addition of resins/sorbents, QuEChERS dispersive salts, pills, or special resins in the standard autosampler ready vial. The filter vial consists of two parts: a filter vial shell and a plunger which includes a multi-layer filter on one end and a screw cap on the other end.

Large solids/large particulates can be placed within the eXtractor 3D® where multiple extraction techniques occur. Prior to the introduction of the eXtractor3D|FV®, samples required multiple steps using SPE, or other methods to remove interfering analytes and co-eluting compounds. SPE or Quechers can now be completed with multi-depth filtration without risk of solids compromising the autosampler. Pills and other large solids can be broken down for complete testing using the eXtractor3D|FV®. eXtractor3D|FV® allows for compounds to be separated from the matrix with the addition of resins/sorbents, resulting in both a higher signal-to-noise ratio and peaks that are more differentiated.



eXTRACTOR3D|FV®

.2µm PTFE
Part No. 95530

.45µm PTFE
Part No. 95540

.2µm PVDF
Part No. 95531

.45µm PVDF
Part No. 95541

.2µm NYLON
Part No. 95538

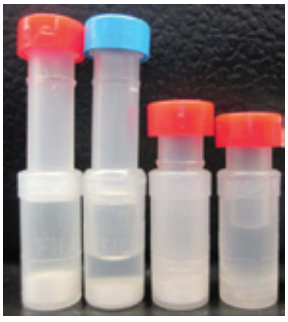
.45µm NYLON
Part No. 95539

.2µm PES
Part No. 95535

Available in Quantities of 200 or 500

THOMSON

Fits Standard Autosamplers



Add Sorbents & Resins for in Vial Clean Up

Comparison of different methods of extraction for incurred contaminants in fish using the eXtractor3D|FV® & analyzed by LPGC-MS/MS

Membrane	Pore Size	Part #	Benefit
PVDF	0.2µm	92231	Reduce sample steps. Reduce Solvent waste. High solid content filtration

Yelena Sapozhnikova and Steven J. Lehotay.

U.S. Department of Agriculture, Agricultural Research Service, Eastern Regional Research Center; 600 East Mermaid Lane; Wyndmoor, PA 19038. Poster presented as part of ACS-IUPAC Conference, San Francisco, CA, 8-13 August 2014.

Introduction:

The goal of this study was to investigate variables impacting extraction yields of incurred pesticides and environmental contaminants: polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and flame retardants (FRs) in fish samples of white croaker and salmon. We sought to compare extraction efficiencies of different shakers and extraction devices including the determination of the optimum shaking/extraction time, sample size, and sample-to-solvent ratio. In Filter-Vial Dispersive Solid-Phase Extraction with MgSO4, Z-Sep, C18, and primary secondary amine sorbents were used for sample clean-up in the Thomson eXtractor3D|FV®. Samples were analyzed by Low Pressure Vacuum Outlet Gas Chromatography coupled to a Triple Quadrupole Tandem Mass Spectrometry (LPGC-MS/MS).

Equipment:

- Agilent LPGC-MS/MS System with Multi-Mode Inlet (MMI)
- Carrier Gas: He+ @ 2mL/min constant flow rate
- MMI @ 80°C
- Injection Volume: 5µL
- Thomson eXtractor3D|FV®, 0.2um PVDF (part # 95531)
- Vortex
- Centrifuge

Sample Preparation:

Approximate Fish Composition:

Sample	%H2O	%Lipid	%Protein
Croaker	78	3-4	18
Salmon	68-75	5-10	20-22
SRM 1947	73	10	17

Sample Extraction & Clean-up:

1. Add 10g of homogenized fish and Internal Standard to a conical tube.
2. Add 10mL of Acetonitrile to the homogenate mix
3. Vortex for 10 minutes at 80% with max pulsing
4. Add 5g HCO_2NH_4 to the conical tube and shake for 1 minute
5. Centrifuge for 2 minutes at 3700RCF
6. Add 75mg of each: $MgSO_4$, 1:1:1 PSA:C18:Z-Sep to the outer shell of the Thomson eXtractor|3D®
7. Add 0.5mL of the fish extract to the sorbents in the outer shell of the Thomson

eXtractor3D|FV®

8. Partially depress the eXtractor3D|FV® plunger into the outer shell
9. Shake for 30 seconds
10. Fully depress the plunger.

Homogenization

Fish Type	Homogenizer Type	Size (g)	Acetonitrile(mL)	Time (min)	n
Croaker / Salmon	Vortex & Vibrate	10	10	1,10,30,60	4
SRM 1947	Vortex & Vibrate	5	5	1,10,30,60	1
Croaker / Salmon	Blender	10	10	1	4
SRM 1947	Blender	5	5	1	1
Croaker / Salmon	Vortex & Vibrate	2,4,4	2,4,8	10	4
SRM 1947	Vortex & Vibrate	2,4,4	2,4,8	10	1

Results:

Compounds were analyzed to determine the optimum extraction, sample size, and solvent ratio. Please see the following tables for the compounds that were analyzed: the pesticides analyzed can be found in Table 1; Table 2 shows the PCB Congeners; Table 3 shows the PBDE Congeners; Table 4 shows the PAH's and Table 5 shows the isotopically-labeled internal standards.

Pesticides Analyzed		
α-BHC	γ-BHC (lindane)	cis-Chlordane
trans-Chlordane	o,p'-DDD	p,p'-DDD
o,p'-DDE	p,p'-DDE	o,p'-DDT
p,p'-DDT	4,4'-dichlorobenzophenone	Dieldrin
Heptachlor epoxide	Hexachlorobenzene	Mirex
cis-nonachlor	trans-nonachlor	

Table 1. Pesticides Analyzed

PCB Congeners Analyzed		
105	114	118
123	156	157
167	170	180

Table 2. PCB Congeners Analyzed

PAH's Analyzed		
Acenaphthylene	Anthracene	Fluoranthene
Fluorine	Phenanthrene	

Table 4 PAH's Analyzed

PBDE Congeners Analyzed		
28	99	100
153	154	

Table 3. PBDE Congeners Analyzed

Isotopically Labeled Internal Standards Analyzed		
Atrazine-d5	Fenthion-d6	13C12-o
p'-DDE	Pyrene-d10	Acenaphthalene-d8
Fluoranthene-d10	Phenanthrene-d10	13C12-PCB 153
5'-Fluoro-3,3',4,4',5-Pentabromodiphenyl Ether (FBDE 126)		

Table 5 Isotopically Labeled Internal Standards Analyzed

Fig 1. SMR 1947 results for PCBs

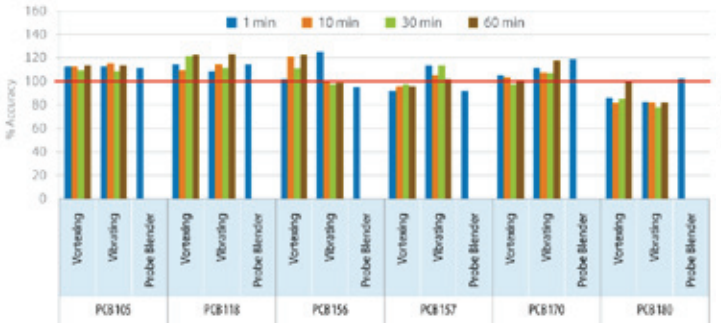


Fig 2. SMR 1947 results for PBDEs

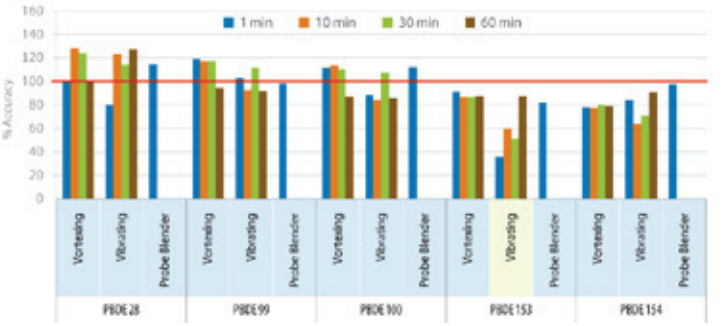


Fig 3. SMR 1947 results for pesticides (part 1)

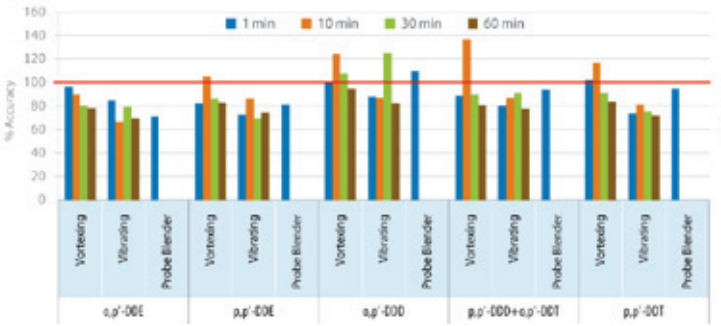


Fig 4. SMR 1947 results for pesticides (part 2)

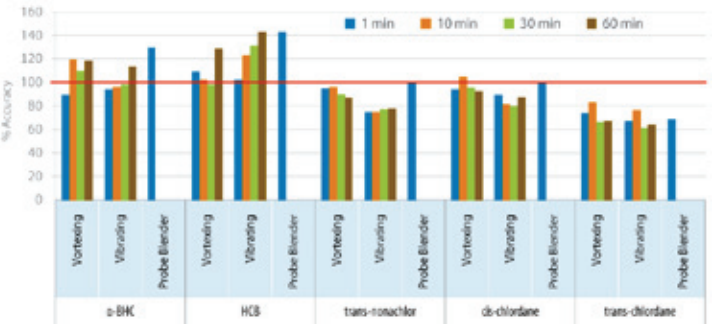
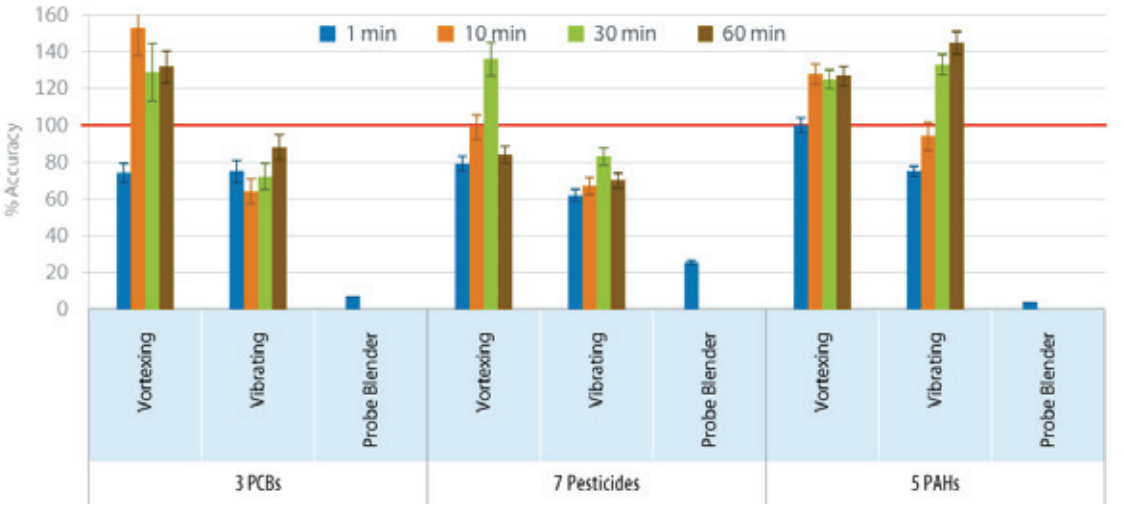


Fig 5. Salmon results



Sample (g)	Acetonitrile (mL)	Croaker (n=28)	Salmon (n=13)	SRM 1947 (n=27)
2	2	10	13	102
4	4	12	12	100
5	5	-	-	11
10	10	9	13	-
4	8	9	10	108

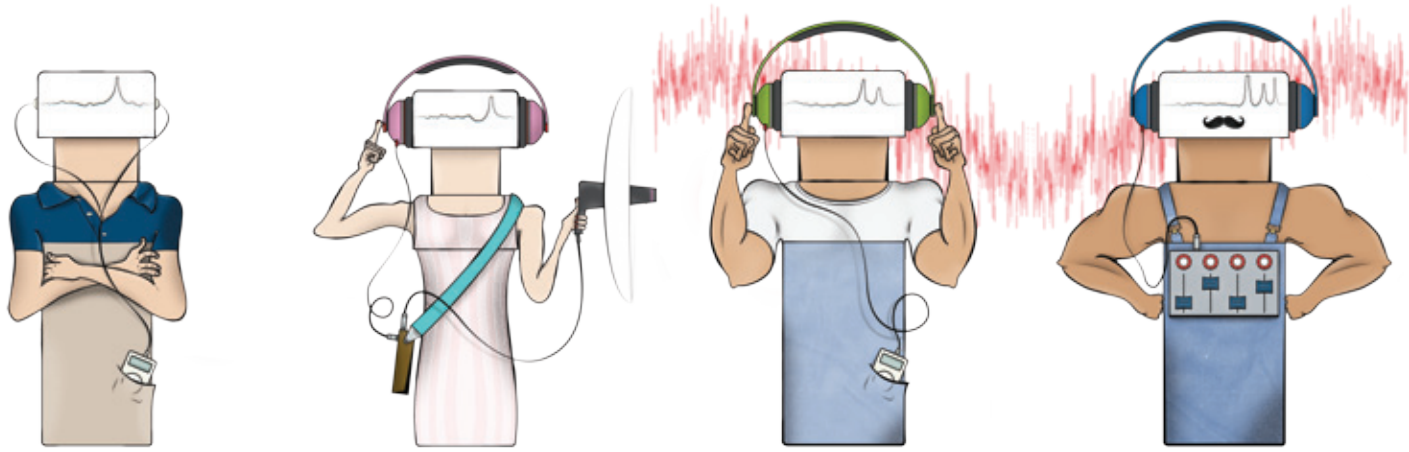
Table 6. Optimal sample size and acetonitrile concentration was evaluated. The optimum sample size and solvent ratio was evaluated using various quantities of croaker, salmon, and SRM 1947 combined with different amounts of acetonitrile, table 6. The samples were analyzed in quadruplicates. The percent accuracy was determined as experimental results versus a NIST Certified concentration.

Conclusion:

- A 1 minute extraction with the pulsed vortex shaker is sufficient for extraction of many but not all of the incurred contaminants in homogenized fish tissues. A 10 min extraction time was better and worked well for all the incurred contaminants in homogenized fish tissues.
  - Extraction with the prototype vibration shaker often took 60 minutes to achieve 100% extraction efficiency
  - Extraction with a probe blender was rapid and complete, but it limited sample throughput and was inconvenient
- The 1:1 Sample / Acetonitrile (g/mL) ratio was sufficient to achieve full extraction.
  - 2g of homogenized sample gave equivalent results as 4g and 10g samples.

New and Improved Final Sample Prep Method:

1. Add 10g of homogenized fish and Internal Standard to a conical tube.
2. Add 10mL of Acetonitrile to the homogenate mix
3. Vortex for 10 minutes at 80% with max pulsing
4. Add 5g HCO_2NH_4 to the conical tube and shake for 1 minute
5. Centrifuge for 2 minutes at 3700 RCF
6. Add 75mg of each: $MgSO_4$, 1:1:1 PSA:C18:Z-Sep to the outer shell of the Thomson eXtractor3D|FV®
7. Add 0.5mL of the fish extract to the sorbents in the outer shell of the Thomson eXtractor3D|FV®
8. Partially depress the eXtractor3D|FV® plunger into the outer shell
9. Shake for 30 seconds
10. Fully depress the plunger




MeOH
separatory
THF

Appendix

Chemical Compatibility

	Housing Materials	Filter Membrane			
	Polypropylene	PTFE	PVDF	PES	NYLON
Acetic Acid (glacial) | *acid, organic*	TST	R	R	R	NR
Acetone | *ketone*	R	R	NR	GNR	R
Acetonitrile (ACN) | *nitrile*	R	R	LTD	NR	R
Alconox, 1% | *surfactant/detergent*	ND	TST	TST	ND	TST
Ammonium Hydroxide | *caustic*	TST	GR	R	NR	TST
Ammonium Sulfate (saturated) | *salt, aqueous solution*	R	GR	NR	ND	R
Amyl Acetate | *ester*	TST	R	R	GR	TST
Amyl Alcohol | *alcohol*	R	R	R	GR	TST
Benzene | *HC, aromatic*	NR	—	—	—	—
Benzyl Alcohol | *HC aromatic/alcohol*	NR	—	—	—	—
Boric Acid (aqueous solution) | *acid, inorganic*	R	GR	TST	GR	R
Butyl Acetate | *ester*	TST	GR	TST	GNR	R
Butyl Alcohol | *alcohol*	R	GR	R	GR	R
Carbon Tetrachloride | *HC, halogenated*	NR	—	—	—	—
Cellosolve (Ethyl) | *glycol ether*	R	GR	ND	GR	R
CHAPS (aqueous solution) | *surfactant/detergent*	ND	TST	ND	ND	TST
Chloroform | *HC, halogenated*	NR	—	—	—	—
Cyclohexanone | *ketone*	NR	—	—	—	—
Diethyl Pyrocarbonate, 0.2% | *carboxylic anhydride*	ND	ND	TST	ND	ND
Dimethyl Sulfoxide (DMSO) | *sulfoxide*	R	R	NR	NR	R
Dimethylacetamide | *amide*	R	GR	NR	NR	NR
Dimethylformamide | *amide*	R	GR	NR	ND	R
Dioxane | *ether*	R	GR	R	ND	R
Ethers | *ether*	NR	—	—	—	—
Ethyl Acetate | *ester*	TST	R	R	GNR	R
Ethyl Alcohol | *alcohol*	R	R	R	GR	TST
Ethylene Glycol | *glycol*	R	R	R	GR	R
Formaldehyde | *aldehyde*	R	R	R	ND	R
Formic Acid, 50% | *acid, organic*	R	GR	R	ND	NR
Freon (TF or PCA) | *HC, halogenated*	R	GR	R	ND	R
Gasoline | *HC*	NR	—	—	—	—
Glycerine (Glycerol) | *glycol*	R	GR	R	GR	R
Guanidine Hydrochloride, 6M | *salt, aqueous solution*	ND	GR	ND	ND	ND
Guanidine Thiocyanate, 5M | *salt, aqueous solution*	ND	GR	ND	ND	ND
Helium | *gas*	R	R	TST	ND	R
Hexane | *HC, aliphatic*	NR	—	—	—	—
Hydrochloric Acid, 1N (HCL) | *acid, inorganic*	GR	R	R	GR	GR
Hydrochloric Acid, 6N (HCL) | *acid, inorganic*	TST	R	TST	GR	TST
Hydrochloric Acid, conc. (HCL) | *acid, inorganic*	NR	—	—	—	—
Hydrofluoric Acid | *acid, inorganic*	NR	—	—	—	—
Hydrogen | *gas*	R	R	R	ND	R
Hydrogen Peroxide, 3% | *peroxide*	R	R	R	ND	R
Hydrogen Peroxide, 30% | *peroxide*	TST	R	R	ND	TST

R = Recommended | **GR** = Generally Recommended | **NR** = Not Recommended | **GNR** = Generally Not Recommended

LTD = Limited Recommendation | **TST** = Testing Recommended | **ND** = No Data Presently Available

Chemical Compatibility

	Housing Materials	Filter Membrane			
	Polypropylene	PTFE	PVDF	PES	NYLON
Hydrogen Peroxide, 90% | *peroxide*	R	R	R	ND	NR
HYPO (aqueous solution) | *salt, aqueous solution*	R	GR	R	ND	R
Isobutyl Alcohol | *alcohol*	R	R	R	GR	TST
Isopropyl Acetate | *ester*	TST	R	R	GNR	R
Isopropyl Alcohol | *alcohol*	R	R	R	GR	TST
Kerosene | *HC*	TST	LTD	R	GR	R
Lactic Acid, 50% | *acid, organic/alcohol*	R	GR	TST	ND	TST
Lubrol PX (aqueous solution) | *surfactant/detergent*	ND	TST	ND	ND	ND
Methyl Ethyl Ketone (MEK) | *ketone*	R	R	NR	GNR	R
Mercaptoethanol, 0.1M | *alcohol/mercaptan*	ND	ND	ND	ND	ND
Methyl Acetate | *ester*	TST	R	NR	GNR	R
Methyl Alcohol | *alcohol*	R	R	R	GR	TST
Methylene Chloride | *HC, halogenated*	NR	—	—	—	—
Methyl Isobutyl Ketone (MIBK) | *ketone*	NR	—	—	—	—
Mineral Spirits | *HC*	NR	—	—	—	—
Nitric Acid, 6N | *acid, inorganic*	TST	R	R	R	NR
Nitric Acid (concentrated) | *acid, inorganic*	NR	—	—	—	—
Nitrobenzene | *HC, aromatic*	NR	—	—	—	—
Nitrogen | *gas*	ND	R	R	ND	R
Nonidet-P40 (aqueous solution) | *surfactant/detergent*	ND	ND	ND	ND	ND
Ozone | *gas*	NR	—	—	—	—
Paraldehyde | *aldehyde*	TST	GR	TST	ND	R
Pentane | *HC, aliphatic*	NR	—	—	—	—
Petroleum Ether | *ether*	ND	GR	R	ND	R
Phenol (aqueous solution) | *phenol*	NR	—	—	—	—
Potassium Hydroxide, 3N | *caustic*	R	R	R	ND	R
Pyridine | *amine*	R	GR	NR	NR	TST
Silicone Oils | *silicone*	R	GR	R	ND	R
Sodium Carbonate (aqueous solu-tion) | *salt, aqueous solution*	R	R	R	ND	TST
Water (Brine) | *salt, aqueous solution*	R	R	R	ND	R
Sodium Chloride (aqueous solution) | *salt, aqueous solution*	R	R	R	ND	R
Sodium Dodecyl Sulfate | *surfactant/detergent*	ND	ND	ND	ND	ND
Sodium Hydroxide, 3N | *caustic*	R	R	R	R	R
Sodium Hydroxide (concentrated) | *caustic*	R	R	R	R	NR
Sulfuric Acid (concentrated) | *acid, inorganic*	NR	—	—	—	—
Tetrahydrofuran (THF) | *ether*	NR	—	—	—	—
Toluene | *HC, aromatic*	NR	—	—	—	—
TCA (aqueous solution) | *acid, organic*	R	GR	R	ND	TST
Trichloroethane | *HC, halogenated*	NR	—	—	—	—
Trichloroethylene | *HC, halogenated*	NR	—	—	—	—
Tween 20 (aqueous solution) | *surfactant/detergent*	ND	R	TST	ND	TST
Urea, 8M | *salt, aqueous solution*	R	GR	R	ND	R
Xylene | *HC, aromatic*	NR	—	—	—	—

R = Recommended | **GR** = Generally Recommended | **NR** = Not Recommended | **GNR** = Generally Not Recommended

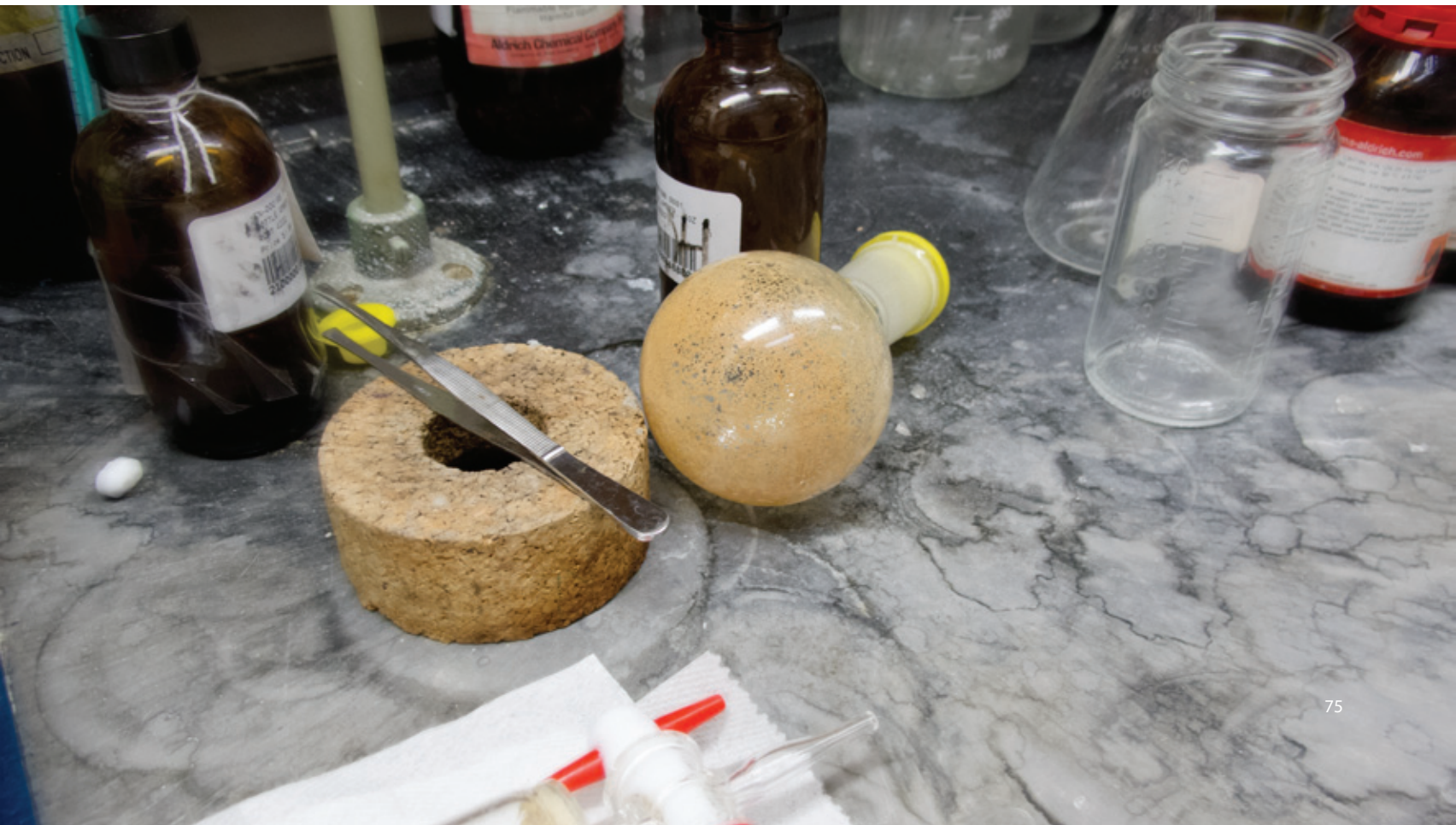
LTD = Limited Recommendation | **TST** = Testing Recommended | **ND** = No Data Presently Available

Compound Compatibility

	Recommended Filter Membrane				
	PVDF	PES	PTFE	PES	PVDF
	.2 µm	*.2 µm*	*.2 µm*	*.45 µm*	*.45 µm*
5-Fluorouracil			●		
(18F) Fluoromisondazole, Misiomidazole	●				
Acebutolol		●			
Acetylsalicylic acid		●			
Alpha1-Proteinase Inhibitor (Human)					●
Alprenolol		●			
Amiloride		●			
Amphotericin B for Injection USP					●
Atenolol		●			
Azathioprine				●	●
Azodicarbonamide		●			
Bleomycin Sulfate			●		
Caffeine		●			
Cetirizine				●	●
Chlorothiazide		●			
Chloramphenicol		●			
Cimetidine		●			
Ciprofloxacin		●			
Cisplatin, Cisplatin Injection			●		
Cyclosporine A	●				
Cytarabine			●		
Daunorubicin			●		
DE-310		●			
Diclofenac					●
Enalapril		●			
Ethionamide			●		
Factor IX Complex Heat-Treated					●
Gatifloxacin				●	●
Hydrochlorothiazide		●			
Ibuprofen				●	●
Iosniazid			●		
isonicotinic acid			●		
Ketamine		●			
Las 35917					●
Levofloxacin				●	●
Lomefloxacin				●	●
Methyl Gag; NSC-32946			●		
Metoprolol		●			
Mitomycin			●		
Morphazinamide			●		
Nadolol		●			
Nicotinic acid			●		
Paclitaxel	●				
p-Aminobenzoic acid (PABA)					●

Compound Compatibility

	Recommended Filter Membrane				
	PVDF	PES	PTFE	PES	PVDF
	.2 µm	*.2 µm*	*.2 µm*	*.45 µm*	*.45 µm*
p-aminosalicylic acid			●		
Pefloxacin				●	●
Pentoxifylline (PTX)	●				
Phenytoin					●
Pyrazinamide			●		
Pyrimethamine				●	●
Ranitidine		●			
Rifampicin				●	●
Sabeluzole					●
Streptokinase					●
Sulfadozine					●
Sulphasalazine		●			
Sulpiride		●			
Terbutaline		●			
Thiotepa Parenteral Sterile			●		
Timolol		●			
Tobramycin Vincristine Sulfate			●		
Tranexamic acid		●			
Triamcinolone Acetonide		●			
Triazinate; NSC-139105			●		
Tropicamide				●	
Vinblastine Sulfate			●		



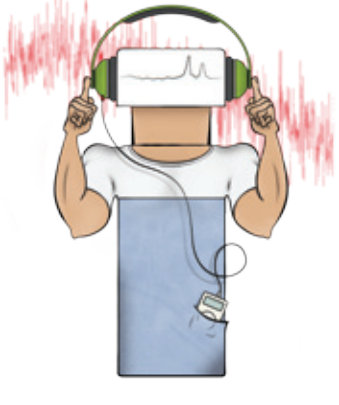
Part Numbers

Standard Filter Vial (Pre-Slit Cap)

	Cap Color	Pore Size	Membrane	Qty	Part #
☐		.2µm	PTFE	200	35530-200
☐		.2µm	PTFE	500	35530-500
☐		.45µm	PTFE	200	35540-200
☐		.45µm	PTFE	500	35540-500
☐		.2µm	PVDF	200	35531-200
☐		.2µm	PVDF	500	35531-500
☐		.45µm	PVDF	200	35541-200
☐		.45µm	PVDF	500	35541-500
☐		.2µm	NYLON	200	35538-200
☐		.2µm	NYLON	500	35538-500
☐		.45µm	NYLON	200	35539-200
☐		.45µm	NYLON	500	35539-500
☐		.2µm	PES	200	35535-200
☐		.2µm	PES	500	35535-500

extensaFV (Pre-Slit Cap)

	Cap Color	Pore Size	Membrane	Qty	Part #
☐		.2µm	PTFE	200	85530-200
☐		.2µm	PTFE	500	85530-500
☐		.45µm	PTFE	200	85540-200
☐		.45µm	PTFE	500	85540-500
☐		.2µm	PVDF	200	85531-200
☐		.2µm	PVDF	500	85531-500
☐		.45µm	PVDF	200	85541-200
☐		.45µm	PVDF	500	85541-500
☐		.2µm	NYLON	200	85538-200
☐		.2µm	NYLON	500	85538-500
☐		.45µm	NYLON	200	85539-200
☐		.45µm	NYLON	500	85539-500
☐		.2µm	PES	200	85535-200
☐		.2µm	PES	500	85535-500

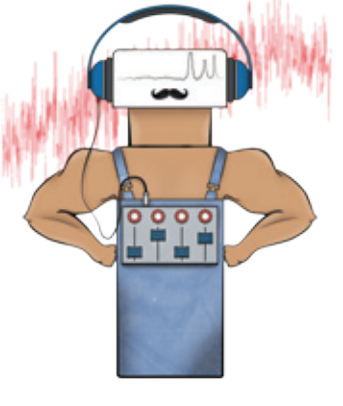


Filter Vial

	Cap Color	Pore Size	Membrane	Qty	Part #
☐		.2µm	PTFE	200	15530-200
☐	*Pre-Slit Cap*	.2µm	PTFE	200	25530-200
☐		.2µm	PTFE	500	15530-500
☐	*Pre-Slit Cap*	.2µm	PTFE	500	25530-500
☐		.45µm	PTFE	200	15540-200
☐	*Pre-Slit Cap*	.45µm	PTFE	200	25540-200
☐		.45µm	PTFE	500	15540-500
☐	*Pre-Slit Cap*	.45µm	PTFE	500	25540-500
☐		.2µm	PVDF	200	15531-200
☐	*Pre-Slit Cap*	.2µm	PVDF	200	25531-200
☐		.2µm	PVDF	500	15531-500
☐	*Pre-Slit Cap*	.2µm	PVDF	500	25531-500
☐		.45µm	PVDF	200	15541-200
☐	*Pre-Slit Cap*	.45µm	PVDF	200	25541-200
☐		.45µm	PVDF	500	15541-500
☐	*Pre-Slit Cap*	.45µm	PVDF	500	25541-500
☐		.2µm	NYLON	200	15538-200
☐	*Pre-Slit Cap*	.2µm	NYLON	200	25538-200
☐		.2µm	NYLON	500	15538-500
☐	*Pre-Slit Cap*	.2µm	NYLON	500	25538-500
☐		.2µm	PES	200	15535-200
☐	*Pre-Slit Cap*	.2µm	PES	200	25535-200
☐		.2µm	PES	500	15535-500
☐	*Pre-Slit Cap*	.2µm	PES	500	25535-500

Extractor Vial

	Cap Color	Pore Size	Membrane	Qty	Part #
☐		.2µm	PTFE	200	95530-200
☐		.2µm	PTFE	500	95530-500
☐		.45µm	PTFE	200	95540-200
☐		.45µm	PTFE	500	95540-500
☐		.2µm	PVDF	200	95531-200
☐		.2µm	PVDF	500	95531-500
☐		.45µm	PVDF	200	95541-200
☐		.45µm	PVDF	500	95541-500
☐		.2µm	NYLON	200	95538-200
☐		.2µm	NYLON	500	95538-500
☐		.45µm	NYLON	200	95539-200
☐		.45µm	NYLON	500	95539-500
☐		.2µm	PES	200	95535-200
☐		.2µm	PES	500	95535-500



Accessories

	Press	Description	Press Capacity	Qty	Part #
☐	Filter Vial Toggle Press	For High Solid Content and Very Viscous liquid samples	5	1	35005
☐	Multi-Use Press	8 Position for 30mL Filter Vials and 48 Position for Autosampler Ready Filter Vials	8/48	1	35015

Notes

Notes

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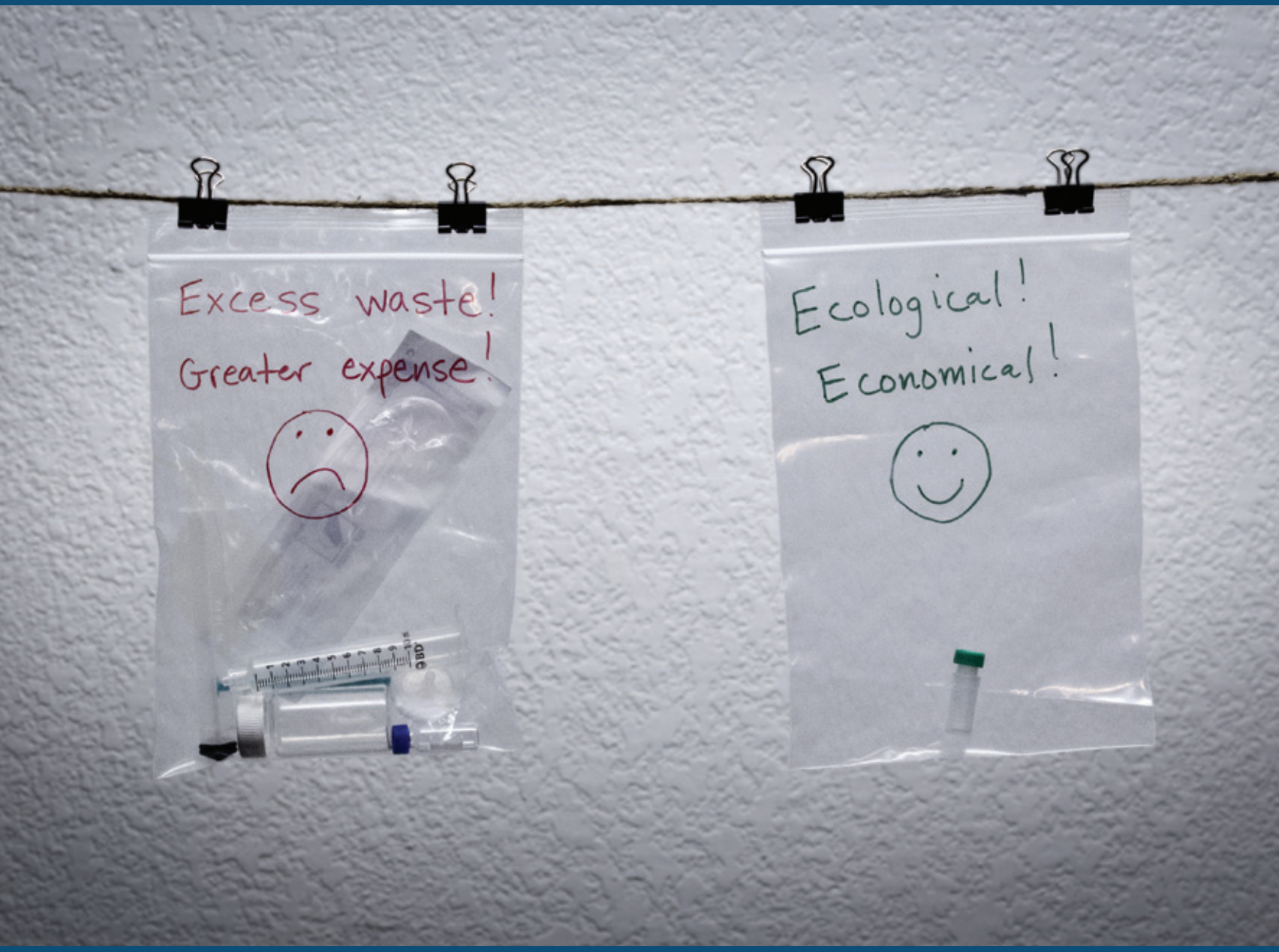
Filter Vials

Patented

Saves Time, Money & the Environment



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