What you don’t see…

…CAN hurt you

Sample Prep for Today’s Analytical World

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Today's Agenda

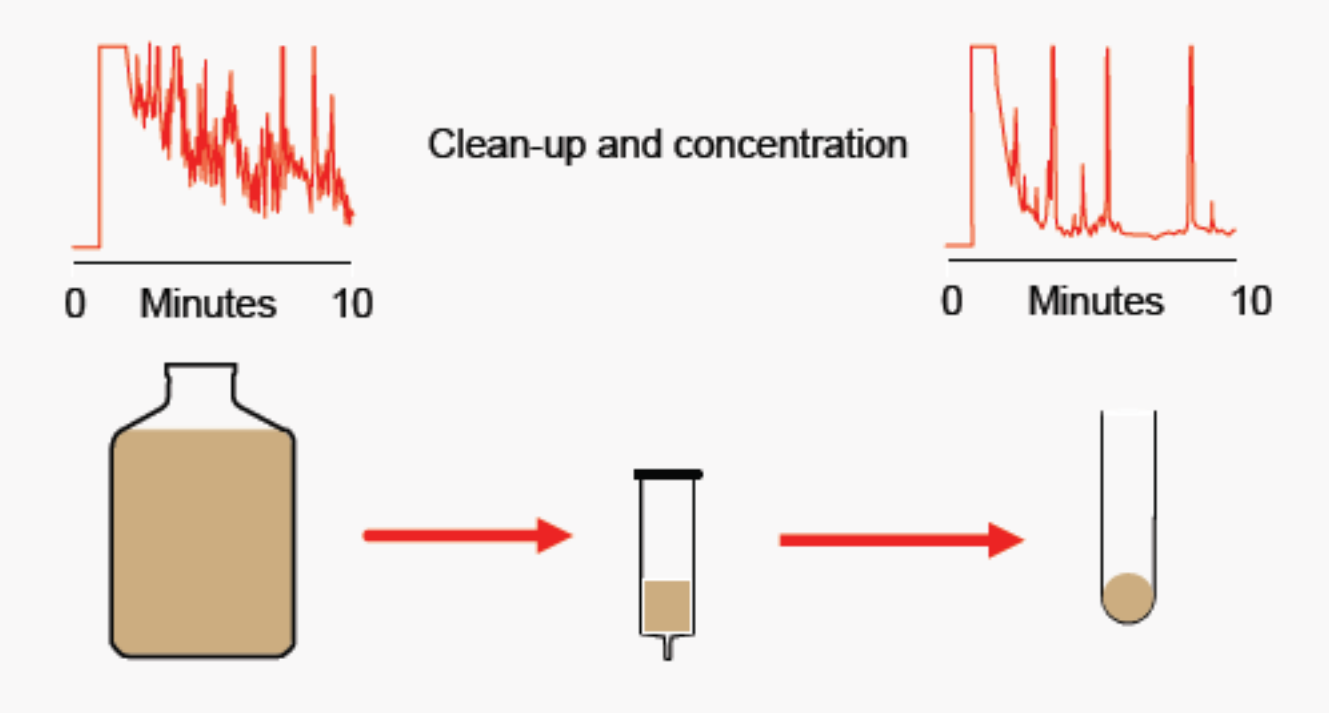
Introduction

Addressing difficult samples

1. Polar analytes
2. High fat samples
3. How to get rid of interfering terpenes

Summary and Conclusions

Objectives of Sample Preparation



- Removal of interferences which would affect detection of analyte
- Removal of interferences that would affect instrument or column lifetime
- Concentration of an analyte to a detectable concentration

With news instruments - more Sample Preparation Techniques can be used

	More Specific ← **Instrument Separation and Detection Specificity** ← *Less Specific*								
	Less Specific → ***Sample Preparation Specificity*** → *More Specific*								
Sample Prep Technique / **Interference Removed**	**Dilute & Shoot**	**Filtration**	**Liquid/Liquid Extractions**	**Supported Liquid Extractions (SLE)**	**Dried Matrix Spotting**	**Precipitation**	**QuEChERS**	**Lipid Removal 'Hybrid' Filtration**	**Solid Phase Extraction**
Lipids	No	No	No	Some	No	No	Yes	Yes	Yes
Oligomeric Surfactants	No	No	No	No	No	No	No	Yes	Yes
Particulates	No	Yes	No	Some	No	Yes	Yes	Yes	Yes
Pigments	No	No	No	Some	No	No	Yes	No	Yes
Polar Organic Acids	No	No	Yes	Yes	No	No	Yes	No	
Proteins	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Salts	No	No	Yes	Yes	No	No	No	No	Yes
Suggested Agilent Product	Agilent Autosampler Vials	Captiva Syringe Filters		Chem Elut		Captiva ND	Bond Elut QuEChERS	Captiva ND LIPIDS	Bond Elut Silica and Polymeric SPE

Agilent Captiva Filtration Products are recommended for use with any LC or LC-MS method

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1. **Polar analytes**
2. High fat samples
3. How to get rid of interfering terpenes

Summary and Conclusions

Polar analytes often require advanced solid phase extraction (SPE)

- Analyte is too polar for acetonitrile extraction
- Filtration is not clean enough
- Ion exchange can be used to filter polar interferences away
- We then often need an SPE phase that can bind a wide range of polar analytes that are basic, neutral and acidic

Bond Elut Packed Bed Phases – Which one!

Non-polar

C18, C8, C2, C1
C18 variations in carbon load and endcapping
EnvirElut
CH – cyclohexyl
CN-E – endcapped cyano
PH – phenyl
ENV, LMS, PPL, Focus, Nexus
Bond Elut Plexa

Polar

PSA - primary and secondary amine
NH2 - aminopropyl
CN-U –unendcapped cyano
DEA - diethylaminopropyl
Diol
Si - silica

Cation Exchange

SCX – benzenesulfonic acid
PRS – propylsulfonic acid
CBA – carboxylic acid

Reversible Covalent

PBA – phenylboronic acid

Specialty Phases

AccuCAT
Atrazine
Etc..

Anion Exchange

SAX – quaternary amine
PSA – primary and secondary amine
NH2 – aminopropyl
DEA – diethylaminopropyl

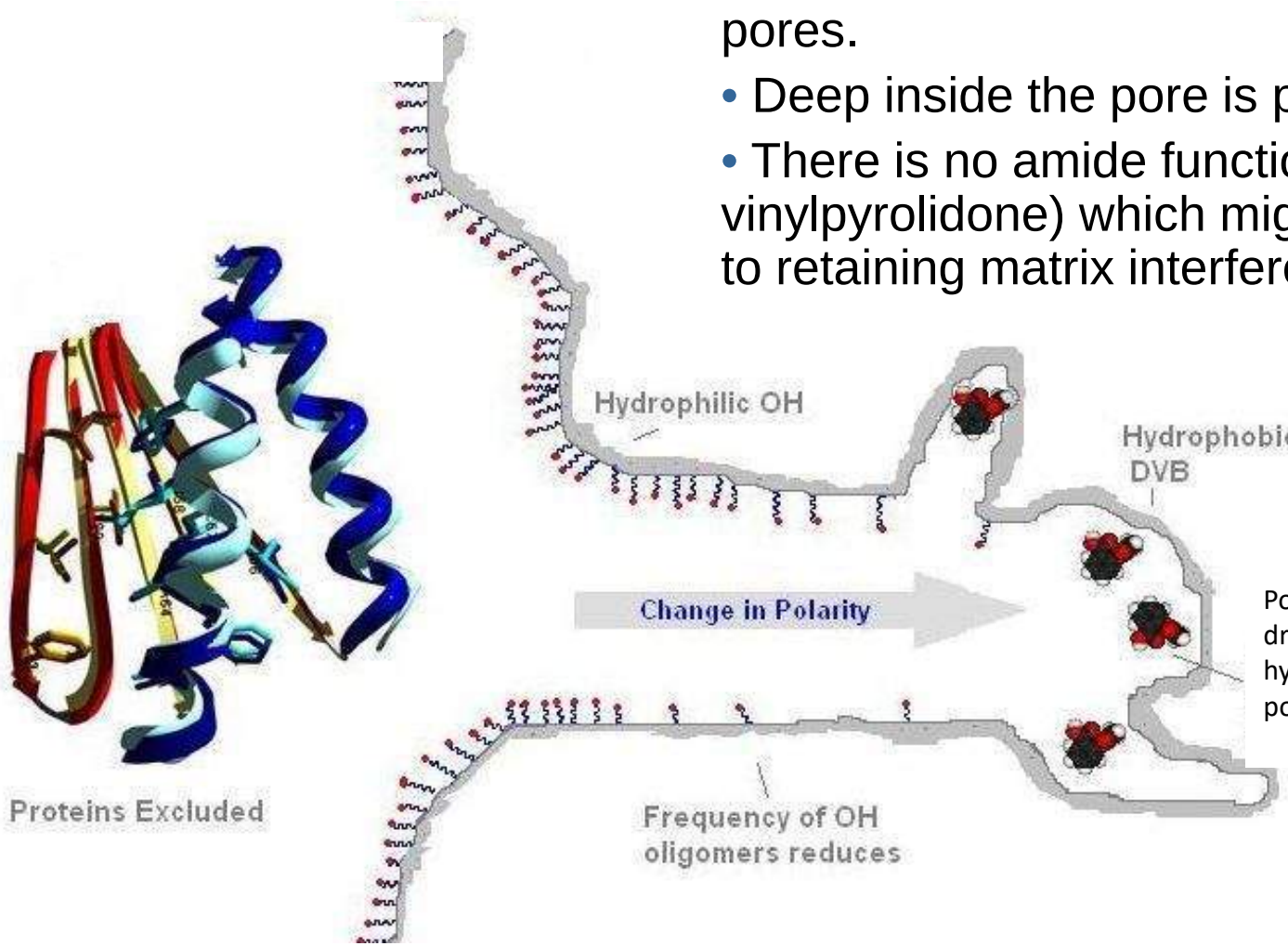
Mixed mode IEX/NP

Certify – SCX/C8
Certify II – SAX/C8
Plexa PCX
Plexa PAX

Alumina – aluminum oxide
Florisil – magnesium-silica
Carbon
Carbon/NH2

Bond Elut Plexa - A Different Type of Polymeric Sorbent

- The hydroxylated ligands exist on the surface and in the outer regions of the pores.
- Deep inside the pore is pure S/DVB.
- There is no amide functionality (N-vinylpyrolidone) which might contribute to retaining matrix interferences



Polar and non polar drugs bind in the SDVB hydrophobic end of the pore structure

Plexa Recoveries Versus HLB – good results with a wide range of compounds

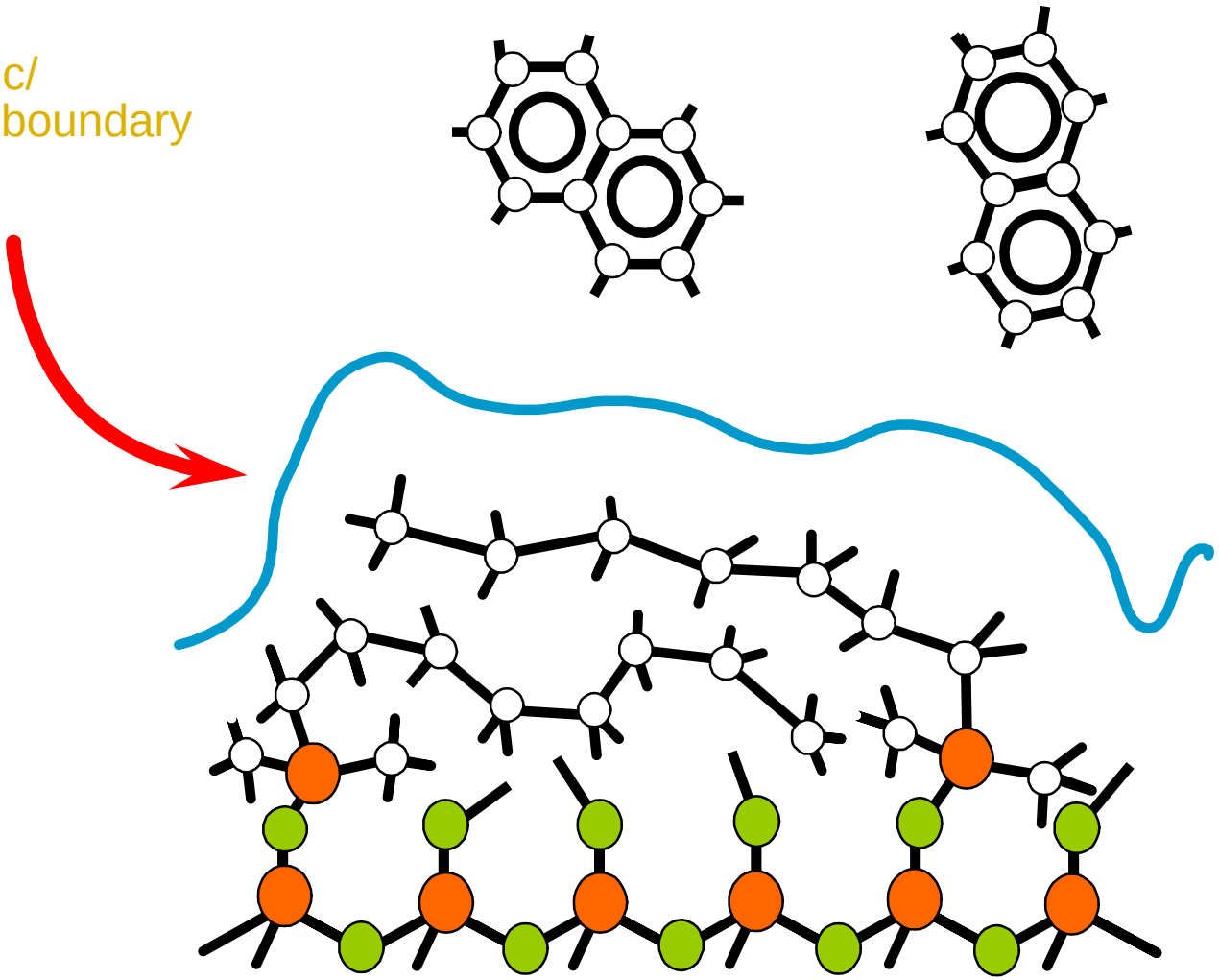
Analyte	Plexa	HLB	pKa	LogP
Albuterol	97.9	115.4	5.9	1.3
Atenolol	97.0	94.0	4.2	4.2
Loratadine	71.0	49.0	5.7	1.5
Metoprolol	92.0	74.0	5.7	1.5
Naltrexone	85.7	13.0	4.9	5.2
Pravastatin	85.0	59.0	4.9	5.2
Propranolol	55.0	35.0	4.9	5.2
Zolpidem	93.0	96.8	9.9	3.4

Plexa gives equivalent or better absolute recoveries than Oasis HLB for a wide range of pKa and logP compounds

Conditions: Absolute Recovery from human plasma
Basic load conditions, n=6, 200 ng/ml

Sorbent Conditioning - Why Do It?

Hydrophobic/
hydrophilic boundary



Drying a silica-based Cartridge (ex: C18)

Over drying / lack of conditioning before sample application can contribute to

- low recoveries
- poor flow
- irreproducibility (high RSDs)

Examples on how polymeric SPE perform

Bond Elut Plexa / Phenols from Drinking Water

Bond Elut™ Plexa™

Efficient Preparation of Phenols in Drinking Water

Advantage Statement: Varian's Bond Elut Plexa solid phase extraction (SPE) column has a very high extraction capacity for analytes and efficient removal of contaminants, making it ideal for extraction of phenols from drinking water. Plexa features a unique structure never before seen in standard styrene divinyl benzene polymer SPE columns, whereby polarity is separated between a hydrophilic exterior and hydrophobic core (Figure 1).

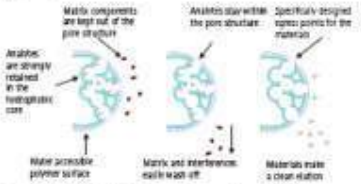


Figure 1. Varian Bond Elut Plexa retention, washing and elution mechanisms

Figures 4 and 5 show a comparison of extraction for one of the analytes in the phenol class, between a styrene divinyl benzene *N*-vinyl pyrolidone SPE and Varian Bond Elut Plexa.

Sample preparation method of phenols in drinking water using Varian Bond Elut Plexa (200 mg)

Water sample (500 mL) adjusted with HCl to pH 2		
Bond Elut Plexa 6 mL (200 mg)	1. Condition with	10 mL ethyl acetate 10 mL methanol 10 mL water
	2. Sample application	Flow rate 10-20 mL/min.
Washing	Rinse with 10 mL water.	
Drying	Dry for 30 or more min. via either N_2 gas or using a vacuum manifold.	
Elution	Elute with 5 mL ethyl acetate.	
Removing the water	Dry using a few crystals of anhydrous sodium sulfate.	
Concentration of extract	4 mL of eluted solution is gently concentrated down to 0.8 mL under N_2 gas.	
Derivatization	1. Add 100 µL *N,O*-bis(trimethylsilyl)trifluoroacetamide and let stand for an hour. 2. Add 20 µL of internal standard. 3. Make up to 1 mL with ethyl acetate.	
GC/MS/MS analysis		

Bond Elut PPL - EPA 528 Phenols from Drinking Water

Method 528 provides procedures for the determination of phenols in finished drinking water. The method may be applicable to untreated source waters but has not been evaluated for these uses. The method is applicable to a variety of phenols that are efficiently partitioned from the water sample into a modified PSDB SPE sorbent (Varian's PPL) and is sufficiently volatile and thermally stable for gas chromatography.

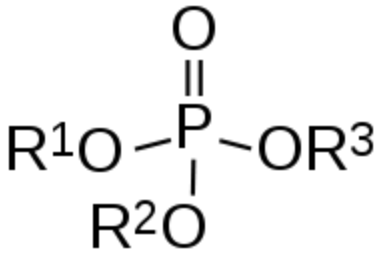
Extraction is performed by passing a 1L water sample through a SPE cartridge with 500mg modified PSDB (PPL). The phenols are eluted with methylene chloride.

ANALYTE	CAS NUMBER
phenol	108-95-2
2-chlorophenol	95-57-8
2-methylphenol (o-cresol)	95-48-7
2-nitrophenol	88-75-5
2,4-dimethylphenol	105-67-9
2,4-dichlorophenol	120-83-2
4-chloro-3-methylphenol	59-50-7
2,4,6-trichlorophenol	88-06-2
2,4-dinitrophenol	51-28-5
4-nitrophenol	93951-79-2
2-methyl-4,6-dinitrophenol	534-52-1
pentachlorophenol	87-86-5

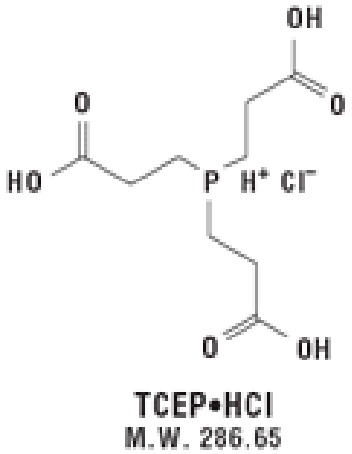
Determination of Organophosphates in Lake Water: Bond Elut PPL

SI-02094

Julia Regnery, Goethe-Universität Frankfurt, Institut für Atmosphäre und Umwelt, AG-Umweltanalytik, 60438 Frankfurt, Germany, Elisabeth Korte, Varian Deutschland GmbH



Chlorinated organophosphates are used as flame retardants in insulation foams, paints, coatings, plastics, and textiles while the non-chlorinated ones are mostly used as plasticizers. The compounds have been detected in air, sediment and soil, sewage sludge, streams and lakes. Particularly the chlorinated organophosphates are known to persist in the aquatic environment.



- **Because of the low concentration of the analytes in the water sample an enrichment step is necessary.**

SPE Conditions

Cartridge: Bond Elut PPL, 100 mg sorbent in 1 mL cartridge

Condition: 1 mL methanol, 1 mL methanol / acetonitrile (1/1)

Apply 1.5 -2.5 L water sample

Dry the cartridge using nitrogen

Elution with 3 x 333 µL methanol / acetonitrile (1/1)

Results

The simple clean-up and enrichment with SPE has the advantage that up to 20 water samples can be extracted simultaneously without using complex apparatus. Bond Elut PPL has been proven to be a robust sorbent with high capacity for the extraction of polar and medium polar analytes.

Table 1. Recoveries and LODs of organophosphates; extracted from the water sample with SPE.

Analyte	Recovery (%)	LOD (ng/L)	Quantifiying ion m/z
Tris(1-chloro-2-propyl)-phosphate (TCPP)	91	1	99
Tris(2-chloroethyl)-phosphate (TCEP)	95	2	63
Tris(1,3-dichloro-2-propyl)-phosphate (TDCP)	99	1	75
Tri-n-butylphosphate (TnBP)	89	1	99
Tri-isobutylphosphate (TiBP)	85	2	99
Tris(2-butoxyethyl)-phosphate (TBEP)	93	3	125

Conclusion

Novel polymeric SPE phases are recommended:

1. They have double the binding capacity over silica
2. They can bind a wide range of polar analytes
3. They don’t decondition/dry out on the SPE manifold
4. They provide more robust methods

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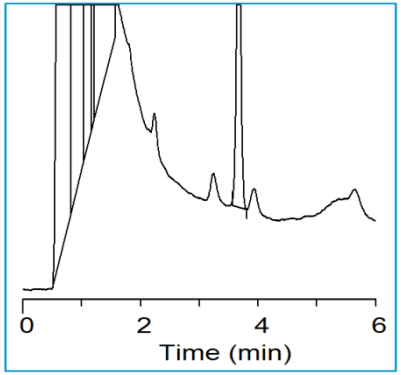
Summary and Conclusions

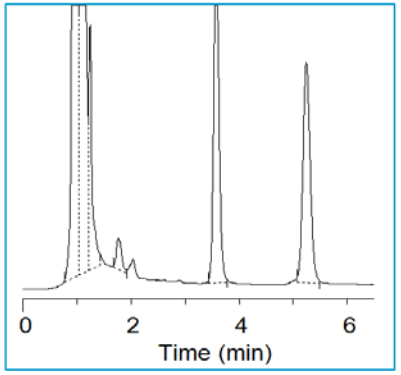
Remove interferences…

- To acquire desired sensitivity/selectivity
- To reduce contamination/carryover issues
- Use of sensitive and expensive instruments: ***Protect your investment!!!***

Pesticides in Avocado *without* SP

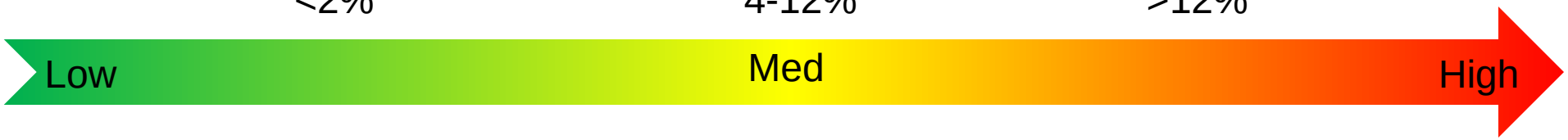


Pesticides in Avocado with SP



Lipids

Matrices and Approximate Total Lipid Content



Spinach (0%)
Strawberry (0%)
Onion (0%)
Paprika (1%)
Cumin (2%)
Rice (2%)
Hops (2%)
Tilapia (2%)
Sea Bass (3%)
Wheat (3%)

Soy Milk (4%)
Beef Liver (4%)
Pork Liver (4%)
Corn (4%)

Pork (8%)
Trout (8%)
Chocolate (8%)
Canned Pet Food (~10%)
Cow's Milk (5%)
Catfish (12%)
Carp (12%)

Plasma or whole blood
(10 – 20 %)

Nut Butters (16%)
Avocado (21%)
Salmon (27%)
Soy Oil (100%)
Avocado Oil (100%)
Canola Oil (100%)
Coconut Oil (100%)

Current Procedures for Lipid Removal

Method	How Lipids are removed	Weakness
Dilute and Shoot	No lipid removal, only dilution	No lipid removal
Protein Precipitation	PPT followed by centrifugation	Insufficient lipid removal
	PPT followed by filtration with or without sorbent	Insufficient lipid removal; low analyte recovery
QuEChERS	**PSA/C18 sorbent (dSPE)**	**Not selective; insufficient lipid removal; analyte loss**
	Zr-containing sorbent	**Low total lipid capacity; analyte recovery**
	Freeze sample	Time needed; loss of analyte
SPE/SLE	**Load and elute**	**Time needed; solvent usage; extensive method development**
SEC/GPC	Chromatographic separation	Uses copious amounts of solvent and time; capital expense

EMR-Lipid

Enhanced Matrix Removal

EMR: As easy to use as QuEChERS; as clean as SPE

EMR Product offering

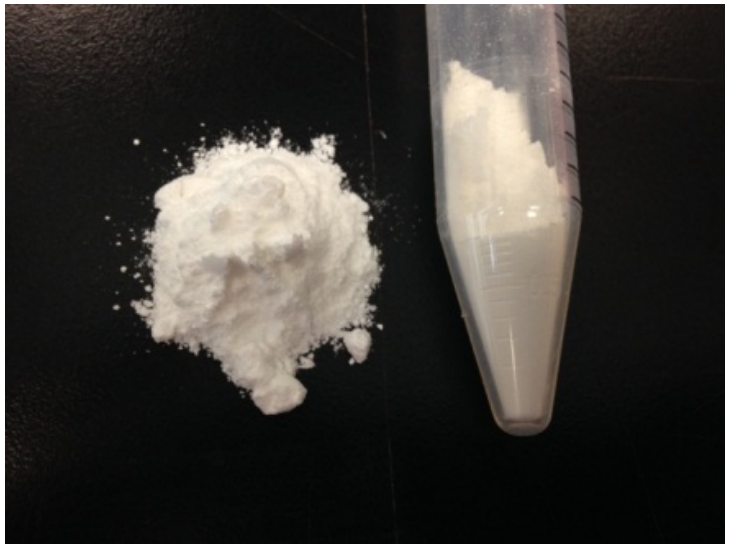
Extraction Tube

EMR-Polish (p/n 5982-0102)

EMR-Lipid (p/n 5982-1010)

EMR fits into current sample preparation workflows

EMR Sorbent - What is it?



1.0 g EMR in 15 mL tube

When "activated" by water…

- The materials selective hydrophobic interactions increase.
- Suspension of nano particles (high surface area).
- Rapidly interacts with straight chain, "lipid-like" functional groups.

Centrifugation preferably used to separate precipitate from solution (*not filtration*).

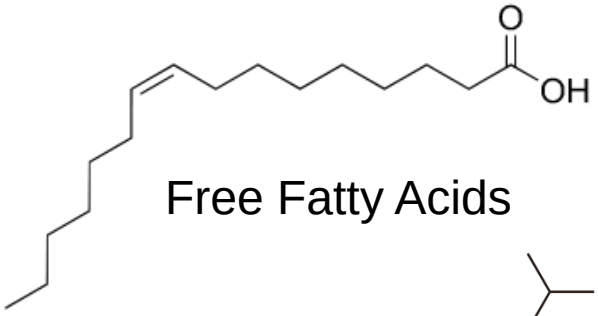
EMR-Lipid Mechanism – Size exclusion and hydrophobic interaction.

… and what does it do?

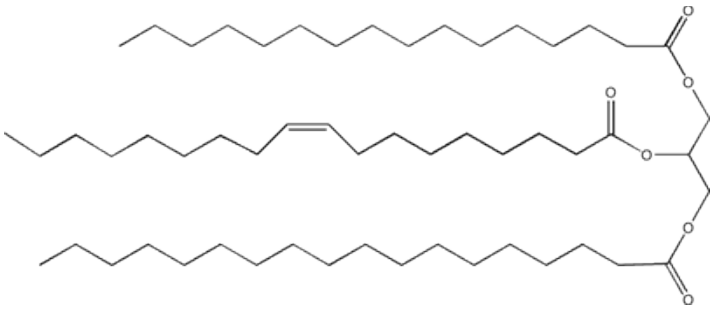
EMR sorbent removes Lipids

What are Lipids?

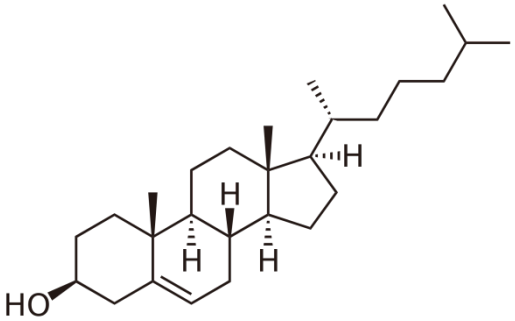
A class of naturally occurring hydrocarbon containing compounds commonly known as fats and oils



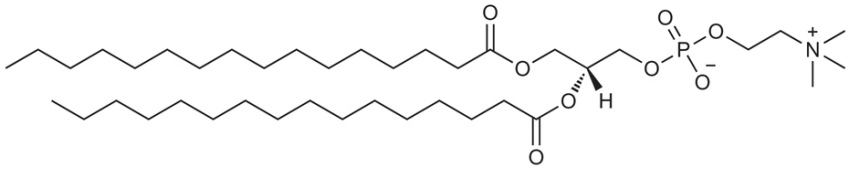
Free Fatty Acids



Triglycerides



Cholesterol



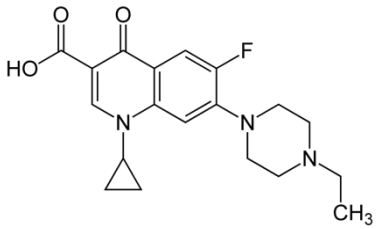
Phospholipids

What Does EMR *NOT* Interact With?

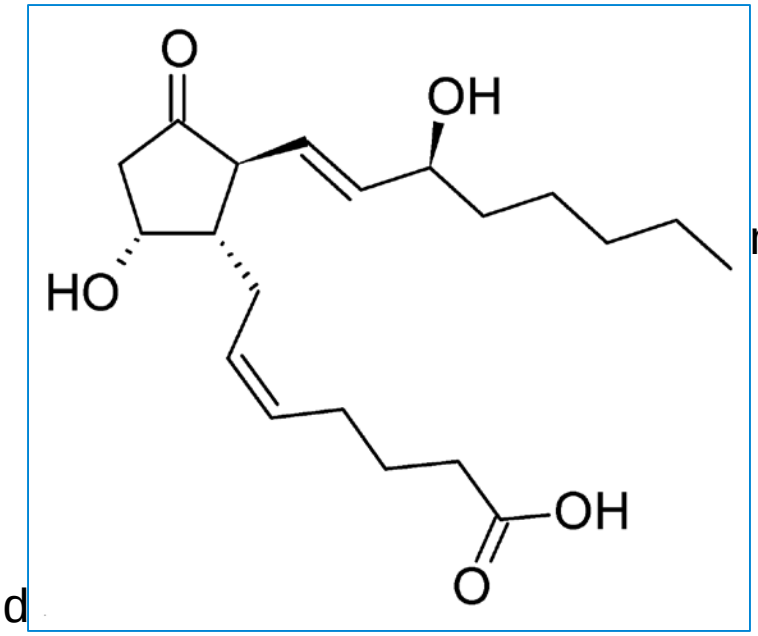
EMR does NOT remove analytes of interest

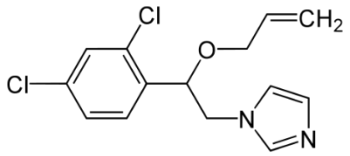
Exceptions?

Compounds containing long aliphatic functional groups (e.g. prostaglandins)

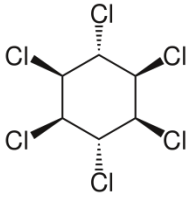


Fluoroquinolones

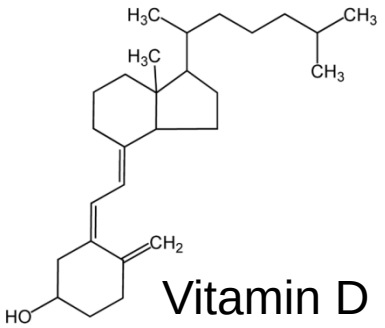




midazole pesticides



Organochlorine Pesticid



Vitamin D

EMR Fits into Existing Workflows

QuEChERS (Quick, Easy, Cheap, Effective, Rugged, Safe)

- Easy-to-use sample preparation for food testing, solid samples (e.g. vegetables, fruits, meat, seafood, etc.)

  ***EMR Applications*: -** Pesticide Residues in Avocado,

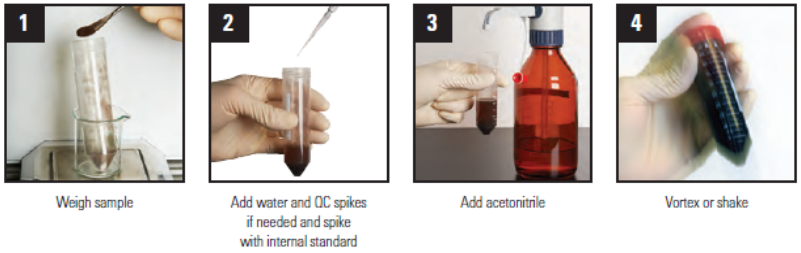
Modified Liquid Extraction (Protein Precipitation)

- Proteins are removed by a “crash” step prior to injection or cleanup (e.g. milk, meat, seafood, etc.)

  ***EMR Applications*: -** PAHs in Salmon,
  - Veterinary Drugs in Bovine Liver

Improving dSPE in QuEChERS

1. Extraction



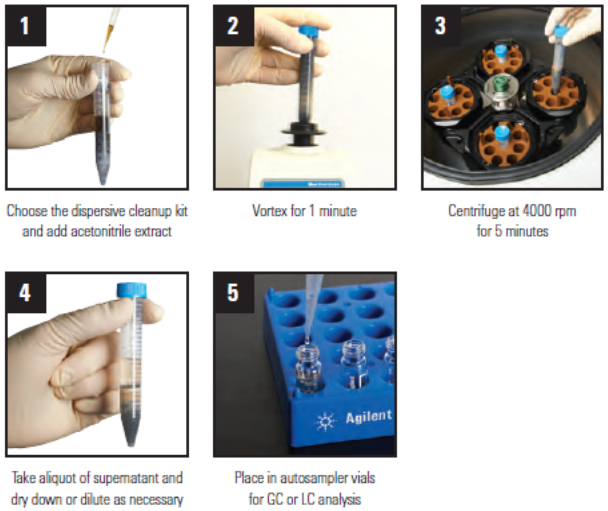
Pros

- Fast and inexpensive
- Takes minimal experience
- Doesn't require special equipment
- Accommodates multiple matrices
- Accommodates large analyte groups

Cons

- Large amount of coextractives

2. Dispersive SPE



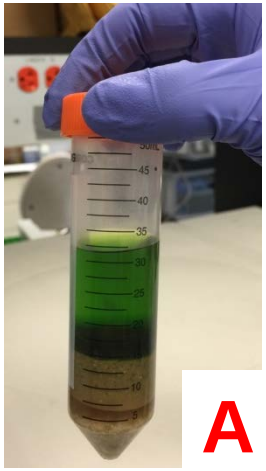
Pros

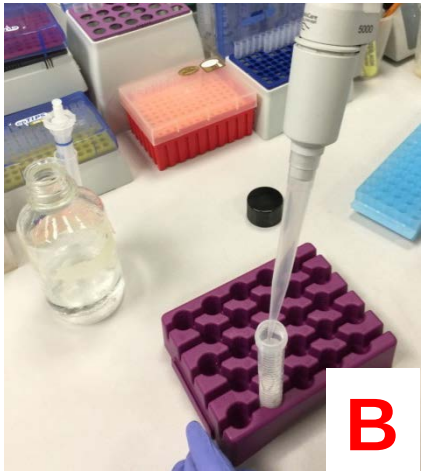
- Same as extraction

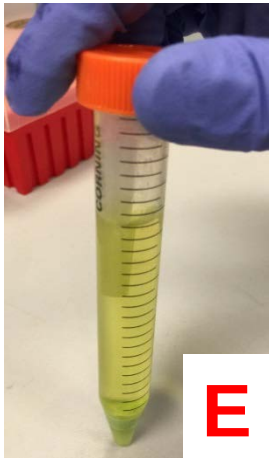
Cons

- Minimal cleanup provided
- Can remove analytes
- Lipids are challenging to remove selectively

EMR – Lipid – dSPE Cleanup

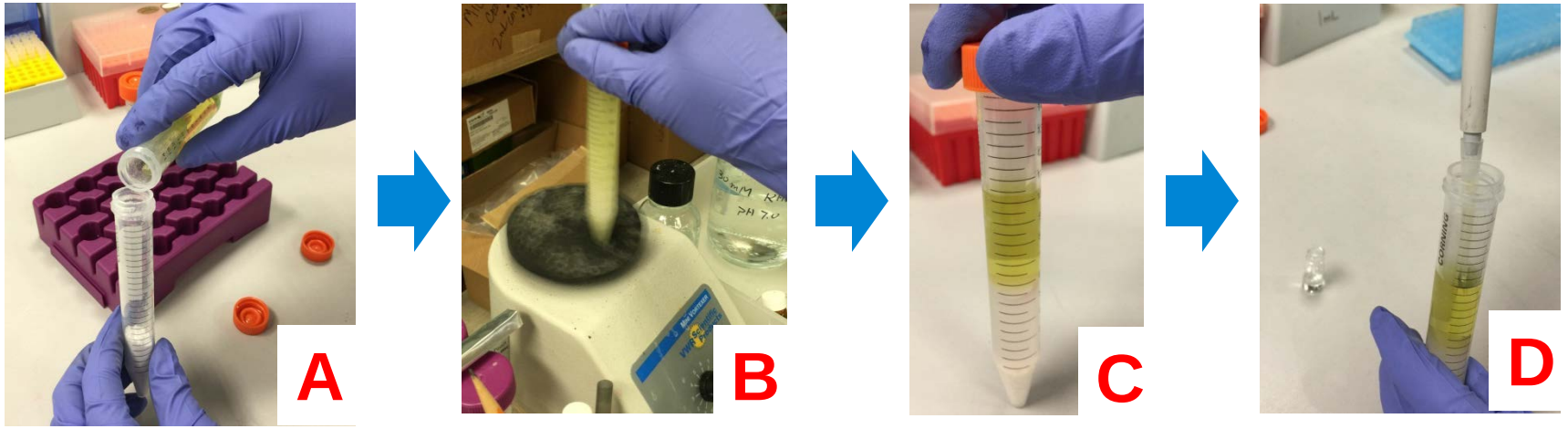




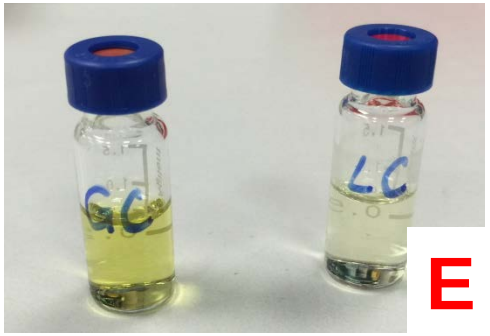


A. QuEChERS or Liquid Extract
B. Add H_2O to EMR tube ("activation")
C. Transfer extract
D. Vortex and centrifuge
E. Supernatant (1:1; extract: H_2O)

EMR – Polish – ACN/H_2O Phase Separation



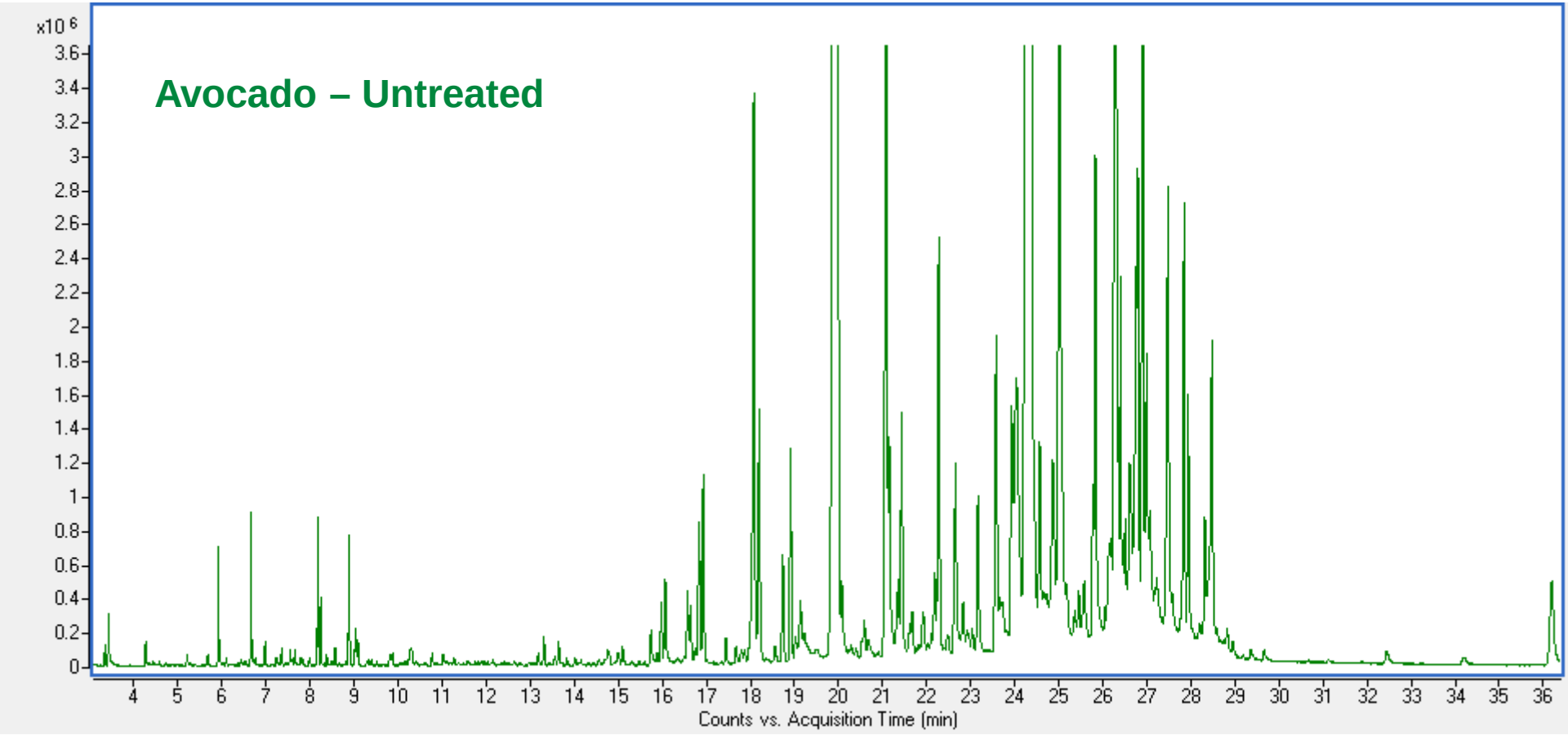
A. Add supernatant to EMR – Polish tube
B. Vortex immediately
C. Phase separation after centrifuge
D. Transfer upper layer for analysis
E. Final samples split for GC and LC analysis
F. Extra dry step recommended prior to GC



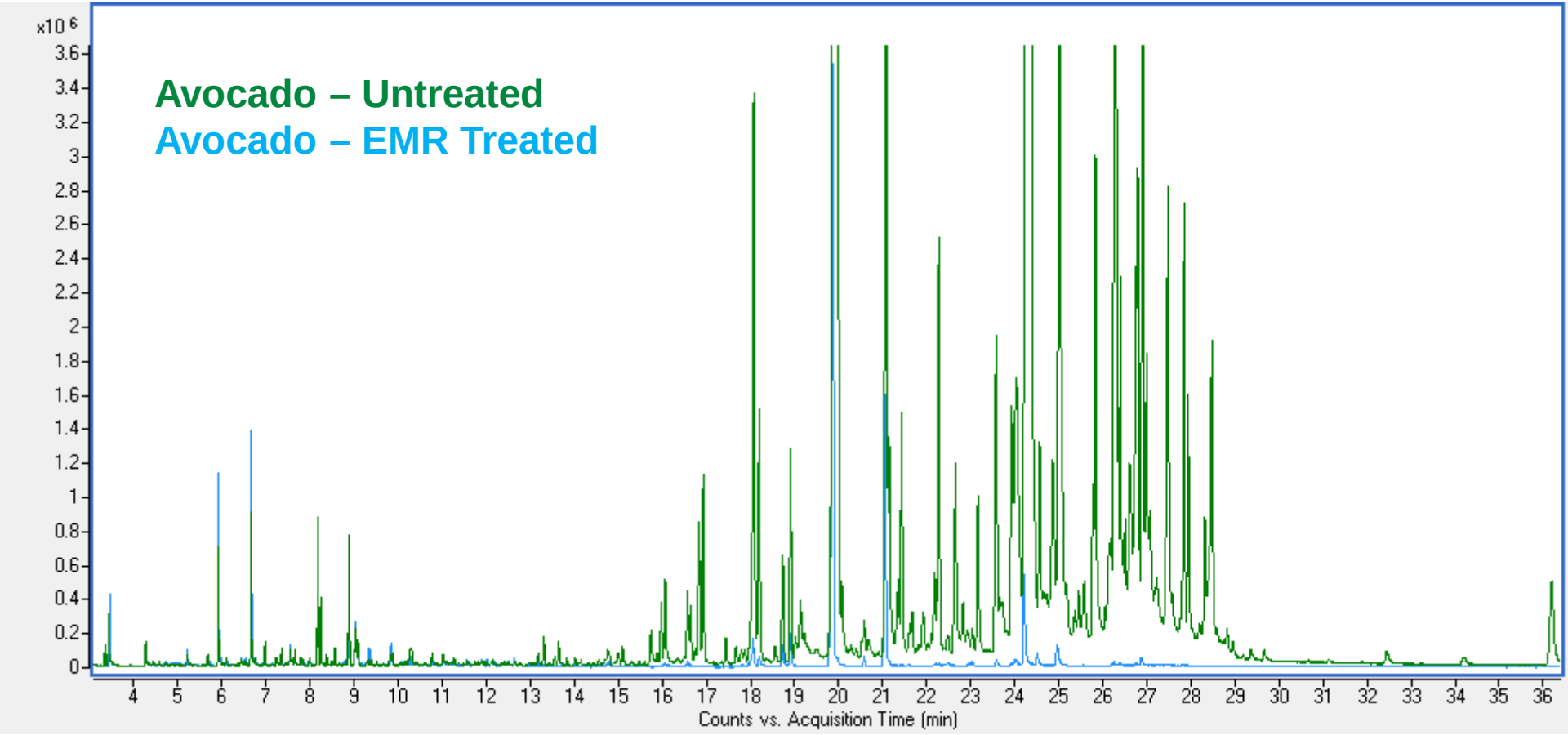
EMR Workflow

In acetonitrile
Or acetone

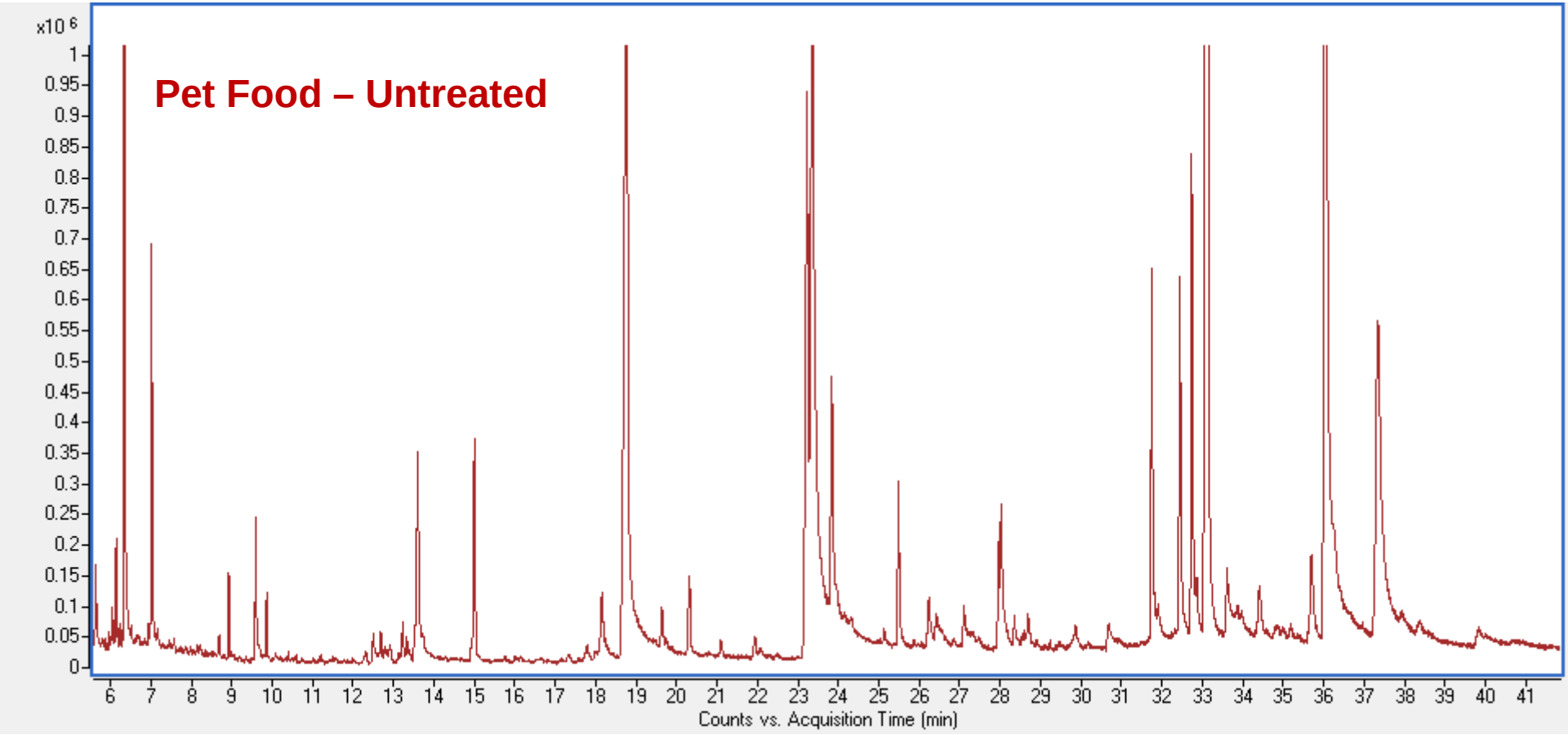
GC-MS Fullscan Avocado



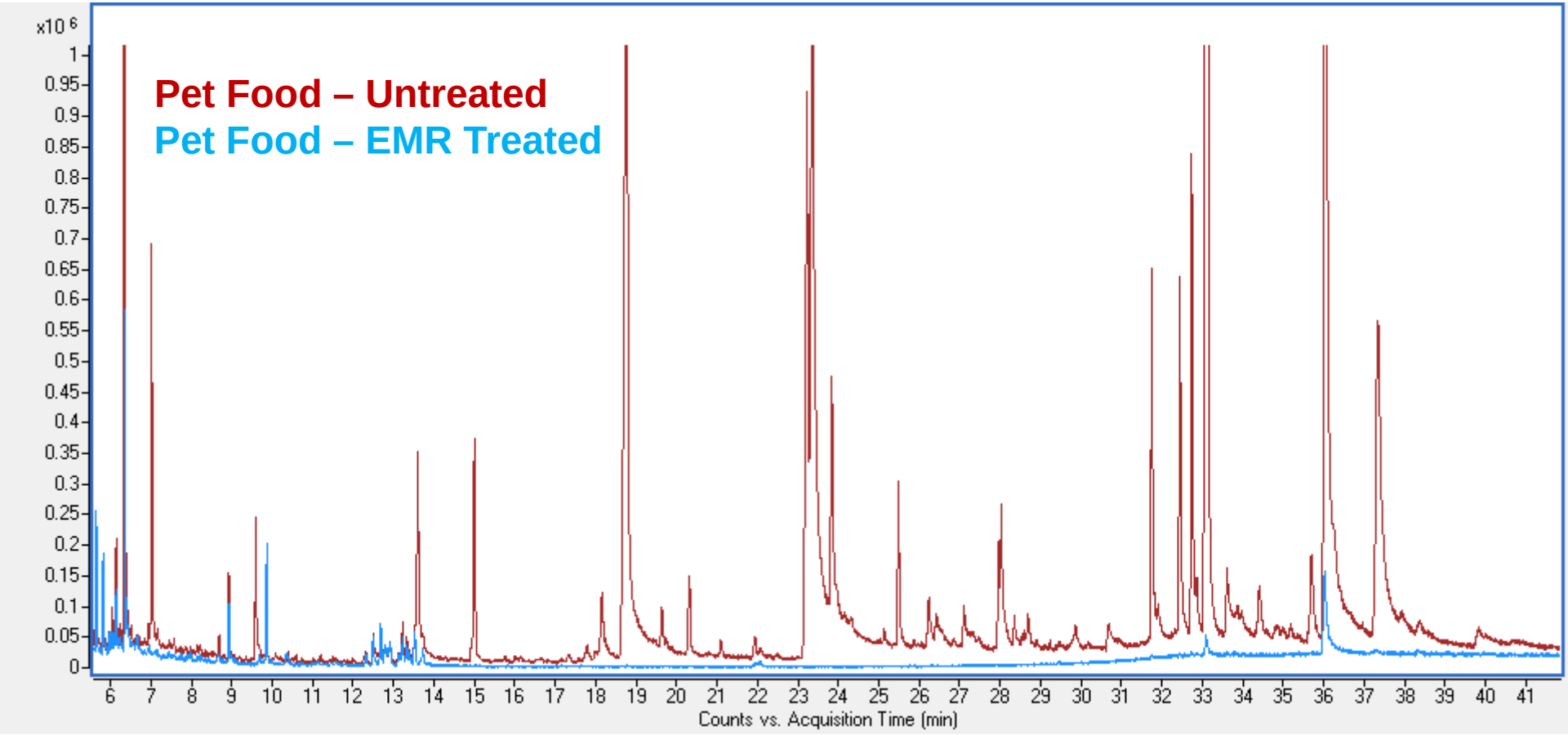
GC-MS Fullscan Avocado



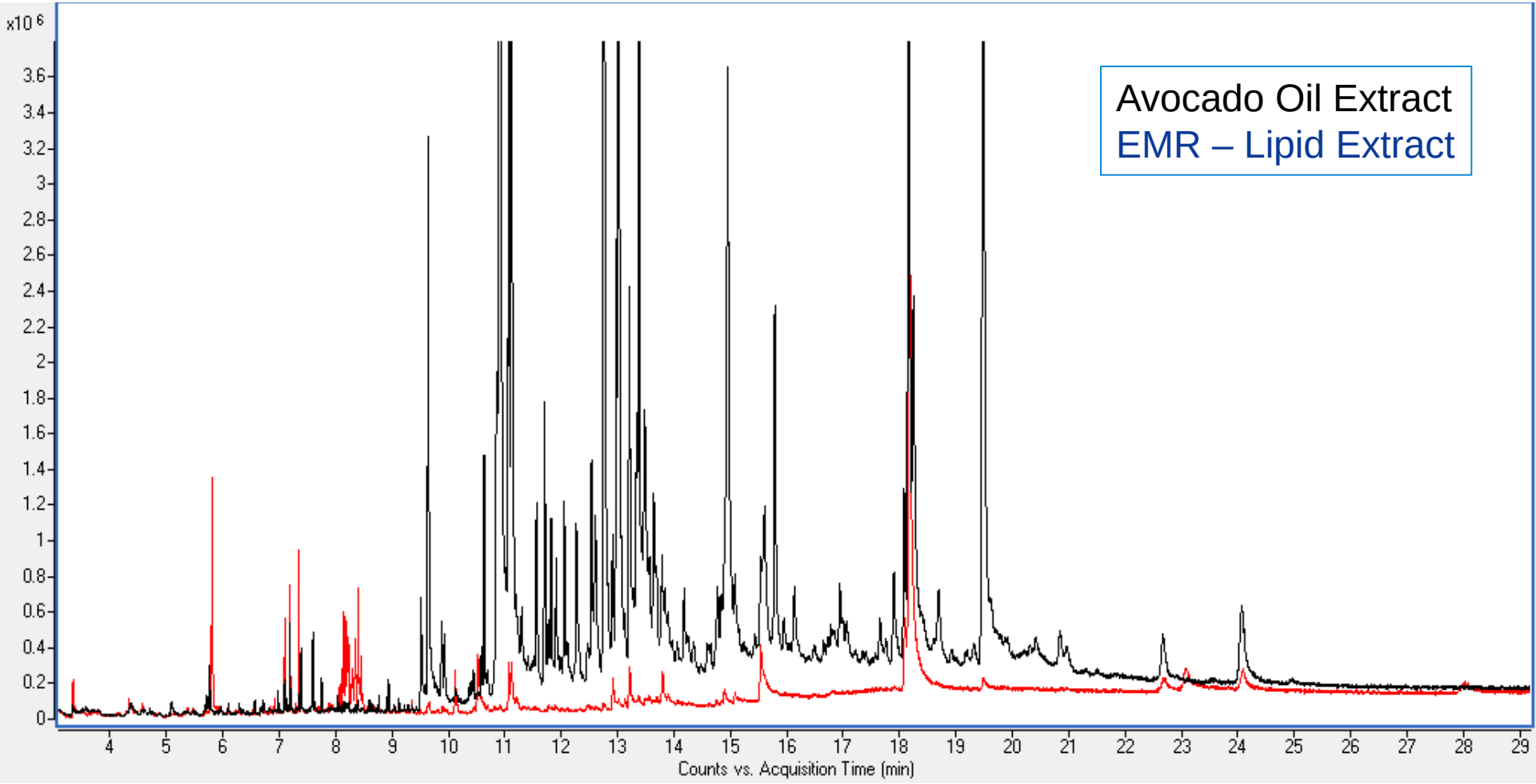
GC-MS Fullscan Pet Food



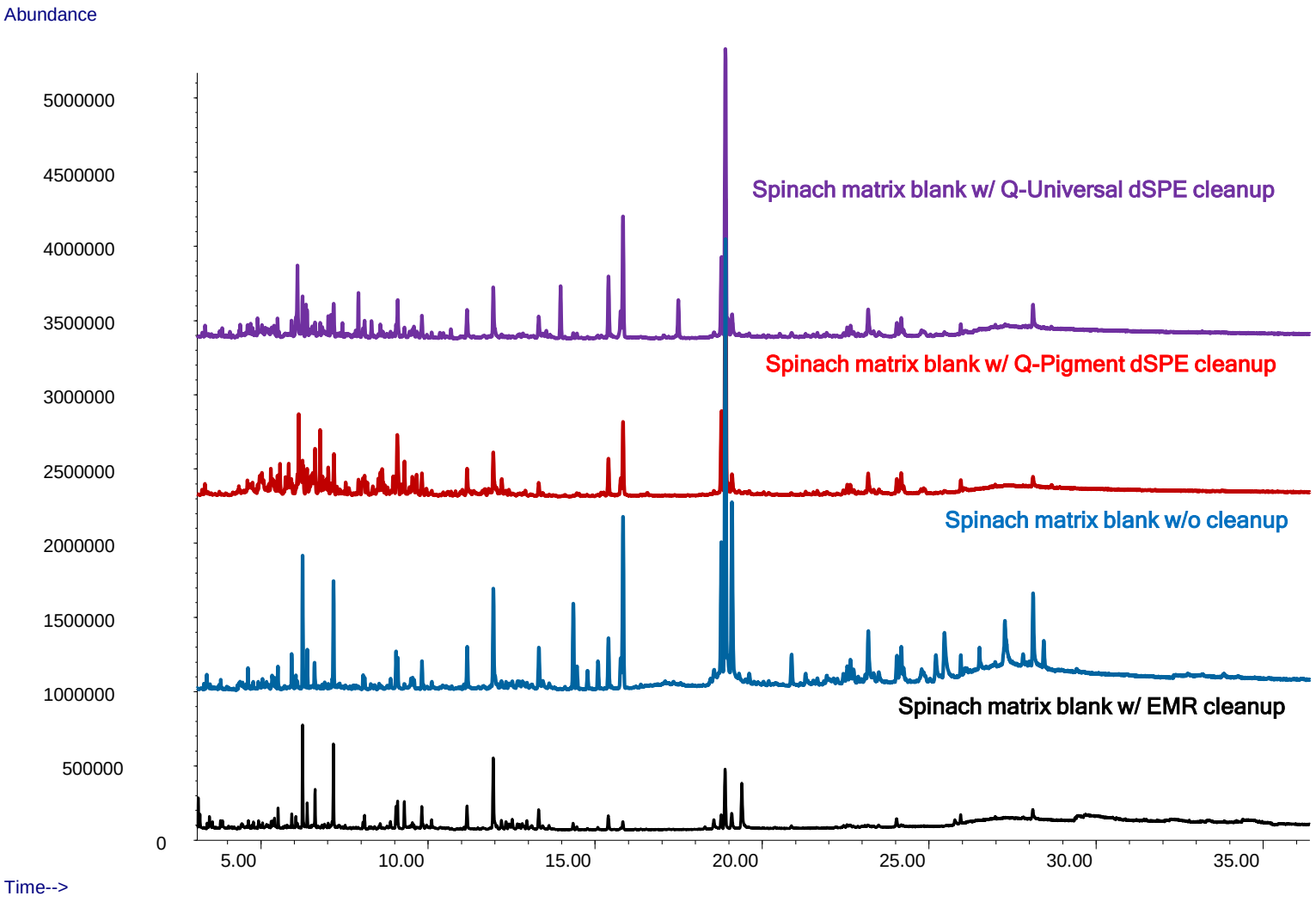
GC-MS Fullscan Pet Food



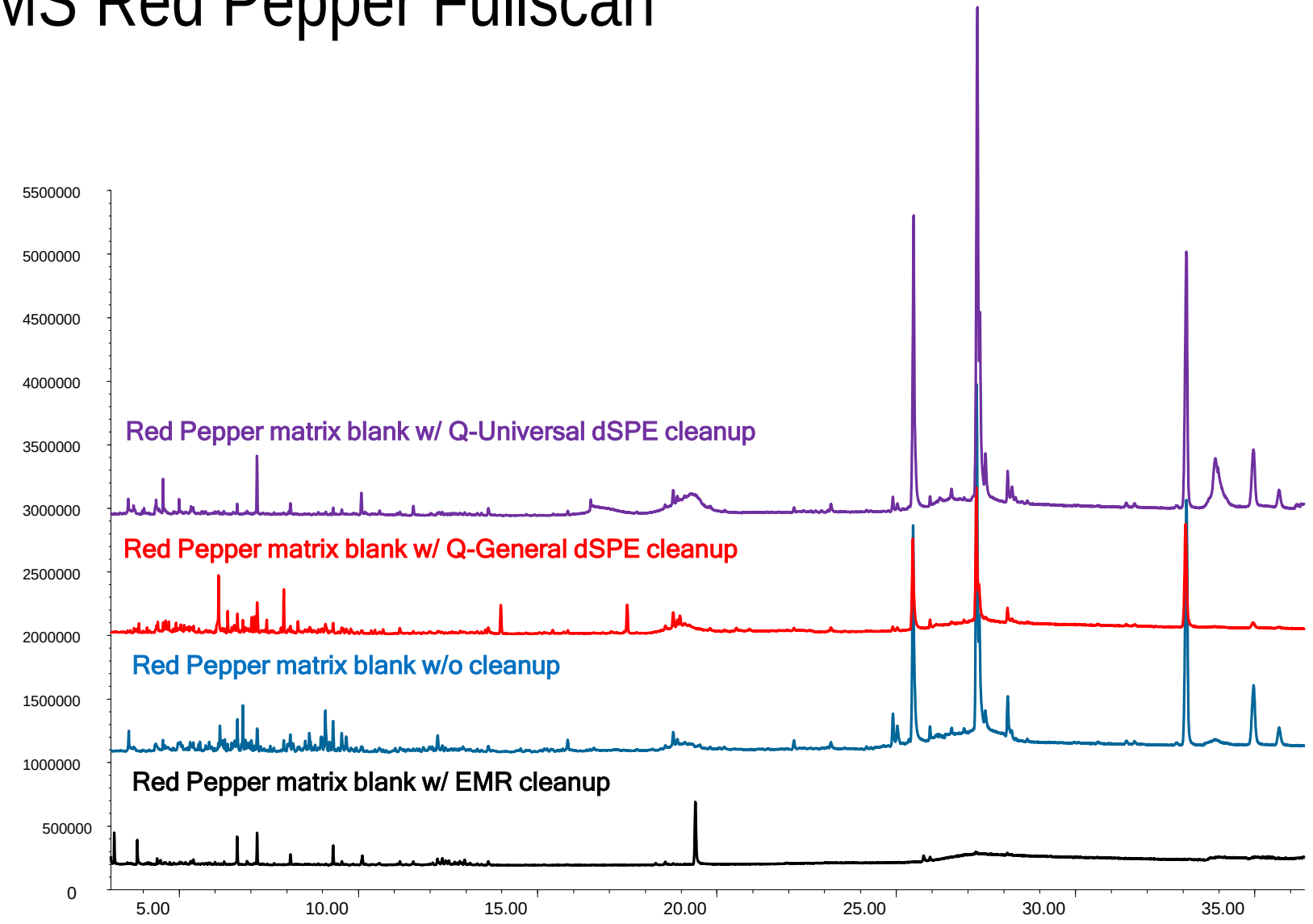
GC-MS Full Scan– Avocado Oil



GC-MS Spinach Fullscan

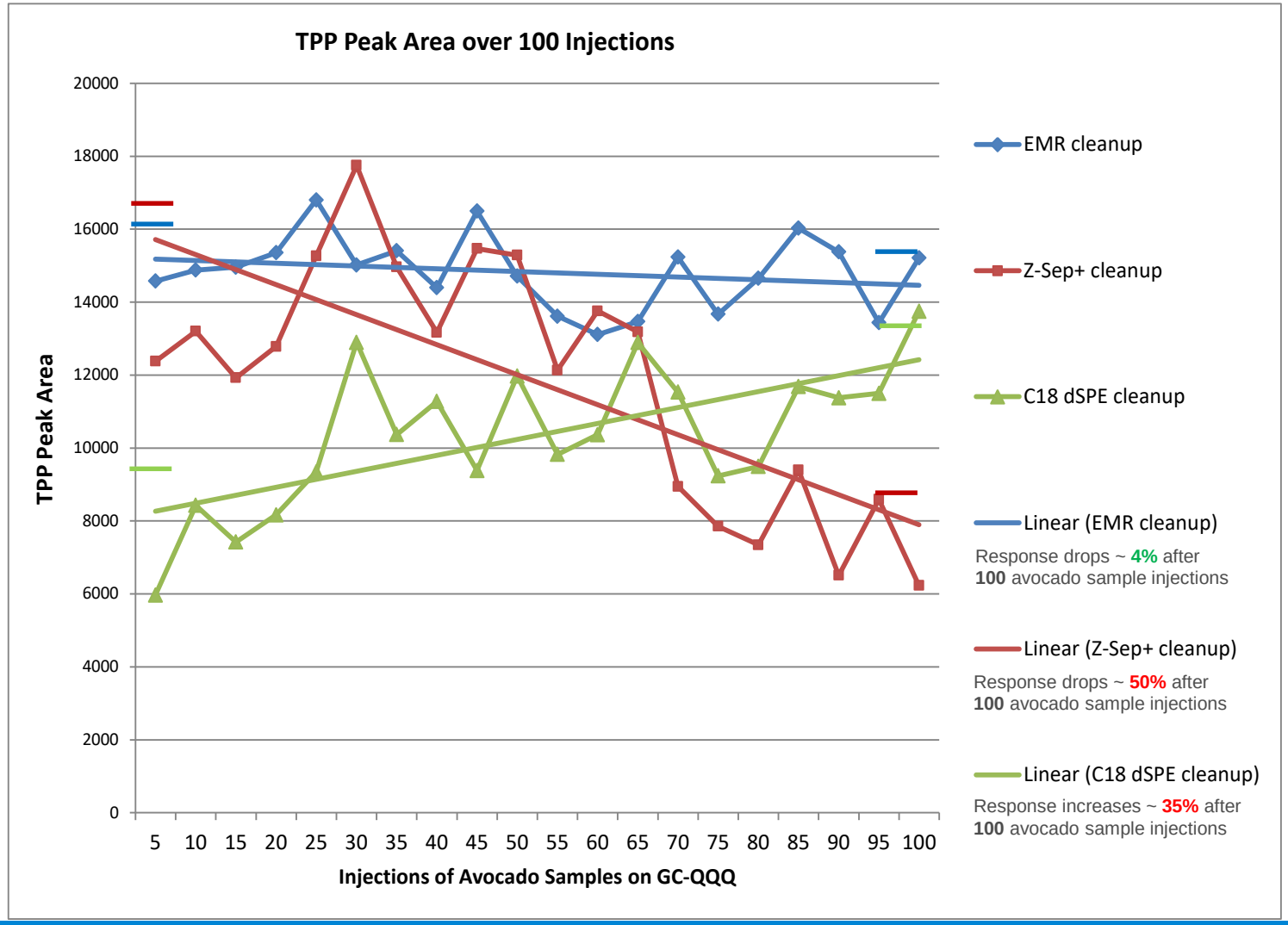


GC-MS Red Pepper Fullscan



Benefits to Instrumental Flowpath

Comparison of Analytes Response Consistency over Multiple Avocado Sample Injections



TPP

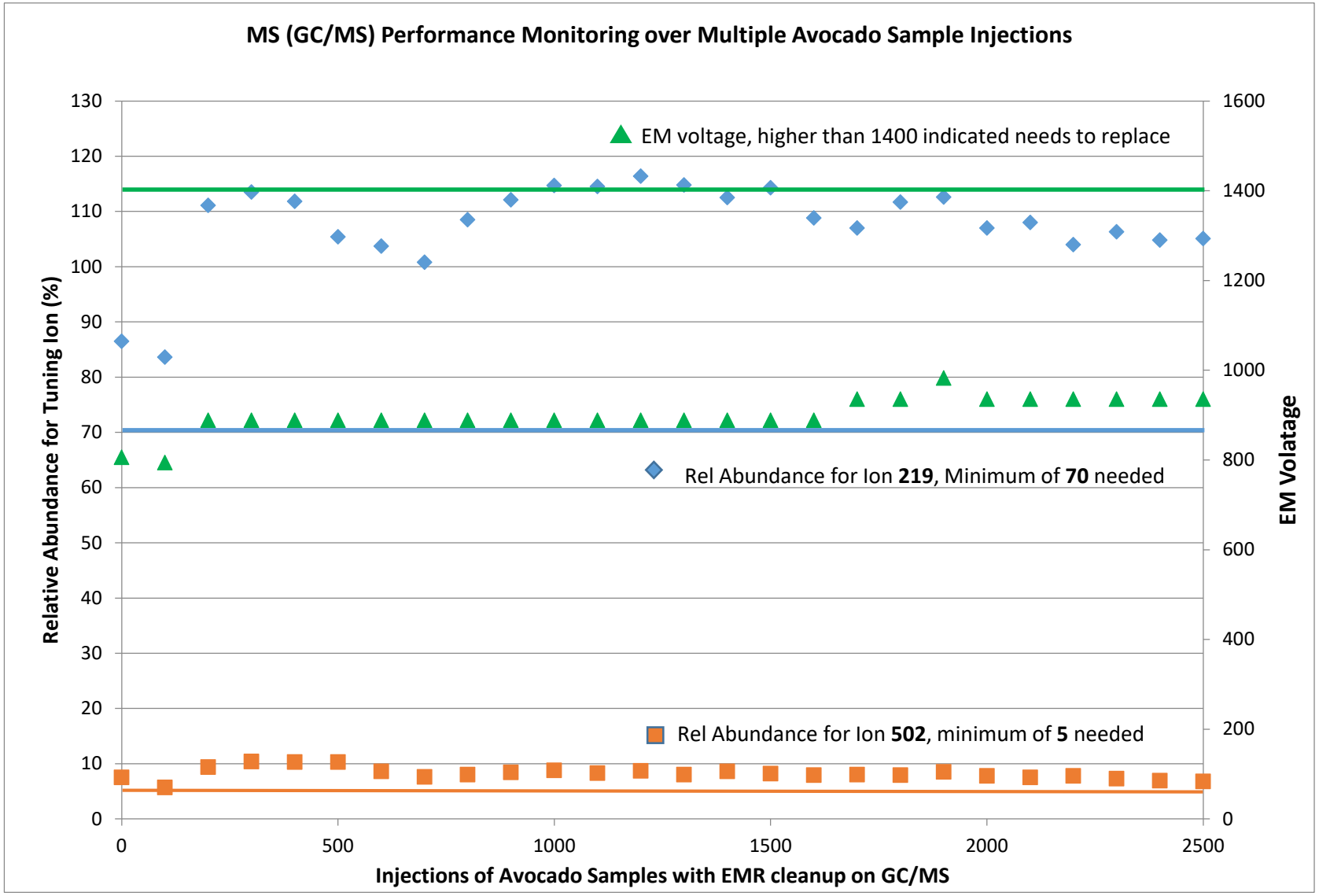
Commonly used IS

RT: 18.3 min

Analytes Responses Reproducibility on GC/MS/MS over 100 Injections of Avocado Samples

Pesticides	Analytes RSD over 100 injections on GC/QQQ (n = 20)			RSD over 50 injections on GC/QQQ (n = 10)		
	EMR Cleanup	C18/PSA cleanup	Zirconia sorbent cleanup	EMR Cleanup	C18/PSA cleanup	Zirconia sorbent cleanup
Dichlorvos	6.2	10.5	16.8	2.2	9.4	6.3
2-Phenylphenol	7.0	13.6	19.5	5.0	12.4	8.4
Ethalfluralin	12.4	18.8	32.0	5.8	10.3	7.9
Sulfotep	7.1	11.8	17.2	3.1	6.4	10.8
Atrazin	6.8	12.2	19.1	3.2	12.2	5.2
Lindane	8.5	10.8	20.0	4.6	10.9	5.1
Chlorothalonil	12.5	11.7	37.4	8.0	12.9	11.0
Diazinon	6.6	11.7	16.9	4.4	10.5	5.6
Chlorpyriphos-methyl	8.4	8.9	14.9	3.8	8.6	6.6
Dichlorfluanid	11.7	9.0	25.9	5.4	9.9	5.5
Aldrin	9.8	19.3	25.7	8.6	19.3	7.1
Tolylfluanid	10.5	6.6	17.8	4.2	6.9	6.6
Captan	29.9	51.9	47.1	11.1	24.9	21.7
Procymidone	6.8	14.3	22.5	5.6	13.8	4.8
Bupirimate	6.8	10.4	20.7	7.6	11.0	6.2
Endrin	8.3	12.6	24.1	5.9	13.8	5.4
Endosulfan sulfate	8.5	12.1	22.4	5.3	12.7	6.4
DDT	21.6	22.4	42.6	6.4	12.0	11.8
Iprodione	11.0	10.7	40.0	8.2	10.9	16.3
Permethrin	6.8	11.8	18.8	5.2	11.2	8.6
Parathion ethyl-D10 (IS)	11.8	7.2	13.0	4.7	6.8	7.0
TPP (IS)	9.1	19.9	28.3	9.0	22.5	12.8

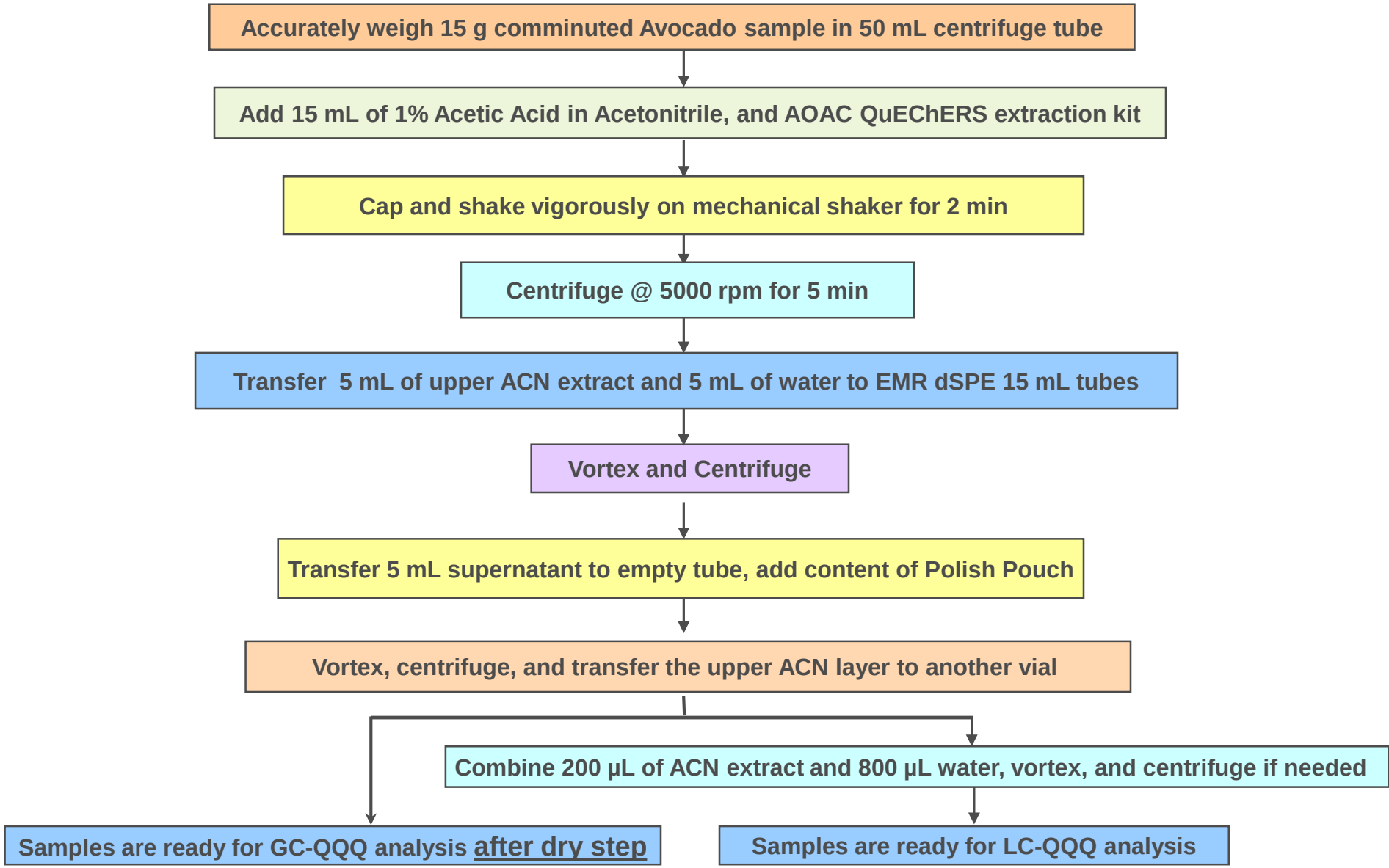
MS Source Critical Tuning Parameters



67 Pesticides Analysis in Avocado by LC and GC-QQQ

Representative Pesticide	Chemical Class	Pesticide Group	Detection Technique	Representative Pesticide	Chemical Class	Pesticide Group	Detection Technique	Representative Pesticide	Chemical Class	Pesticide Group	Detection Technique
Dichlorvos	Organophosphate	Herbicide	GC-MS	Methamidophos	Organophosphate	Insecticide	LC-MS	Simazine	Triazine	Herbicide	LC-MS
Sulfotep		Insecticide		Acephate				Sebuthylazine			
Diazinon				Omethoate				Terbuthylazine		Algaecide	
Chlorpyriphos methyl				Dimethoate				Carbofuran	Carbamate	Insecticide	
Coumaphos				Phosmet				Methiocarb			
Trichlorfon				Carbaryl	Carbamate			Chlorpropham		Herbicide	
Lindane	Organochlorine			Propoxur				Propham			
Aldrin				Dichlofluanid	Sulphamide	Fungicide		Monuron	Urea		
Endrin				Tolylfluanid				Chlorotoluron			
DDT				Carbendazim	Benzimidazole			Diuron			
Endosulfan sulfate				Thiabendazole				Fluometuron			
Methoxychlor				Thiophanate methyl				Isoproturon			
2-Phenylphenol	Phenol	Fungicide		Cyprodinil	Anilinopyrimidine			Metobromuron			
Atrazine	Triazine	Herbicide		Imidacloprid	Neonicotinoid	Insecticide		Siduron			
Bupirimate	Pyrimidinol	Fungicide		Pymetrozine	Pyridine			Linuron			
Chlorothanil	Chloronitrile			Imazalil	Imidazole	Fungicide		Neburon			
Captan	Phthalimide			Penconazole	Triazole			2,4-D Acid	Chlorophenoxy acid		
Folpet				Aminocarb	Carbamate	Insecticide		Dichlorprop			
Captafol				Oxamyl				Metazachlor	Chloracetanilide		
Iprodione	Dicarboximide			Methomyl				Bentazon	Unclassified		
Procymidone				Aldicarb				Malathion	OP	Insecticide	
Permethrin	Pyrethriod	Insecticide		Fenuron	Urea	Herbicide		EPN			
Deltmethrin				Metoxuron				Tepp-A			
Pyraclostrobin	Strobilurin	Fungicide						Monocrotophos			
Ethalfluralin	Dinitroaniline	Herbicide									

QuEChERS-EMR Protocol for Multi-residue Analysis of Pesticides in Avocado



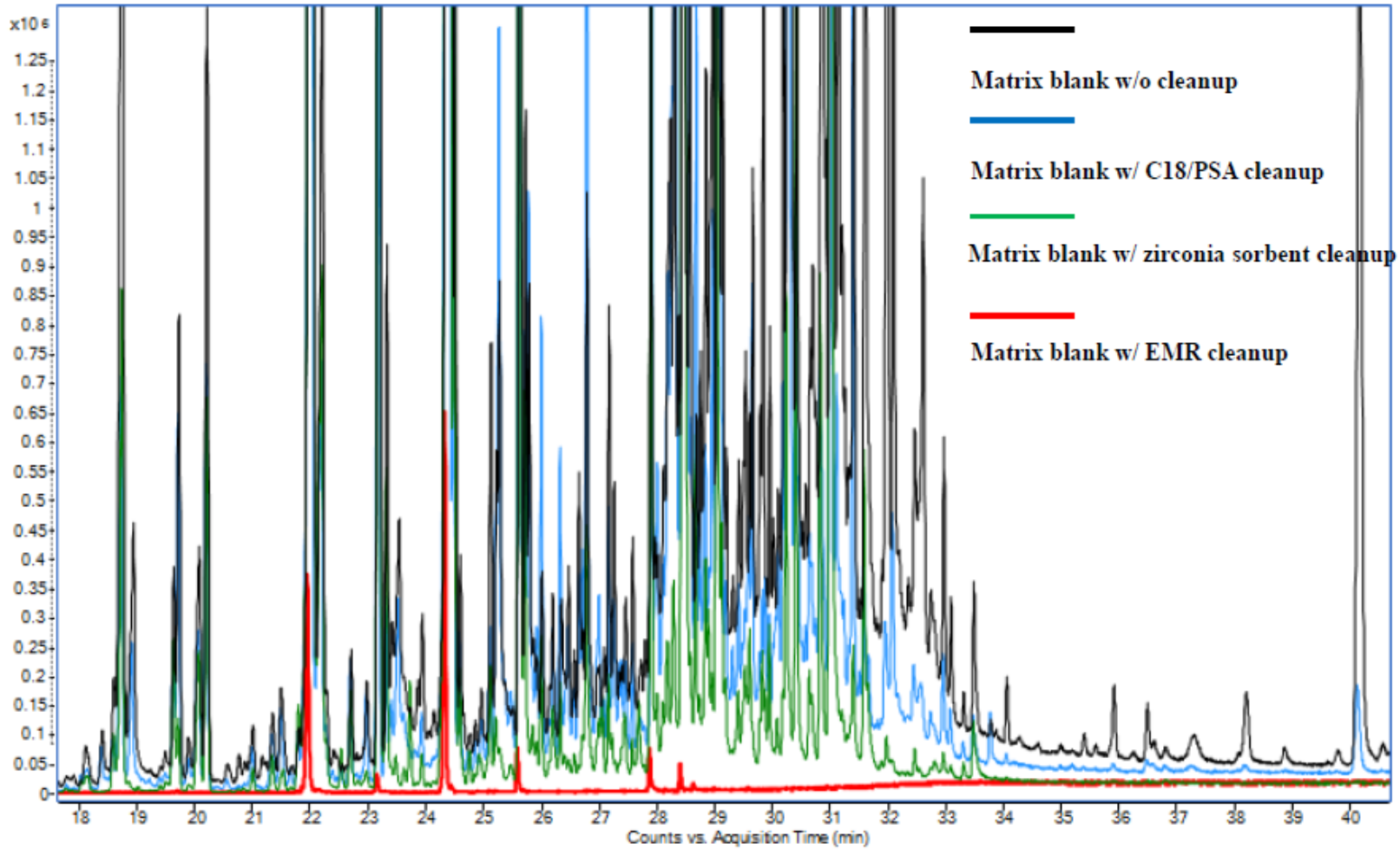
Comparison of Avocado Co-extractives by Weight

Cleanup	Amount of co-extractives (mg, n= 3)	Amount of co-extractives removed by cleanup (mg, n = 3)	% of matrix co-extractives removed by cleanup
No further cleanup	**14.7**	**--**	
C18/PSA Cleanup	**9.5**	**5.2**	**35.4**
EMR-Lipid Cleanup	**4.2**	**10.5**	**71.4**
Zirconia sorbent Cleanup	**7.0**	**7.7**	**52.4**

$$\%\ \text{Matrix Co-extractives Removed by Cleanup} = \frac{Amount\ of\ Co{-}extractives\ Removed\ after\ \ Cleanup}{Amount\ of\ Co{-}extractives\ without\ Cleanup} \times 100\%$$

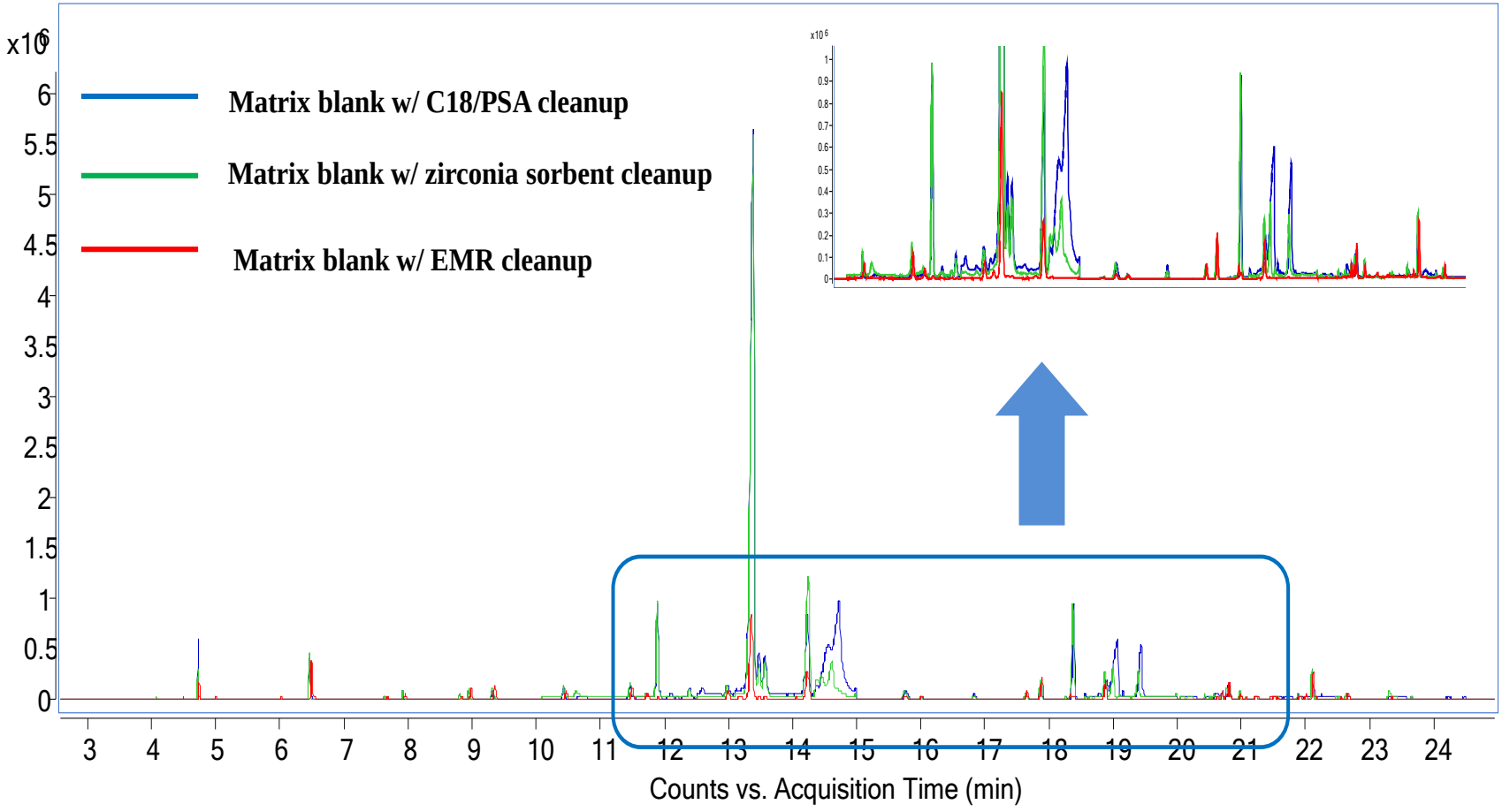
The use of EMR material cleanup removes extra 20-30% of Avocado co-extractives in comparison to traditional QuEChERS and/or competitor's cleanup

Comparison of GC/MS Full-scan Chromatogram for Matrix Background

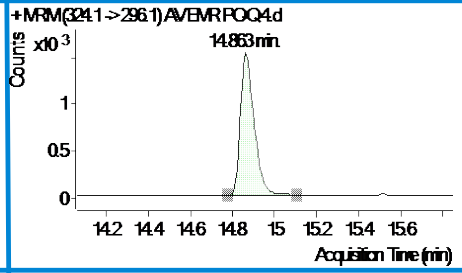
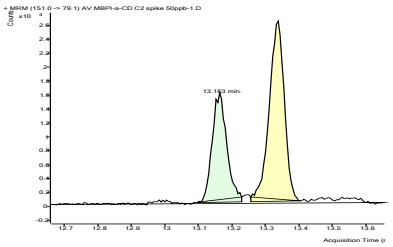
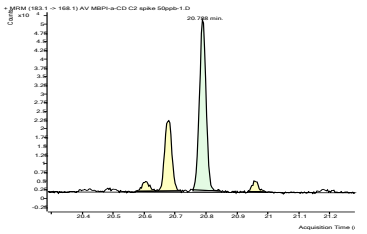
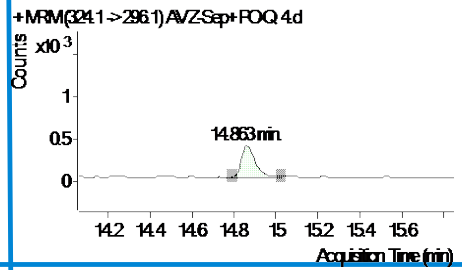
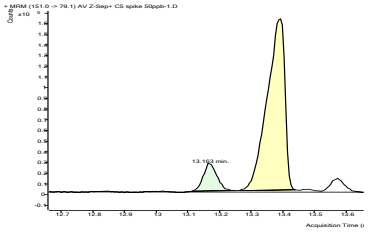
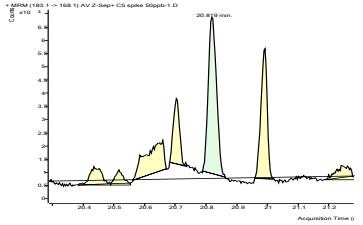
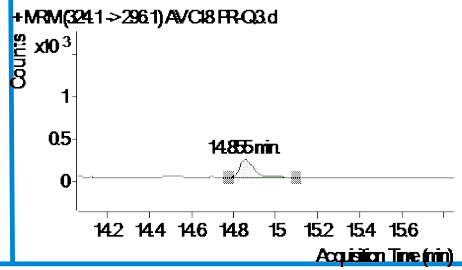
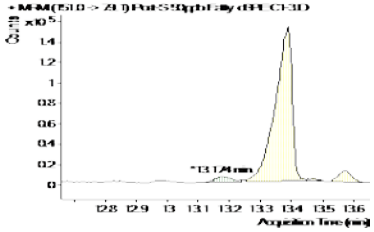
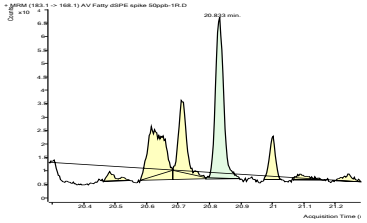


The use of EMR material cleanup provides significantly cleanup chromatographic sample background.

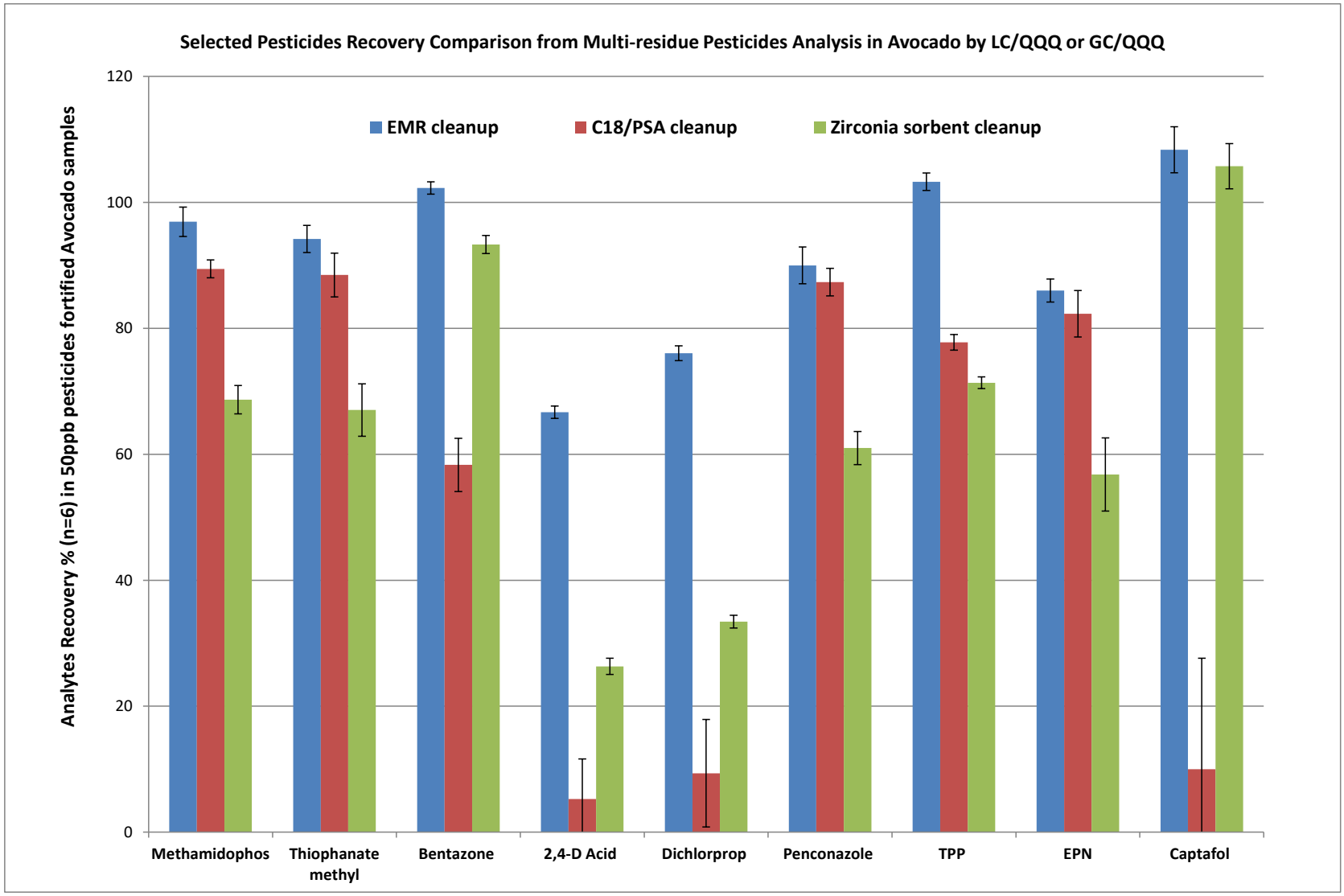
Comparison of GC/MS/MS MRM Chromatogram for Matrix Background



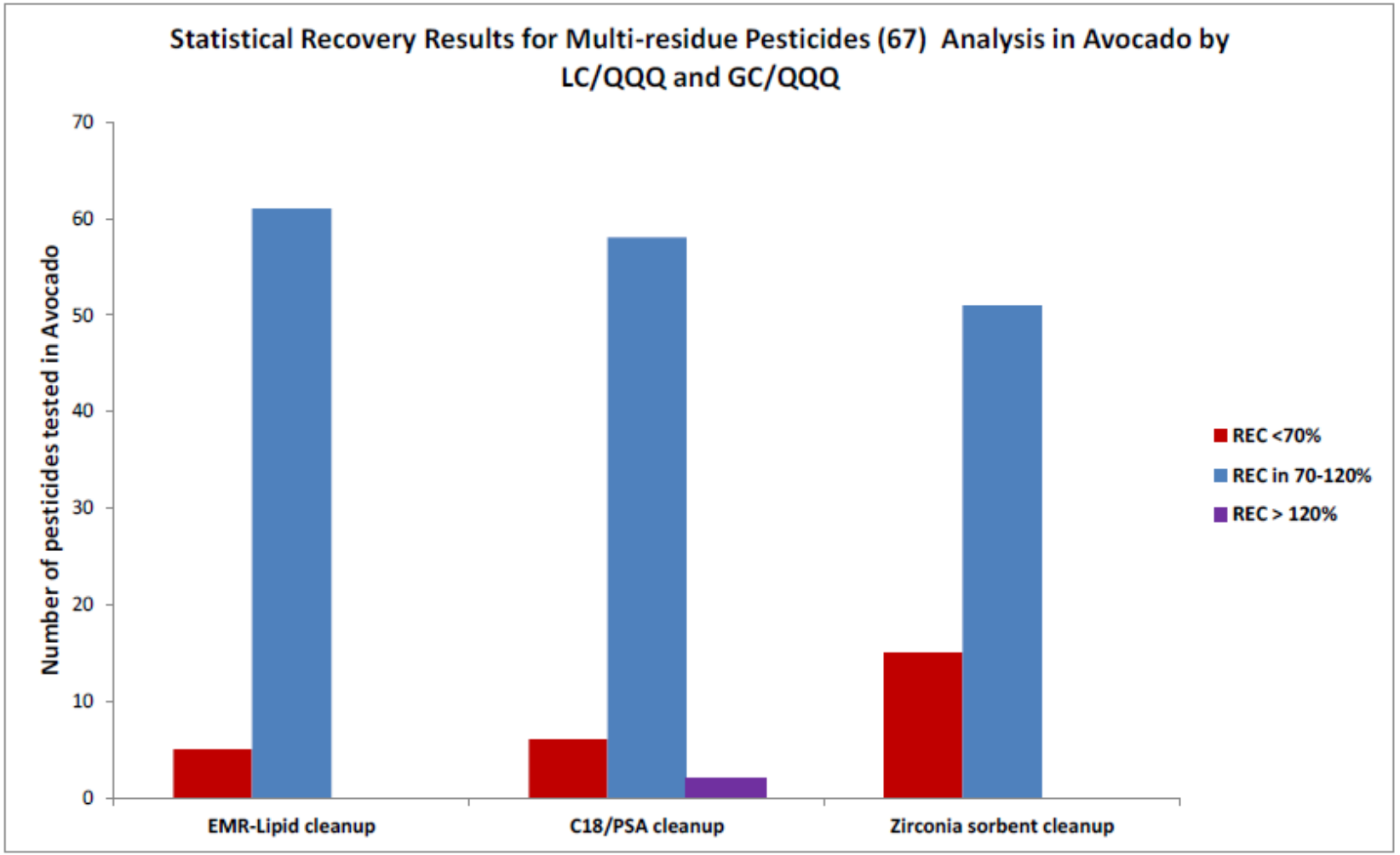
Chromatographic Benefits of Matrix Removal Provided by EMR Cleanup

Benefit	Reduced matrix suppression	Improved S/N ratio	Less interferences for accurate integration
Example	EPN in Avocado on LC-QQQ	Captan in Avocado on GC-QQQ	Permethrin in Avocado on GC-QQQ
EMR-Lipid cleanup			
Zirconia sorbent cleanup			
C18/PSA cleanup			

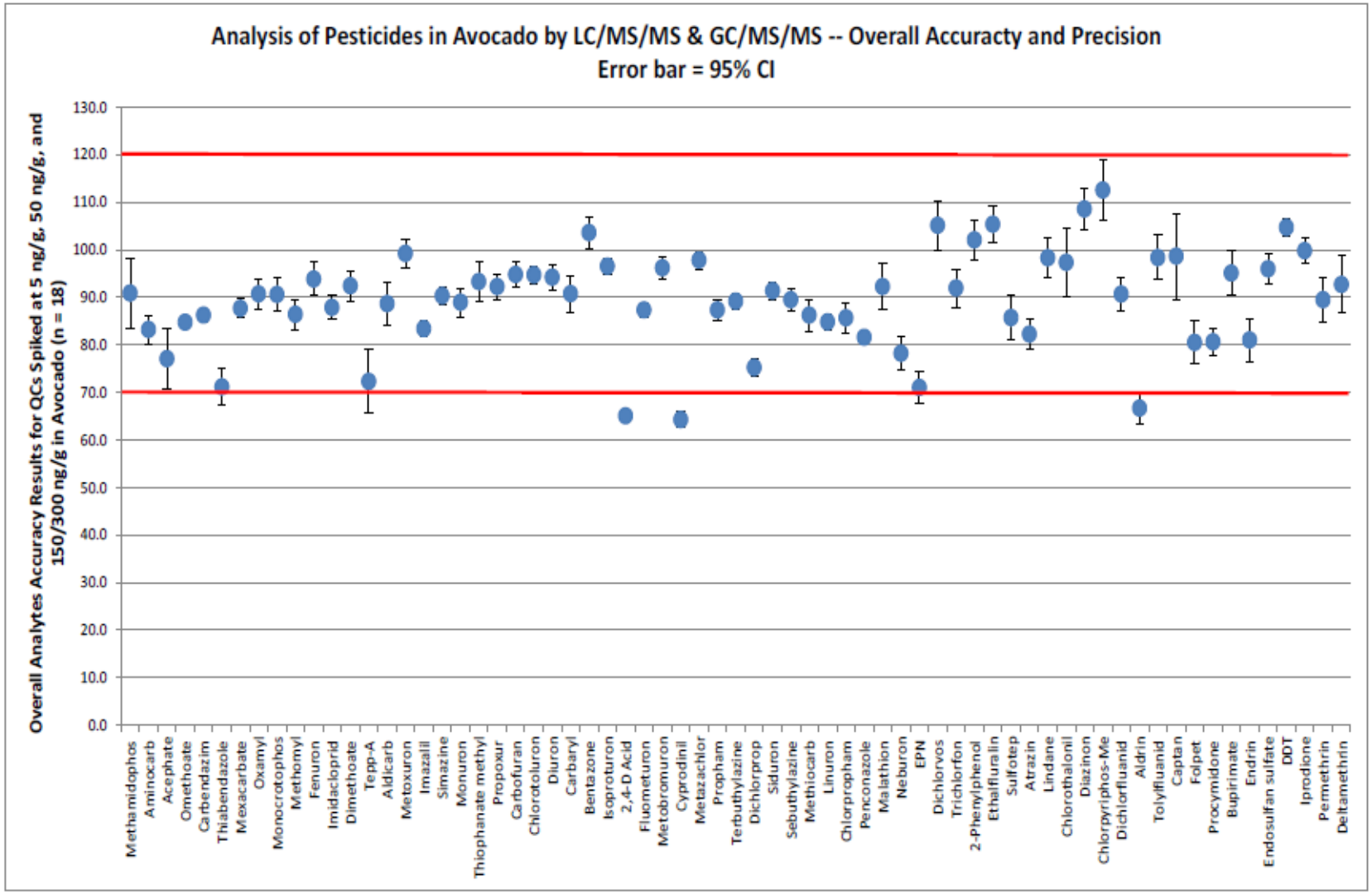
Selected Problematic Pesticides for Recovery Comparison



Statistical Recovery Results Comparison



Method Accuracy and Precision



Summary and Conclusion

- EMR-Lipid provides the most complete lipid removal of any sorbent on the market.
- Achieve SPE cleanliness with dSPE simplicity.
  - EMR is a one size fits all sorbent for a variety of sample types and analytes.
- Key applications were validated with EMR and demonstrate better recovery, better precision, and decreased matrix impact to the instrument and results.

Today's Agenda

Introduction

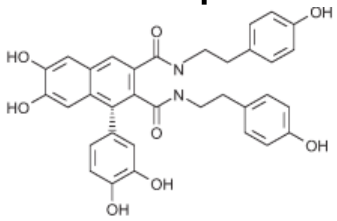
Addressing difficult samples

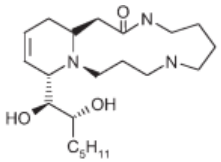
1. Polar analytes
2. High fat samples
3. **How to get rid of interfering terpenes**

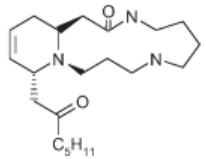
Summary and Conclusions

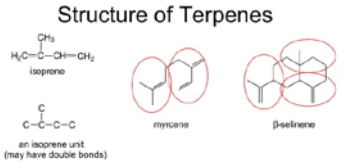
Constituents of Cannabis and Hop: Complex

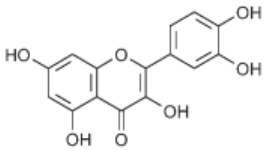
- **Nitrogenous compounds (27 known)**
- Amino acids (18),
- Proteins (3)
- Glycoproteins (6)
- Enzymes (2)
- **Sugars and related compounds (34)**
- Hydrocarbons (50)
- Simple alcohols (7)
- Aldehydes (13)
- Ketones (13)
- Simple acids (21)
- **Fatty acids (22)**
- Simple esters (12)
- Lactones (1)
- Steroids (11)
- **Terpenes (120)**
- **Non-cannabinoid phenols (25)**
- **Cannabinoids (66)**
- **Flavonoids (21)**
- Vitamins (1) [Vitamin A]
- Pigments (2)
- Elements (9).

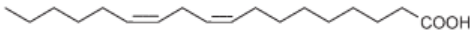


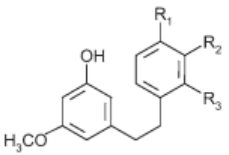




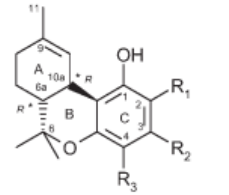






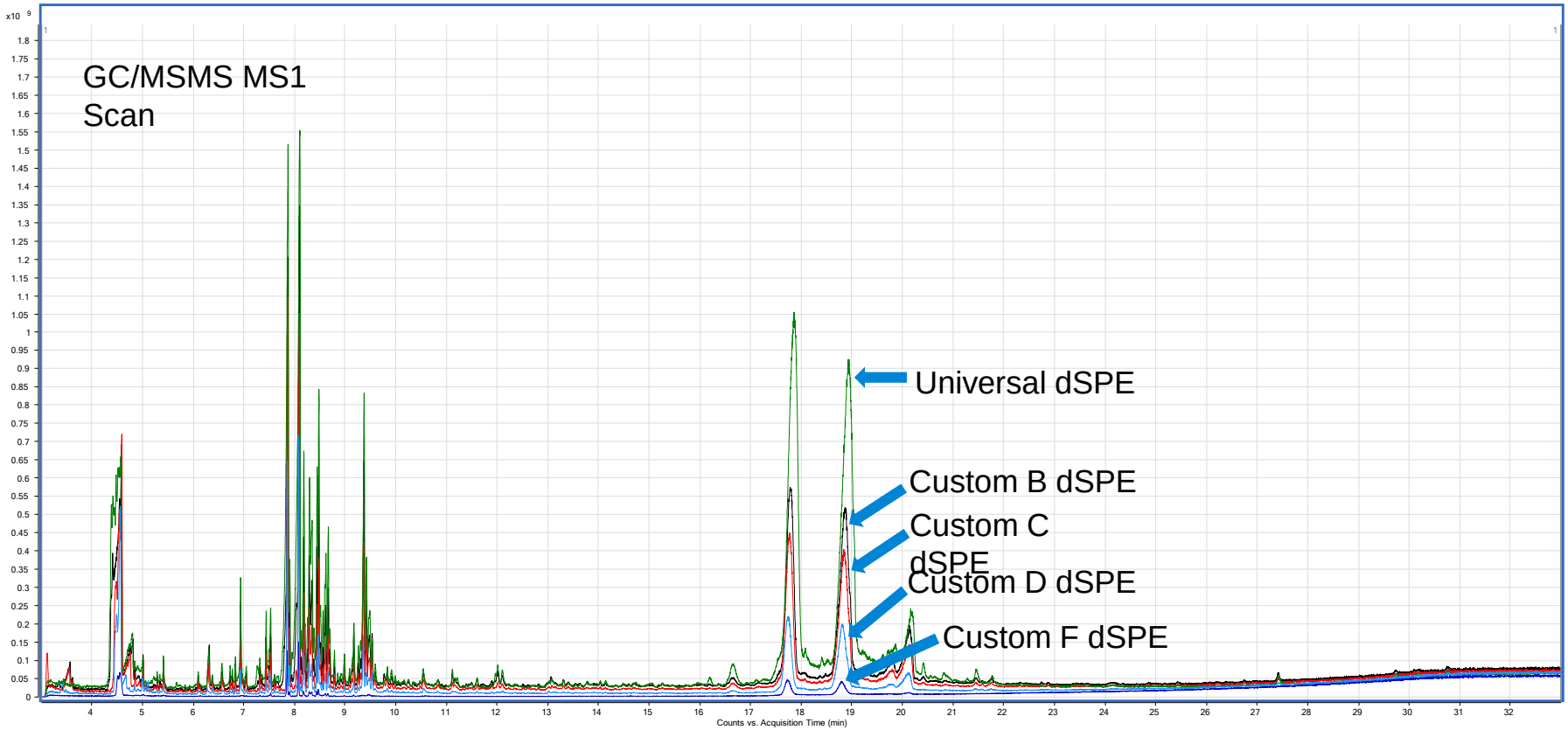


R_1 = OH, R_2 = isoprenyl, R_3 = H

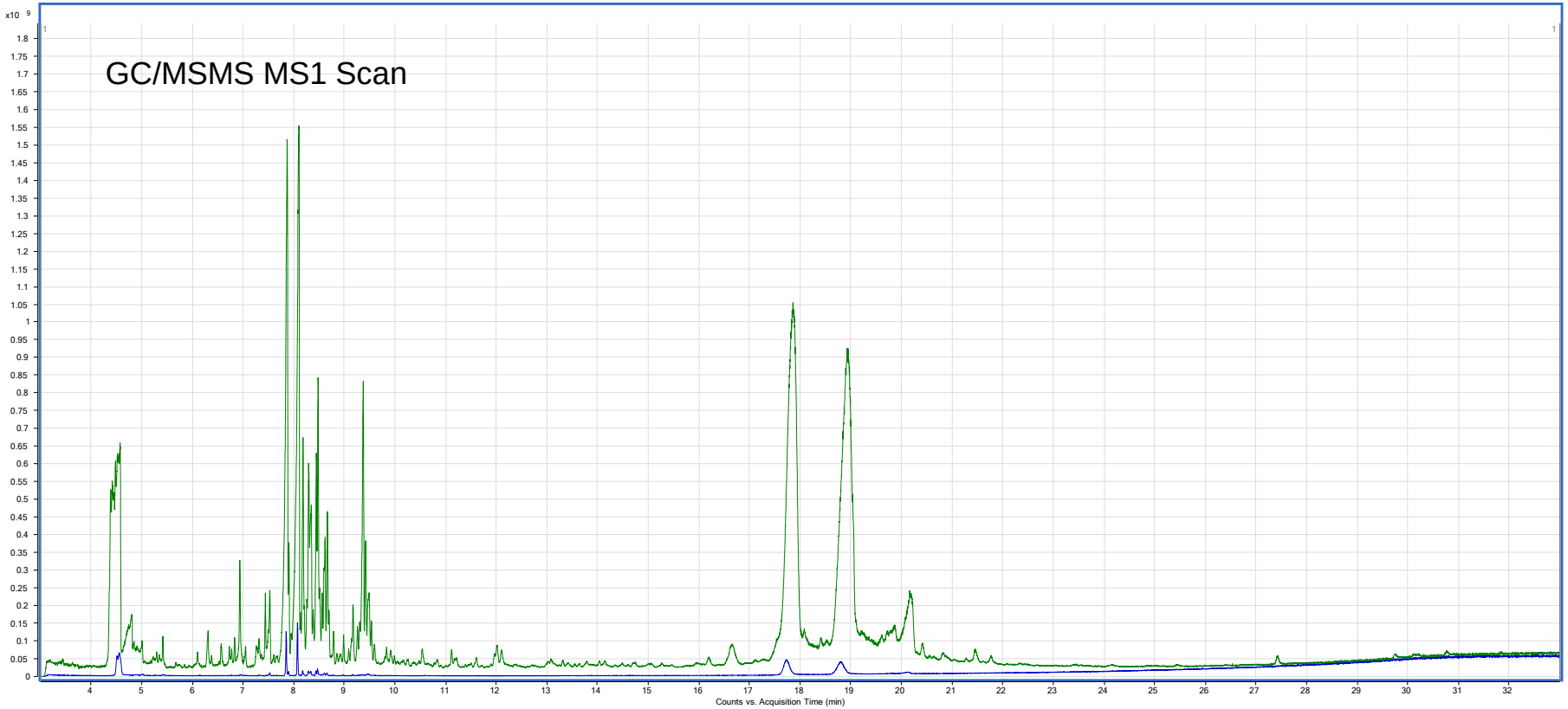


R_1 = COOH, R_2 = C_5H_{11}, R_3 = H

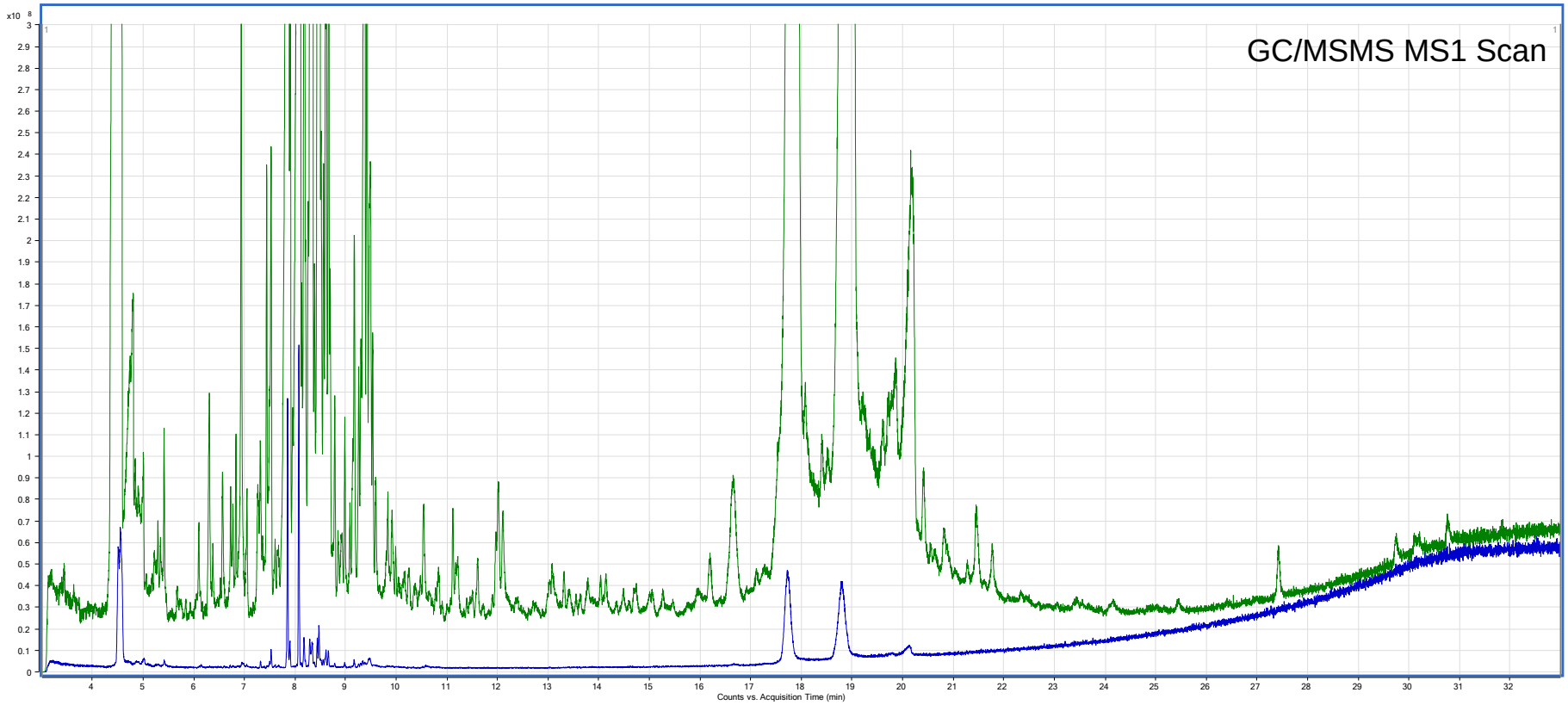
QuEChERS AOAC Extraction/Partitioning with Custom dSPE versus Universal dSPE: Hops



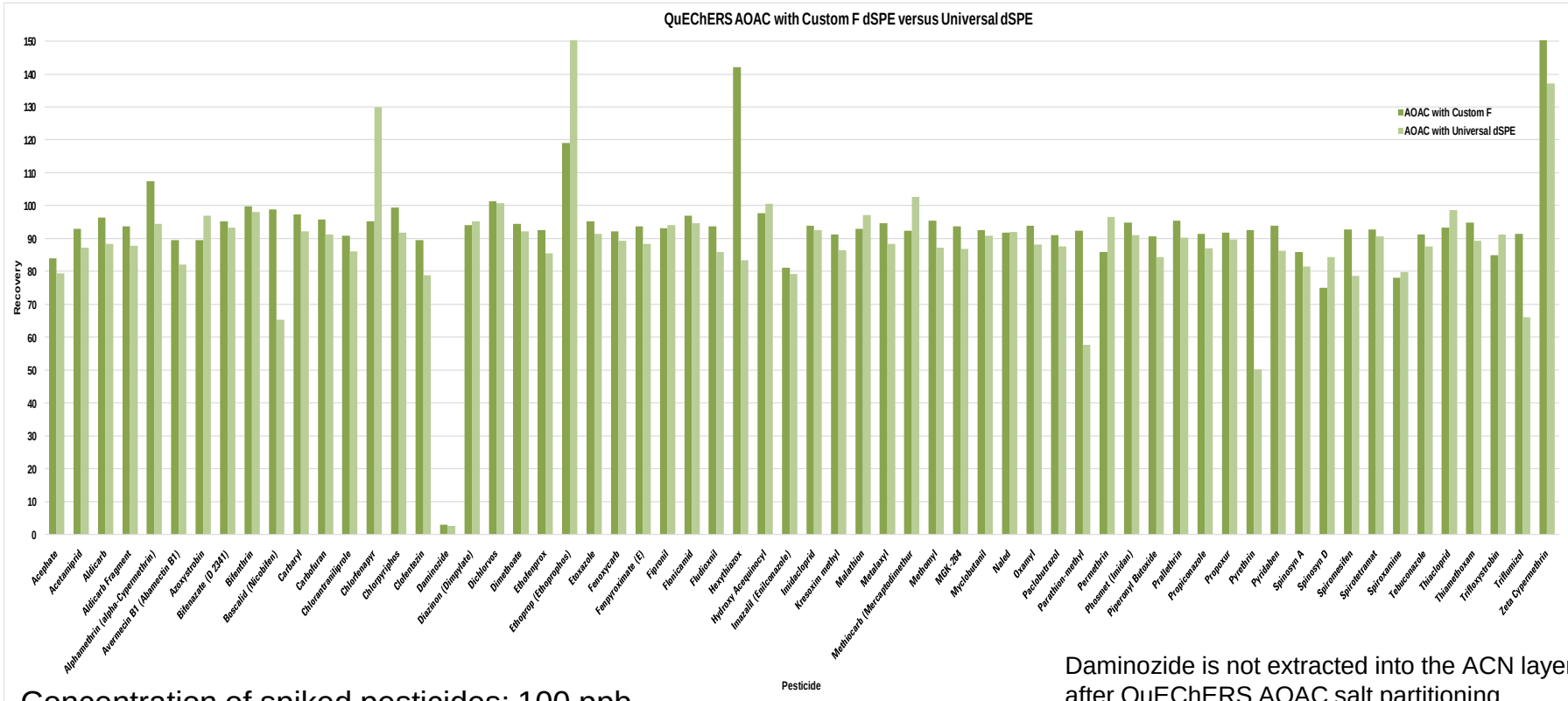
QuEChERS AOAC Extraction/Partitioning with Custom F dSPE versus Universal dSPE: Hops



QuEChERS AOAC Extraction/Partitioning with Custom F dSPE versus Universal dSPE: Hops



Pesticide Recovery after QuEChERS AOAC with Custom F dSPE or Universal dSPE: Hops



Concentration of spiked pesticides: 100 ppb

Daminozide is not extracted into the ACN layer after QuEChERS AOAC salt partitioning

Conclusion

Addressing difficult samples

1. Polar analytes : Explore new polymeric SPE phases
2. High fat samples: Consider EMR Lipids as a dSPE
3. How to get rid of interfering terpenes: stay tuned ☺

Thank You!