GracePure™
SIMPLY SPE

Grace Davison Discovery Sciences™
www.discoverysciences.com

Brochure #534

GEN

Contact your office or distributor for pricing.

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Quality and Value

With in-house capability to make everything from the silica particle to the finished product, it is easy to deliver **GracePure™** SPE products at exceptionally low prices. No compromise on quality – **simply the best value in SPE.**

Experts in Silica

Pure silica is key to predictable analyte-sorbent interactions. It is also the foundation for manufacturing bonded phases with high and reproducible recoveries. Grace Davison has been making Davisil® silica for over a quarter century and delivering it to top SPE suppliers — we know what it takes to make world-class SPE media.

Reproducible Methods Start with Reproducible Product

Two main factors contribute to a consistent SPE product — selectivity and bed weight. GracePure™ SPE silica-based bonded sorbents are characterized with over 20 tests to ensure unvarying lot-to-lot selectivity. Packed SPE columns have less than 2% bed weight variation. Removing variables associated with the product allows you to concentrate on the method development process.

Knowledgeable Application Support

We understand that the solid phase extraction process can be the most challenging part of your analysis. That is why our dedicated SPE chemists are committed to developing new and pertinent methods. From sample clean-up to sample concentration, our support team is ready to help you with product selection and method advice.

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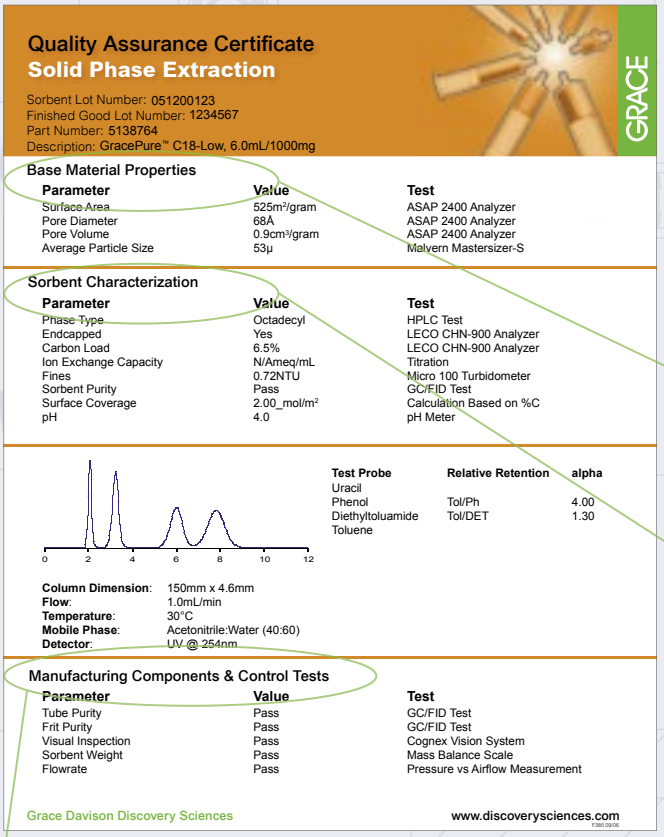
Highest Quality Control

Every part of our SPE manufacturing process is carefully monitored. From silica production to final product, we perform over 30 tests, and provide a comprehensive quality assurance certificate that displays the 18 most meaningful results to the SPE user.*

*Applies to silica-based media.



Quality Assurance Certificate
Solid Phase Extraction

Sorbent Lot Number: 051200123
Finished Good Lot Number: 1234567
Part Number: 5138764
Description: GracePure™ C18-Low, 6.0mL/1000mg

GRACE

Base Material Properties

Parameter	Value	Test
Surface Area	525m²/gram	ASAP 2400 Analyzer
Pore Diameter	68Å	ASAP 2400 Analyzer
Pore Volume	0.9cm³/gram	ASAP 2400 Analyzer
Average Particle Size	53µ	Malvern Mastersizer-S

Sorbent Characterization

Parameter	Value	Test
Phase Type	Octadecyl	HPLC Test
Endcapped	Yes	LECO CHN-900 Analyzer
Carbon Load	6.5%	LECO CHN-900 Analyzer
Ion Exchange Capacity	N/Ameq/mL	Titration
Fines	0.72NTU	Micro 100 Turbidometer
Sorbent Purity	Pass	GC/FID Test
Surface Coverage	2.00_mol/m²	Calculation Based on %C
pH	4.0	pH Meter

Test Probe	Relative Retention	alpha
Uracil		
Phenol	Tol/Ph	4.00
Diethyltoluamide	Tol/DET	1.30
Toluene		

Column Dimension: 150mm x 4.6mm
Flow: 1.0mL/min
Temperature: 30°C
Mobile Phase: Acetonitrile:Water (40:60)
Detector: UV @ 254nm

Manufacturing Components & Control Tests

Parameter	Value	Test
Tube Purity	Pass	GC/FID Test
Frit Purity	Pass	GC/FID Test
Visual Inspection	Pass	Cognex Vision System
Sorbent Weight	Pass	Mass Balance Scale
Flowrate	Pass	Pressure vs Airflow Measurement

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Component Tests

GC/FID shows that GracePure™ tubes are constructed from a highly inert grade of polypropylene to prevent extractable contamination. Polyethylene frits are thoroughly washed in organic solvent which also eliminates extractables.

Manufacturing Control

GracePure™ SPE products are packed and assembled using custom-designed, precision equipment. Every manufacturing batch is guaranteed to have less than 2% bed weight variation and uniform flow rates. A sophisticated visual inspection system only accepts product that meets our high standards for bed consistency and frit integrity.

Quality Assurance Certificate

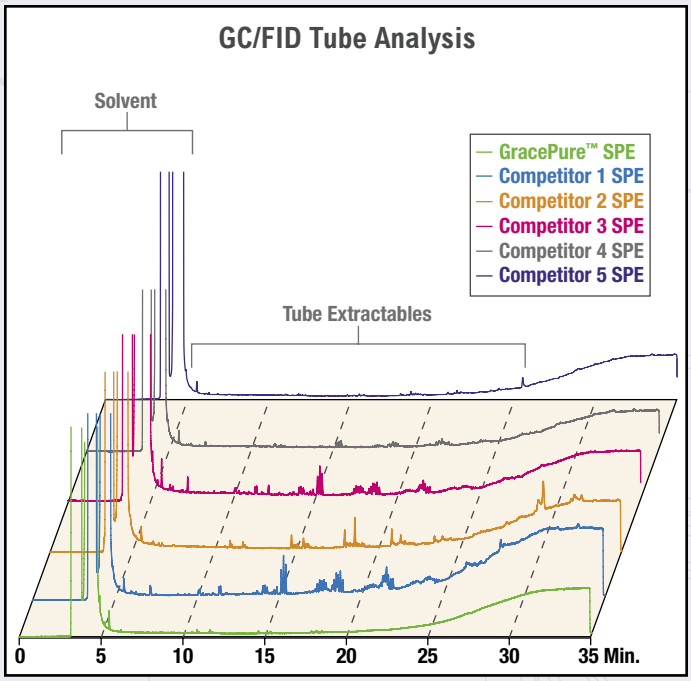
Base Material Properties

GracePure™ base silicas are characterized multiple ways to ensure that the starting point for every batch of media is consistent. Parameters that can directly affect SPE results are shown for lot-to-lot comparison.

DAVISIL® Silica

Sorbent Characterization

Tight specifications promise clean and reproducible sorbent performance. An HPLC chromatogram offers a detailed look at selectivity that is not possible with recovery tests alone. Turbidity measurements after sorbent bonding confirm that fines were not created during the manufacturing process.



Chloroform wash determines if extractables are present in medical grade polypropylene tubes. GracePure™ tubes have no detectable extractables.

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Simple Choices

GracePure™ SPE products have a concise offering of sorbents suitable for a variety of applications. Whether pharmaceutical or petrochemical, these products deliver the selectivity and high recovery you expect. Use this guide to help you choose the appropriate sorbent, bed size, and solvent volumes to ensure you have a cleaner, more concentrated sample at the end of your SPE process.

REVERSED PHASE SORBENTS

Sorbent	Support	Carbon (%)	Endcapping	Surface Area (m^2/g)	Particle Size (µm)	Pore Size (Å)	Feature	Benefit	Application type
C18-Max	Silica	17.1	Yes	518	50	60	Polymerically bonded 17% carbon load	Highest binding capacity, best for complex samples or structurally diverse analytes.	Drugs and their metabolites in serum and plasma, pesticides
C18-Aq	Silica	12.5	Yes	518	50	60	Hydrophilic endcapping	Water-wettable C18 ideal for aqueous samples. Phase remains active even when completely dry.	Desalting proteins, pharmaceuticals, hormones, pesticides, organics in water
C18-Low	Silica	6.5	Yes	518	50	60	Least hydrophobic C18 phase	C18 phase that easily releases very hydrophobic compounds.	Surfactants, oils, antibiotics
C18-Fast	Silica	7.0	Yes	518	100	60	Large 100µm particle	Process large volume (>500mL) or viscous samples with fast flow rates.	Aniline, pesticides, haloethers, phthalate esters, EPA 3620, 3610
TMS	Silica	5.6	No	518	50	60	Low carbon load trimethyl silane phase	Least hydrophobic reversed phase elutes non-polar compounds easily. Short carbon chain has little steric hindrance to uniformly cover silica surface.	Oils, dyes, surfactants

NORMAL PHASE SORBENTS

Sorbent	Support	Carbon (%)	Endcapping	Surface Area (m^2/g)	Particle Size (µm)	Pore Size (Å)	Feature	Benefit	Application type
Silica	Silica	N/A	N/A	518	50	60	Most polar phase	Able to differentiate between structurally similar compounds.	Aflatoxins, pesticides, steroids, structural isomers
Amino	Silica	4.3	No	518	50	60	Duel retention	Retains polar compounds, or can act as a weak anion exchanger. Easily releases strong acids when SAX binds too strongly.	Carbohydrates, dyes, lipids, mycotoxins, strong acids
Diol	Silica	N/A	No	518	50	60	Reproducible polar bonded phase	Very polar phase that has the same benefits as silica, but wets easily and offers more reproducibility.	Alkaloids, lipids, oils, structural isomers

ION EXCHANGE SORBENTS

Sorbent	Support	Exchange Capacity (meq/g)	Counter Ion	Particle Size (µm)	Feature	Benefit	Application type
Anion-X	8% cross-linked styrene-divinylbenzene	1.5	Acetate form	50	Tetramethyl ammonium functional group on polymer base material	pH range from 1–14, with excellent exchange capacity.	Anionic compounds: organic acids, fatty acids
Cation-X	8% cross-linked styrene-divinylbenzene	2.4	Hydrogen form	50	Benzene sulfonic acid functional group on polymer base material	pH range from 1–14, with excellent exchange capacity.	Cationic compounds: amines, amino acids

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Tip! To calculate sorbent bed volume, use 150µL for every 100mg of sorbent.

Tip! Retention capacity describes the total amount that an SPE sorbent will bind. This includes all compounds retained — analytes of interest as well as the contaminants.

Tip! Minimum elution volume recommended in bed size chart below will offer best sensitivity, but more solvent may be required depending on application.

RECOMMENDED USAGE GUIDELINES*

Bed Size (mg):	50	100	200	500	500	1000	2000	5000	10000
Sorbent Retention Capacity (mg)	2.5	5	10	25	25	50	100	250	500
Condition Volume (mL) *4 bed volumes*	0.30	0.60	1.20	3.00	3.00	6.00	12.00	30.00	60.00
Wash Volume (mL) *6 bed volumes*	0.45	0.90	1.80	4.50	4.50	9.00	18.00	45.00	90.00
Min. Elution Volume (mL) *3 bed volumes*	0.23	0.45	0.90	2.25	2.25	4.50	9.00	22.50	45.00

* Estimates only. Must optimize for each application.

SORBENT TRADENAME CROSS REFERENCE

TRY *GracePure™ Sorbent*	If you use:	*JT Baker* Bakerbond™	*Phenomenex* Strata™	*Supelco* Discovery™ Supelclean™	*Varian* Bond Elut®	*Waters* Sep-Pak®
C18-Max		Octadecyl	C18-E	DSC-18	C18	tC18
C18-Aq		Octadecyl lightload	C18-U	DSC-18Lt	C18OH	C18
C18-Low		N/A	N/A	LC-18	N/A	N/A
C18-Fast		N/A	N/A	N/A	N/A	N/A
TMS		N/A	N/A	N/A	C1	C2
Silica		Silica Gel	Si-1	DSC-Si or LC-Si	LC-Si	Silica
Amino		Amino	NH2	LC-NH2	NH2	NH2
Diol		N/A	N/A	DSC-Diol or LC-Diol	2OH	Diol
Anion-X		Quaternary Amine	SAX	DSC-SAX or LC-SAX	SAX	N/A
Cation-X		Aromatic Sulfonic Acid	SCX	DSC-SCX or LC-SCX	SCX	N/A

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SPE Method Development

SPE method development typically contains four steps: **1) Condition** – the conditioning step is comprised of two substeps; the first activates the sorbent ligands, the second equilibrates the sorbent bed. **2) Load** – in the load step, sample is applied to the SPE device. Matrix and flow rate are optimized to quantitatively retain target analytes. **3) Wash** – in the wash step, choose a solvent that elutes impurities but retains target analytes. **4) Elute** – the elution step ideally removes all target analytes with minimal solvent to maximize sensitivity. Sometimes this requires a combination of solvents to break both the primary and secondary interactions.

GENERAL METHOD DEVELOPMENT PROCEDURES			
1) Condition	**2) Load**	**3) Wash**	**4) Elute**
Reversed Phase Extraction Procedure **Mechanism**: Bind moderately polar to non-polar compounds from a polar sample matrix ***GracePure™ Sorbents:*** *C18-Max, C18-Aq, C18-Low, C18-Fast, TMS* Methanol followed by water	Process sample at a flow rate of 1-5mL per minute.	Water or water:methanol (95:5)	Methanol or acetonitrile. May need to add strong acid or base to organic solvent to break secondary interactions.
Normal Phase Extraction Procedure **Mechanism**: Bind polar compounds from a non-polar sample matrix ***GracePure™ Sorbents:*** *Silica, Amino, Diol* IPA followed by hexane	Process sample at a flow rate of 1-5mL per minute.	Hexane or hexane:IPA (98:2)	IPA, ethyl acetate, acetone, or hexane:IPA (50:50)
Ion Exchange Extraction Procedure **Mechanism**: Bind charged (negative/anionic, or positive/cationic) compounds ***GracePure™ Sorbents:*** *Anion-X, Cation-X* Methanol: water (50:50) followed by low ionic strength (0.1M) buffer	Apply slowly: less than or equal to 1mL/min. ion exchange kinetics are slower than reversed or normal phase	Methanol: low ionic strength (0.1M) buffer (10:90)	High ionic strength (0.5M-1.0M) buffer or modify pH such that the analyte is uncharged. May need to add organic to break hydrophobic interactions.

Tip! Do not allow bed to dry out unless using C18-Aq.

Tip! If less than desirable recoveries, collect filtrate on load, wash, and elution steps to determine where sample is being lost.

Tip! Often, the equilibration solvent is a suitable wash solvent

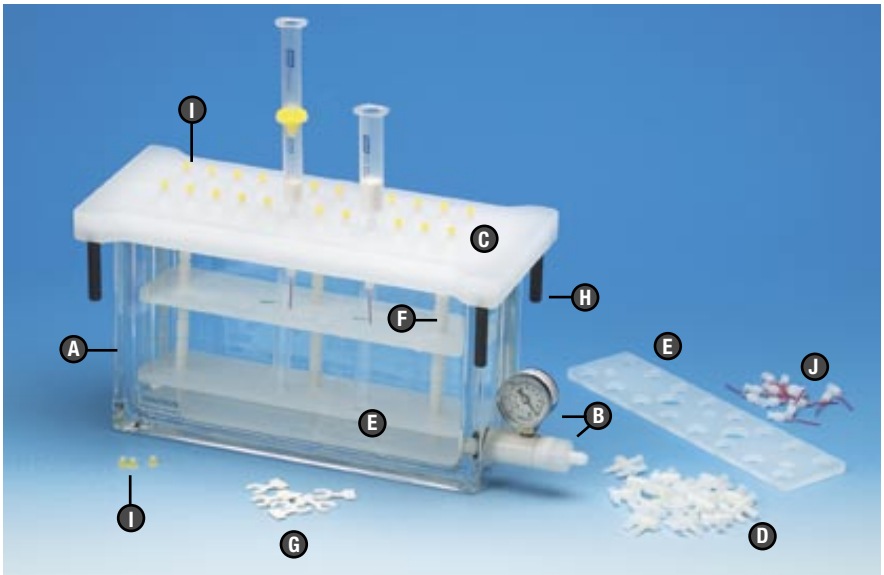
Tip! Be sure solvent is compatible with next step in the analysis.

SPE Processing Equipment

Vacuum manifolds process multiple samples simultaneously, saving time and effort. Manifold systems come complete with the components listed below. See page 12 for ordering information.

Vacuum Manifold Components

A. Glass Chamber
B. Vacuum Valve and Gauge
C. Polypropylene Lid
D. Stopcock Valves
E. Collection Rack Plates
F. Support Posts for Collection Racks
G. Retaining Clips for Collection Racks
H. Lid Legs
I. Manifold Inlet Caps
J. Polypropylene Needles



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Hypericins from St. John's Wort

CHROM 9107

Procedure Using GracePure™ C18-Max, 1000mg:

Sample Treatment – Pulverize 300mg St. John's Wort powder into five, 3mL aliquots of methanol:water (80:20). Combine and filter extracts to produce 15mL filtrate. Dilute to 30mL with water.

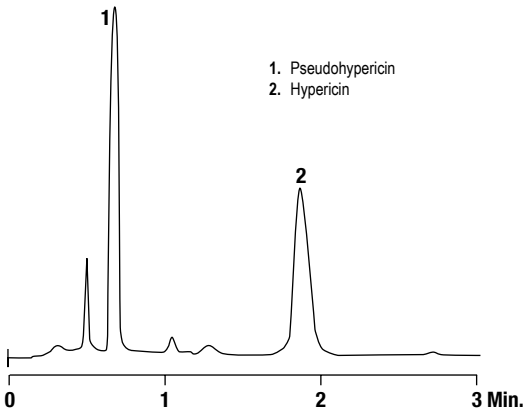
Conditioning – Rinse device with 5mL methanol followed by 5mL deionized water.

Sample Application – Apply 2mL filtrate to the top of the SPE device and draw through the C18 packed bed.

*Wash** – Wash device with 3mL of deionized water.

Elution – Elute with 2mL methanol.

*Repeat load and wash steps consecutively until filtrate is consumed.



Column: Alltima™ C18, 3µm 53 x 7mm Rocket™ HPLC Column, (Part No. **50605**)
Mobile Phase: MeOH:0.2% H_3PO_4 (95:5)
Flow Rate: 4.0mL/min
Detector: VIS at 585nm

Phenolic Acids from Echinacea

CHROM 9110

Procedure Using GracePure™ C18-Max, 1000mg:

Sample Treatment – Pulverize 300mg echinacea powder into five, 3mL aliquots of methanol. Combine and filter extracts to produce 15mL filtrate. Dilute to 30mL with water.

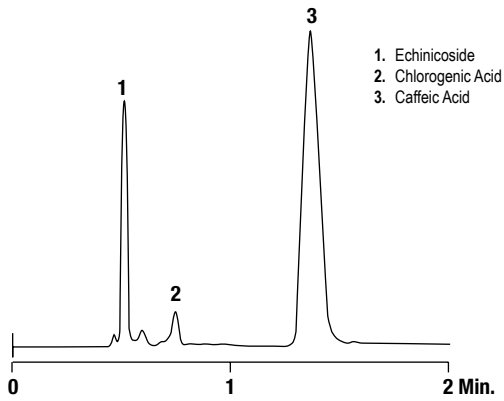
Conditioning – Rinse device with 5mL methanol followed by 5mL deionized water.

Sample Application – Apply 2mL filtrate to the top of the SPE device and draw through the C18 packed bed.

*Wash** – Wash device with 2mL of deionized water.

Elution – Elute with 5mL of methanol:water (50:50).

*Repeat load and wash steps consecutively until filtrate is consumed.



Column: Alltima™ C18, 3µm 53 x 7mm Rocket™ HPLC Column, (Part No. **50605**)
Mobile Phase: ACN:10mM K_2HPO_4, pH 2.6 (20:80)
Flow Rate: 3.5mL/min
Detector: UV at 330nm

Chlorinated Pesticides from Water

CHROM 1668

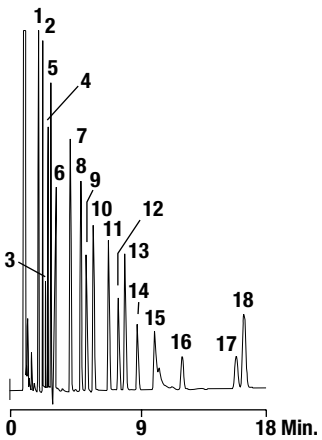
Procedure Using GracePure™ C18-Fast, 1000mg:

Conditioning – Rinse device with 5mL of methanol followed by 5mL deionized water.

Sample Application – Pass 100mL–500mL (containing 1% methanol) of water sample through the device at 20mL/minute.

Wash – Wash device with 10mL of deionized water then 10mL of methanol:deionized water (20:80). Remove excess by passing air through the device for two minutes.

Elution – Elute with 2mL of hexane:ethyl acetate (70:30). Pass extract through 2g–3g sodium sulfate to remove residual water.



Recovery (as % Standard)

1. α-BHC (104%)
2. Lindane (109%)
3. β-BHC (106%)
4. Heptachlor (92%)
5. δ-BHC (110%)
6. Aldrin (98%)
7. Heptachlor Epoxide (107%)
8. α-Endosulfan (105%)
9. p,p'-DDE (79%)
10. Dieldrin (102%)
11. Endrin (104%)
12. p,p'-DDD (92%)
13. β-Endosulfan (103%)
14. p,p'-DDT
15. Endrin Aldehyde (102%)
16. Endosulfan Sulfate (103%)
17. Methoxychlor (99%)
18. Endrin Ketone (104%)

Column: AT™-Pesticide 20m x 0.53mm x 0.60µm Capillary GC Column, (Part No. **16846**)
Temperature: 210°C
Carrier Gas: Helium, 35cm/sec
Detector: ECD

Antioxidants from Chamomile

CHROM 9133

Procedure Using GracePure™ C18-Max, 1000mg:

Sample Treatment – Pulverize 1g commercial chamomile tea grounds into 6mL dioxane:methanol (50:50). Filter extract and dilute to 20mL with water.

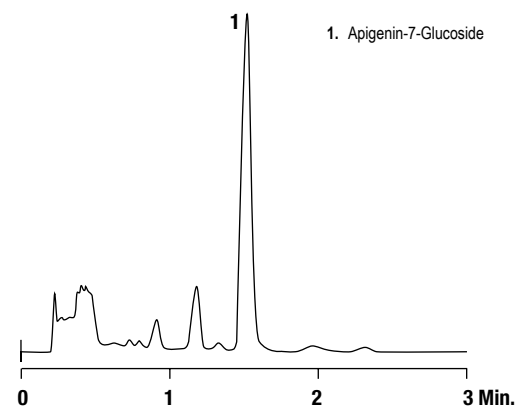
Conditioning – Rinse device with 5mL methanol followed by 5mL water.

*Sample Application** – Apply 1mL filtrate.

*Wash** – Wash with 1mL water.

Elution – Elute first with 2mL methanol:water (50:50). Elute second, fraction and use for this analysis, with 2mL methanol.

*Before elution step, repeat load and wash steps until filtrate is consumed.



Column: Alltima™ C18, 3µm 53 x 7mm Rocket™ HPLC Column, (Part No. **50605**)
Mobile Phase: ACN:20mM K_2HPO_4, pH 7.3 (65:35)
Flow Rate: 3mL/min
Detector: UV 340nm
Inj. Vol.: 5µL

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Vasodilators from Dong Quai

CHROM 9132

Procedure using GracePure™ C18-Max, 1000mg:

Sample Treatment – Pulverize 1500mg commercial *dong quai* root powder into three, 5mL aliquots of methanol. Combine and filter extracts to produce 15mL filtrate. Dilute to 30mL with water.

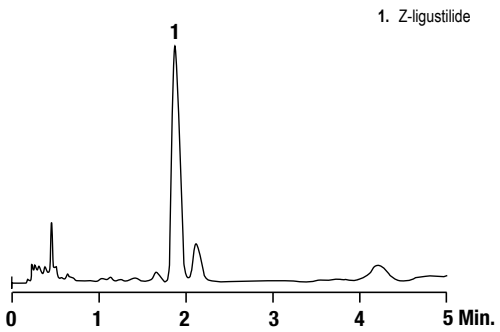
Conditioning – Rinse device with 5mL methanol followed by 5mL water.

*Sample Application** – Apply 1mL filtrate.

*Wash** – Wash with 2mL water.

Elution – Elute with 2mL methanol.

*Before elution step, repeat load and wash steps until filtrate is consumed.



Column: Alltima™ C18, 3µm 53 x 7mm Rocket™ HPLC Column (Part No. **50605**)
Mobile Phase: Methanol:0.2% Acetic Acid (65:35)
Flow Rate: 4.5mL/min
Detector: UV 270nm
Inj. Vol.: 5µL

Sedatives from Kava Kava

CHROM 9125

Procedure using GracePure™ C18-Max, 1000mg:

Sample Treatment – Pulverize 300mg commercial *kava kava* root powder into four, 2mL aliquots of methanol:water (80:20). Combine and filter extracts to produce 8mL filtrate. Dilute to 10mL with water.

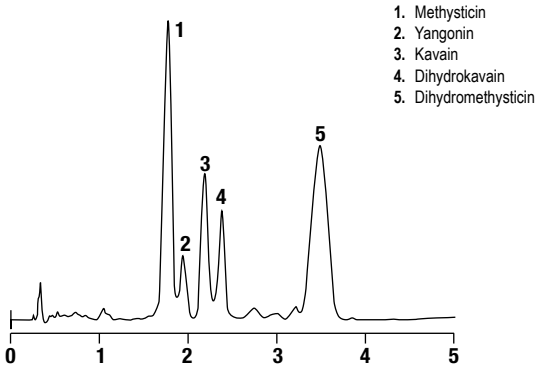
Conditioning – Rinse device with 5mL methanol followed by 5mL water.

*Sample Application** – Apply 2mL filtrate.

*Wash** – Wash with 2mL water.

Elution – Elute with 3mL methanol.

*Before elution step, repeat load and wash steps until filtrate is consumed.



Column: Alltima™ C18, 3µm, 53 x 7mm Rocket™ HPLC Column (Part No. **50605**)
Mobile Phase: ACN:IPA:0.2% Acetic Acid (17:23:60)
Flow Rate: 3.5mL/min
Detector: UV 220nm
Inj. Vol.: 5µL

Fungicides from Red Wine

CHROM 10637 10638

Procedure using GracePure™ C18-Max, 500mg:

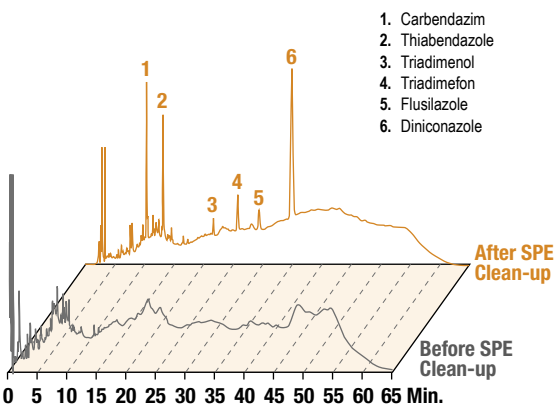
Sample Treatment – Add 0.167mg/mL each of carbendazim, thiabendazolem, triadimenol, triadimefon, flusilazole, diniconazole into 1mL water. Combine with 1mL Beaujolais red wine.

Conditioning – Rinse device with 3mL methanol followed by 3mL water.

Sample Application – Apply 2mL red wine mixture.

Wash – No wash.

Elution – Elute with 3mL methanol.



Column: Alltima™ HP C18 Amide, 5µm, 250 x 4.6mm HPLC Column (Part No. **87734**)
Mobile Phase: **A:** Water **B:** Acetonitrile
Gradient: **(Time, %B):** (0,15%), (15,45%), (50,45%), (65,15%)
Flow Rate: 1mL/min
Detector: UV at 254nm

Nitroaromatics and Naphthols from Soil

CHROM 10597 10598

Procedure using GracePure™ C18-Max, 500mg:

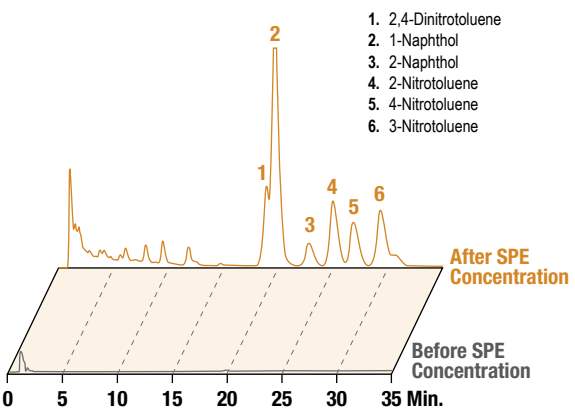
Sample Treatment – Spike 100g soil with 7.5µg/g of each analyte. Combine soil with 1000mL deionized water, shake for 10 minutes, and filter.

Conditioning – Rinse device with 5mL methanol followed by 5mL water.

Sample Application – Aspirate 1000mL water sample through SPE at flow rate 1-5mL/min.

Wash – No wash. Air dry for 15 seconds.

Elution – Elute with three 1mL aliquots of methanol:water (50:50). Air dry for 15 seconds between each elution.



Column: Adsorbosphere™ UHS C18, 5µm, 150 x 4.6mm HPLC Column (Part No. **288118**)
Mobile Phase: Methanol:Water (50:50)
Flow Rate: 1.0mL/min
Detector: UV at 254nm
Temperature: Ambient

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Benzodiazepines from Human Plasma

CHROM 10606 10608

Procedure using GracePure™ C18-Aq, 500mg:

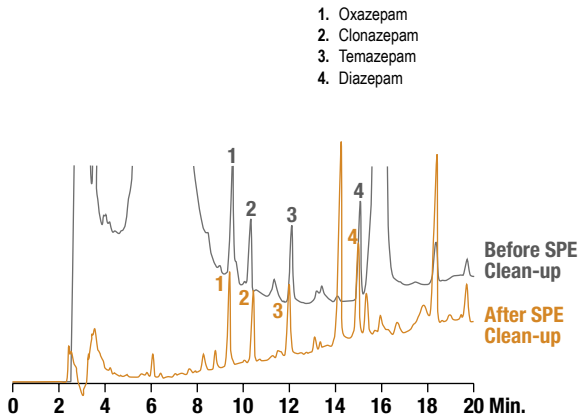
Sample Treatment – Spike 500µL plasma with 10µL of a 0.1mg/mL standard solution. Combine with 100µL of 0.1M sodium carbonate buffer. Vortex and centrifuge for 10 minutes.

Conditioning – Rinse device 2mL water.

Sample Application – Apply entire sample.

Wash – Wash with 2mL water and then 50µL methanol.

Elution – Elute with 600µL methanol.



Column: Alltima™ HP C18, 5µm, 250 x 4.6mm HPLC Column (Part No. **87680**)
Mobile Phase: **A:** Water **B:** Acetonitrile
Gradient: **(Time, %B):** (0,30), (30,80)
Flow Rate: 1mL/min
Detector: UV at 254nm
Temperature: Ambient

Carbamate Pesticides from Water

CHROM 10599 10600

Procedure using GracePure™ C18-Fast, 500mg:

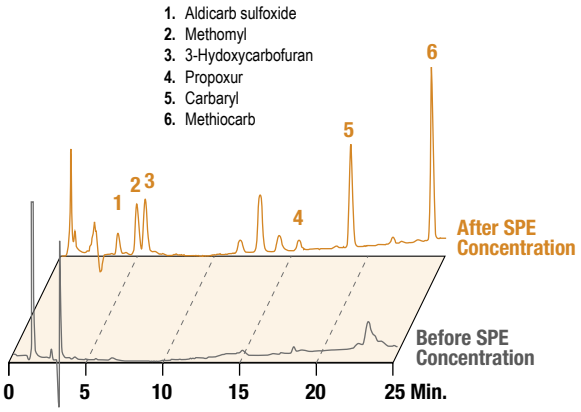
Sample Treatment – Spike 500mL tap water with 125µL carbamate solution for final concentration of 25ppb.

Conditioning – Rinse with 3mL acetonitrile:water (80:20) followed by 3mL water. Dry with vacuum.

Sample Application – Apply 500µL sample.

Wash – 2 x 3mL water.

Elution – Elute with 4 x 1mL acetonitrile:water (80:20)



Column: Platinum™ EPS C18, 5µm, 250 x 4.6mm HPLC Column (Part No. **32246**)
Mobile Phase: **A:** DI water **B:** Acetonitrile
Gradient: **(Time, %B):** (0,25,), (5,25), (20,50), (25,50), (30,25)
Flow Rate: 1mL/min
Detector: UV at 210nm
Temperature: Ambient

Preservatives from Fruit Punch

CHROM 2576

Procedure using GracePure™ Anion-X, 500mg:

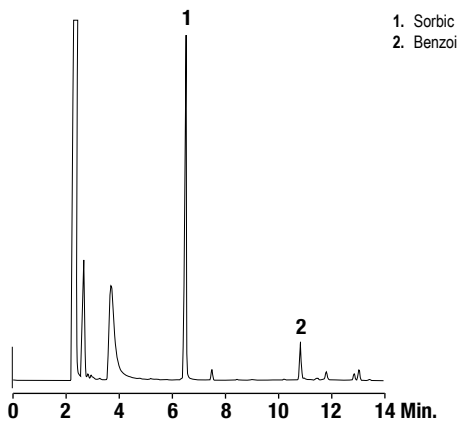
Sample Treatment – Use 8mL fruit punch and adjust pH to 10 using potassium hydroxide.

Conditioning – Rinse device 10mL water.

Sample Application – Apply 8mL pH adjusted fruit punch sample.

Wash – Wash with 20mL water.

Elution – Elute with 1mL 1.0N hydrochloric acid followed by 1mL methanol.



Column: Heliflex® AT™ AquaWax-DA, 30m x 0.25mm x 0.25µm Capillary GC Column (Part No. **14537**)
Temp: 200°C (5 min hold) to 230°C (4 min hold) at 5°C/min
Carrier: Helium at 0.75mL/min (25cm/sec)
Detector: FID at 250°C

Diuretics from Urine

CHROM 10289 10290

Procedure using GracePure™ C18-Max, 1000mg:

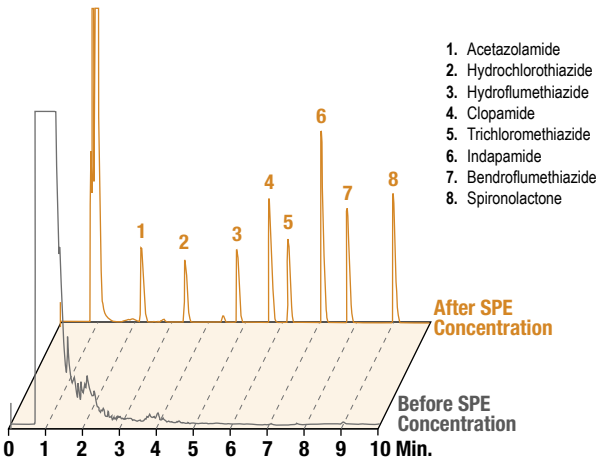
Sample Treatment – Spike synthetic urine with 8 diuretics to a concentration of 1.25µg/mL each.

Conditioning – Rinse device 5mL methanol, followed by 5mL water.

Sample Application – Apply 15mL spiked urine sample at 1mL/min.

Wash – Wash with 5mL water.

Elution – Elute with 2mL methanol. Evaporate solvent and reconstitute in 250µL HPLC mobile phase.



Column: Alltima™ C18, 3µm, 100 x 4.6mm HPLC Column (Part No. **81382**)
Mobile Phase: **A:** 25mM Ammonium Acetate, 0.1%TFA **B:** Acetonitrile, 0.1%TFA
Gradient: **(Time, %B):** (0,20,), (10,90)
Flow Rate: 1.0mL/min
Detector: ELSD

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Applications Chart

Analyte Class	Matrix	Analytes per Application	GracePure™ Product	Pretreatment
Amphetamines	Urine	Amphetamine and Methamphetamine	C18-Aq, 500mg	Spike urine with 1µg/mL target analytes. Dilute with equal volume of 2% ammonium hydroxide in DI water.
Anticonvulsants	Serum	Phenobarbital, Primidone, Carbamazepine, 5,5-Diphenylhydantoin, MPPH (5-Methylphenyl-5-phenylhydantoin)	C18-Low, 500mg	Add 100µL of 0.1M KH_2PO_4 buffer, pH 3.5 to 500µL of serum in a test tube. Add 200µg/mL MPPH, 5-methylphenyl-5-phenyl-hydantoin as internal standard. Vortex 1 minute.
Benzodiazepines	Serum	Norchlordiazepoxide, Demoxepam, Chlordiaz-epoxide, Nitrazepam, Nordiazepam (Metabolite of diazepam), Diazepam	C18-Low, 500mg	Use 500µL serum. Add 500µL internal standard solution: 50µg/mL benzodiazipine. Vortex 1 minute.
BHA	Soy Oil	BHA (3-*tert*-Butyl-4-hydroxyanisole)	Amino, 200mg	Add 10mg BHA into 1mL soy oil and dilute to 10mL with *n*-Pentane.
Caffeine	Coffee	Caffeine	C18-Aq, 500mg	None, will work equally well for any beverage containing caffeine.
Carbohydrates	Molasses	Fructose, Glucose, Sucrose	C18-Low, 500mg	Dilute 20g molasses to 250mL with DI water.
Carbohydrates	Wine	Ethanol, Glucose, Sucrose	C18-Max, 100mg	None.
Chlorinated Pesticides	Water	α-BHC, Lindane, β-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, p,p'-DDE, Dieldrin, o,p'-DDD, Endrin, o,p'-DDT, p,p'-DDD, p,p'-DDT	C18-Fast, 500mg	Due to the large sample volume, attach large volume reservoir to SPE device.
Chlorotetracycline	Ointment	Chlorotetracycline	Diol, 500mg	Add 2mL of hexane to 50mg of ointment. Vortex 1 minute.
Chlorphenoxy Acid Herbicides	Water	2,4-D; 2,4,5-T; Silvex	C18-Fast, 500mg	Acidify 100mL water sample to pH 2.2.
Desalting	Protein Solution	Cytochrom C, Ribonuclease-A	C18-Aq, 500mg	None.
Lactic Acid	Water	Lactic Acid	Anion-X, 500mg	None.
Lidocaine, Metabolites	Serum	GX (Glycinexylidide), MEGX (Monoethylgly-cinexylidide), Lidocaine, Mepivacaine (internal standard),	C18-Low, 500mg	Use 500µL serum. Add 500µL internal standard solution: 50µg/mL Mepivacaine HCl in 0.1M NaH_2PO_4. Vortex 1 minute.
Nitroaromatics and Naphthols	Water	2,4-DNT, 2-NT, 4-NT, 3-NT, 1- Naphthol, 2-Naphthol	C18-Fast, 500mg	Spike 1000mL tap water with 0.75µg/mL of analytes.
Off Flavors	Wine	4-Ethyl Phenol, 4-Ethyl Gualacol	C18-Low, 500mg	None.
Paraben Preservatives	Cosmetics	Methyl Paraben, Propyl Paraben	C18-Low, 500mg	Weigh one gram of cosmetic (hand cream, toothpaste, liquid soap) into a test tube. Add 10mL methanol and vortex one minute. Centrifuge resulting mixture to remove insoluble materials. Remove a 100µL aliquot to a 2mL volumetric flask and dilute to volume with methanol.
Perchlorate	Biological Matrix	Perchlorate	Anion-X, 500mg	None.
Phenylpropanolamine	Urine	Phenylpropanolamine	C18-Low, 100mg	1mL urine sample is placed in a small test tube. Add 250mL of carbonate buffer ($NaHCO_3/Na_2CO_3$, 5:1 w/w) Vortex 1 minute.
Phthalate Esters	Drinking Water	Dimethyl Phthalate, Diethyl Phthalate, Diallyl Phthalate, Dibutyl Phthalate, Diamyl Phthalate	C18-Low, 500mg	None.
Polyaromatic Hydrocarbons	River Water	Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Dibenz[ah]anthracene, Benzo[ghi]perylene, Indeno[1,2,3-cd]pyrene	C18-Aq, 500mg	None.
Polyaromatic Hydrocarbons	Tap Water	Acenaphthalene, Fluorene, Phenanthrene, Anthracene, Fluoranthrene, Pyrene, Benz[a]anthracene, Benzo[b]fluoranthrene, Benzo[k]fluoranthrene, Benzo[a]pyrene, Dibenz[a,h]anthracene, Indeno[1,2,3-cd]pyrene, Benzo[ghi]perylene	C18-Low, 500mg	None.
Preservatives	Beverages	Propionic Acid, Butyric Acid, Valeric Acid, Caproic Acid, Heptanoic Acid, Caprylic Acid	Anion-X, 500mg	Adjust beverage pH to 10 using KOH.
Quinidine	Urine	Quinidine	Diol, 500mg	Add 1mL HCl and 1mL urine sample to a 5mL volumetric flask. Heat to 65ºC in a water bath for 10 minutes. Cool and add 1mL ammonium hydroxide. Dilute to volume with distilled water.
Salicylic Acid	Urine	Salicylic Acid, Acetylsalicylic Acid	C18-Max, 100mg	Spike 2mL synthetic urine with 100ppm salicylic acid and 100ppm acetylsalicylic acid.
Sedatives/Hypnotics	Serum	Barbital, Methyprylon, Amobarbital, Phenacetin, Secobarbital, Meprobamate, Glutethimide, Caf-feine, Phenobarbital, Methaqualone, Oxazepam, 4-Methyl Primidone, Diazepam, Nodiazepam	C18-Low, 500mg	Use 500µL serum. Add 200µL internal standard solution: 10µg/mL 4-methyl primidone in 0.1M KH_2PO_4, pH 4. Vortex 1 minute.
Steroids	Hydrocortisone Cream	Hydrocortisone	Silica, 500mg	Weigh one gram of cream into a 20mL vial. Add 10mL hexane: ethyl acetate (50:50). Vortex 3 minutes. Decant supernatant into a 50mL volumetric flask. Repeat extraction and combine super-natants. Dilute to volume with hexane:ethyl acetate (50:50).
THC	Urine	Δ9-Tetrahydrocannabinol	C18-Low, 500mg	Place 10mL urine sample in a centrifuge tube. Add 0.9mL of 10N NaOH. Cap tube and place in boiling water bath for 15 minutes. Cool to room temperature. Adjust pH to 2. Vortex 1 minute.
THC, Metabolites	Urine	Δ9-Tetrahydrocannabinol Methyl Ester, 9-Carboxy-11-nor-Δ9-THC Methyl Ester (Metabolite of #1)	C18-Low, 500mg	Add 1mL methanolic KOH (10% w/v) to 10mL of urine in a test tube. Cap and heat tube to 100ºC for 15–20 minutes. Cool to room temperature and adjust pH to 3.
Theophylline	Serum	β-Hydroxyethyl Theophylline (internal standard), Theophylline	C18-Low, 100mg	Add 2mL of 0.1M KH_2PO_4 (pH 4) buffer to 1mL serum. Vortex for one minute.
Topical Anesthetics	Serum	Benzocaine, Procaine, Mepivacaine	C18-Low, 500mg	Use 500µL serum. Add 500µL internal standard solution: 50µg/mL Mepivacaine HCl in 0.1M NaH_2PO_4. Vortex 1 minute.

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GracePure™

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Precondition	Load	Wash	Elute
5mL methanol followed by 5mL DI water.	Apply 10mL sample.	2mL DI water, followed by 1mL IPA:DI water (25:75). Vacuum 2 minutes. Next wash 1mL hexane, vacuum 2 minutes. Final wash with 1mL IPA.	3 x 1mL IPA containing 2% ammonium hydroxide.
5mL methanol followed by 5mL DI water.	Add the prepared sample.	9mL of DI water, vacuum 2 minutes.	500µL of methanol.
5mL methanol followed by 5mL DI water.	Add the serum sample.	6mL DI water, vacuum 2 minutes.	1mL of methanol.
3mL pentane.	Add 1mL sample.	1.5mL *n*-pentane.	2mL ethanol.
5mL methanol followed by 5mL DI water.	Add 1mL prepared sample.	6mL DI water, vacuum 10 minutes.	3mL of chloroform.
5mL methanol followed by 5mL DI water.	Add 2mL prepared sample.	No wash, apply vacuum for 5 minutes.	Collect eluate. Filter through a 0.45µm syringe filter.
2mL methanol followed by 2mL DI water.	Add 2mL of wine with the vacuum turned off.	No wash, allow wine to remain in contact with cartridge for 2 minutes.	Turn on vacuum and collect eluant. The organic acids and anthocyanins will retain while the carbohydrates pass through.
5mL methanol followed by 5mL DI water.	Add 100mL of water sample.	No wash, apply vacuum for 5 minutes.	2mL of ethyl acetate.
3mL of hexane.	Add 500µL prepared sample.	2mL of hexane, continue vacuum for 3 minutes.	2mL of a methanol:0.1N HCl solution (50:50).
5mL methanol followed by 5mL DI water.	Add acidified sample.	Wash with 6mL of DI water.	3mL of chloroform.
3mL methanol followed by 0.025% ammonium hydroxide.	Apply 1mL protein salt solution.	No wash.	500µL 0.4% TFA followed by 500µL acetonitrile containing 0.4% TFA. Apply vacuum until dry.
2mL 1M NaCl followed by 10mL DI water.	1mL, 1mL/min. (pH 7).	DI water, 2mL.	0.1M HCl, 500µL.
5mL methanol followed by 5mL DI water.	Add sample.	8mL DI water:methanol (75:25), vacuum 2 minutes.	500µL methanol.
5mL methanol followed by 5mL DI water.	Add 1000mL sample at flow rate of 5mL/min.	No wash.	Elute with 3 x 1mL methanol:water (50:50). Air dry after each elution.
5mL methanol followed by 5mL DI water.	Apply 10mL wine sample.	5mL water.	1mL isopropyl alcohol.
5mL methanol followed by 5mL DI water.	Add 2mL prepared sample.	3mL DI water, vacuum 2 minutes.	1mL methanol.
3mL 0.5M NaCl followed by 3mL DI water.	Apply 1mL sample.	No wash.	3 x 0.75mL of 0.1M NaCl.
2mL methanol followed by 2mL DI water.	Add the buffered urine.	2mL DI water, vacuum 2 minutes.	6mL of chloroform:isopropanol (90:10) through the cartridge. Repeat with an additional 0.2mL.
5mL methanol followed by 5mL DI water.	Add 200mL water sample.	3mL DI water.	Pass two 500µL aliquots of ethyl acetate.
5mL methanol followed by 5mL DI water.	Apply 200mL water containing PAH's.	2mL DI water followed by 2mL IPA:Water (20:80).	2 x 2mL methanol.
6mL 2-propanol:DI water (15:85).	Add 100mL water sample.	2mL 2-propanol:DI water (15:85).	1mL methylene chloride.
10mL DI water.	Apply 8mL beverage sample.	20mL DI water.	1mL 1.0N HCl followed by 1mL methanol.
3mL methanol followed by 3mL DI water adjusted to pH 9.	Add 500µL prepared sample.	1mL of distilled water, continue vacuum for 2 minutes to remove residual wash solution.	Pass two aliquots of 500µL methanol.
3mL methanol followed by 3mL DI water.	Add 2mL spike urine.	2mL 50mM phosphate buffer monobasic, pH 2.	2mL methanol:water (50:50).
5mL methanol followed by 5mL DI water.	Add prepared serum sample.	6mL DI water, vacuum 2 minutes.	500µL acetone.
2mL, hexane:acetone (80:20).	Add 1mL prepared sample.	2mL of hexane:acetone (80:20) vacuum 2 minutes.	Pass two aliquots of 500µL methanol.
5mL methanol followed by 5mL DI water.	Add prepared urine sample.	Wash first: 10mL of 0.1M HCl . Wash second 25mL of 50µM phosphoric acid containing 10% acetonitrile. Vacuum 2 minutes.	3mL of acetone through the cartridge. Collect eluate and add 1.5mL of methylene chloride, centrifuge 5 minutes. Remove upper phase and add 1.5mL of hexane. Centrifuge for 5 minutes. Remove upper phase once again and dry the treated sample. Redissolve in 200µL of chloroform for subsequent GC analysis.
5mL methanol followed by 5mL DI water.	Add prepared urine sample.	5mL DI water followed by 5mL of acetonitrile:water (40:60). Vacuum 2 minutes.	2mL of methanol.
2mL methanol followed by 2mL DI water.	Add buffered serum.	2mL DI water, vacuum 2 minutes.	1mL of methanol.
5mL methanol followed by 5mL DI water.	Add sample.	8mL DI water:methanol (75:25), vacuum 2 minutes.	Pass 500µL of methanol and dry. Redissolve in 200µL of chloroform for subsequent analysis by gas chromatography.

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Ordering Information

Simply the Best Value in SPE
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GracePure™ SPE Columns			
Sorbent	Bed Size/ Tube Volume	Qty.	Part No.
C18-Max	100mg/1mL	100pk	**5138765**
	500mg/3mL	50pk	**5138766**
	500mg/6mL	30pk	**5138767**
	1000mg/6mL	30pk	**5138768**
C18-Aq	100mg/1mL	100pk	**5138774**
	500mg/3mL	50pk	**5138775**
	1000mg/6mL	30pk	**5138776**
C18-Low	100mg/1mL	100pk	**5138760**
	200mg/3mL	50pk	**5138761**
	500mg/3mL	50pk	**5138762**
	500mg/6mL	30pk	**5138763**
	1000mg/6mL	30pk	**5138764**
C18-Fast	500mg/3mL	50pk	**5138758**
	1000mg/6mL	30pk	**5138759**
TMS	100mg/1mL	100pk	**5138785**
	500mg/3mL	50pk	**5138786**
Silica	100mg/1mL	100pk	**5138777**
	200mg/3mL	50pk	**5138778**
	500mg/3mL	50pk	**5138779**
	5000mg/20mL	20pk	**5138780**
	500mg/6mL	30pk	**5138781**
	1000mg/6mL	30pk	**5138782**
	2000mg/12mL	30pk	**5138783**
	10000mg/60mL	16pk	**5138784**
Amino	500mg/3mL	50pk	**5138752**
	1000mg/6mL	30pk	**5138753**
Diol	100mg/1mL	100pk	**5138771**
	200mg/3mL	50pk	**5138772**
	500mg/3mL	50pk	**5138773**
Anion-X	100mg/1mL	100pk	**5138754**
	500mg/3mL	50pk	**5138755**
Cation-X	100mg/1mL	100pk	**5138769**
	500mg/3mL	50pk	**5138770**

Vacuum Manifold & Accessories (photo on p. 6)		
Description	Qty.	Part No.
12-Port Vacuum Manifold	ea	**210351**
Replacement Parts		
Lid, Gaskets, and 12 Stopcocks	ea	**212001**
Glass Chamber	ea	**213212**
Vacuum Gauge, Valve, & Glass Chamber	ea	**212304**
Collection Rack, 12-Port Size	ea	**212518**
Gaskets, 12-Port Size	2	**212112**
One-Way Stopcocks	12	**213112**
Waste Container	2	**210033**
24-Port Vacuum Manifold	ea	**210224**
Replacement Parts		
Lid, Gaskets, and 24 Stopcocks	ea	**211224**
Glass Chamber	ea	**210124**
Vacuum Gauge, Valve, & Glass Chamber	ea	**210324**
Collection Rack, 24-Port Size	ea	**210424**
Gaskets, 16- and 24-Port Size	2	**210724**
One-Way Stopcocks	24	**211524**

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