

Restek Clinical/Forensic Products

Innovative Solutions, Comprehensive Support



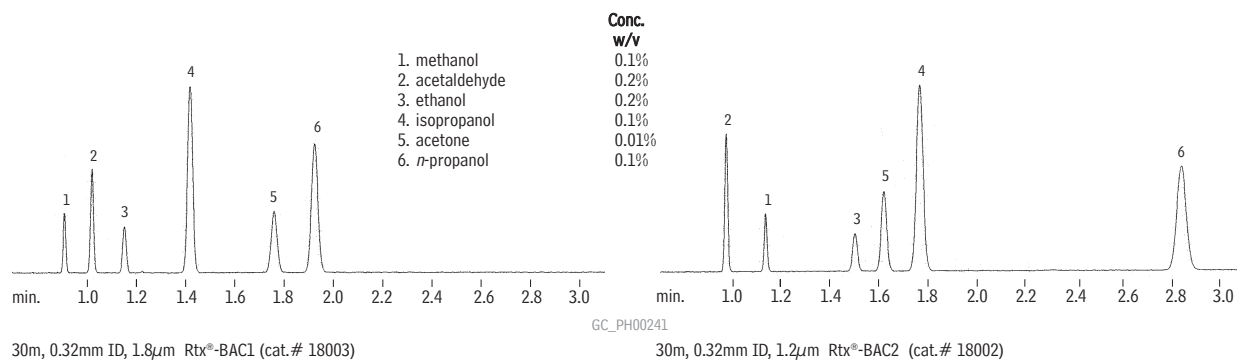
Chromatography Products

www.restek.com 800-356-1688 • 814-353-1300

Blood Alcohols

Resolution and analysis time are critical factors in method development and the routine analysis of ethanol and other volatiles in blood. Sample throughput can be maximized using this quick dual column analysis. Two capillary column stationary phases developed specifically for blood alcohol analysis, Rtx®-BAC1 and Rtx®-BAC2, will baseline resolve all low molecular weight alcohols and their metabolites. Using this dual column analysis, blood alcohol screening and confirmation can be done in a single injection with a total analysis time of less than three minutes isothermally. Packed columns may also be used for analyzing blood alcohols. Ethanol and its metabolites can be resolved to baseline in less than 5 minutes using a Carbowax® 20M stationary phase.

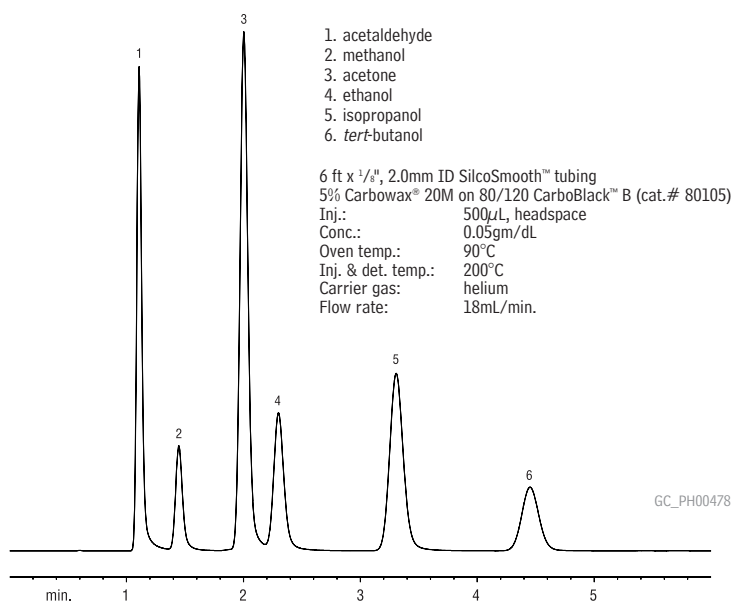
Figure 1 Baseline resolution of blood alcohols in less than three minutes on Rtx®-BAC1 and Rtx®-BAC2 capillary columns. Primary and confirmation analyses can be done from a single injection.



Dual-column analysis using a two-hole ferrule.
1.0mL headspace sample of a blood alcohol mix on a PerkinElmer HS 40 headspace autosampler
Oven temp.: 40°C
Inj. temp.: 200°C
Carrier gas: helium
Sample equilibration: 70°C, 15 min.
Vial pressure: 30psi
Vial pressurization time: 0.15 min.

Vial sampling time: 0.01 min.
Transfer line: 0.32mm ID Hydroguard™ fused silica tubing
Transfer line temp.: 200°C
Injection port sleeve: 2mm ID
Split flow: 20mL/min.

Figure 2 Excellent resolution of ethanol and its metabolites on a Carbowax® 20M packed column in less than five minutes.



1. acetaldehyde
2. methanol
3. acetone
4. ethanol
5. isopropanol
6. *tert*-butanol

6 ft x 1/8", 2.0mm ID SilcoSmooth™ tubing
5% Carbowax® 20M on 80/120 CarboBlack™ B (cat.# 80105)
Inj.: 500µL, headspace
Conc.: 0.05gm/dL
Oven temp.: 90°C
Inj. & det. temp.: 200°C
Carrier gas: helium
Flow rate: 18mL/min.

Recommended Columns

Rtx®-BAC1 Columns (fused silica)

ID	df (µm)	temp. limits	length	cat. #
0.32mm	1.80	-20 to 240/260°C	30-Meter	18003
0.53mm	3.00	-20 to 240/260°C	30-Meter	18001

Rtx®-BAC2 Columns (fused silica)

ID	df (µm)	temp. limits	length	cat. #
0.32mm	1.20	-20 to 240/260°C	30-Meter	18002
0.53mm	2.00	-20 to 240/260°C	30-Meter	18000

Intermediate-Polarity Deactivated Guard Columns/Transfer Lines

Nominal ID	Nominal OD	5-Meter
0.32mm	0.45 ± 0.04mm	10044
0.53mm	0.69 ± 0.05mm	10045

CarboBlack™ Packed Columns

Silcosteel®-deactivated stainless steel tubing

On CarboBlack™ B	L	OD	ID	cat.#*
5% Carbowax® 20M	2m	1/8"	2mm	80105-

*Please add configuration suffix number to cat.# when ordering. See our catalog or website for configuration options.

Analytical Reference Materials

Blood Alcohol Standards

Concentration	Volume	qty.	cat.#	Concentration	Volume	qty.	cat.#
0.010g/dL	1mL/ampul	5-pk.	36276	0.08g/dL	1mL/ampul	5-pk.	36262
0.015g/dL	1mL/ampul	5-pk.	36232	0.1g/dL	1mL/ampul	5-pk.	36236
0.02g/dL	1mL/ampul	5-pk.	36233	0.15g/dL	1mL/ampul	5-pk.	36237
0.025g/dL	1mL/ampul	5-pk.	36234	0.2g/dL	1mL/ampul	5-pk.	36238
0.04g/dL	1mL/ampul	5-pk.	36235	0.3g/dL	1mL/ampul	5-pk.	36239
0.05g/dL	1mL/ampul	5-pk.	36257	0.4g/dL	1mL/ampul	5-pk.	36266

All standards are NIST-traceable forensic ethanol solutions. Also available in 10-pks. and 5mL & 20mL ampuls.

Blood Alcohol Mix Resolution Control Standard (8 components)

acetaldehyde	ethanol (NIST certified value)	methanol
acetone	ethyl acetate	methyl ethyl ketone
acetonitrile	isopropanol	

0.100g/dL each in water, 1mL/ampul

cat. # 36256

Inlet Liners

For Agilent GCs

2mm Splitless Liners

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
2.0 ID x 6.5 OD x 78.5	20712		20713	

1mm Split Liners

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
1.0 ID x 6.3 OD x 78.5	20972		20973	

For Varian GCs

1mm Split Liners for 1075/1077 GCs

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
1.0 ID x 6.3 OD x 72	20970		20971	

2mm Splitless Liners for 1075/1077 GCs

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
2.0 ID x 6.3 OD x 74	20721		20722	

Open 0.75mm ID Liners for 1078/1079 GCs

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
0.75 ID x 5.0 OD x 54	21714		21715	

For Shimadzu GCs

1mm Split Liners for 17A, 2010, & 2014 GCs

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
1.0 ID x 5.0 OD x 95	20976		20977	

For PerkinElmer GCs

2mm Splitless Liners

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
2.0 ID x 5.0 OD x 100	20730		20731	

Auto SYS™ Splitless Liners

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
1.0 ID x 6.2 OD x 92.1	21272		21273	

For Thermo Scientific GCs

2mm Splitless Liners for 4000-5000-6000 Series GCs

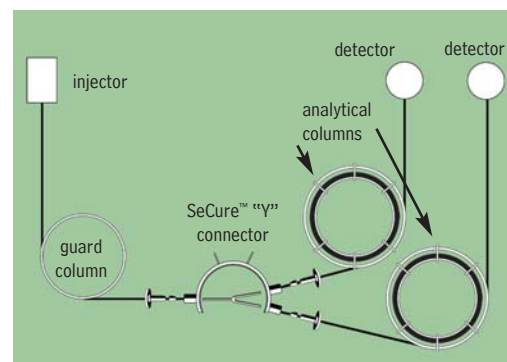
ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
2.0 ID x 5.4 OD x 79.5	20811		20812	

1mm Split Liners for TRACE™ & Focus SSL

ID*/OD & Length (mm)	cat.#	ea.	cat.#	5-pk.
1.0 ID x 8.0 OD x 105	20916		20917	

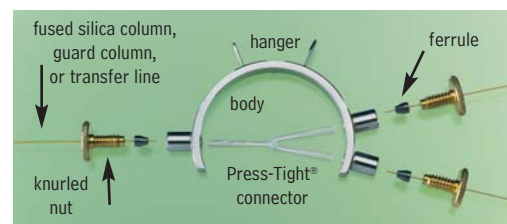
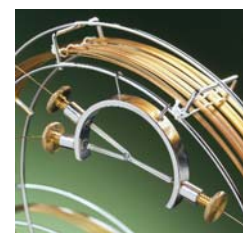
*Nominal ID at syringe needle expulsion point.

Dual-column confirmational analysis with a single injection— one of the SeCure™ “Y” connector’s many uses.



SeCure™ “Y” - The most secure connector available!

The SeCure™ “Y” connector’s open design allows visual confirmation of the seal.



Kits include: SeCure™ “Y” connector body, 3 knurled nuts, “Y” Universal Press-Tight® union, 3 ferrules.

Ferrules Fit Column ID	qty.	cat.#
0.18/0.25/0.28mm	kit	20276
0.32mm	kit	20277
0.45/0.53mm	kit	20278

free literature

GC Analysis of Commonly Abused Inhalants in Blood Using Rtx®-BAC1 and Rtx®-BAC2 Columns
lit. cat.# 59548

Dual Column Confirmation GC Analysis of Blood Alcohols Using Rtx®-BAC1 and Rtx®-BAC2 Columns Optimized for the PE HS40 Headspace Autosampler
lit. cat.# 59598

Ethanol Standards for Blood Alcohol Testing
lit. cat.# 59382C

Available on our website at www.restek.com.

For Headspace Vials

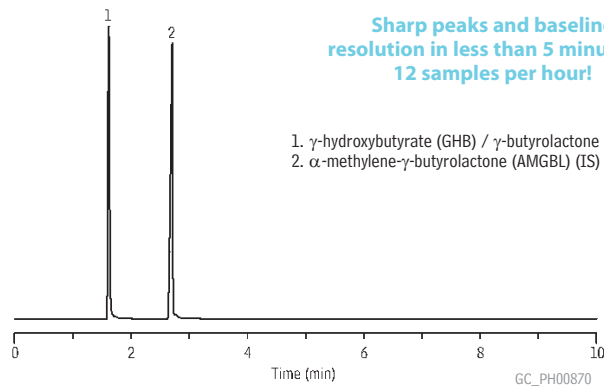
see page 5.

γ -hydroxybutyrate (GHB)

A headspace GC-FID blood alcohol test system using an Rtx[®]-BAC1 or Rtx[®]-BAC2 column can be adapted for GHB screening. All positive samples in the screening assay can then be run by GC/MS to confirm the presence of GHB. The confirmation method shown here uses headspace as the sample introduction technique and we recommended the Rxi[™]-5ms column for the excellent peak shape and resolution it produces.

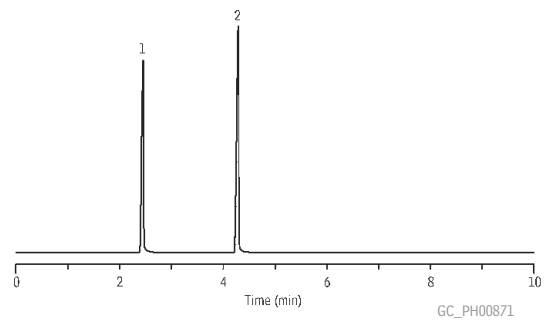
Figure 1 Excellent peak symmetry and baseline resolution from an internal standard in less than five minutes using an Rtx[®]-BAC1 or Rtx[®]-BAC2 column. Fast analysis time increases sample throughput.

Rtx[®]-BAC1 column



Column: Rtx[®]-BAC1 30m, 0.32mm ID, 1.8 μ m (cat.# 18003) and Rtx[®]-BAC2 30m, 0.32mm ID, 1.2 μ m (cat.# 18002), connected via universal "Y" Press-Tight[™] connector (cat.# 20405)
Sample: GHB, GBL, α -methylene- γ -butyrolactone (AMGBL), 10 μ g/mL each in water
Inj.: 1.0mL headspace, split (split ratio 1:10), 1mm split inlet liner (cat.# 20972)
Inj. temp.: 200°C
Carrier gas: helium, constant pressure
Linear velocity: 44cm/sec. @ 50°C
Oven temp.: 50°C (3 min.) to 150°C @ 20°C/min. (hold 7 min.)

Rtx[®]-BAC2 column

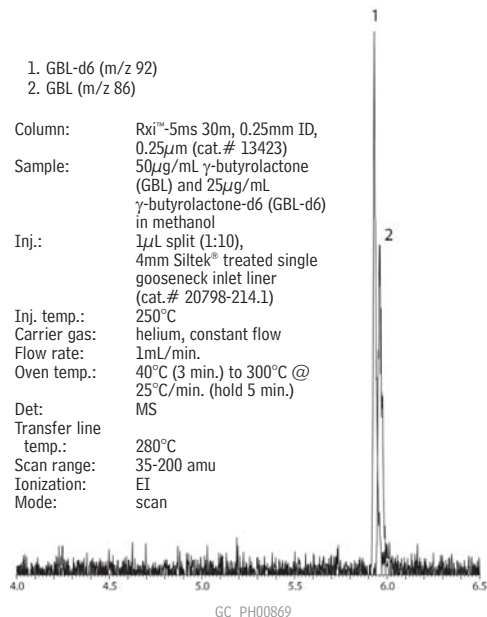


Det: FID @ 240°C
Headspace autosampler: Teledyne/Tekmar HT3
Sample/platen temp.: 100°C
Sample equilibration: 15 min.
Mixing time: 5 min.
Vial pressure: 10psig
Vial pressurization time: 2 min.
Loop fill time: 2 min.
Transfer line temp.: 120°C

Figure 2 Positive identification of GHB using the Rxi[™]-5ms column (overlays of extracted ion chromatograms for GBL and GBL-d6)

1. GBL-d6 (m/z 92)
2. GBL (m/z 86)

Column: Rxi[™]-5ms 30m, 0.25mm ID, 0.25 μ m (cat.# 13423)
Sample: 50 μ g/mL γ -butyrolactone (GBL) and 25 μ g/mL γ -butyrolactone-d6 (GBL-d6) in methanol
Inj.: 1 μ L split (1:10), 4mm Siltek[®] treated single gooseneck inlet liner (cat.# 20798-214.1)
Inj. temp.: 250°C
Carrier gas: helium, constant flow
Flow rate: 1mL/min.
Oven temp.: 40°C (3 min.) to 300°C @ 25°C/min. (hold 5 min.)
Det: MS
Transfer line temp.: 280°C
Scan range: 35-200 amu
Ionization: EI
Mode: scan



Recommended Columns

Rtx®-BAC1 Columns (fused silica)

ID	df (µm)	temp. limits	length	cat. #
0.32mm	1.80	-20 to 240/260°C	30-Meter	18003
0.53mm	3.00	-20 to 240/260°C	30-Meter	18001

Rtx®-BAC2 Columns (fused silica)

ID	df (µm)	temp. limits	length	cat. #
0.32mm	1.20	-20 to 240/260°C	30-Meter	18002
0.53mm	2.00	-20 to 240/260°C	30-Meter	18000

Rxi™-5ms Columns (fused silica)

(Crossbond® 5% diphenyl / 95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	length	cat. #
0.25mm	0.25	-60 to 330/350°C	30-Meter	13423

Analytical Reference Materials

Exempted Drug of Abuse Reference Materials

Concentration is 1,000µg/mL. Volume is 1mL/ampul.

Compound	CAS#	Solvent Code	Individual cat. #
GHB			
1,4-butanediol	110-63-4	M	34078
γ-butyrolactone (GBL)	96-48-0	ACN	34077
γ-hydroxybutyrate (GHB)	502-85-2	M	34076
α-methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	34079
γ-valerolactone	108-29-2	ACN	34080

ACN = acetonitrile

M = methanol

free literature

A Technical Guide for Static Headspace Analysis Using GC
lit. cat. # 59895A

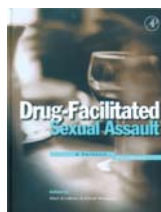
Fast Screening and Confirmation for Gamma-Hydroxybutyrate (GHB). Restek Advantage 2006.03
lit. cat. # 580095

Clinical/Forensic In-Review
lit. cat. # 580026

Call Restek at 800-356-1688 or 814-353-1300, ext. 5,
or contact your Restek representative, to request your free copy!

additional reading

Drug-Facilitated Sexual Assault: A Forensic Handbook



This unique handbook educates readers in how drugs are used as weapons in committing sexual assaults. It is designed for everyone involved in the investigation of these crimes, including forensic scientists, law enforcement officers, lawyers, toxicologists, and medical professionals.

M. LeBeau and A. Mozayani, Eds.,

Elsevier Science, 2001, 326pp., ISBN 0-12-440261-5
cat. # 23054

Vials

Headspace Autosampler Vials

Description	100-pk.	1000-pk.
10mL Clear Vial, Flat Bottom	24683	24684
10mL Clear Vial, Rounded Bottom	21164	21165
20mL Clear Vial, Flat Bottom	24685	24686
20mL Clear Vial, Rounded Bottom	21162	21163

20mm Aluminum Seals w/Septa, Assembled

Description	100-pk.	1000-pk.
Silver Seal w/ PTFE/Gray Butyl Rubber	21761	21762
Silver Seal w/ PTFE/Silicone	21763	21764
Pressure Release Silver Seal w/ PTFE/Gray Butyl Rubber Septum	21765	21766
Pressure Release Silver Seal w/ PTFE/Silicone Septum	21767	21768

GC Accessories

Replacement Jets

High-Performance Version

- Similar to the standard version, but Siltek® treated.
- Extremely inert, use with active compounds.

Capillary Dedicated FID Replacement Jet for Agilent 6890/6850 GCs

Similar to					
0.011-Inch ID	Agilent part #	qty.	cat. #	qty.	cat. #
High-Performance					
Siltek® Treated	G1531-80560	ea.	21620	3-pk.	21683



Packed Column Replacement Jets for Agilent 5890/6890/6850 GCs

Similar to					
0.018-Inch ID	Agilent part #	qty.	cat. #	qty.	cat. #
High-Performance					
Siltek® Treated	18710-20119	ea.	21696	3-pk.	21697
Similar to					
0.030-Inch ID	Agilent part #	qty.	cat. #	qty.	cat. #
High-Performance					
Siltek® Treated	18789-80070	ea.	21686	3-pk.	21687



Restek Electronic Leak Detector

- Reliable thermal conductivity leak detector.
- Responds to leaks in less than 2 seconds.
- Audible alarm plus LED readout.
- Auto zeros with the touch of a button.
- Built-in rechargeable 9 volt battery.



Small, compact unit—easy to hold and operate.

Leak Detector Facts

Detectable gases:	helium, nitrogen, argon, carbon dioxide
Battery:	Rechargeable Ni-MH, 9 volt
Operating	
Temperature Range:	32°-120°F (0°-48°C)
Humidity Range:	0-97%
CE Approved:	Yes

Description	qty.	cat. #
Leak Detector with 110Volt Battery Charger	ea.	22451
Leak Detector with 220Volt European Battery Charger	ea.	22451-EUR
Leak Detector with 220Volt UK Battery Charger	ea.	22451-UK

Caution: The Restek Electronic Leak Detector is NOT designed for determining leaks of combustible gases. A combustible gas detector should be used for determining combustible gas leaks under any condition. The Restek Electronic Leak Detector may be used for determining trace amounts of hydrogen in a GC environment only.

Cannabinoids

Analysis of cannabinoids includes confirming the presence of parent compounds as well as metabolites of the active constituents in marijuana. The low bleed and high temperature stability of the Rxi™-5ms resolve cannabinoids well – without lengthening the run time unnecessarily. Cannabinoid analysis can further be streamlined by using LC/MS/MS methodology, which eliminates time consuming derivatization steps, yet retains excellent sensitivity. Highly retentive stationary phases allow the use of highly organic mobile phases, increasing desolvation efficiency, reducing ion suppression, and, thus, increasing sensitivity when using an ESI interface. For example, the Allure® Biphenyl HPLC column shows increased sensitivity in a short analysis time (less than five minutes).

Figure 1 An Rxi™-5ms column provides baseline resolution and a short analysis time for derivatized cannabinoids. Low bleed, even at 340°C, ensures accurate results.

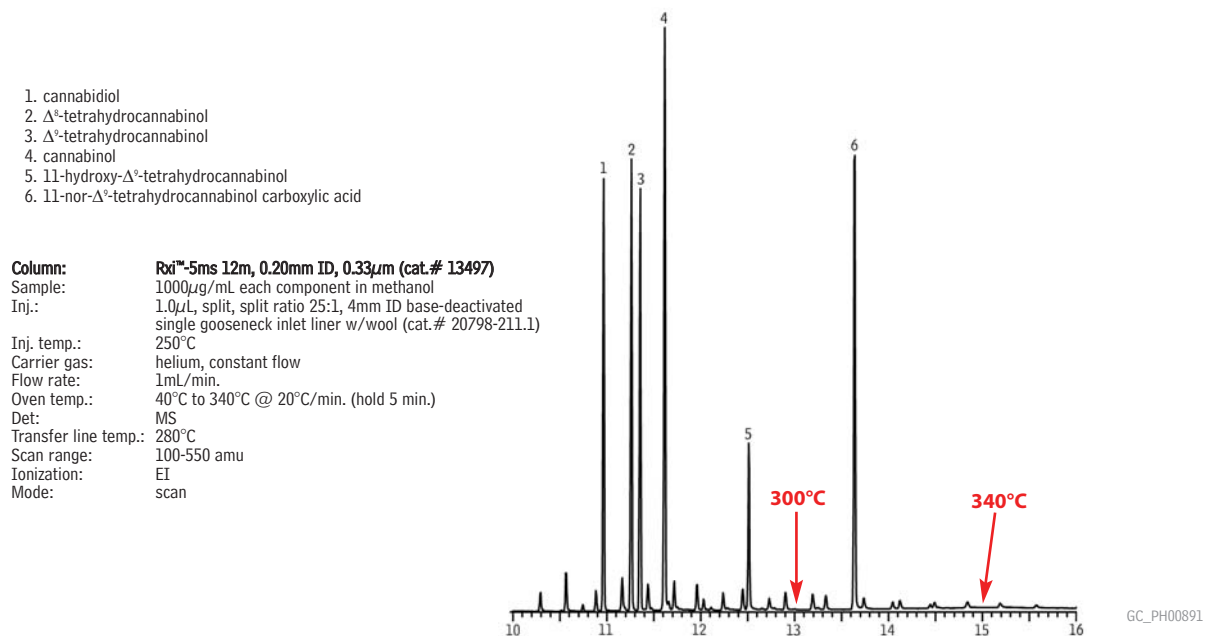


Figure 2 Fast analysis of Δ^9 -THC and its metabolites, using an Allure® Biphenyl HPLC column (extracted ion chromatography).

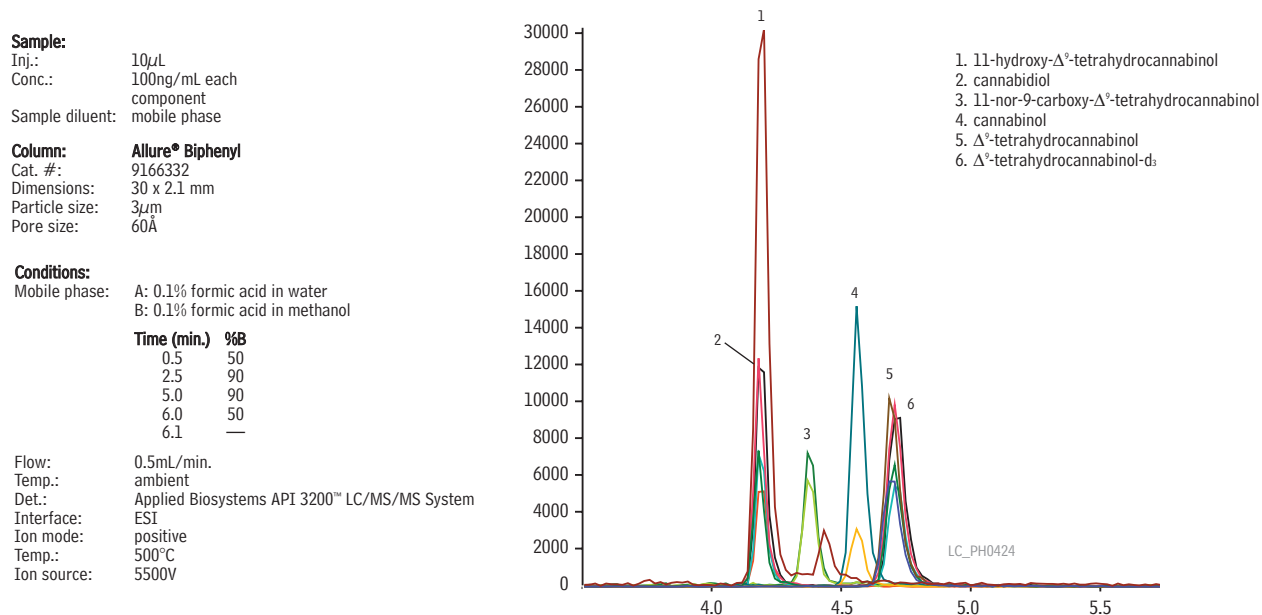
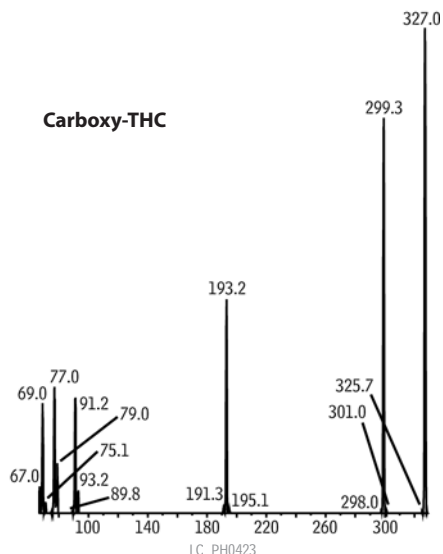
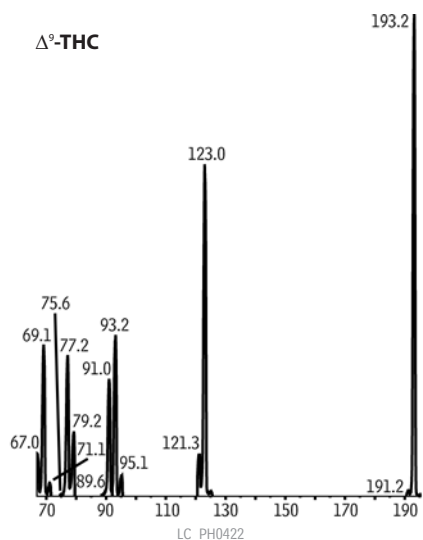


Figure 3 Final product spectra used in developing MRM transitions for compound identification and optimized sensitivity.



Sample:
 Inj.: 10µL
 Conc.: 100ng/mL each component
 Sample diluent: mobile phase

Column: Allure® Biphenyl
 Cat. #: 9166332
 Dimensions: 30 x 2.1 mm
 Particle size: 3µm
 Pore size: 60Å

Conditions:
 Mobile phase: A: 0.1% formic acid in water
 B: 0.1% formic acid in methanol

Time (min.)	%B
0.5	50
2.5	90
5.0	90
6.0	50
6.1	—

Flow: 0.5mL/min.
 Temp.: ambient
 Det.: Applied Biosystems API 3200™ LC/MS/MS System
 Interface: ESI
 Ion mode: positive
 Temp.: 500°C
 Ion source: 5500V

Recommended Columns

Rxi™-5ms Columns (fused silica)

(Crossbond® 5% diphenyl / 95% dimethyl polysiloxane)

ID	df (µm)	temp. limits	length	cat. #
0.20mm	0.33	-60 to 330/350°C	12-Meter	13497
0.20mm	0.33	-60 to 330/350°C	25-Meter	13498

Allure® Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
 pore size: 60Å
 carbon load: 23%

endcap: yes
 pH range: 2.5 to 7.5
 temperature limit: 80°C

3µm Column, 2.1mm	cat. #	5µm Column, 2.1mm	cat. #
30mm	9166332	30mm	9166532
50mm	9166352	50mm	9166552
100mm	9166312	100mm	9166512
3µm Column, 3.2mm	cat. #	5µm Column, 3.2mm	cat. #
30mm	9166333	30mm	9166533
50mm	9166353	50mm	9166553
100mm	9166313	100mm	9166513

ordering note

For guard cartridges for these columns, or to order these columns with a Trident™ Integral Inlet Fitting, visit our website at www.restek.com.

Analytical Reference Materials

Exempted Drug of Abuse Reference Materials

Concentration is 1,000µg/mL unless otherwise noted. Volume is 1mL/ampul.

Compound	CAS#	Solvent Code	Individual cat. #
Cannabinoid & Metabolites			
cannabidiol	13956-24-1	PTM	34011
cannabinol	521-35-7	PTM	34010
Δ ⁹ -THC	1972-08-3	M	34067
(±)11-nor-9-carboxy-Δ ⁹ -THC*	104874-50-2	M	34068

*100µg/mL.

M = methanol; PTM = purge & trap grade methanol

Sample Preparation

Method Specific SPE Cartridges

Extraction of THCA from biological samples. Copolymeric anion exchange sites provide selective, reproducible extraction of THCA from urine.

Description	Tube Volume, Bed Weight	qty.	cat. #
Drug Prep I	3mL, 200mg	50-pk.	26046
Drug Prep II	10mL, 200mg	50-pk.	26047

additional reading

Forensic Applications of Mass Spectrometry

J. Yinon, CRC Press LLC, 1994, 320pp., ISBN 0-8493-8252-1
 cat. # 23056

Handbook of Forensic Drug Analysis

F. Smith and J. Siegel, Elsevier Science, 2004, 584pp., ISBN 0-12-650641-8
 cat. # 23055

Solid Phase Extraction: Principles and Practice

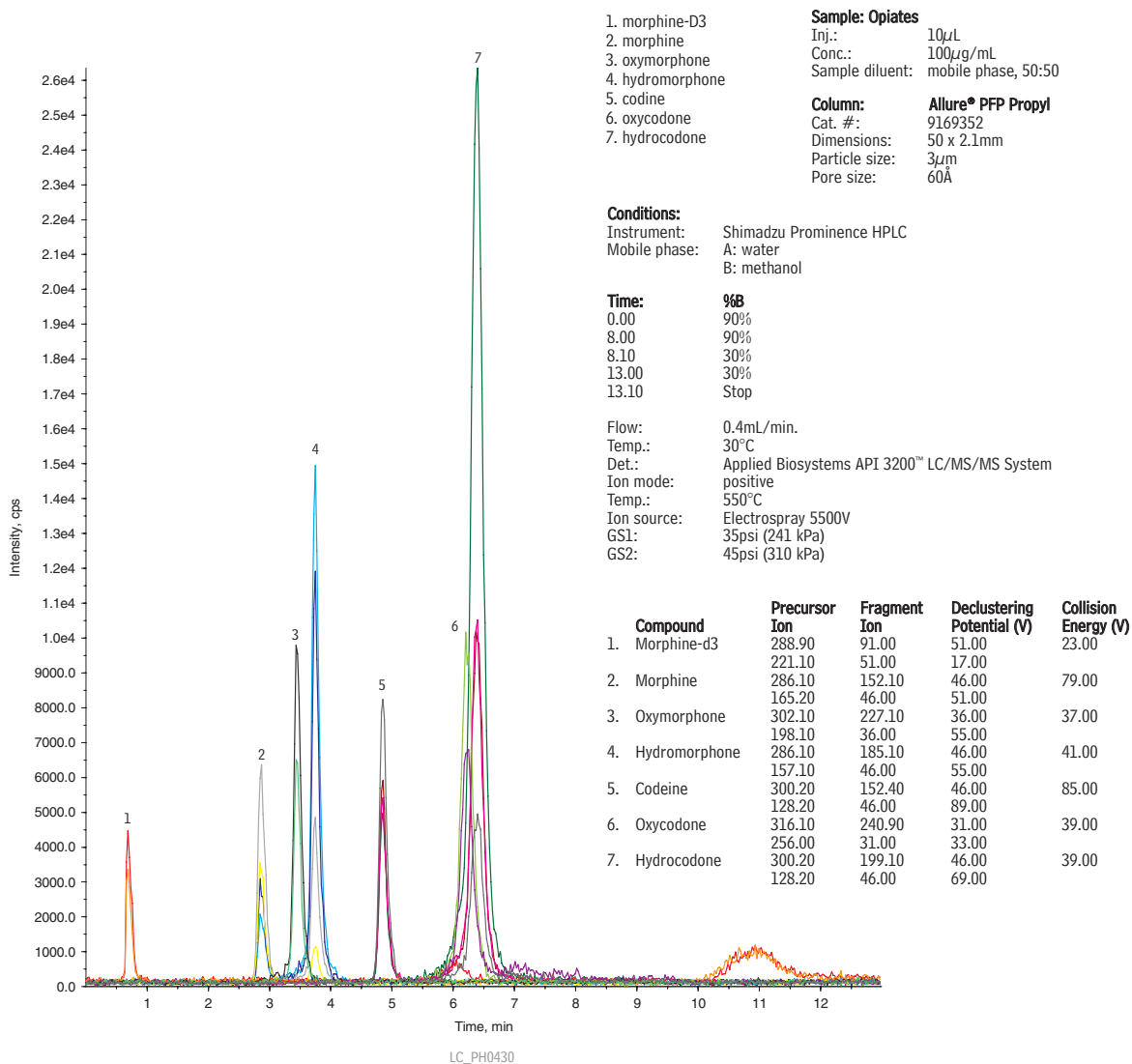
E.M. Thurman and M.S. Mills, John Wiley, 1998, 372pp., ISBN 0-471-61422-X
 cat. # 20494



Opiates

Typically, opiates must be derivatized before analysis by GC/MS, which significantly lengthens sample preparation time. However, when using LC/MS/MS, derivatization can be eliminated and sensitivity can be increased. High retention of opiates on the Allure® PFP Propyl column allows for a high organic mobile phase to be used. The result is increased sensitivity due to an increased desolvation efficiency, and thus better ionization of the target compounds. The combination of using LC/MS/MS, an Allure® PFP Propyl column, and a 90% organic mobile phase allows for detection limits in the low picogram range.

Figure 1 Fast analysis of opiates & their metabolites using an Allure® PFP propyl column (extracted ion chromatography).



did you know?

We can supply all your sample extract clean-up needs. See our catalog or website for details.

Recommended Columns

Allure® PFP Propyl Columns (USP L43) Excellent Columns for LC/MS and ELSD Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 60Å
carbon load: 17%

endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

3µm Column, 2.1mm	cat. #
30mm	9169332
50mm	9169352
100mm	9169312
3µm Column, 3.2mm	cat. #
30mm	9169333
50mm	9169353
100mm	9169313
5µm Column, 2.1mm	cat. #
30mm	9169532
50mm	9169552
100mm	9169512
5µm Column, 3.2mm	cat. #
30mm	9169533
50mm	9169553
100mm	9169513

To order these columns with a Trident™ Integral Inlet Fitting, visit our website at www.restek.com.

Allure® PFP Propyl Guard Cartridges	qty.	cat. #
10 x 2.1mm	3-pk.	916950212
10 x 4.0mm	3-pk.	916950210
20 x 2.1mm	2-pk.	916950222
20 x 4.0mm	2-pk.	916950220

Analytical Reference Materials

Exempted Drug of Abuse Reference Materials

Concentration is 1,000µg/mL. Volume is 1mL/ampul.

Compound	CAS#	Solvent Code	Individual cat.#
Methadone & Metabolites			
EDDP perchlorate	66729-78-0	M	34069
methadone	1095-90-5	PTM	34005
Opiates & Metabolites			
codeine	76-57-3	PTM	34000
dextromethorphan HBr monohydrate	125-69-9	M	34081
hydrocodone	125-29-1	PTM	34002
hydromorphone	466-99-9	PTM	34063
morphine	57-27-2	PTM	34006
oxycodone	76-42-6	PTM	34007
oxymorphone	76-41-5	PTM	34065

M = methanol; PTM = purge & trap grade methanol

New singles & custom mixes available!

We can supply all your reference materials—
See our catalog or website for details.



Sample Preparation

Method Specific SPE Cartridges

Suitable for acidic, basic, and neutral drugs. Mixed-mode hydrophobic and ion exchange sites provide selective, reproducible extraction of biological samples containing therapeutic or illegal drugs.

Description	Tube Volume, Bed Weight	qty.	cat.#
Drug Prep I	3mL, 200mg	50-pk.	26044
	10mL, 200mg	50-pk.	26045

Syringes

SGE Syringes for Agilent 1090 & 1100 LC Autosamplers

1/4-32 UNEF Thread



Volume	Model	SGE cat.#	Restek qty.	Restek cat.#
25µL	25D-HP1090-GT	003670	ea.	22290
250µL	250D-HP1090-GT	006670	ea.	22291

SGE Syringes for Waters WISP™ LC Autosamplers

1/4-28 UNF Thread



Volume	Model	SGE cat.#	Restek qty.	Restek cat.#
25µL	25D-WISP	003990	ea.	22293
250µL	250D-WISP	006690	ea.	22294

free literature

Allure® PFP Propyl and Ultra PFP HPLC Columns Provide Improved Analysis of Basic Compounds. lit. cat.# 59118A

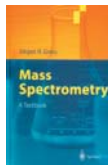
Exempted Drugs of Abuse Analytical Reference Materials. lit. cat.# 580143A

Clinical/Forensics Products & Applications for GC & HPLC (2006/2007 Edition).

lit. cat.# 59989A

Call Restek at 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative, to request your free copy!

additional reading



Mass Spectrometry, A Textbook

J. H. Gross, Springer, 2004, XVIII, 518pp., 357 illus, ISBN 3-540-40739-1 cat.# 22696



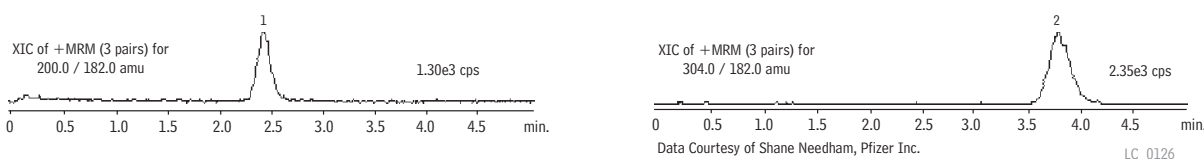
Interpretation of Mass Spectra, 4th Edition

F. W. McLafferty and F. Turecek, University Science, 1993, 371pp., ISBN 0-935702-25-3 cat.# 20498

Cocaine

Identifying cocaine and its metabolites, benzoylecgonine and ecgonine methyl ester, using mass spectrometry is very easy since all three compounds have distinctive masses. However, quantifying these compounds by GC/MS can be challenging and time consuming since derivatization is generally required to improve peak shape and response. Analysis by LC/MS/MS, such as the analysis shown here on an Allure® PFP Propyl column, offers the advantage of simplified sample preparation and high sensitivity to target analytes – leading to more reproducible results, even at low concentrations.

Figure 1 An Allure® PFP Propyl column and LC/MS/MS provide excellent sensitivity for cocaine and ecgonine methyl ester.



Peak List:

1. EME (ecgonine methyl ester)
2. COC (cocaine)

Sample:

Inj.: 10µL
 Conc.: 1µg/mL
 Solvent: water
 Temp.: 4°C

Column: Allure® PFP Propyl

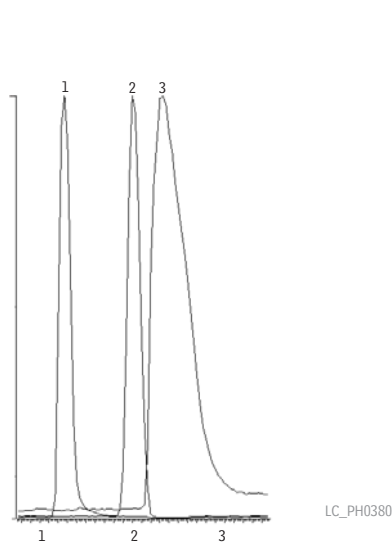
Cat. #: 9169532
 Dimensions: 30 x 2.1mm
 Particle size: 5µm
 Pore size: 60Å

Conditions:

Mobile phase: 5mM ammonium formate, pH 3.0; acetonitrile (10:90, v/v)
 Flow: 0.6mL/min.
 Column temp.: ambient
 Det.: Applied Biosystems API 3200™ LC/MS/MS System
 Interface: turbo ion spray, ESI
 Interface temp.: 150°C
 Ion mode: positive
 ESI probe voltage: 5000V

Orifice: + 71V
 Ring: + 265V
 Collision gas: nitrogen
 Collision gas pressure: 2.2 mTorr
 Collision gas energy: 28 eV (COC)
 26 eV (EME)
 Electron multiplier: 2100 volts
 Auxiliary gas flow: 7000cc/min.
 Nebulizer gas setting: 15lb/in.²
 Curtain gas setting: 12lb/in.²

Figure 2 An Allure® PFP Propyl column and a highly organic mobile phase promote retention and ionization for cocaine analysis (extracted ion chromatograms).



Peak List	Mass	Ret. Time (min.)
1. ecgonine methylester	200	1.27
2. benzoylecgonine	290	2.00
3. cocaine	304	2.33

Sample:

Inj.: 10µL, 5pg each compound on column
 Solvent: mobile phase

Column: Allure® PFP Propyl

Cat. #: 9169532
 Dimensions: 30 x 2.1mm
 Particle size: 5µm
 Pore size: 60Å

Conditions:

Mobile phase: acetonitrile:5mM ammonium formate in water, pH=3.0, 80:20
 Flow: 0.6mL/min.
 Temp.: 25°C

Detection:

MS, Micromass LCT Premier
 ESI: positive
 Capillary: 3000V
 Sample cone: 20V
 Desolvation temp.: 250°C
 Source temp.: 120°C

Recommended Columns

Allure® PFP Propyl Columns (USP L43) Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 60Å
carbon load: 17%

endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

3µm Column, 2.1mm	cat. #
30mm	9169332
50mm	9169352
100mm	9169312

3µm Column, 3.2mm	cat. #
30mm	9169333
50mm	9169353
100mm	9169313

3µm Column, 2.1mm	cat. #
30mm (with Trident™ Inlet Fitting)	9169332-700
50mm (with Trident™ Inlet Fitting)	9169352-700
100mm (with Trident™ Inlet Fitting)	9169312-700

3µm Column, 3.2mm	cat. #
30mm (with Trident™ Inlet Fitting)	9169333-700
50mm (with Trident™ Inlet Fitting)	9169353-700
100mm (with Trident™ Inlet Fitting)	9169313-700

5µm Column, 2.1mm	cat. #
30mm	9169532
50mm	9169552
100mm	9169512
200mm	9169522
250mm	9169572

5µm Column, 3.2mm	cat. #
30mm	9169533
50mm	9169553
100mm	9169513

5µm Column, 2.1mm	cat. #
30mm (with Trident™ Inlet Fitting)	9169532-700
50mm (with Trident™ Inlet Fitting)	9169552-700
100mm (with Trident™ Inlet Fitting)	9169512-700

5µm Column, 3.2mm	cat. #
30mm (with Trident™ Inlet Fitting)	9169533-700
50mm (with Trident™ Inlet Fitting)	9169553-700
100mm (with Trident™ Inlet Fitting)	9169513-700

Allure® PFP Propyl Guard Cartridges	qty.	cat. #
10 x 2.1mm	3-pk.	916950212
10 x 4.0mm	3-pk.	916950210
20 x 2.1mm	2-pk.	916950222
20 x 4.0mm	2-pk.	916950220

Analytical Reference Materials

Exempted Drug of Abuse Reference Materials

Concentration is 1,000µg/mL. Volume is 1mL/ampul.

Compound	CAS#	Solvent Code	Individual cat. #
Cocaine & Metabolites			
cocaine	529-38-4	ACN	34066
cocaine	53-21-4	PTM	34015
benzoylecgonine	519-09-5	PTM	34016
ecgonine	5796-31-6	PTM	34017
ecgonine methyl ester	7143-09-1	PTM	34018

ACN = acetonitrile; PTM = purge & trap grade methanol

Sample Preparation

Method Specific SPE Cartridges

Suitable for acidic, basic, and neutral drugs. Mixed-mode hydrophobic and ion exchange sites provide selective, reproducible extraction of biological samples containing therapeutic or illegal drugs.

Description	Tube Volume, Bed Weight	qty.	cat. #
Drug Prep I	3mL, 200mg	50-pk.	26044
	10mL, 200mg	50-pk.	26045

free literature

0.5pg Limit of Detection for Cocaine Using an Allure® PFP Propyl Column and HPLC/TOF/MS Restek Advantage 2005.04. lit. cat. # 580022

Allure® PFP Propyl and Ultra PFP HPLC Columns Provide Improved Analysis of Basic Compounds. lit. cat. # 59118A

Call Restek at 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative, to request your free copy!

HPLC Accessories

Super-Clean™ Gas Trapping System for LC/MS

- Changing filters is quick and easy.
- Up to 20L of hydrocarbon-free nitrogen per minute.

Description	qty.	cat. #
Super-Clean™ Gas-Trapping System (2-position baseplate, 2 charcoal filters)	ea.	22062
2-Position Baseplate (1/4" Fittings)	ea.	22060
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061



Hub-Cap 4 Liter Bottle Tops

Use instead of parafilm, aluminum foil, or tape on your mobile phase reservoirs.



cat. # 26538 cat. # 26540



cat. # 26541

Description	qty.	cat. #
Hub-Cap (assembly of the bottle cap and plug)	kit	26541
Hub-Cap Multi-pack	3-pk.	26542

Hub-Cap Adapters

Allow the use of the Opti-Cap™ with 4-liter solvent bottles.

Description	qty.	cat. #
Hub-Cap Adapter	ea.	26538
Hub-Cap Adapter Multi-pack	3-pk.	26539
Hub-Cap Adapter and Opti-Cap™	kit	26540

Clinical/Forensics Essentials

Trident™ Direct provides three levels of protection



Trident™ Direct high-pressure filter
Protection against particulate matter.



Trident™ Direct 10mm guard cartridge holder with filter
Protection against particulate matter and moderate protection against irreversibly adsorbed compounds.



Trident™ Direct 20mm guard cartridge holder with filter
Protection against particulate matter and maximum protection against irreversibly adsorbed compounds.

Trident™ Direct Guard Cartridge System

Easy to Use, Low Dead Volume—The Ultimate Combination of Convenience and Column Protection

Unlike “one size fits all” guard systems, the Trident™ Direct system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection and guard cartridges in four dimensions, with a variety of bonded phases to match your analytical column.

Description*	qty.	cat.#
High-pressure filter	ea.	25082
10mm guard cartridge holder without filter	ea.	25083
10mm guard cartridge holder with filter	ea.	25084
20mm guard cartridge holder without filter	ea.	25085
20mm guard cartridge holder with filter	ea.	25086
Connection tip for Waters-style end fittings	ea.	25088
PEEK™ tip standard fittings	ea.	25087
Replacement Cap Frits: 4mm, 2.0µm	5-pk.	25022
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023
Replacement Cap Frits: 2mm, 2.0µm	5-pk.	25057

*The standard PEEK™ tip in Trident™ Direct systems is compatible with Parker®, Upchurch®, Valco®, and other CPI-style fittings. To use Trident™ Direct systems with Waters-style end fittings, replace the tip with cat.# 25088.

Restek's Exclusive Trident™ Integral System

The system's foundation consists of the analytical column configured with our exclusive Trident™ end fitting and XF fitting. This configuration contains the standard internal frit as well as a replaceable cap frit, which easily can be changed without disturbing the packed bed. Changing the external frit can reverse the effects of accumulated particles, such as high backpressure or peak distortion. To obtain this basic configuration, simply order any Restek HPLC column, and add the suffix -700 to the catalog number for the column. Nominal additional charge.

Description	qty.	cat.#
XG-XF Fitting for 10mm Guard Cartridge	ea.	25026
XG-XF Fitting for 20mm Guard Cartridge	ea.	25062
Replacement XF Filter Fitting	ea.	25024
Replacement Cap Frits: 4mm, 2.0µm	5-pk.	25022
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023
Replacement Cap Frits: 2mm, 2.0µm	5-pk.	25057



Column with Trident™ Integral Inlet Fitting (to order add “-700” to catalog number of column) and guard cartridge, XG-XF fitting, cap frit, and XF end fitting.

PEEK™ Survival Kit for HPLC

The PEEK™ Survival Kit is an invaluable parts kit that contains tubing, fittings, and tools essential for setting up and maintaining your HPLC system: PEEK™ tubing, connectors, and elbows, PTFE tubing, a tubing cutter and extra blades, a ValvTool wrench, open-end wrenches, and more.

For start-up and maintenance in all HPLC systems.

Description	qty.	cat.#
PEEK™ Survival Kit for HPLC	kit	25322

Stainless Steel Survival Kit for HPLC

The stainless steel survival kit contains a wide range of tubing, fittings, and tools necessary to set up and maintain your HPLC system: a selection of lengths and IDs of 1/16-inch tubing, plus nuts, ferrules, a ValvTool wrench, and a zero-dead-volume union.

Description	qty.	cat.#
Stainless Steel Survival Kit for HPLC	kit	25097

O-Rings



	Max. temp.	qty.	cat.#
A) Viton® O-Rings for Agilent GCs	250°C	25-pk.	20377
B) Graphite O-rings for Agilent & Varian split liners (6.35mm ID)	450°C	10-pk.	20296
B) Graphite O-rings for Agilent & Varian splitless liners (6.5mm ID)	450°C	10-pk.	20298
C) 5mm Graphite Liner Seals for Varian 1078/1079 GCs	450°C	10-pk.	22683
D) Viton® O-Rings for Shimadzu 17A, 2010, and 2014 GCs	250°C	10-pk.	21477
E) Graphite O-Rings for Shimadzu 17A, 2010, & 2014 Split Liners	450°C	5-pk.	20243
E) Graphite O-Rings for Shimadzu 17A, 2010, & 2014 Splitless Liners	450°C	5-pk.	20244
F) Silicone O-Rings for PerkinElmer Auto SYS™ GCs	250°C	10-pk.	20262
G) Viton® O-Rings for PerkinElmer PSS	250°C	10-pk.	20366
H) Graphite Sealing Ring for TRACE™ and Focus SSL Instruments	450°C	ea.	21898
H) Graphite Sealing Rings for TRACE™ and Focus SSL Instruments	450°C	2-pk.	21899

Ferrules

Capillary Ferrules—For 1/16-Inch Compression-Type Fittings



ID	Fits Column ID	qty.	VespeL® / Graphite		
			VespeL®	Graphite	VespeL® / Graphite
	0.18/0.25/				
0.4mm	0.28mm	10-pk.	22214	20200	20211
0.5mm	0.32mm	10-pk.	22215	20201	20212

Compact Ferrules—For Agilent 5890/6890/6850 GCs



ID	Fits Column ID	qty.	Graphite	VespeL® / Graphite
0.4mm	0.25/0.28mm	10-pk.	20250	20238
0.5mm	0.32mm	10-pk.	21007	20248

50-pk. also available

Vials

Crimp-Top Vials, Snap Seal™ Style—12 x 32mm, 11mm Crimp

Description	100-pk.	1000-pk.
2.0mL Clear Glass Vial w/White Graduated Marking Spot	24383	24384
2.0mL Amber Glass Vial w/White Graduated Marking Spot	24385	24386
2.0mL Clear Glass Vial without Graduated Marking Spot	21152	21153

11 mm Aluminum Crimp Seals with Septa

Description	100-pk.	500-pk.	1000-pk.
Silver Seal, PTFE/Natural Rubber Septa	21174	—	21175
Blue Seal, PTFE/Red Rubber Septa	24351	—	24352
Mixed Colors, PTFE/Rubber Septa	—	21724	—
Silver Seal, PTFE/Silicone Septa	24359	—	24360
Mixed Colors, PTFE/Silicone Septa	—	21725	—
Silver Seal, PTFE/Silicone/PTFE Septa	24369	—	24370

Limited Volume Inserts for 2mL Crimp-Top & Short-Cap, Screw-Thread Vials



Glass, Limited Volume Insert with Bottom Spring

Description	100-pk.	1000-pk.
50µL Glass, Big Mouth, Bottom Spring	24513	21782
250µL Glass, Big Mouth Insert w/ Bottom Spring	21776	21777
250µL Glass, Big Mouth Insert w/ Glass Flange (Step™ Design)*	24516	21779
350µL Glass, Flat Bottom Insert	21780	24517
350µL Glass, Flat Bottom Insert w/ ID Ring	24692	24693
250µL Polypropylene, Big Mouth, Bottom Spring	24518	—
250µL Polypropylene, Big Mouth, Top Flange	24519	—
250µL Polypropylene, Big Mouth, No Spring	24520	—

*Not to be used with 9mm screw-thread vials.

Syringes

Standard MICROLITER Syringes for Agilent 7673, 7683, and 6850 Autosamplers Hamilton Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		Restek	
					Model	cat.#	qty.	cat.#
5µL	ASN	23s–26s	1.71"	Agilent	75	87994	6-pk.	24594
10µL	ASN	23s–26s	1.71"	Agilent	701	80391	6-pk.	24600

SGE Syringes

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		Restek	
					Model	cat.#	qty.	cat.#
5µL	F	23–26s	42mm	Cone	SK-5F-HP-0.63/0.47	001822	6-pk.	21214
10µL	F	23–26s	42mm	Cone	SK-10F-HP-0.63/0.47	002822	6-pk.	21215

Searching for a product?

www.restek.com



Deactivated Wool

Further improving our proprietary deactivation process, we make this deactivated wool more inert than our traditional fused silica wool, yet it is as flexible as our traditional borosilicate glass wool.

Description	qty.	cat.#
Deactivated Wool	10 grams	24324

Base-Deactivated Wool

Ideal for amines and other basic compounds.

Description	qty.	cat.#
Base-Deactivated Wool	10 grams	20999



Mini Wool Puller/Inserter

Insert and remove wool plugs easily. Order a spare pack so you'll always have one available.

Description	qty.	cat.#
Mini Wool Puller/Inserter	2-pk.	20114

Not recommended for use with double gooseneck liners.



No more burned fingers!

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

Septum Puller

- Keep several on hand in your laboratory—can be used in many different ways.
- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or fragments.



Description	qty.	cat.#
Septum Puller	ea.	20117

EZ No-Vent™ GC Column-Mass Spectrometer Connector

- Change GC/MS columns in minutes without venting—100µm transfer line throttles vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- Deactivated transfer line keeps analytes focused; high-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other “no-vent” fittings.



Description	qty.	cat.#
EZ No-Vent™ Connector Kit for Agilent 5971/5972 and 5973 GC/MS Kit includes: EZ No-Vent™ Connector, two 0.4mm ID ferrules for capillary column, two 0.4mm ID ferrules for transfer line, 100µm deactivated transfer line (3 ft.), column plug, column nut.	kit	21323
EZ No-Vent™ Connector Kit for Thermo Scientific Focus DSQ GC Mass Spectrometers Kit includes: EZ No-Vent™ Connector, two 0.4mm ID ferrules for capillary column, two 0.4mm ID ferrules for transfer line, 100µm deactivated transfer line (3 ft.), column plug, column nut.	kit	22454
EZ No-Vent™ Connector Kit for Varian Saturn 2000 Series MS Kit includes: EZ No-Vent™ Connector, two 0.4mm ID ferrules for capillary column, two 0.4mm ID ferrules for transfer line, 100µm deactivated transfer line (3 ft.), column plug, column nut.	kit	22423
Replacement ferrules for connecting capillary column to EZ No-Vent™ Connector: 0.4mm ID (Polyimide)	2-pk.	21015
0.5mm ID (Polyimide)	2-pk.	21016
Replacement ferrules for connecting transfer line to EZ No-Vent™ Connector: 0.4mm ID	2-pk.	21043
Replacement 100µm deactivated transfer line	3 ft.	21018
Replacement EZ No-Vent™ Column Nut	5-pk.	21900
Replacement EZ No-Vent™ Plug	2-pk.	21915
Open-End Wrenches (1/4" x 5/16")	2-pk.	20110
Open-End Wrenches (3/8" x 7/16")	2-pk.	22455

Restek Septa

- Precision molding assures consistent, accurate fit.
- Ready to use.
- Do not adhere to hot metal surfaces.
- Packaged in non-contaminating glass jars.

Septum Diameter	25-pk.	50-pk.	100-pk.
Thermolite® Septa			
5mm (3/16")	27120	27121	27122
6mm (1/4")	27123	27124	27125
7mm	27126	27127	27128
8mm	27129	27130	27131
9mm	27132	27133	27134
9.5mm (3/8")	27135	27136	27137
10mm	27138	27139	27140
11mm (7/16")	27141	27142	27143
11.5mm	27144	27145	27146
12.5mm (1/2")	27147	27148	27149
17mm	27150	27151	27152
Shimadzu Plug	27153	27154	27155
IceBlue™ Septa			
9mm		27156	27157
9.5mm (3/8")		27158	27159
10mm		27160	27161
11mm (7/16")		27162	27163
11.5mm		27164	27165
12.5mm (1/2")		27166	27167
17mm		27168	27169
Shimadzu Plug		27170	27171
BTO® Septa			
5mm CenterGuide™		27100	27101
6mm (1/4")		27102	27103
9mm CenterGuide™		27104	27105
9.5mm (3/8")		27106	27107
10mm		27108	27109
11mm (7/16") CenterGuide™		27110	27111
11.5mm CenterGuide™		27112	27113
12.5mm (1/2") CenterGuide™		27114	27115
17mm CenterGuide™		27116	27117
Shimadzu Plug		27118	27119

Dual Vespel® Ring Inlet Seals - Eliminates the need for a washer!

0.8mm ID Dual Vespel® Ring Inlet Seal	2-pk.	10-pk.
Gold-Plated	21240	21241
Siltek® Treated	21242	21243
Stainless Steel	21238	21239
1.2mm ID Dual Vespel® Ring Inlet Seal	2-pk.	10-pk.
Gold-Plated	21246	21247
Siltek® Treated	21248	21249
Stainless Steel	21244	21245

Replacement Inlet Seals with Washers

Single-Column Installation (0.8mm Opening)	2-pk.	10-pk.
Gold-Plated (similar to Agilent #18740-20885)	21317	21318
Siltek® Treated	21319	21320
Stainless Steel (similar to Agilent #18740-20880)	21315	21316
0.25/0.32mm ID Dual-Column Installation (1.2mm Opening)	2-pk.	10-pk.
Gold-Plated	21305	21306
Siltek® Treated	21307	21308
Stainless Steel	20390	20391
0.53mm ID Dual-Column Installation (1/16-inch opening)	2-pk.	10-pk.
Stainless Steel	20392	20393



Thermolite® Septa

- Usable to 340°C inlet temperature.
- Excellent puncturability.



IceBlue™ Septa

- Usable to 250°C inlet temperature.
- General-purpose septa.
- Excellent puncturability.
- Ideal for SPME.



BTO® Septa

- Usable to 400°C inlet temperature.
- CenterGuide™ design—requires less force for initial penetration.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC/MS applications.



HANDY septum size chart

Instrument	Septum Diameter (mm)
Agilent (HP)	
5880A, 5890, 6890, 6850, PTV	11
5700, 5880	9.5/10
On-Column Injection	5
Thermo Scientific	
TRACE™ GC	17
GCQ w/TRACE™, PTV	17
8000 series	17
Finnigan (TMQ)	
GC 9001	9.5
GCQ	9.5
QCQ™	9.5
TRACE™ 2000	9.5
Gow-Mac	
6890 series	11
All other models	9.5
PerkinElmer	
Sigma series	11
900,990	11
8000 series	11
Auto SYS™	11
Auto SYS™ XL	11
Pye/Unicam	
All models	7
Shimadzu	
All models	Plug
SRI	
All models	Plug
Tracor	
540	11.5
550,560	9.5
220,222	12.5
Varian	
Injector type:	
Packed column	9.5/10
Split/splitless	
1078/1079	10/11
1177	9
1075/1077	11

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Allure, CarboBlack, Crossbond, EZ No-Vent, Hydroguard, IceBlue, Press-Tight, Rtx, Rxi, SeCure, SilcoSmooth, Silcosteel, Siltek, Thermolite, Trident.

Other Trademarks:

API 3200 (Applied Biosystems), BTO, CenterGuide (Chromatography Research Supplies, Inc.), Vespel, Viton (E.I. du Pont de Nemours & Co., Inc.), QCQ (Finnigan Corp.), Snap Seal, Step (J.G. Finneran Associates, Inc.), Opti-Cap (Jour Research), Auto SYS (Perkin-Elmer), Shop Vac (Shop-Vac Corp.), TRACE (Thermo Scientific), Carbowax (Union Carbide Corp), PEEK (Victrex plc), WISP (Waters Associates, Inc.).

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