



# LC AND LC/MS

Your Essential Resource for Columns & Supplies



The Measure of Confidence



Agilent Technologies

## LC and LC/MS Troubleshooting

### HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Baseline disturbance at void time	Positive/negative – Difference in refractive index of injection solvent	Use mobile phase for sample solvent
Detector leaks	Plugged inlet frit	Replace seals/gaskets
Drifting baseline	Positive direction – Contaminant buildup/elution	Flush column, clean up sample, use pure solvents
	Positive/negative – Difference in refractive index of injection solvent	Use mobile phase for sample solvent
	Negative direction (gradient) – Absorbance of "A" mobile phase solvent	Use non-absorbing or HPLC-grade or better solvent
	Positive direction (gradient) – Absorbance of "B" mobile phase solvent	Use non-absorbing or HPLC-grade or better solvent
	Random – Temperature changes	Insulate column and tubing
	Random – Temperature changes	Thermostat column and tubing
	Wavy or undulating – Temperature changes in room	Monitor room temperature and control
Ghost peaks	Peaks from previous injection	Flush column to remove contaminants
	Contamination	Sample cleanup or pre-fractionation
	Unknown interferences in samples	Sample cleanup or pre-fractionation
	Ion-pair – Upset equilibrium	Prepare sample in actual mobile phase to minimize disturbance
	Peptide mapping – Oxidation of TFA	Prepare fresh daily; use anti-oxidant
	Reversed-phase – Contaminated water	Check suitability of water by running different amount through reversed-phase column and measure peak height with elution; use HPLC grade solvents
	Spikes – Bubbles in solvent	De-gas solvents
High column backpressure	Column blockage, adsorbed sample	Better sample cleanup; use guard column
	Mobile phase viscosity too high	Use lower viscosity solvents or higher temperature
	Particle size too small	Use larger $d_p$ packing
	Plugged inlet frit	Replace column
	Plugged inlet frit	Reverse solvent flow
Leaks	Subtle – White powder at fitting/loose fitting	Tighten fittings, cut tubing, or replace ferrules
Leaks, injection valve	Catastrophic – Worn valve rotor	Replace rotor in valve
Leaks, column or other fittings	Catastrophic – Loose fittings	Tighten or replace fittings
Leak, pump	Catastrophic – Pump seal failure	Replace pump seal

(Continued)

## HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Negative peaks	RI detector – solute refractive index less than solvent	No problem; reverse polarity to make positive
	UV detector – solute absorbance less than mobile phase	Use mobile phase with lower UV absorbance; do not recycle solvent too long
Noisy baseline	Random – Contaminant buildup	Flush column; clean up sample; use HPLC-grade solvent
	Continuous – Detector lamp problem	Replace detector lamp
	Occasional – External electrical interference	Use voltage stabilizer for LC system
Peak doubling	Sample volume too large	Reduce the volume e.g. by half and re-inject
	Injection solvent too strong	Use weaker injection solvent or mobile phase
	Blocked frit	Replace and use 0.5 µm porosity in-line filter
	Column void or channeling	Replace column; for some columns, fill in void with packing
	Unswept injector flowpath	Replace injector rotor
	Void at head of column	Replace column, top off column with packing
	Column overloaded with sample	Use higher capacity stationary phase Increase column diameter Decrease sample size
	Single peak – interfering components	Sample cleanup; pre-fractionation
Peak tailing	Beginning of peak doubling	See "peak doubling"
	Unswept dead volumes	Minimize number of connections Ensure injector seal is tight Ensure fittings are properly seated
	Basic compounds – Silanol interactions	Choose endcapped bonded phase Switch to polymeric phase
	Basic substances – Silanol interactions	Use stronger mobile phase or add competing base (e.g. TMA)
	Silica-based – Column degradation	Use specialty column; polymeric column or sterically protected

(Continued)

## HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Peaks are broad	Injection volume too large	Decrease solvent strength of injection solvent to focus solute
	Peak dispersion in injector valve	Introduce air bubble in front/back of sample to decrease dispersion
	Sampling rate of data system too slow	Increase frequency of sampling
	Slow detector time constant	Adjust time constant to match peak width
	Mobile phase viscosity too high	Increase column temperature
	Detector cell volume too large	Use smallest possible cell volume with no heat exchanger in system
	Injector volume too large	Decrease injection volume
	Long retention times	Use gradient elution or stronger mobile phase
Pressure fluctuation	Leaky check valve	Replace check valve
	Pump seal leaks	Replace pump seals
	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
Pressure increasing	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
	Water/organic systems – buffer precipitation	Test buffer-organic mixtures; ensure compatibility
Retention beyond total permeation volume	Size exclusion – Specific interactions	Add mobile phase modifiers or change solvent
Retention times changing	Column temperature varying	Thermostat column; insulate column; ensure lab temperature constant
	Equilibration time insufficient with gradient run or changes in isocratic mobile phase	Make sure at least 10 column volumes pass through column after solvent change or gradient conclusion
	Selective evaporation of mobile phase component	Less vigorous helium sparging; keep solvent reservoirs covered; prepare fresh mobile phase
	Buffer capacity insufficient	Use >20 mM concentration of buffer
	Inconsistent on-line mobile phase mixing	Ensure gradient system delivering constant composition; check vs. manual prep of mobile phase
	Contamination buildup	Occasionally flush column with strong solvent to remove contaminants
	First few injections – Adsorption on active sites	Condition column by initial injection of concentrated sample

(Continued)

## HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Retention times decreasing	Flow rate increasing	Check pump to make sure correct; if not, reset
	Column overloaded with sample	Decrease sample size
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
Retention times increasing	Flow rate is slowing	Fix leaks in liquid lines, replace pump seals, check for pump cavitation or air bubbles
	Active sites on silica packing	Use mobile phase modifier
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
	Mobile phase composition changing	Make sure mobile phase container is covered
	Active sites on silica packing	Add competing base to mobile phase
	Active sites on silica packing	Use higher coverage packing for stationary phase
Sensitivity problem	Peaks are outside of linear range of detector	Dilute/concentrate to bring into linear region
	First few sample injections – Absorption of sample in loop or column	Condition loop/column with concentrated sample
	Autosampler flow lines blocked	Check flow and make sure there are no blockages
	Injector sample loop underfilled	Make sure that loop is overfilled with sample
	Sample-related losses during preparation	Use internal standard during sample prep; optimize sample prep method
Slow column equilibration times (ion-pairing)	Equilibration time slow for long-chain ion-pairing reagents	Use shorter alkyl chain ion-pair reagent

## LC/MS Troubleshooting

Symptom Type	Solution
No peaks	Spray from the nebulizer
	Make sure capillary voltage is set correctly
	Make sure LC/MSD is tuned correctly
	Make sure LC/MSD pressures are within normal ranges
	Check drying gas flow and temperature
	Make sure fragmentor is set correctly
Poor mass accuracy	Recalibrate the mass axis
	Make sure ions used for tuning span mass range of sample ions and show strong stable signals
Low signal	Check the solution chemistry; make sure solvent is appropriate for sample
	Make sure sample is fresh and has been stored correctly
	Make sure LC/MSD is tuned correctly
	Check the nebulizer condition
	Clean the capillary entrance
Unstable signal	Check the capillary for damage and contamination
	Make sure drying gas flow and temperature are correct for the solvent flow
	Make sure solvent is thoroughly degassed
	Make sure LC backpressure is steady; this indicates a steady solvent flow

(Continued)

## LC/MS Troubleshooting

Symptom Type	Solution
High spectral noise	Use appropriate mass filter values
	Check spray shape; nebulizer may be damaged or set incorrectly
	Make sure drying gas flow and temperature are correct for the solvent flow
	Make sure solvent is thoroughly degassed
	Make sure LC backpressure is steady; this indicates a steady solvent flow
Droplets, not spray, exiting the nebulizer	If you are using water as part of the mobile phase, make sure it is de-ionized (> 18 MΩ cm)
	Make sure nebulizing gas pressure is set high enough for the LC flow
	Check position of needle in nebulizer
	Stop solvent flow and remove nebulizer assembly
No flow	Examine end of nebulizer for damage
	Make sure LC is on and there is sufficient solvent in correct bottle
	Check for LC error messages
	Check for blockages
	Repair or replace any blocked components
	Check for leaks
Undesired fragmentation	Make sure MS stream selector valve is set to LC to MSD
	(APCI vs. Electrospray)
	APCI temperature is too high
	Fragmentor voltage is set too high

# BioPharmaceutical Applications

**NEW!**

## Protein digest analysis

**Column:** ZORBAX 300SB-C18  
858750-902  
2.1 x 100 mm, 1.8 µm

**Mobile Phase:** A: 0.1% TFA in water  
B: 0.085% TFA in ACN

**Flow Rate:** 0.5 mL/min

**Pressure:** 640 bar

**Gradient:** 2% B 1 min, 2-45% B 8.8 min,  
45-95% B 0.2 min, 95% B 2 min,  
98-2% B 0.2 min, 2% B 1.8 min

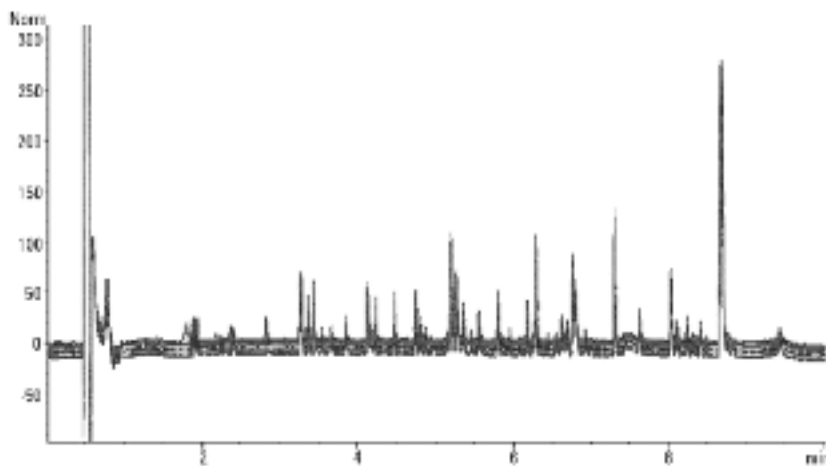
**Temperature:** 50 °C

**Detector:** Agilent 1290 Infinity LC

**Injection:** 5 µL

**Sample:** Protein digest

**Sample Conc:** 1 mg/mL



Overlaid chromatograms of 30 runs of a protein digest on an Agilent ZORBAX RRHD 300SB-C18 column.



**NEW!**

**Analysis of oxidized insulin chains**

**Column:** ZORBAX RRHD 300SB-C18  
857750-902  
2.1 x 50 mm, 1.8 µm

**Mobile Phase:** A: 0.1% TFA in water  
B: 80% ACN + 0.01% TFA in water

**Flow Rate:** 1.0 mL/min

**Pressure:** 650-700 bar

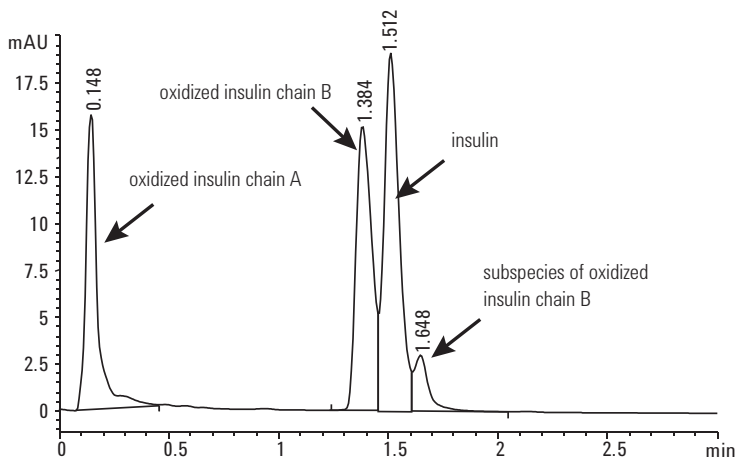
**Gradient:** 33-50% B, 0-4 min; 33% B, 4-5 min

**Detector:** UV, 280 nm  
Agilent 1290 Infinity LC

**Sample:** Insulin, oxidized insulin chain A and chain B from bovine pancreas (Sigma Aldrich, St. Louis, MO)

**Sample Conc:** 1 mg/mL

**Injection:** 2 µL



Insulin and oxidized insulin A and B chains are resolved quickly but insulin and oxidized chain B often co-elute.

**NEW!**

**Fast separation of recombinant human erythropoietin**

**Column:** ZORBAX RRHD 300SB-C18  
857750-902  
2.1 x 50 mm, 1.8 µm

**Mobile Phase:** A: 0.1% TFA in water  
B: 0.01% TFA in ACN

**Flow Rate:** 1.0 mL/min

**Pressure:** 650 bar

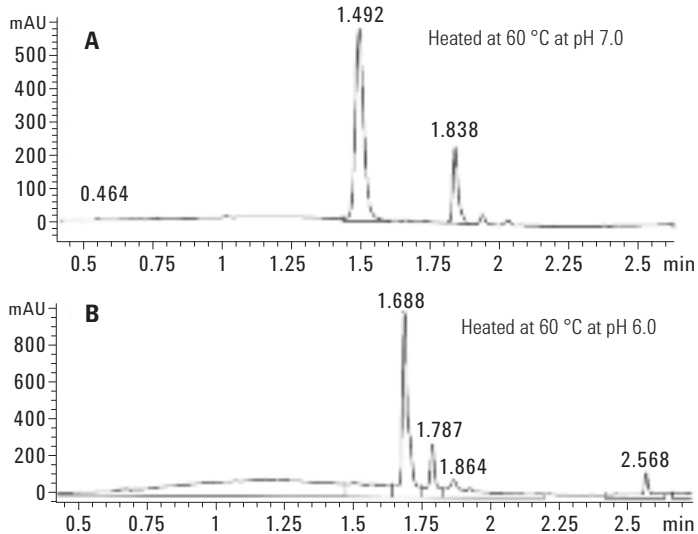
**Gradient:** 5 to 100% B solvent from 0 to 2.5 min

**Detector:** UV, 280 nm  
Agilent 1290 Infinity LC

**Sample:** Recombinant human EPO protein (rEPO)

**Sample Conc:** 1.0 mg/mL

**Injection:** 3 µL



Heat-treated rEPO protein are well resolved by the Agilent ZORBAX RRHD 300SB-C18 column. The column separated these heat-treated rEPO proteins.

**NEW!**
**Separation optimization for ultra fast analysis of reduced and alkylated monoclonal antibody**

**Column:** ZORBAX RRHD 300SB-C8  
 858750-906  
 2.1 x 100 mm, 1.8  $\mu$ m

**Mobile Phase:** (Various)  
 A: H<sub>2</sub>O + 0.1% TFA (v/v)  
 B: n-propanol:ACN:H<sub>2</sub>O (80:10:10) + 0.1% TFA (v/v)

**Injection:** 1-3  $\mu$ L

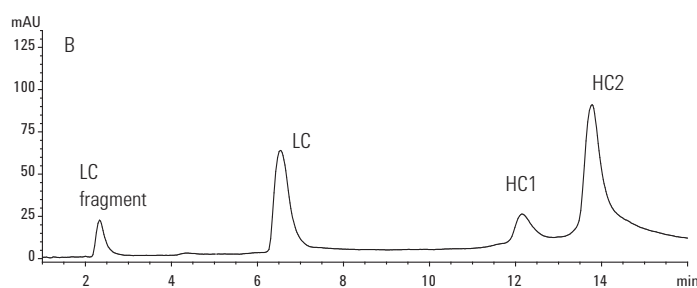
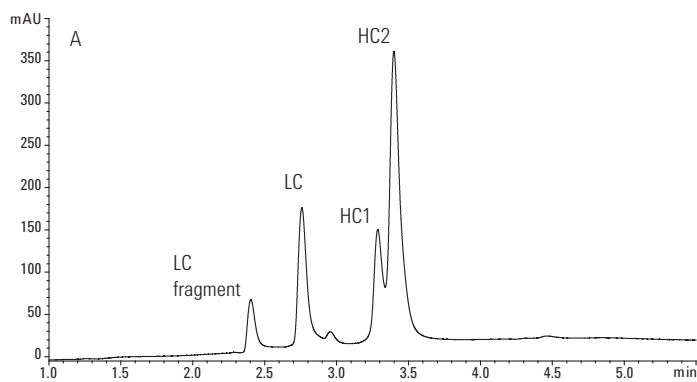
**Flow Rate:** 0.5 mL/min

**Gradient:** Multi-segmented  
 A (optimized for speed): 0 min-20% B, 3 min-35% B,  
 4 min-40% B, 5 min-40% B, 5.1 min-90% B,  
 5.5 min-90% B, 6 min-25% B  
 B (optimized for resolution): 0 min-25% B,  
 15 min-32% B, 16 min-32% B, 17 min-90% B,  
 17.5 min-90% B, 18 min-25% B

**Temperature:** 75 °C

**Detector:** UV, 225 nm  
 Agilent 1290 Infinity LC

For consecutive chromatographic runs, a 2-minute post run was added to re-equilibrate the column.



Comparison of two optimized gradients for the ultra fast separation of reduced and alkylated monoclonal antibodies on an Agilent ZORBAX RRHD 300SB-C8 column. The top panel details a rapid separation of the light and heavy chain variants in a shortened run time of less than 4 minutes. The bottom panel displays complete baseline resolution of the two heavy chain variants during a longer runtime using a shallower gradient profile. Both separations were performed at 75 °C and completed with a fast 90% 1-propanol wash step (UV not shown).

**NEW!****Column reproducibility – 200 injections of reduced monoclonal antibody using an Agilent ZORBAX RRHD 300SB-C3 column**

**Column:** Agilent ZORBAX RRHD 300SB-C3  
858750-909  
2.1 x 100 mm, 1.8 µm

Temperature: 75 °C  
Detector: UV, 280  
Agilent 1290 Infinity LC

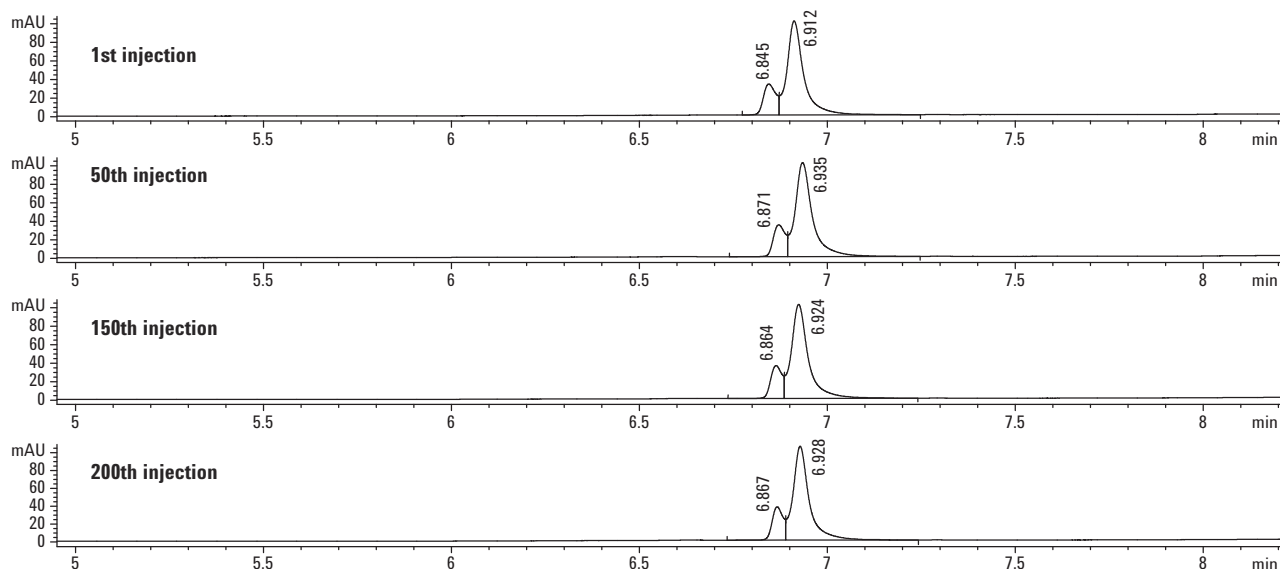
Mobile Phase: A: 0.1% TFA in water  
B: 80% n-propyl alcohol, 10% ACN,  
9.9% water and 0.1% TFA

Sample: Reduced monoclonal antibody (IgG1) (1.0 mg/mL) -  
Agilent BL05 IgG1

Flow Rate: 0.4 mL/min

Injection: 2 µL

Gradient: 0 min-1% B, 2 min-20% B, 5 min-50% B,  
7 min-50% B, 8.0 min-90% B,  
8.3 min-1% hold for 2 min



Reduced and alkylated mAb profiling during 200 repeated injections.



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!**

**Gradient optimizations for ultra fast analysis of reduced monoclonal antibody**

**Column:** Agilent ZORBAX RRHD 300SB-Diphenyl 858750-944 2.1 x 100 mm, 1.8 µm

**Mobile Phase:** A: 0.1% TFA in water  
B: 80% propyl alcohol, 10% ACN, 9.9% water and 0.1% TFA

**Flow Rate:** 0.5 mL/min

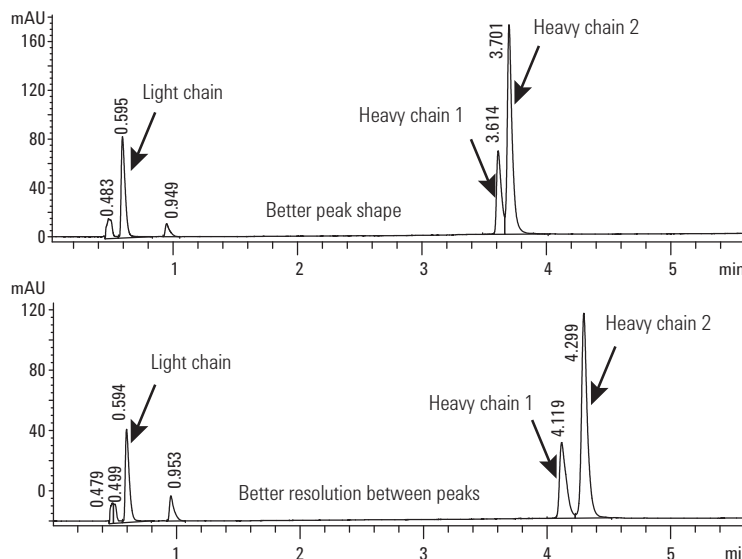
**Gradient:** 1st condition: 0 min-1% B, 2 min-20% B, 5 min-70% B  
2nd condition: 0 min-1% B, 2 min-20% B, 5 min-50% B

**Temperature:** 74 °C

**Detector:** UV, 280 nm

**Sample:** Reduced monoclonal antibody (IgG1) (1.0 mg/mL) - BioCreative IgG1

**Injection:** 2 µL



Comparison of two ultra-fast separations of reduced monoclonal antibodies was achieved on a Agilent ZORBAX RRHD 300SB-Diphenyl under different optimized conditions. The top panel separation delivered narrow peak widths with shorter retention times. The bottom panel separation displays higher resolution between the two heavy chain peaks, but with less efficiency.



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!****Ultra high speed and high resolution  
of intact monoclonal antibodies**

**Column:** Agilent ZORBAX RRHD 300-Diphenyl  
858750-944  
2.1 x 100 mm, 1.8  $\mu$ m

**Mobile Phase:** A: 0.1% TFA in water  
B: 80% n-propyl alcohol,  
10% ACN,  
9.9% water and 0.1% TFA

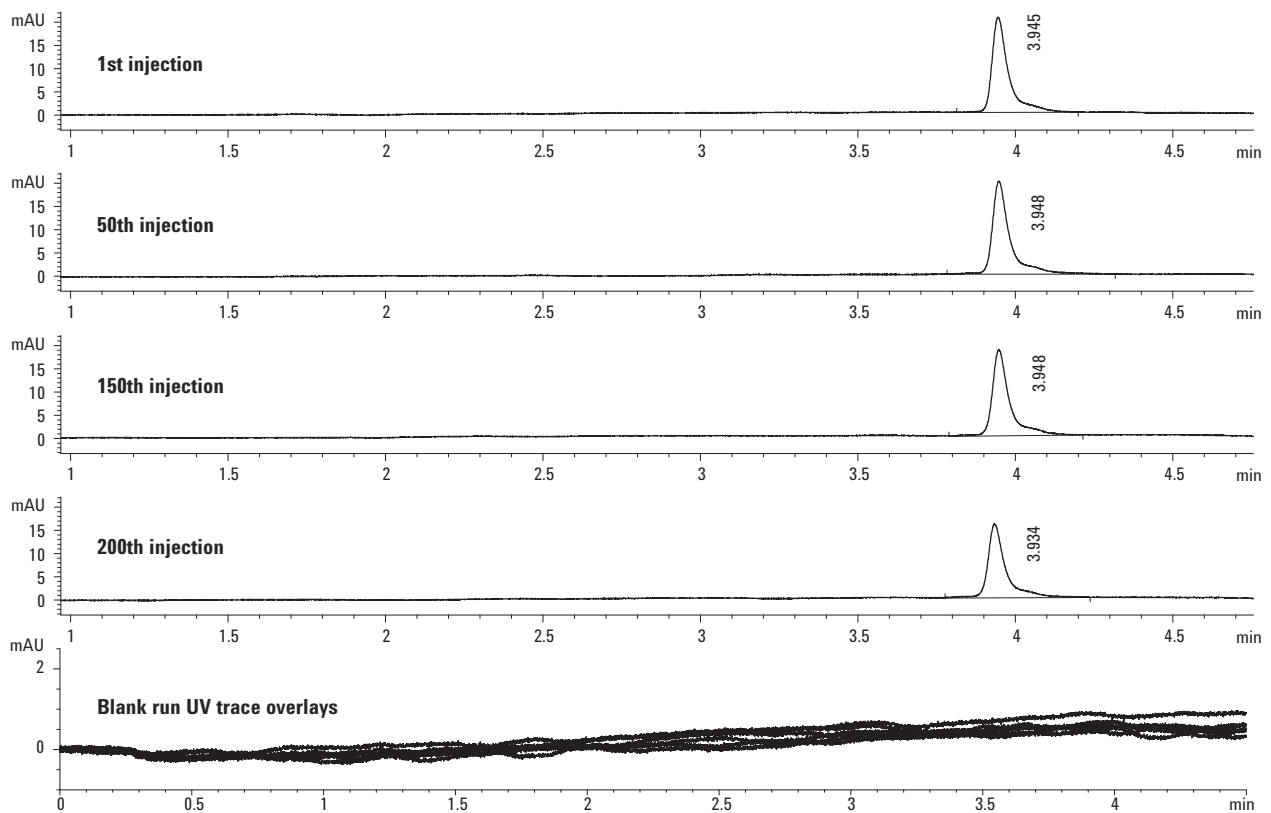
**Flow Rate:** 1.0 mL/min

**Temperature:** 74  $^{\circ}$ C

**Detector:** UV, 280 nm

**Sample:** Monoclonal antibody (IgG1) (1.0 mg/mL) -  
BioCreative IgG1 and Agilent Standard IgG1

**Injection:** 1  $\mu$ L



Details of intact mAb profiling during 200 repeated injections. Intact mAb separations shown were collected at 1, 50, 150, and 200th run intervals. The bottom panel displays 5 UV blank run trace overlays collected every 20th run during the column evaluation (**note:** overlay traces are scaled to 2 mAU).

**NEW!**

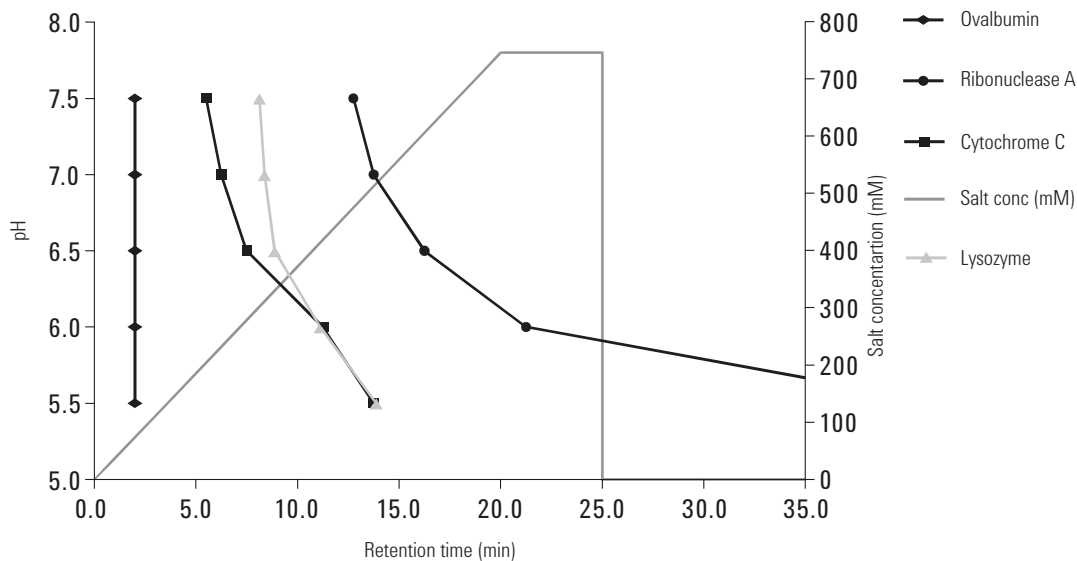
**Optimizing protein separations with Agilent weak cation-exchange columns**

**Column:** Agilent Bio WCX, stainless steel 5190-2453  
4.6 x 250 mm, 10 µm

**Column:** Agilent Bio WCX, stainless steel 5190-2445  
4.6 x 250 mm, 5 µm

**Mobile Phase:** A: water  
B: 1.6 M NaCl  
C: 40.0 mM NaH<sub>2</sub>PO<sub>4</sub>  
D: 40.0 mM Na<sub>2</sub>HPO<sub>4</sub>  
By combining predetermined proportions of C and D, 20 mM buffer solutions at the desired pH range were produced (proportions determined using Buffer Advisor software)

**Flow Rate:** 1.0 mL/min  
**Gradient:** 0 to 50% B, 0 to 20 min  
50% B, 20 to 25 min  
0% B, 25 to 35 min  
**Temperature:** Ambient  
**Detector:** UV, 220 nm  
Agilent 1260 Infinity Bio-inert Quaternary LC  
**Sample:** Ovalbumin, Ribonuclease A, Cytochrome c, Lysozyme  
**Sample Conc:** 2 mg/mL (in 20 mM sodium phosphate buffer, pH 6.0)



Effect of pH on retention time of protein standards using a Agilent Bio WCX column.

**NEW!****Improved resolution with smaller particle size with Agilent weak cation-exchange columns**

**Column:** Agilent Bio WCX, stainless steel  
**5190-2453**  
**4.6 x 250 mm, 10  $\mu$ m**

**Column:** Agilent Bio WCX, stainless steel  
**5190-2445**  
**4.6 x 250 mm, 5  $\mu$ m**

**Mobile Phase:** A: water  
 B: 1.6 M NaCl  
 C: 40.0 mM  $\text{NaH}_2\text{PO}_4$   
 D: 40.0 mM  $\text{Na}_2\text{HPO}_4$   
 By combining predetermined proportions of C and D, 20 mM buffer solutions at the desired pH range were produced (proportions determined using Buffer Advisor software)

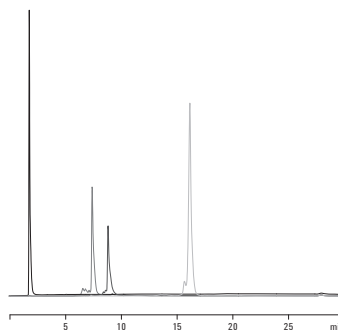
**Gradient:** 0 to 50% B, 0 to 20 min  
 50% B, 20 to 25 min  
 0% B, 25 to 35 min

**Temperature:** Ambient

**Detector:** UV, 220 nm  
 Agilent 1260 Infinity Bio-inert Quaternary LC

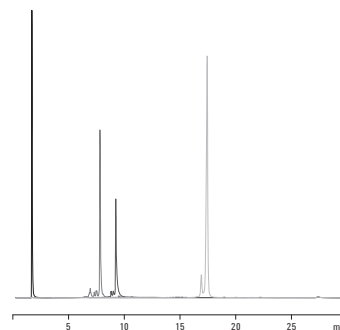
**Sample:** Ovalbumin, Ribonuclease A, Cytochrome c, Lysozyme

**Sample Conc:** 2 mg/mL (in 20 mM sodium phosphate buffer, pH 6.0)



Separation of protein standards at pH 6.5 using an Agilent Bio WCX, NP10 column.

1. Ovalbumin
2. Ribonuclease A
3. Cytochrome c
4. Lysozyme



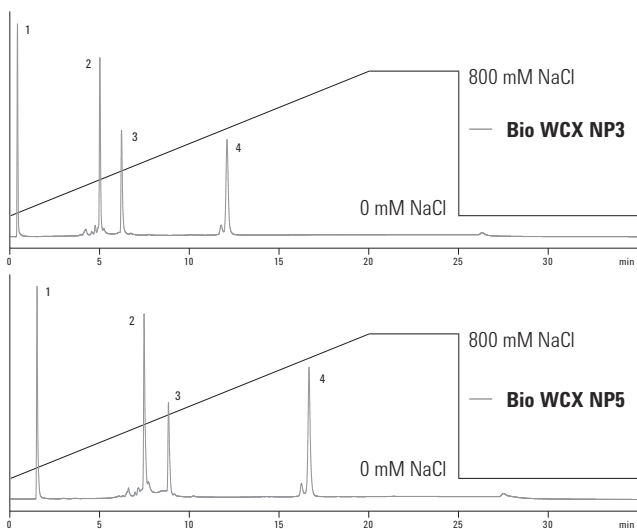
Separation of protein standards at pH 6.5 using an Agilent Bio WCX, NP5 column.



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!**

**Faster separations using Agilent weak cation-exchange columns**



Protein separation on Agilent Bio WCX NP5 versus Agilent Bio WCX NP3.

**Column:** Agilent Bio WCX, stainless steel  
5190-2445  
4.6 x 250 mm, 5 µm

**Column:** Agilent Bio WCX, stainless steel  
5190-2443  
4.6 x 50 mm, 3 µm

**Column:** Agilent Bio WCX, stainless steel  
5190-2441  
4.6 x 50 mm, 1.7 µm

**Mobile Phase:** A: 20 mM sodium phosphate, pH 6.5  
B: A + 1.6 M NaCl

**Flow Rate:** 1.0 mL/min

**Gradient:** 0 to 50% B

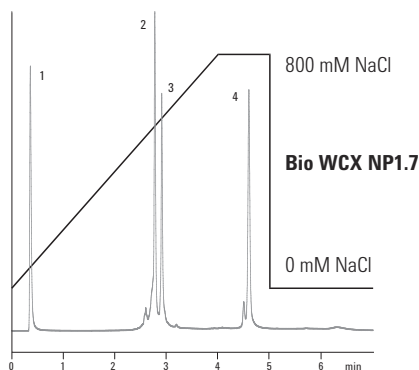
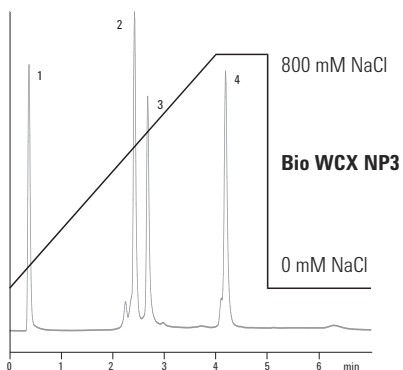
**Temperature:** Ambient

**Detector:** UV, 220 nm  
Agilent 1260 Infinity Bio-inert Quaternary LC

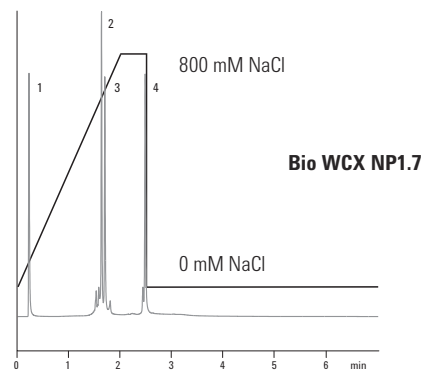
**Sample:** Ovalbumin, Ribonuclease A, Cytochrome c, Lysozyme

**Sample Conc:** 0.5 mg/mL

1. Ovalbumin
2. Ribonuclease A
3. Cytochrome c
4. Lysozyme



Comparison of Agilent Bio WCX NP3 versus Agilent Bio WCX NP1.7 (flow rate 1.0 mL/min).



Agilent Bio WCX NP1.7 for protein separations under 3 minutes (flow rate 1.7 mL/min).



**NEW!****pH gradient elution for improved separation of monoclonal antibody charged variants**

**Column:** Bio MAb, stainless steel  
5190-2405  
4.6 x 250 mm, 5  $\mu$ m

**Mobile Phase:** A: water  
B: 1.6 M NaCl  
C: 100 mM  $\text{NaH}_2\text{PO}_4$   
D: 100 mM  $\text{Na}_2\text{HPO}_4$   
By combining predetermined proportions of C and D, buffer solutions at the desired pH range were produced at the selected buffer strengths.

**Flow Rate:** 1.0 mL/min

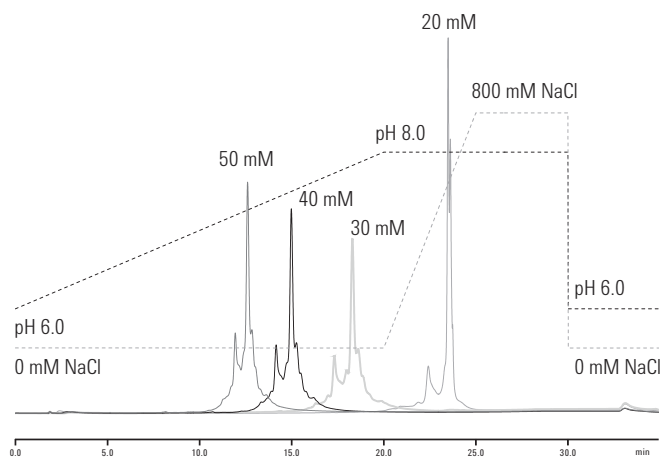
**Gradient:** pH 6.0 to 8.0, 0 to 20 minutes  
0 to 800 mM NaCl, 20 to 25 minutes  
800 mM NaCl, 25 to 30 minutes

**Temperature:** Ambient

**Detector:** UV, 220 nm  
Agilent 1260 Infinity Bio-inert Quaternary LC

**Sample:** IgG monoclonal antibody

**Sample Conc:** 2 mg/mL (in 20 mM sodium phosphate buffer, pH 6.0)



Chromatograms of IgG monoclonal antibody at different ionic strengths.



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!**

**Separation of recombinant human erythropoietin (rEPO) using Agilent Bio SEC-3**

**Column:** Bio SEC-3, 100Å  
5190-2503  
4.6 x 300 mm, 3 µm

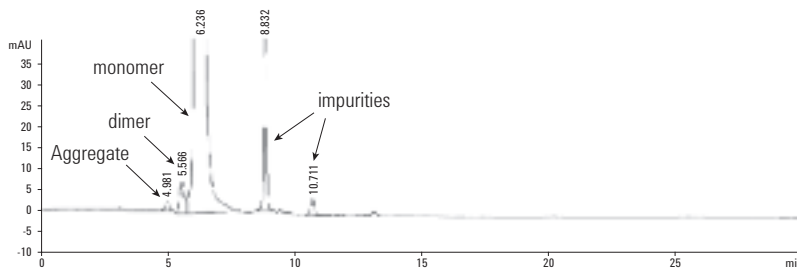
**Mobile Phase:** 150 mM sodium phosphate buffer, pH 7.0

**Flow Rate:** 0.35 mL/min

**Detector:** UV, 225 nm  
Agilent 1260 Infinity Bio-inert Quaternary LC

**Sample:** Recombinant human EPO protein (rEPO)

**Sample Conc:** 1.0 mg/mL



**Consistent ion-exchange MAb separation**

**Column:** Bio MAb, PEEK  
5190-2411  
2.1 x 250 mm, 5 µm

**Buffer:** A: Sodium phosphate buffer, 20 mM  
B: Buffer A + 400 mM NaCl

**Gradient:** 15-35% Buffer B from 0-30 min

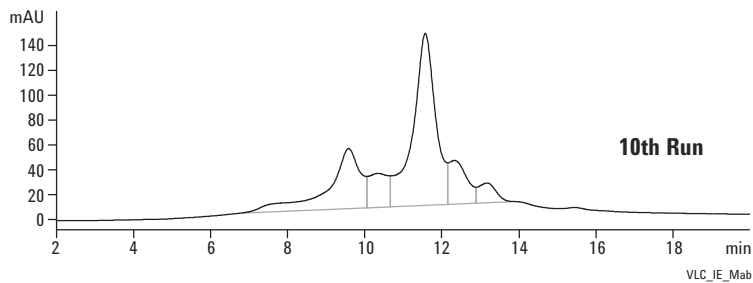
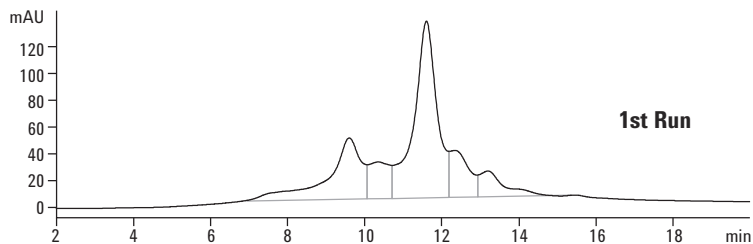
**Flow Rate:** 0.65 mL/min

**Sample:** CHO-humanized MAb, 1 mg/mL

**Injection:** 2.5 µL

**Detector:** UV, 220 nm

**Temperature:** Ambient



**Intact MAb monomer and dimer separation**

**Column:** Bio SEC-3, 300Å  
5190-2511  
7.8 x 300 mm, 3 µm

Buffer: Sodium phosphate buffer, pH 7.0, 150 mM

Gradient: 0-100% Buffer A from 0-30 min

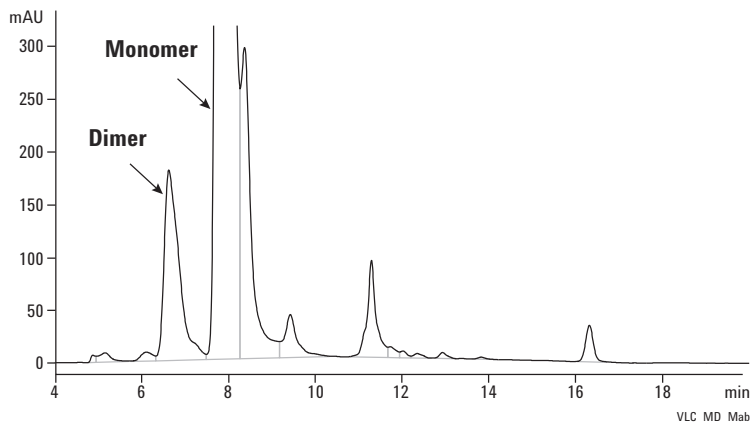
Flow Rate: 1.0 mL/min

Sample: CHO-humanized MAb, 5 mg/mL – intact

Injection: 5 µL

Detector: UV, 220 nm

Temperature: Ambient



**Separation of heated, stressed MAb**

**Column:** Bio SEC-3, 300Å  
5190-2511  
7.8 x 300 mm, 3 µm

Buffer: Sodium phosphate buffer, pH 7.0,  
150 mM +150 mM sodium sulfate

Gradient: 0-100% Buffer A from 0-30 min

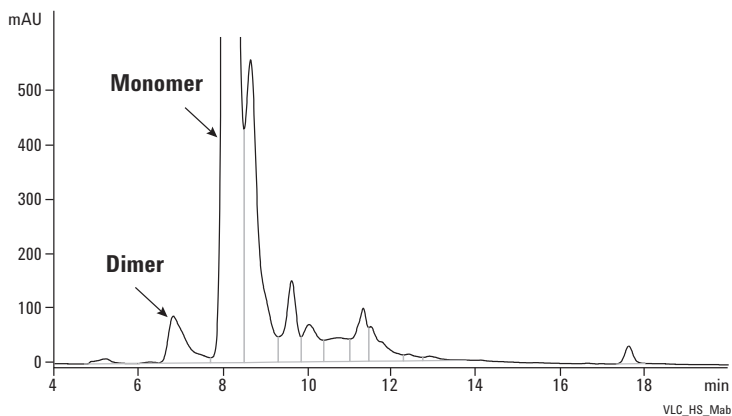
Flow Rate: 1.0 mL/min

Sample: CHO-humanized MAb, 5 mg/mL – stressed at 60 °C

Injection: 5 µL

Detector: UV, 220 nm

Temperature: Ambient



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Nucleosides, purines and pyrimidines**

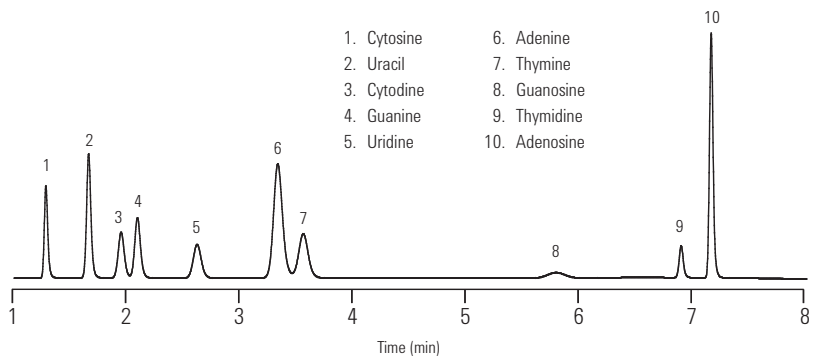
**Column:** Eclipse Plus Phenyl Hexyl  
 959993-912  
 4.6 x 150 mm, 5 µm

Mobile Phase: 1% MeOH: 99% 20 mM Ammonium Acetate, pH 4.5

Flow Rate: 1 mL/min

Detector: UV, 254 nm

- 1. Cytosine
- 2. Uracil
- 3. Cytidine
- 4. Guanine
- 5. Uridine
- 6. Adenine
- 7. Thymine
- 8. Guanosine
- 9. Thymidine
- 10. Adenosine



nucleosides

**Amino acid standard separation on Eclipse Plus C18**

**Column:** Eclipse Plus C18  
 959763-902  
 2.1 x 150 mm, 3.5 µm

Mobile Phase: A: 10 mM Na<sub>2</sub>HPO<sub>4</sub>, 10 mM Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>, 0.5 mM NaN<sub>3</sub>, pH 8.2  
 B: acetonitrile: methanol: water (45:45:10) (v/v/v)

Flow Rate: 0.42 mL/min

Temperature: 40 °C

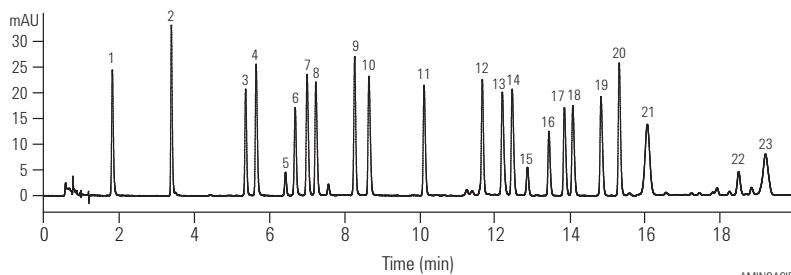
Detector: UV, 338 nm, then switch to 280 nm at 15.7 min

Sample: 900 pmol Amino Acids with extended Amino Acids and Internal Standards (500 pmol)

Derivatization: Automated, online, OPA / FMOC

- 1. ASP
- 2. GLU
- 3. ASN
- 4. SER
- 5. GLN
- 6. HIS
- 7. GLY
- 8. THR
- 9. ARG
- 10. ALA
- 11. TYR
- 12. CY2
- 13. VAL
- 14. MET
- 15. NVA
- 16. TRP
- 17. PHE
- 18. ILE
- 19. LEU
- 20. LYS
- 21. HYP
- 22. SAR
- 23. PRO

Gradient	
Time (min)	% B
0	2
0.5	2
20	57
20.1	100
23.5	100
23.6	2
25	stop



AMINOACID

**Antibodies: Fast separation of IgM and IgG antibodies**

**Column:** ZORBAX GF-250  
884973-701  
4.6 x 250 mm, 4 µm

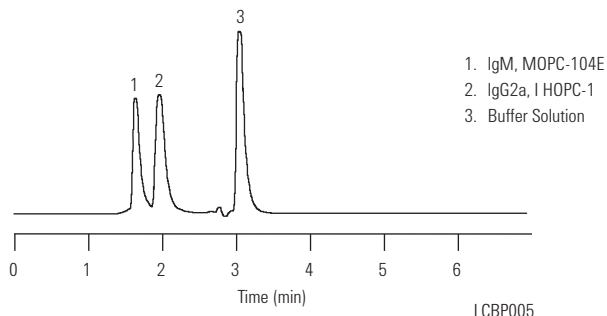
Mobile Phase: 200 mM Sodium Phosphate (pH 7), 0.01% Azide

Flow Rate: 0.94 mL/min

Temperature: Ambient

Detector: UV, 230 nm

Sample: 2.5 µL (1 mg/mL)



**Glycosylated proteins:  
Large molecules on Poroshell 300SB-C18 and 300SB-C8**

**Column A:** Poroshell 300SB-C18  
661750-902  
1.0 x 75 mm, 5 µm

**Column B:** Poroshell 300SB-C8  
661750-906  
1.0 x 75 mm, 5 µm

**Column C:** ZORBAX 300SB-C18  
865630-902  
1.0 x 50 mm, 3.5 µm

Mobile Phase: A: 0.1% TFA in H<sub>2</sub>O  
B: 0.07% TFA in ACN

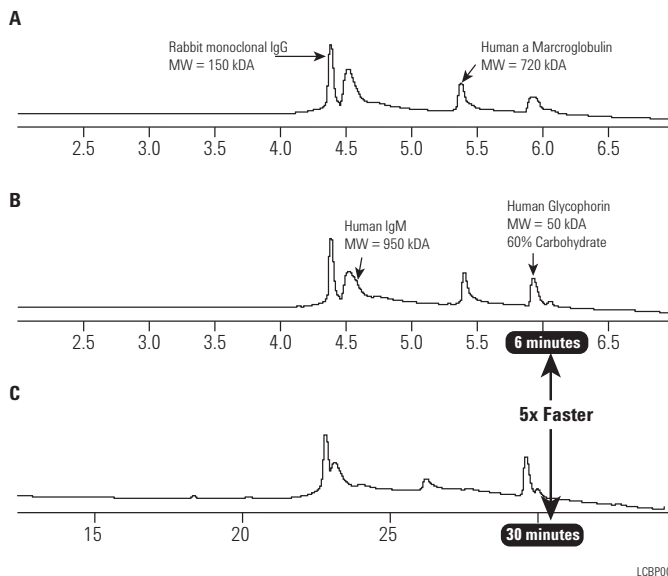
Flow Rate: A, B: 0.454 mL/min  
C: 0.071 mL/min

Gradient: A, B: 0 min 5% B  
10 min 100% B  
C: 0 min 5% B  
50 min 100% B

Temperature: 70 °C

Detector: DAD 212 nm, 1.7 µL flow cell, <0.01 min peak width

Sample: Large glycosylated proteins



Courtesy of:  
Novartis AG, Basel.  
Dr. Kurt Forrer  
Patrik Roethlisberger



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**HSA tryptic digest  
on ZORBAX Rapid Resolution HT 1.8  $\mu$ m**

**Column A:** ZORBAX SB-C18  
883700-922  
2.1 x 150 mm, 5  $\mu$ m

**Column B:** ZORBAX SB-C18  
822700-902  
2.1 x 50 mm, 1.8  $\mu$ m

Mobile Phase: A: Water w/0.1% TFA  
B: ACN w/0.1% TFA

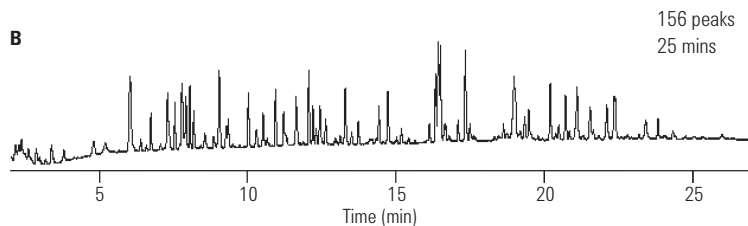
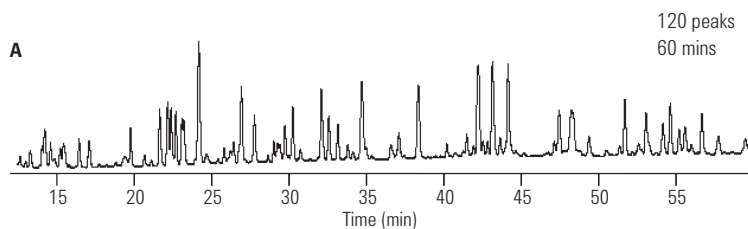
Flow Rate: A: 0.2 mL/min  
B: 0.5 mL/min

Gradient: A: 2 to 50% B in 70min  
B: 2 to 50% B in 30min

Temperature: 50 °C

Detector: UV, 214 nm

Sample: HSA tryptic digest, 8  $\mu$ L of 15 pmol/ $\mu$ L  
(120 pmol on column)



LCBP013

**Human serum: Low abundance protein isolation  
and identification from 1-D gel band by LC/MS**

**Column:** ZORBAX 300SB-C18  
**Trap:** 0.3 x 5 mm, 5  $\mu$ m, 5065-9913  
**Analytical:** 0.3 x 150 mm,  
5  $\mu$ m, 5064-8263

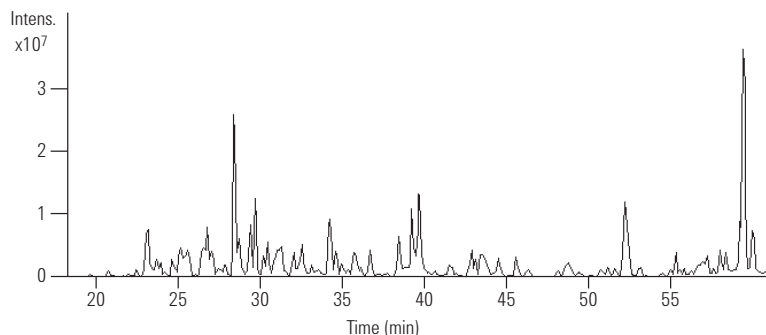
Mobile Phase: A: Water + 0.1% Formic acid  
B: Acetonitrile + 0.1% Formic acid

Flow Rate: 6  $\mu$ L/min

Gradient: 0 min 3% B  
5 min 3% B (loading)  
50 min 45% B  
52 min 80% B  
57 min 80% B  
60 min 3% B

Sample: Band from 1-D in gel digest

**Base Peak Chromatogram**



LCBP014

**Proteins Identified**

1.  $\alpha$ -1-Antichymotrypsin
2. Antithrombin-III Precursor
3. Complement Factor B Precursor

Sample Preparation of Human Serum:  
Major serum proteins removed using Multiple Affinity Removal  
Column: 4.6 x 100 mm, P/N 5185-5985  
Followed by 1-D gel digest

**Monoclonal IgG1 chains:  
Separation on Poroshell 300SB-C8**

**Column:** Poroshell 300SB-C8  
660750-906  
2.1 x 75 mm, 5 µm

**Mobile Phase:** A: 90% water: 10% ACN + 3 mL/L of MW 300 PEG  
B: 10% water: 90% ACN + 3 mL/L of MW 300 PEG

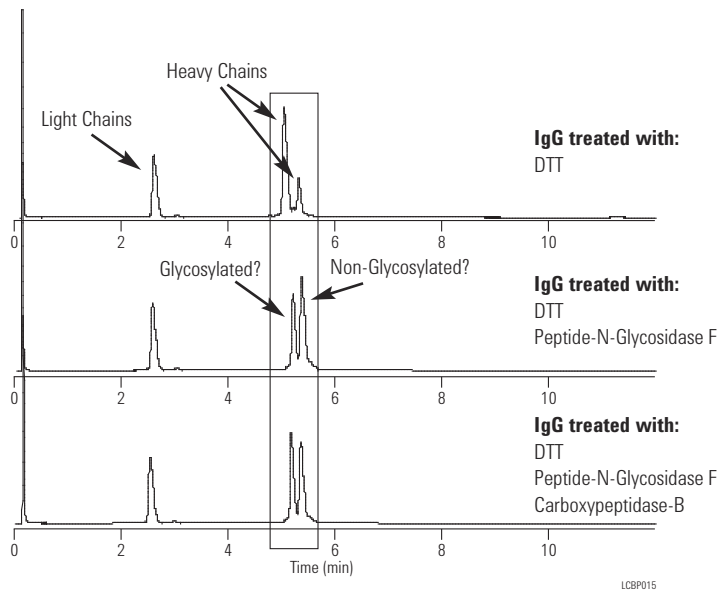
**Flow Rate:** 1.0 mL/min

**Gradient:** 0 min 25% B  
10 min 40% B  
10.1 min 25% B  
12 min 25% B

**Temperature:** 70 °C

**Sample:** Monoclonal IgG1

*Courtesy of:  
Novartis AG, Basel.  
Dr. Kurt Forrer  
Patrik Roethlisberger*



LCBP015

**Use ZORBAX Extend-C18  
for alternate selectivity at high pH**

**Column:** ZORBAX Extend-C18  
773700-902  
2.1 x 150 mm, 5 µm

**Mobile Phase:** A: 0.1% TFA in Water  
B: 0.085% TFA in 80% ACN

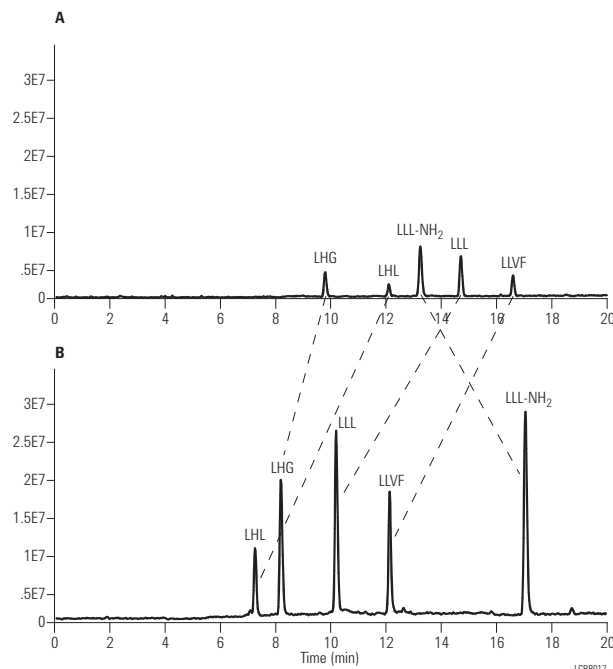
A: 20 mM NH<sub>4</sub>OH in Water  
B: 20 mM NH<sub>4</sub>OH in 80% ACN

**Flow Rate:** 0.25 mL/min

**Gradient:** 5-60% B in 20 min

**Temperature:** 25 °C

**MS Conditions:** Pos. Ion ESI-VI 70V, Vcap 4.5 kV  
N<sub>2</sub> – 35 psi, 12 L/min, 300 °C  
4 µL (50 ng each peptide)



LCBP017

The Extend column can be used for high pH separations of peptides. At high and low pH, very different selectivity can result. Just by changing pH, a complementary method can be developed and it is possible to determine if all peaks are resolved. The Extend column can be used at high and low pH, so the complementary separation can be investigated with one column. Better MS sensitivity for this sample is also achieved at high pH.

**Nucleosides: Separation of deoxy and ribonucleosides**

**Column:** ZORBAX SB-C3  
883975-909  
4.6 x 150 mm, 5 µm

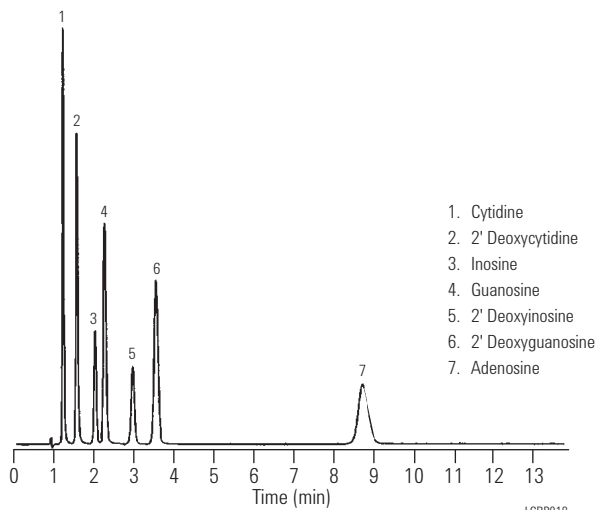
Mobile Phase: 4 mM Ammonium Phosphate (pH 4.0 with Phosphoric Acid)

Flow Rate: 2.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: 2 µL (1.6 µg each)



**Nucleotides: Separation of mononucleotides**

**Column:** ZORBAX SAX  
880952-703  
4.6 x 250 mm, 5 µm

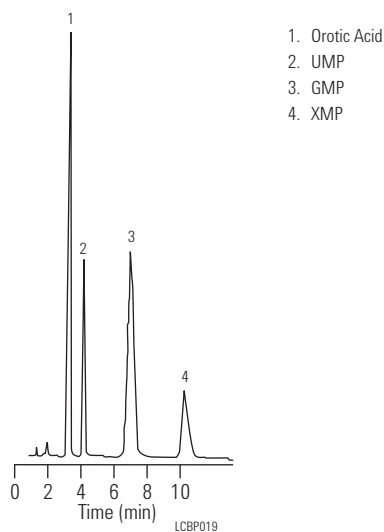
Mobile Phase: 0.1 M NH<sub>4</sub>H<sub>2</sub>PO<sub>4</sub>

Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Orotic Acid, UMP, GMP, XMP





**Separation of basic peptides on Bonus-RP versus traditional Alkyl phase**

**Column A: ZORBAX Bonus-RP  
883668-901  
4.6 x 150 mm, 5 µm**

**Column B: Alkyl C8**

**Mobile Phase:** A: 0.010 M ammonium phosphate, pH 7/0.050 M sodium perchlorate  
B: 0.010 M ammonium phosphate/0.050 M sodium perchlorate in 50% ACN

**Flow Rate:** 1.0 mL/min

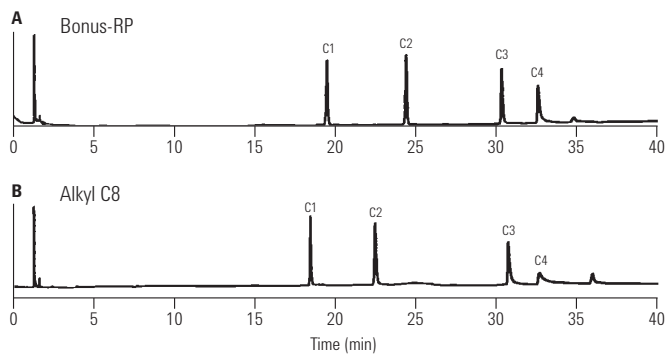
**Gradient:** 0-100% B in 50 min

**Temperature:** 40 °C

**Detector:** 215 nm

**Sample:** Basic 11-residue peptides with net +1, +2, +3, +4 positive charges at neutral pH

C1: Ac-Gly-Gly-Gly-Leu-Gly-Gly-Ala-Gly-Gly-Leu-Lys-amide  
C2: Ac-Lys-Tyr-Gly-Leu-Gly-Gly-Ala-Gly-Gly-Leu-Lys-amide  
C3: Ac-Gly-Gly-Ala-Leu-Lys-Ala-Leu-Lys-Gly-Leu-Lys-amide  
C4: Ac-Lys-Tyr-Ala-Leu-Lys-Ala-Leu-Lys-Gly-Leu-Lys-amide



LCBP020

**Peptides: Effect of TFA concentration**

**Column: ZORBAX 300SB-C8  
883995-906  
4.6 x 150 mm, 5 µm**

**Mobile Phase:** A: Water and TFA  
B: ACN and TFA

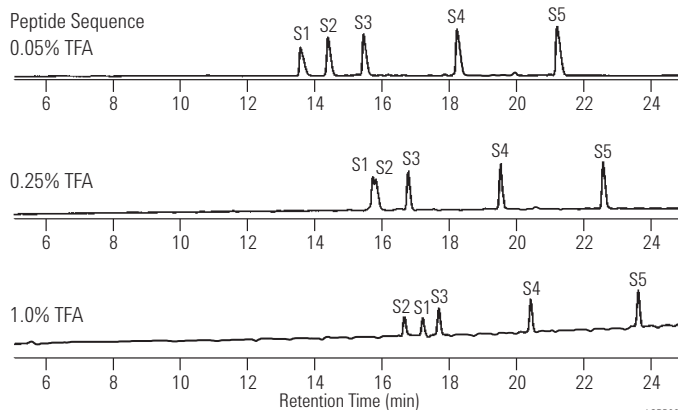
**Flow Rate:** 1.0 mL/min

**Gradient:** 0 min 0% B  
30 min 30% B

**Temperature:** 40 °C

**Detector:** UV, 254 nm

**Sample:** Peptide Standards S1-S5, decapeptides differing slightly in hydrophobicity, 6 µL



LCBP021

**Exploiting chemical stability – TFA concentration**

**Column:** PLRP-S 100Å  
PL1512-5500  
4.6 x 250 mm, 5 µm

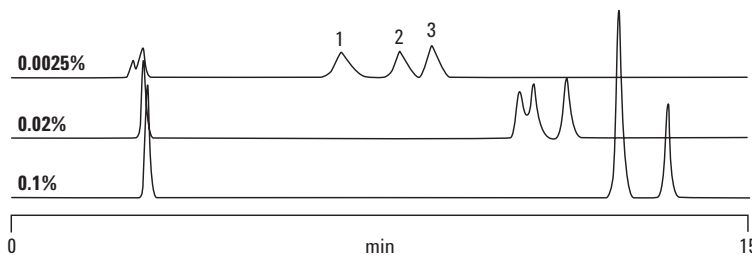
**Mobile Phase:** A: TFA (various %) in water  
B: TFA (various %) in ACN

**Gradient:** Linear 12-40% B in 15 min

**Flow Rate:** 1.0 mL/min

**Detector:** ELS (neb=75 °C, evap=85 °C, gas=1.0 SLM)

1. Angiotensin III
2. Angiotensin II
3. Angiotensin I



VLC0068

**Peptides:  
Separation of Antiotensins I, II, III  
with TFA and NH<sub>4</sub>OH**

**Column:** ZORBAX Extend-C18  
773700-902  
2.1 x 150 mm, 5 µm

**Mobile Phase:** A: Acidic Conditions  
A: 0.1% TFA in water  
B: 0.085% TFA in 80% ACN

B: Basic Conditions  
A: 10 mM NH<sub>4</sub>OH in water  
B: 10 mM NH<sub>4</sub>OH in 80% ACN

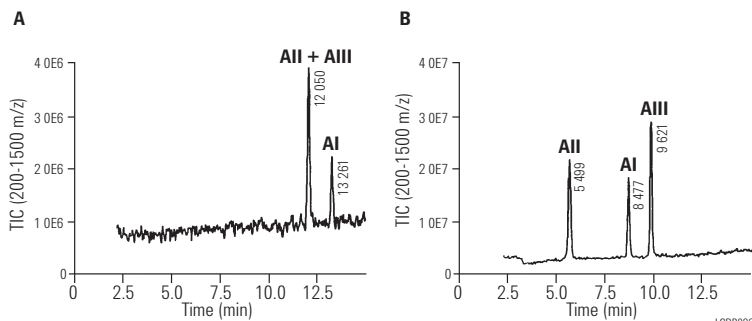
**Flow Rate:** 0.2 mL/min

**Gradient:** 15-50% B in 15 min

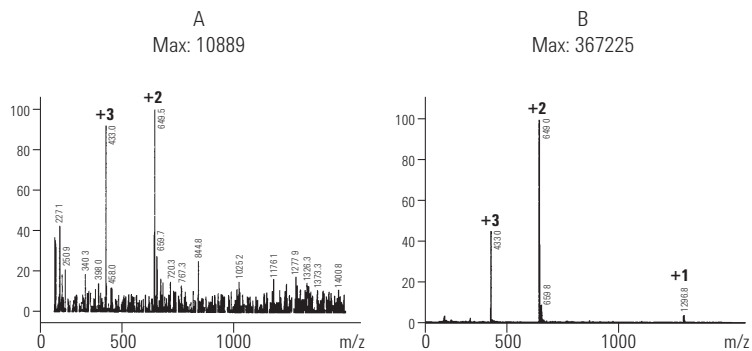
**Temperature:** 35 °C

**MS Conditions:** Pos. Ion ESI - Vf 70V, Vcap 4.5 kV  
N<sub>2</sub>-35 psi, 12 L/min, 325 °C

**Sample:** 2.5 µL sample (50 pmol each)



LCBP022



LCBP023

**Peptides/proteins:  
Equivalent gradient separations**

**Column:** ZORBAX 300SB-C8  
883995-906  
4.6 x 150 mm, 5 µm

**Column:** ZORBAX 300SB-C8  
883750-906  
2.1 x 150 mm, 5 µm

**Mobile Phase:** A: 95% Water: 5% ACN with 0.1% TFA  
B: 5% Water: 95% ACN with 0.085% TFA

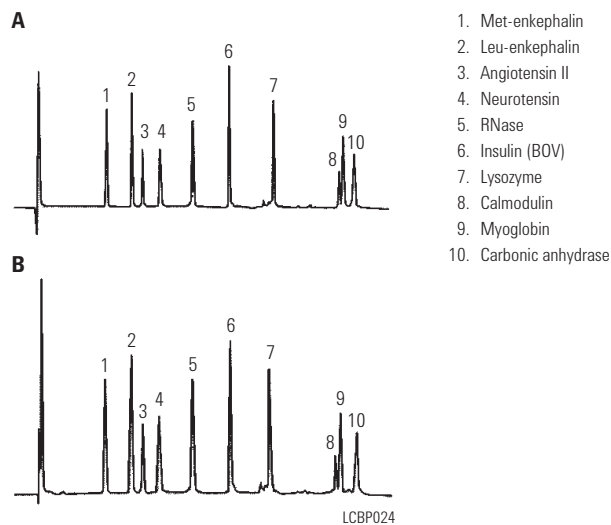
**Flow Rate:** A: Analytical  
1 mL/min  
B: Narrow Bore  
0.2 mL/min

**Gradient:** 10-60% B in 30 min

**Temperature:** 35 °C

**Detector:** UV, 215 nm

**Sample:** 10 µL injection, concentration 2-6 µg



**Peptides/proteins:  
Effect of elevated temperature**

**Column:** ZORBAX 300SB-C3  
883995-909  
4.6 x 150 mm, 5 µm

**Mobile Phase:** A: 5:95 ACN:Water with 0.10% TFA (v/v%)  
B: 95:5 ACN:Water with 0.085% TFA (v/v%)

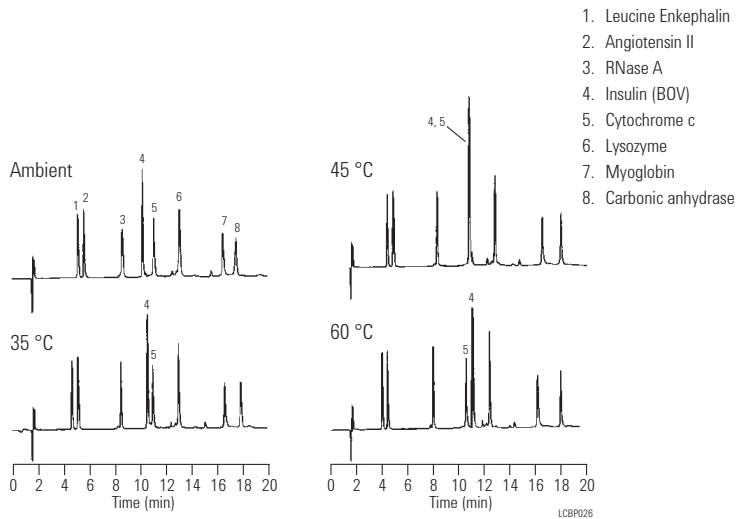
**Flow Rate:** 1.0 mL/min

**Gradient:** 15-53% in 20 min, post time 12 min

**Temperature:** Ambient – 60 °C

**Detector:** UV, 215 nm

**Sample:** Polypeptides



**Separation of polypeptides in under 1 minute**

**Column:** Poroshell 300SB-C18  
660750-902  
2.1 x 75 mm, 5 µm

**Mobile Phase:** A: 0.1% TFA, H<sub>2</sub>O  
B: 0.07% TFA, ACN

**Flow Rate:** 3 mL/min

**Gradient:** 0-100% B in 1.33 min

**Temperature:** 70 °C

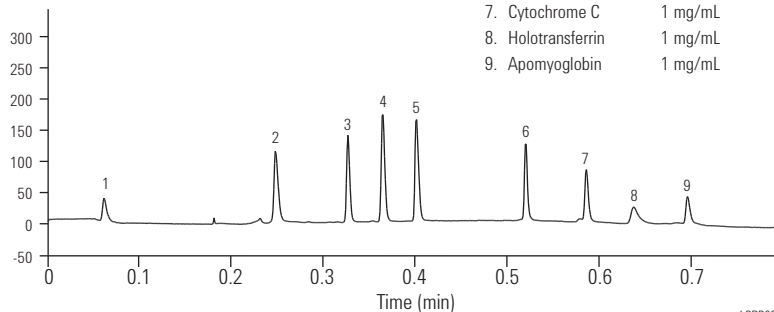
**Detector:** DAD 215/16 nm, ref = 310/10 nm

**Sample:** Peptides/proteins, 0.5 µL

Mixer bypassed with P/N G1312-67301; Loop-bypass program

**Sample (peptides/proteins)**

- 1. gly-tyr 0.125 mg/mL
- 2. Val-tyr-val 0.5 mg/mL
- 3. Met-enkephalin 0.5 mg/mL
- 4. Leu-enkephalin 0.5 mg/mL
- 5. Angiotensin II 0.5 mg/mL
- 6. RNase A 1 mg/mL
- 7. Cytochrome C 1 mg/mL
- 8. Holotransferrin 1 mg/mL
- 9. Apomyoglobin 1 mg/mL



LCBP030

**Fast, high-resolution separation of peptides and proteins with Poroshell 300SB-C18**

**Column:** Poroshell 300SB-C18  
660750-902  
2.1 x 75 mm, 5 µm

**Mobile Phase:** A: 0.1% TFA  
B: 0.07% TFA in ACN

**Flow Rate:** 3.0 mL/min (360 bar pressure)

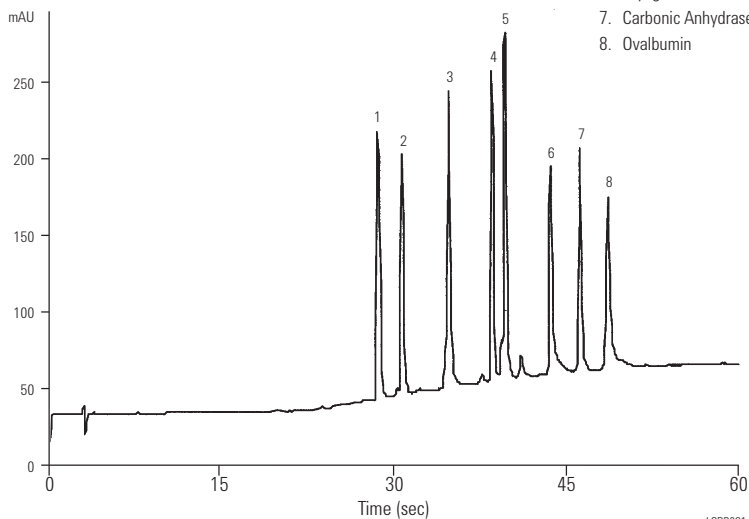
**Gradient:** 5-100% B in 1.0 min

**Temperature:** 70 °C

**Detector:** UV, 215 nm

Spaces between solutes indicate good peak capacity for rapidly separating complex samples.

- 1. Angiotensin II
- 2. Neurotensin
- 3. RNase
- 4. Insulin
- 5. Lysozyme
- 6. Myoglobin
- 7. Carbonic Anhydrase
- 8. Ovalbumin



LCBP031

**Peptide RP-HPLC/ESI-MS  
using NH<sub>4</sub>OH mobile phase  
yields both positive and negative ion spectra**

**Column:** ZORBAX Extend-C18  
773700-902  
2.1 x 150 mm, 5 μm

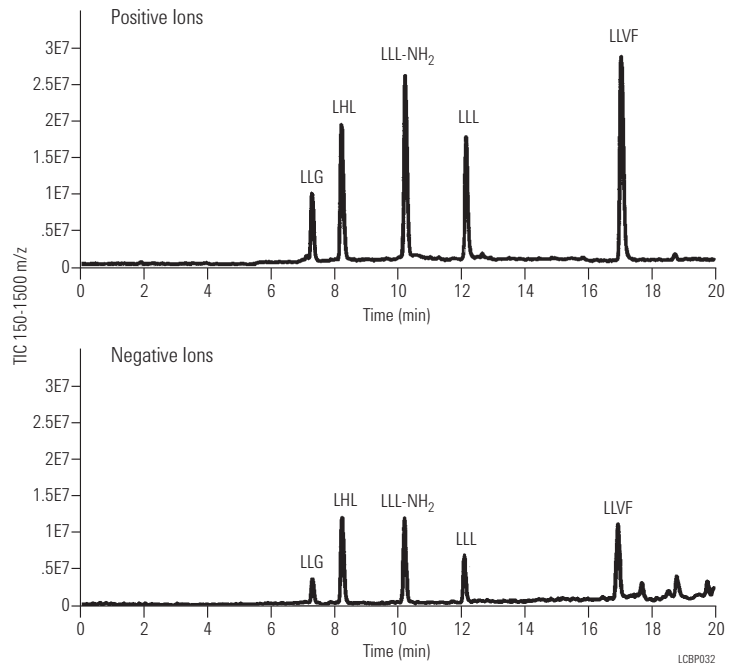
Flow Rate: 0.25 mL/min

Gradient: 5-60% B in 20 min

Temperature: 25 °C

MS Conditions: Pos. Ion ESI – Vt 70 V, Vcap 4.5 kV,  
N<sub>2</sub> – 35 psi, 12 L/min, 300 °C  
TIC 150-1500 m/z

Sample: 4 μL (50 ng each peptide)



**Comparison of Aβ peptide RP-HPLC  
separations at low and high pH**

**Column:** ZORBAX Extend-C18  
773700-902  
2.1 x 150 mm, 5 μm

Mobile Phase: A: 0.1% TFA in water  
B: 0.085% TFA in 80% ACN

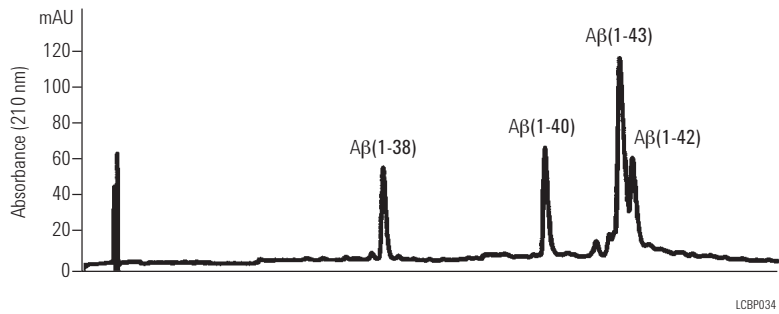
Flow Rate: 0.25 mL/min

Gradient: 29-41% B in 30 min

Temperature: 80 °C

Detector: UV, 210 nm

Sample: 5 μL sample (100 pmol each)



Mobile Phase: A: 20 mM NH<sub>4</sub>OH in water  
B: 20 mM NH<sub>4</sub>OH in 80% ACN

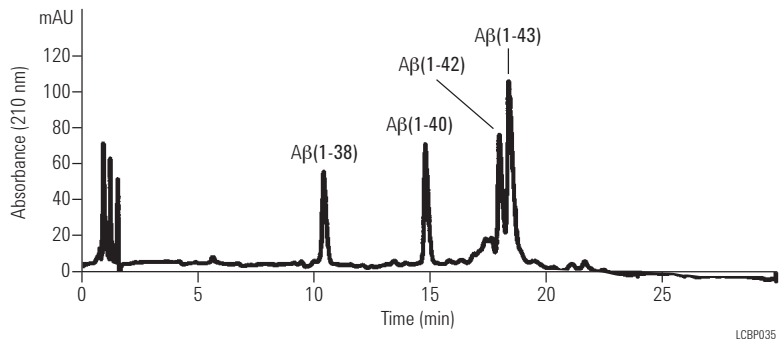
Flow Rate: 0.25 mL/min

Gradient: 26-38% B in 30 min

Temperature: 25 °C

Detector: UV, 210 nm

Sample: 5 μL sample (100 pmol each)



**Selectivity comparison of TFA and NH<sub>4</sub>OH for peptide RP-HPLC\ESI-MS analysis**

**Column:** ZORBAX Extend-C18  
773700-902  
2.1 x 150 mm, 5 μm

**Mobile Phase:** TFA Conditions:  
A: 0.1% TFA in water  
B: 0.085% TFA in 80% ACN  
NH<sub>4</sub>OH Conditions:  
A: 20 mM NH<sub>4</sub>OH in water  
B: 20 mM NH<sub>4</sub>OH in 80% ACN

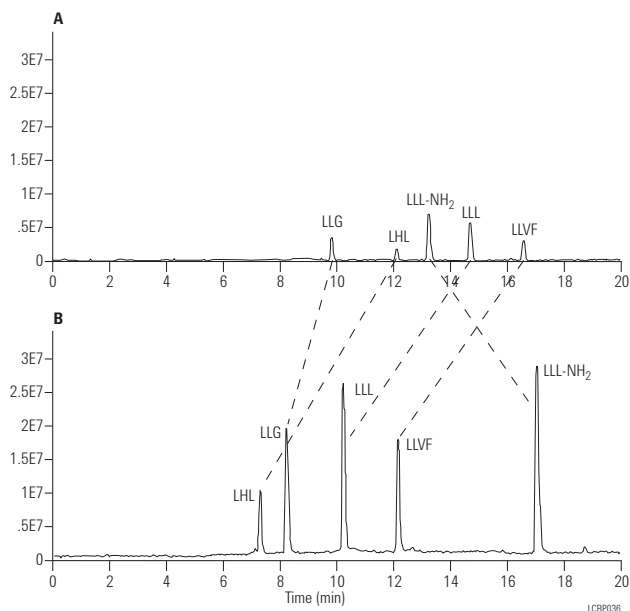
**Flow Rate:** 0.25 mL/min

**Gradient:** 5-60% B in 20 min

**Temperature:** 25 °C

**MS Conditions:** Pos. Ion ESI – V<sub>f</sub> 70V, V<sub>cap</sub> 4.5 kV,  
N<sub>2</sub> – 35 psi, 12 L/min., 300 °C  
TIC 150-1500 m/z

**Sample:** 4 μL (50 ng each peptide)



**Peptide phosphorylation sites LC and LC/MS using Capillary LC columns**

**Column:** ZORBAX 300SB-C18  
5064-8268  
0.5 x 150 mm, 3.5 μm

**Mobile Phase:** A: Water + 0.1% Formic acid  
B: Acetonitrile + 0.1% Formic acid

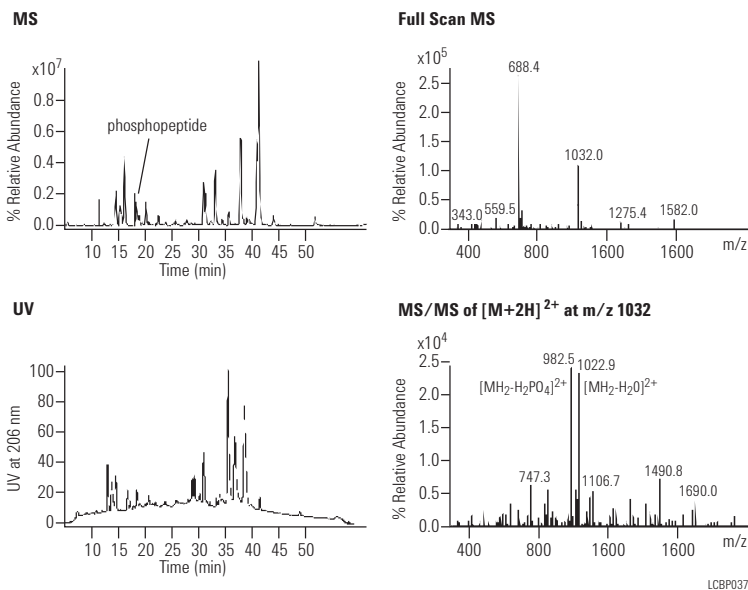
**Flow Rate:** 5.5 μL/min

**Gradient:** 5-55% B in 50 min, to  
85% B from 55-57 min

**Detector:** UV, 206 nm

**MS Conditions:** LC/MS: Pos. Ion ESI with LC/MSD trap  
V<sub>cap</sub>: 4000 V  
Drying gas flow: 7 L/min  
Drying gas temperature: 250 °C  
Nebulizer: 15 psi  
Capillary Exit Volt: 50 V Max  
Accum Time: 300 ms  
Total Averages: 3  
Isolation Width: 3 m/z  
Frag Amplitude: 1.0 V

**Sample:** Beta case in digest, 100 nL (4 pmol)



**Proteins: Effect of bonded phase, RP**

**Column A:** ZORBAX 300SB-C8  
883995-906  
4.6 x 150 mm, 5 µm

**Column B:** ZORBAX 300SB-CN  
883995-905  
4.6 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in Water,  
B: 0.1% TFA in 50/50 ACN/Water

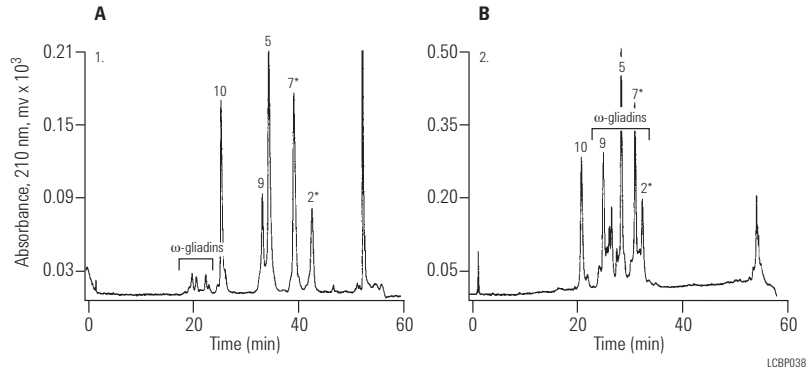
Flow Rate: 1.0 mL/min

Gradient: 1. 46-96% B in 60 min 23-48% ACN  
2. 50-86% B in 60 min 25-43% ACN

Temperature: 50 °C

Detector: UV, 210 nm

Sample: Wheat proteins, including w-gliadins



**Proteins: Effect of bonded phase**

**Column A:** ZORBAX RRHD 300SB-C18  
883995-902  
4.6 x 150 mm, 5 µm

**Column B:** ZORBAX 300SB-C8  
883995-906  
4.6 x 150 mm, 5 µm

**Column C:** ZORBAX 300SB-C3  
883995-909  
4.6 x 150 mm, 5 µm

**Column D:** ZORBAX 300SB-CN  
883995-905  
4.6 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in H<sub>2</sub>O  
B: 0.09% TFA in 80% ACN/20% Water

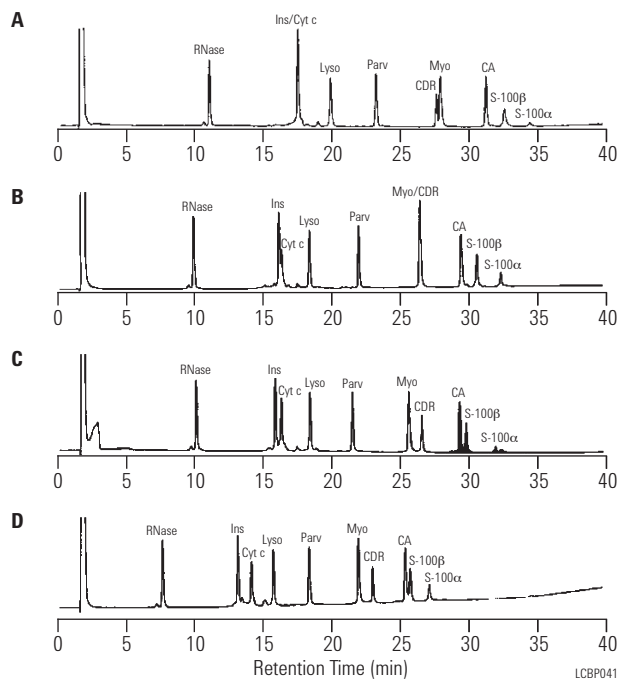
Flow Rate: 1.0 mL/min

Gradient: 25-70% B in 40 min

Temperature: 60 °C

Detector: UV, 210 nm

Sample: Polypeptides, 3 µg each



**Standard proteins by reversed-phase**

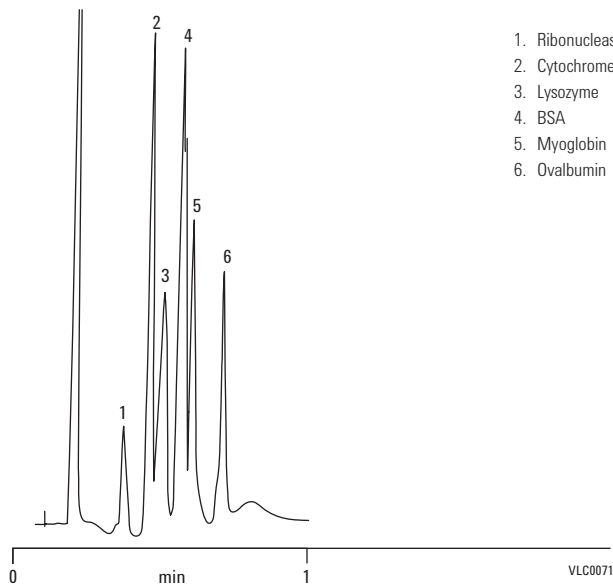
**Column:** PLRP-S 4000Å  
 PL1512-1803  
 4.6 x 50 mm, 8 µm

**Mobile Phase:** A: 0.1% TFA in 95% water:5% ACN  
 B: 0.1% TFA in 5% water:95% ACN

**Gradient:** Linear 18-60% B in 1 min

**Flow Rate:** 4.0 mL/min

**Detector:** UV, 280 nm



- 1. Ribonuclease A
- 2. Cytochrome C
- 3. Lysozyme
- 4. BSA
- 5. Myoglobin
- 6. Ovalbumin

**Standard ion-exchange protein separation**

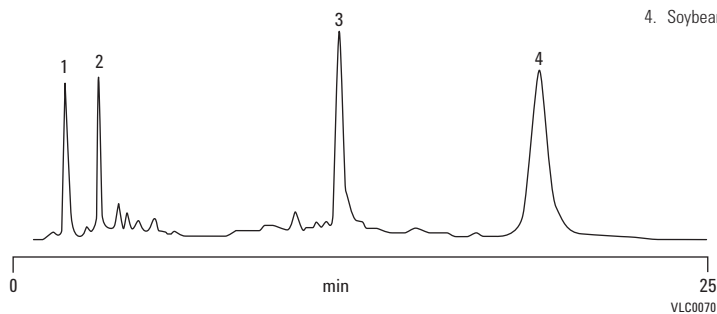
**Column:** PL-SAX 1000Å  
 PL1551-1502  
 4.6 x 50 mm, 5 µm

**Mobile Phase:** A: 10 mM Tris HCl pH 8  
 B: A+0.35 M NaCl pH 8

**Gradient:** 0-100% B in 20 min

**Flow Rate:** 1.0 mL/min

**Detector:** UV, 220 nm



- 1. Myoglobin
- 2. Bovine carbonic anhydrase
- 3. Ovalbumin
- 4. Soybean trypsin inhibitor



**Deoxynucleosides:  
Using rapid resolution 3.5 µm columns**

**Column A:** ZORBAX SB-CN  
883975-905  
4.6 x 150 mm, 5 µm

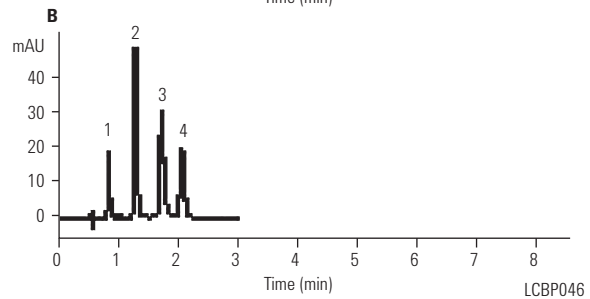
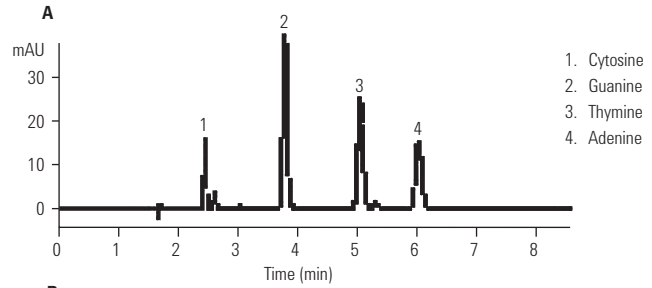
**Column B:** ZORBAX SB-CN  
835975-905  
4.6 x 50 mm, 3.5 µm

Mobile Phase: A: 0.1% TFA  
B: 90/10 v/v Methanol/Water (0.1% TFA)  
Isocratic, 97.5% A, 2.5% B

Flow Rate: 1.0 mL/min

Temperature: 30 °C

Detector: UV, 254 nm



LCBP046

**BSA tryptic digest on RRHT**

**Column:** ZORBAX SB-C18  
820700-902  
2.1 x 150 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA, 5% ACN  
B: 0.08% TFA, 95% ACN

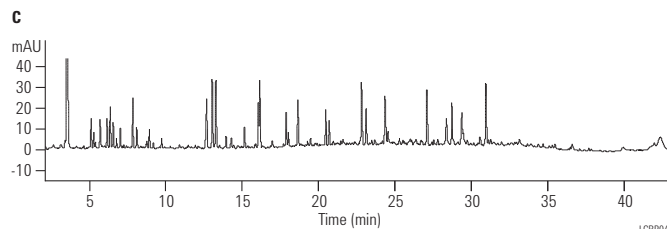
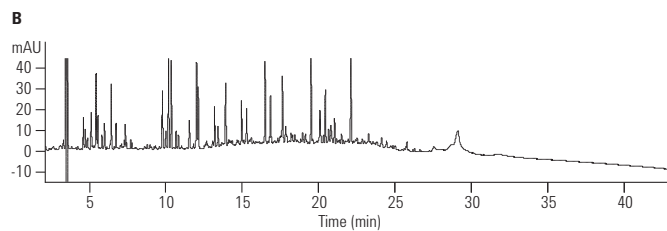
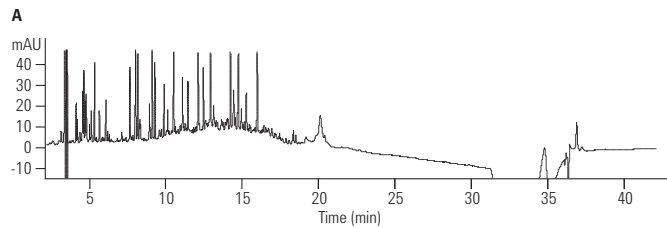
Flow Rate: 0.5 mL/min

Gradient: A: Time 0% B 5 min, Time 30% B 60 min  
B: Time 0% B 5 min, Time 45% B 60 min  
C: Time 0% B 5 min, Time 67.5% B 60 min

Temperature: 80 °C

Detector: UV, 214 nm

Sample: BSA tryptic digest



LCBP046

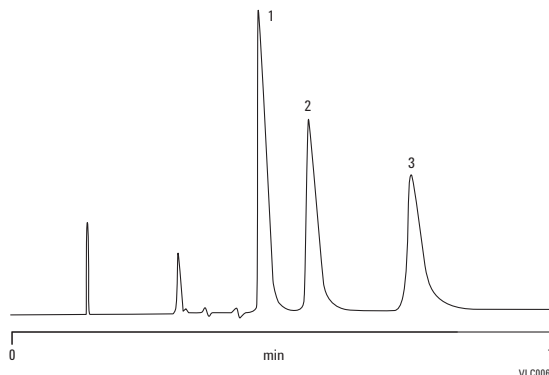
**Catecholamines**

**Column:** PLRP-S 100Å  
 PL1111-3500  
 4.6 x 150 mm, 5 µm

**Mobile Phase:** 95% 25 mM citric acid,  
 25 mM Na<sub>2</sub>HPO<sub>4</sub>, 1 mM heptane  
 sulfonic acid:5% ACN, pH 2.85

**Flow Rate:** 1.0 mL/min

**Detector:** UV, 280 nm



- 1. Noradrenaline
- 2. Adrenaline
- 3. Dopamine

**Whey proteins in dairy samples – milk**

**Column:** PLRP-S 300Å  
 PL1512-3801  
 4.6 x 150 mm, 8 µm

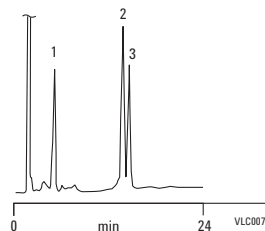
**Mobile Phase:** A: 0.1% TFA in 99% water:1% ACN  
 B: 0.1% TFA in 1% water:99% ACN

**Gradient:** 36-48% B, 0-24 min, 48-100% B, 24-30 min  
 100% B, 30-35 min, 100-36% B, 35-40 min

**Flow Rate:** 1.0 mL/min

**Injection Volume:** 10 µL

**Detector:** UV, 220 nm



- 1. α-Lactalbumin
- 2. β-Lactoglobulin (B chain)
- 3. β-Lactoglobulin (A chain)

**Temperature as a tool to enhance mass transfer and improve resolution of oligonucleotides in ion-pair reversed-phase HPLC**

**Column:** PLRP-S 100Å  
PL1512-1300  
4.6 x 50 mm, 3 µm

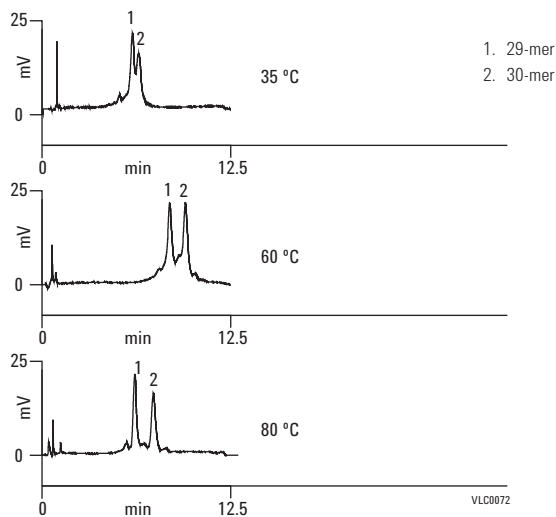
**Mobile Phase:** A: 100 mM TEAA  
B: 100 mM TEAA in 25% ACN

**Gradient:** 5% change in buffer B over 5 min

**Flow Rate:** 1.0 mL/min

**Temperature:** 35 °C, 60 °C, or 80 °C

**Detector:** UV, 254 nm



**Hydrophilic purine/pyrimidine separation**

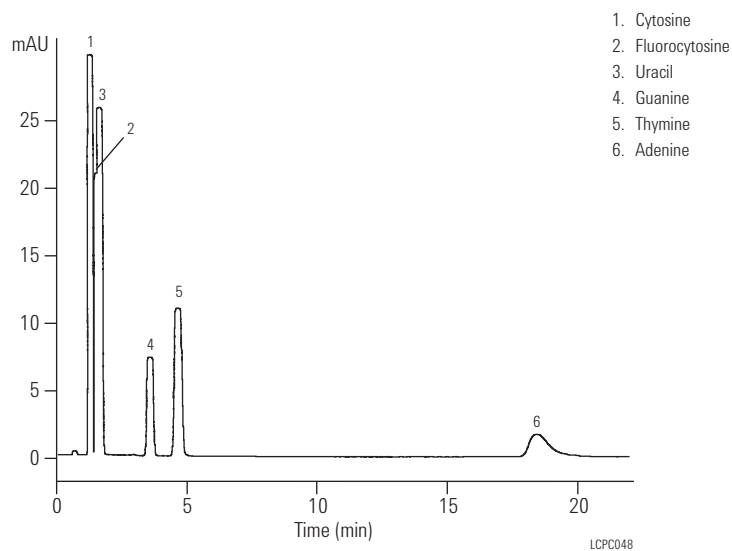
**Column:** ZORBAX SB-Aq  
883975-914  
4.6 x 150 mm, 5 µm

**Mobile Phase:** 50 mM NaOAc, pH 4.6

**Flow Rate:** 2.0 mL/min

**Temperature:** 35 °C

**Detector:** UV, 254 nm



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

# Chemical/Industrial Applications

## Analysis of biocides in hand sanitizer

**Column:** ZORBAX RRHD Eclipse Plus C18  
959757-902  
2.1 x 50 mm, 1.8 µm

**Mobile Phase:** A: H<sub>2</sub>O (0.5% TFA)  
B: ACN (0.04% TFA)

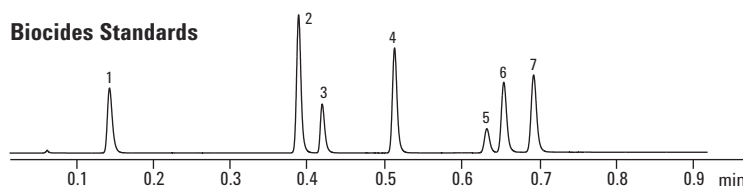
**Flow Rate:** 1.7 mL/min

**Gradient:** Time 0.0 95/5 A/B DAD: 275 nm (0 min)  
Time 1.0 55/45 A/B 225 nm (0.46 min)  
Time 1.1 0/100 A/B 255 nm (0.67 min)

**Sample:** 1 µL injection of 50 ppm std.

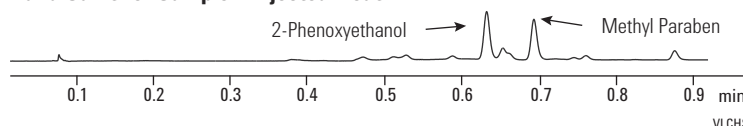
**Temperature:** 30 °C

### Biocides Standards



1. Kathon 1A
2. Kathon 1B
3. Carbendazim
4. 1,2-Benzisothiazol-3(2H)-one
5. 2-Phenoxyethanol
6. Benzoic Acid
7. Methyl Paraben

### Hand Sanitizer Sample - Injected Neat



## Triton X-114: Decreasing run-time by changing bonded phase

**Column A:** ZORBAX SB-C3  
883975-909  
4.6 x 150 mm, 5 µm

**Column B:** ZORBAX SB-C18  
883975-902  
4.6 x 150 mm, 5 µm

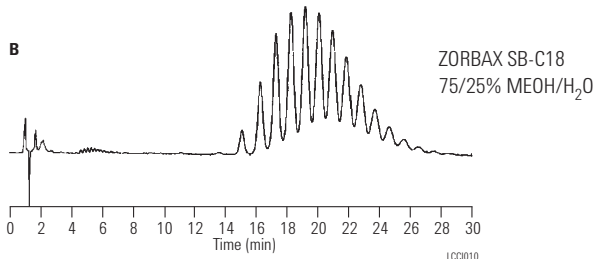
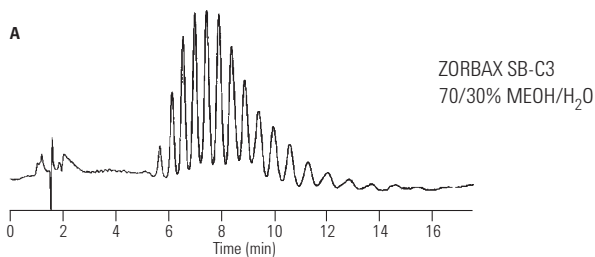
**Mobile Phase:** MeOH and H<sub>2</sub>O (as indicated)

**Flow Rate:** 1.0 mL/min

**Temperature:** 50 °C

**Detector:** UV, 225 nm

**Sample:** Triton X-114



**Organic acids separated on ZORBAX SB-Aq**

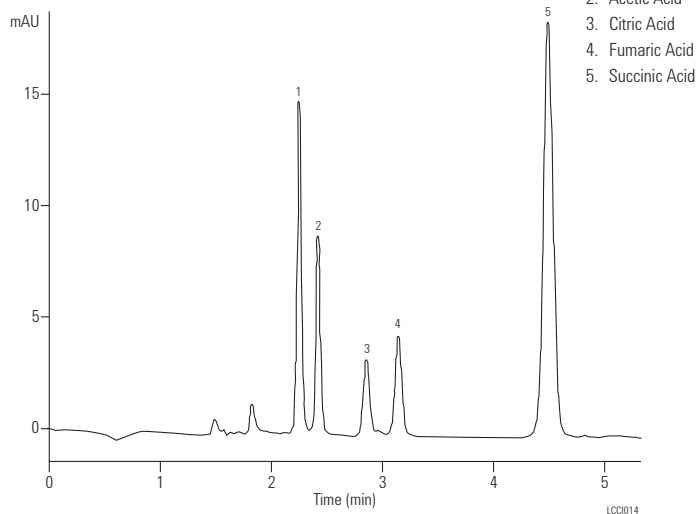
**Column:** ZORBAX SB-Aq  
883975-914  
4.6 x 150 mm, 5 µm

Mobile Phase: 99% 20 mM NaH<sub>2</sub>PO<sub>4</sub>, pH 2, 1% ACN

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 210 nm

**Brij 35**

**Column:** PLRP-S 100Å  
PL1111-3500  
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water  
B: ACN

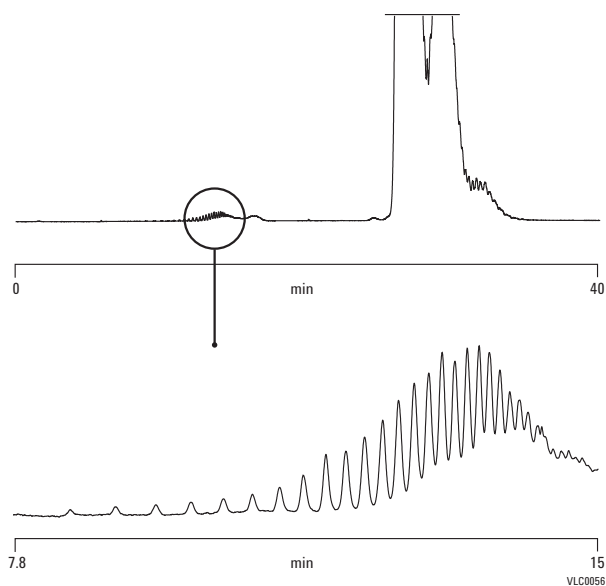
Gradient: 0-100% B in 40 min

Flow Rate: 0.8 mL/min

Injection Volume: 10 µL

Sample Conc: 1 mg/mL

Detector: ELS (neb=50 °C, evap=70 °C, gas=1.5 SLM)



**Alcohols and aliphatic compounds**

**Column:** Hi-Plex H  
PL1170-6830  
7.7 x 300 mm, 8 µm

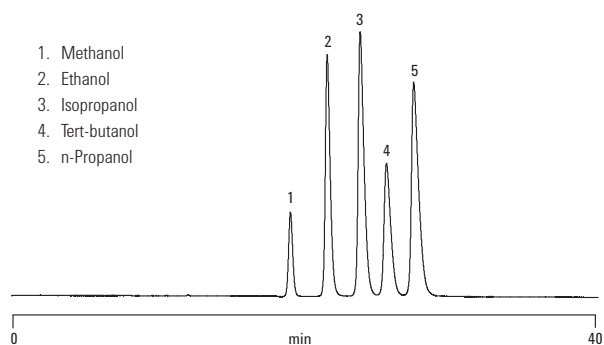
Mobile Phase: Water

Flow Rate: 0.6 mL/min

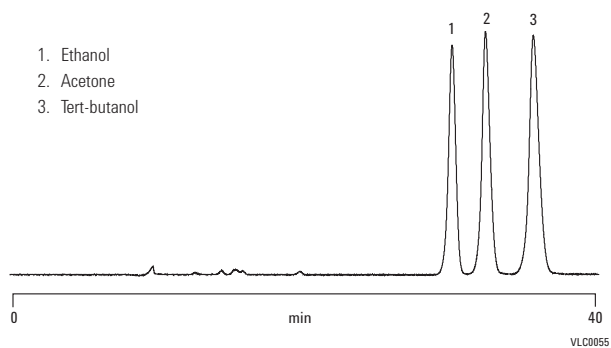
Temperature: 40 °C

Detector: 356-LC RI

1. Methanol
2. Ethanol
3. Isopropanol
4. Tert-butanol
5. n-Propanol



1. Ethanol
2. Acetone
3. Tert-butanol



VLC0055



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

## Environmental Applications

**NEW!****Fast LC/MS/MS analysis of group 4 pharmaceuticals from EPA-1694**

**Column:** ZORBAX RRHD HILIC Plus  
959758-901  
2.1 x 100 mm, 1.8 µm

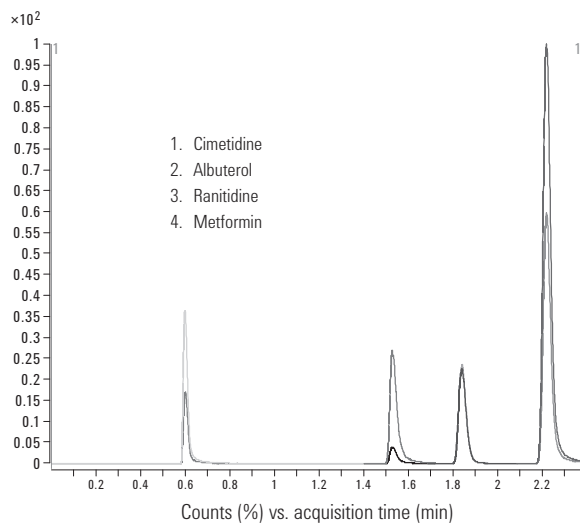
**Mobile Phase:** A: 10 mM ammonium acetate in water, pH 6.7  
B: acetonitrile

**Flow Rate:** 1 mL/min

**Detector:** Agilent 1290 Infinity LC with an  
Agilent 6410 Triple Quadrupole Mass Spectrometer

**MS Conditions:** TCC: 25 °C  
dMRM, ESI positive mode, cycle time 35 ms  
Drying Gas: 9 L/min, 300 °C  
Nebulizer Pressure: 40 psig  
Capillary Voltage: 4000

**Sample:** 0.1 µL injection of 0.1 mg/mL each in  
acetonitrile/water (3:1): cimetidine, albuterol,  
ranitidine and metformin

**NEW!****Separation of azo dye degradation products**

**Column A:** Poroshell 120 EC-C18  
695775-902  
2.1 x 100 mm, 2.7 µm

**Column B:** Poroshell 120 SB-C18  
685775-902  
2.1 x 100 mm, 2.7 µm

**Column C:** Poroshell 120 Phenyl-Hexyl  
695775-912  
2.1 x 100 mm, 2.7 µm

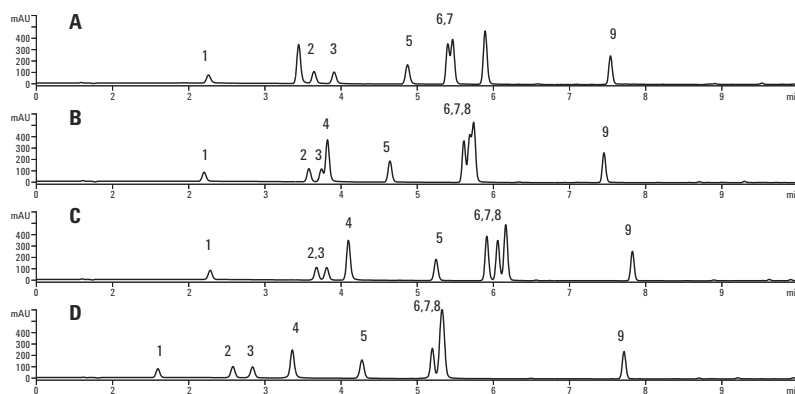
**Column D:** Poroshell 120 Bonus RP  
685775-901  
2.1 x 100 mm, 2.7 µm

**Flow Rate:** 0.4 mL/min

**Gradient:** 15 to 100% MeOH over 10 min

**Solvent:** 10 mM Ammonium acetate, pH 4.8

1. Aniline
2. o-Toluidine
3. Methoxyaniline
4. Chloroaniline
5. Benzidine
6. Dimethylbenzidine
7. 3,3'-Dimethoxybenzidine
8. Naphthylamine
9. Dichlorobenzidine



### Comparison of phenols separation with Poroshell 120

**Column:** Poroshell 120 EC-C18  
699975-902  
4.6 x 50 mm, 2.7 µm

Mobile Phase: A: Water with 0.1% Formic Acid  
B: Acetonitrile

Gradient: Time %B  
0.8 5%  
6.8 60%

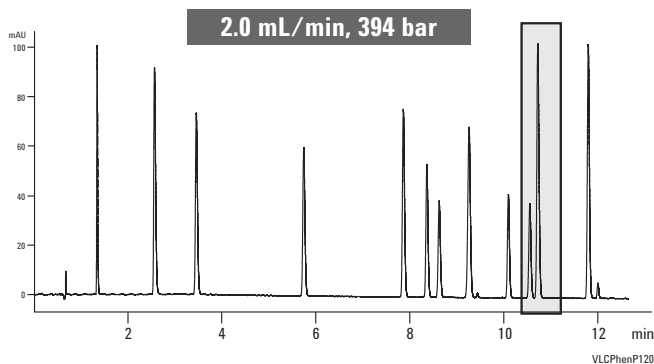
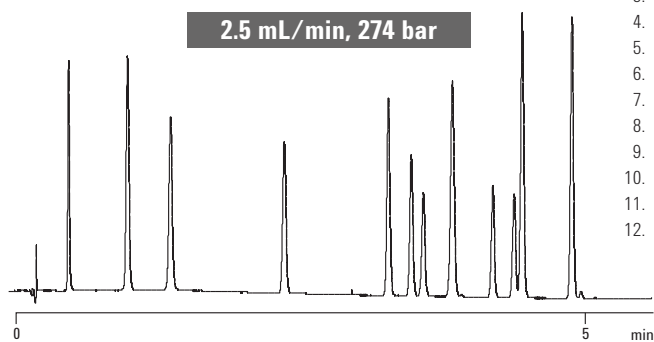
1200 SL controlled temperature  
at 25 °C 2 mm flow cell

**Column:** Poroshell 120 EC-C18  
695975-902  
4.6 x 100 mm, 2.7 µm

Mobile Phase: A: Water with 0.1% Formic Acid  
B: Acetonitrile

Gradient: Time %B  
2.0 5%  
17 60%

1200 RRLC SL controlled temperature  
at 25 °C 2 mm flow cell



### DNPH: Derivatized Aldehydes obtained from air

**Column:** ZORBAX ODS  
884950-543  
4.6 x 250 mm, 5 µm

Mobile Phase: A: 100% Water  
B: 100% ACN

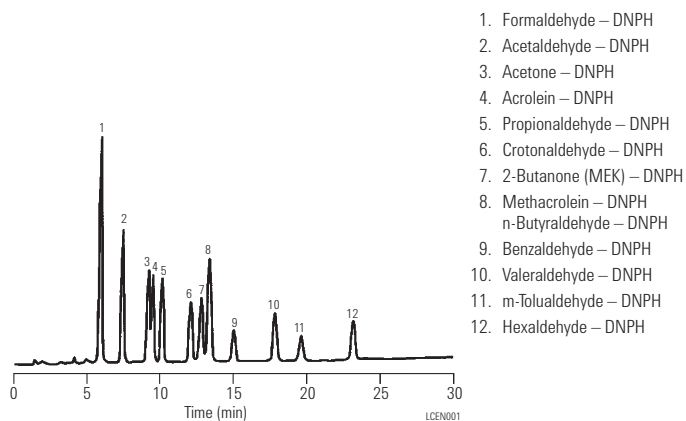
Flow Rate: 1.0 mL/min

Gradient: 60-75% B in 30 min; Wash: From 75-100% B in 5 min, after 5 min return to 60% B

Temperature: 35 °C

Detector: UV, 230 nm

Sample: DNPH Derivatized Aldehydes





**Amitrol in water by LC/MS, 0.05 ppb**

**Column:** ZORBAX SB-C18  
863954-302  
3.0 x 150 mm, 3.5  $\mu$ m

**Mobile Phase:** A: 10 mM ammonium acetate  
B: MeOH

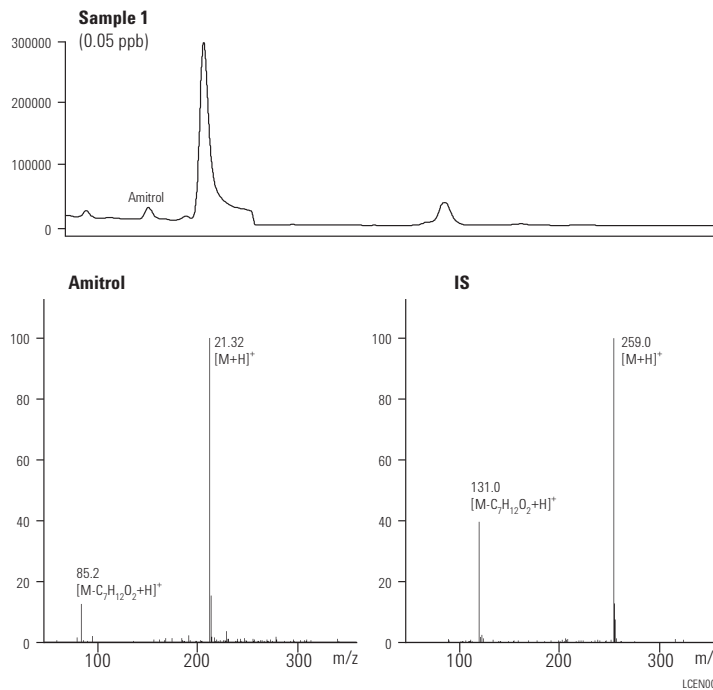
**Flow Rate:** 0.4 mL/min

**Gradient:** 0 min, 65% B; 10 min, 65% B;  
15 min, 100% B; 20 min, 65% B

**Temperature:** 30  $^{\circ}$ C

**MS Conditions:** Ionization Mode: APCI, positive polarity  
SIM parameters: Ion: 213 Amitrol  
Ion: 259 IS  
Fragmentor: 100 V  
SIM Resolution: Low  
Vaporizer: 325  $^{\circ}$ C  
Drying Gas ( $N_2$ ): 5.0 L/min  
Gas Temperature: 350  $^{\circ}$ C  
Nebulizer pressure: 60 psig  
Vcap: 4000 V  
Corona: 4.0  $\mu$ A

**Sample:** Amitrol in water, 100  $\mu$ L

**Anilines, substituted: Rapid separation**

**Column:** ZORBAX Rx/SB-C8  
866953-906  
4.6 x 75 mm, 3.5  $\mu$ m

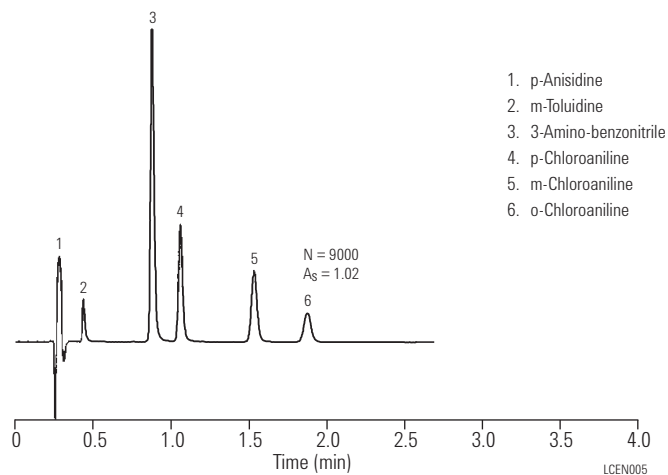
**Mobile Phase:** 20% ACN/80% 25 mM phosphate buffer, pH 2.5

**Flow Rate:** 3.0 mL/min

**Temperature:** 60  $^{\circ}$ C

**Detector:** UV, 254 nm

**Sample:** Anilines



### Explosives and related compounds: Qualitative and quantitative analysis

**Column A:** ZORBAX SB-C18  
883700-922  
2.1 x 150 mm, 5 µm

**Column B:** ZORBAX SB-CN  
883700-905  
2.1 x 150 mm, 5 µm

Mobile Phase: A = ACN + 5% H<sub>2</sub>O + 5 mM CF<sub>3</sub>COONH<sub>4</sub>  
B = H<sub>2</sub>O + 5% ACN + 5 mM CF<sub>3</sub>COONH<sub>4</sub>,  
pH 2.7 (CF<sub>3</sub>COOH)

Flow Rate: 0.23 mL/min

Gradient: A:  
0 min 80% B  
2 min 80% B  
10 min 70% B  
20 min 65% B  
25 min 60% B  
35 min 30% B  
40 min 30% B  
42 min 80% B

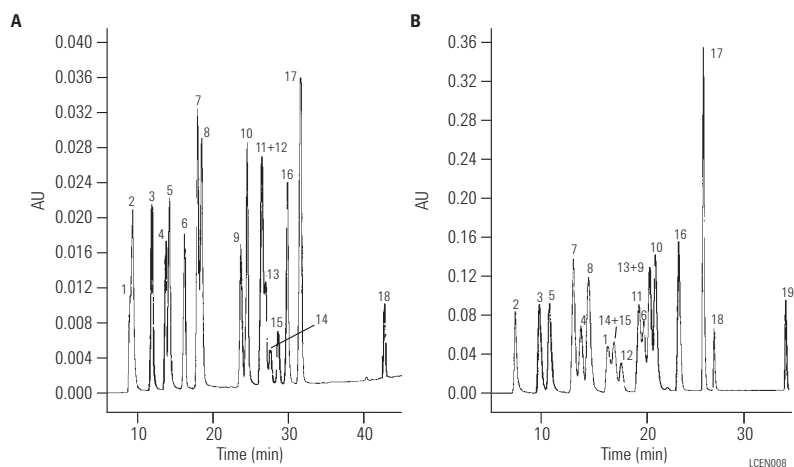
B:  
0 min 80% B  
1 min 80% B  
15 min 70% B  
30 min 20% B  
35 min 20% B  
37 min 80% B

Temperature: 18 °C

Detector: UV, 210, 240, 360 nm, wavelength  
switching for each compound

Sample: 10 µL of 19 explosive compounds  
in ACN/H<sub>2</sub>O (20/80)

- |                               |                                |
|-------------------------------|--------------------------------|
| 1. Picric acid                | 11. 4-Amino-4,6-dinitrotoluene |
| 2. 4-Amino-2-nitrotoluene     | 12. 2-Nitrotoluene             |
| 3. 2-Amino-6-nitrotoluene     | 13. 2,6-Dinitrotoluene         |
| 4. RDX                        | 14. 4-Nitrotoluene             |
| 5. 2-Amino-4-nitrotoluene     | 15. 3-Nitrotoluene             |
| 6. HMX                        | 16. 2,4,6-Trinitrotoluene      |
| 7. 1,3-Dinitrobenzene         | 17. Tetryl                     |
| 8. 1,3,5-Trinitrobenzene      | 18. Diphenylamine              |
| 9. 2-Amino-4,6-dinitrotoluene | 19. Hexyl                      |
| 10. 2,4-Dinitrotoluene        |                                |



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Explosives from soil extract**

**Column:** ZORBAX SB-C18  
880975-302  
3.0 x 250 mm, 5 µm

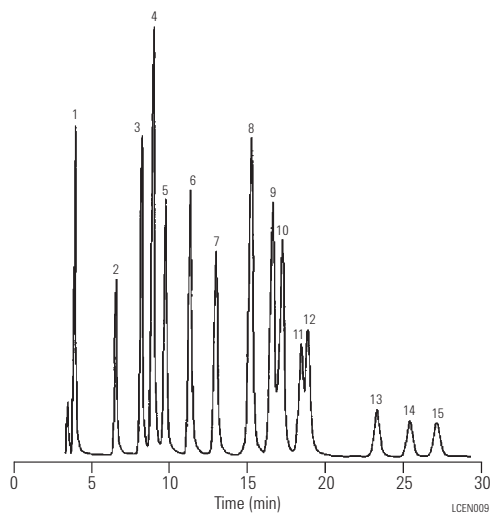
Mobile Phase: Methanol/Water (50/50) (v/v)

Flow Rate: 0.3 mL/min

Temperature: Ambient

Detector: UV, 230 nm

Sample: 10 µL explosives mix



1. Octogen (HMX)
2. Hexogen (RDX)
3. 2-Amino-6-nitrotoluene
4. 1,3,5-Trinitrobenzene
5. 2-Amino-4-nitrotoluene
6. 1,3-Dinitrobenzene
7. Tetryl
8. 2,4,6-Trinitrotoluene
9. 4-Amino-2,6-dinitrotoluene
10. 2-Amino-4,6-dinitrotoluene
11. 2,6-Dinitrotoluene
12. 2,4-Dinitrotoluene
13. 2-Nitrotoluene
14. 4-Nitrotoluene
15. 3-Nitrotoluene

**Herbicides on different bonded phases**

**Column A:** ZORBAX SB-CN  
883975-905  
4.6 x 150 mm, 5 µm

**Column B:** ZORBAX SB-Phenyl  
883975-912  
4.6 x 150 mm, 5 µm

**Column C:** ZORBAX SB-C8  
883975-906  
4.6 x 150 mm, 5 µm

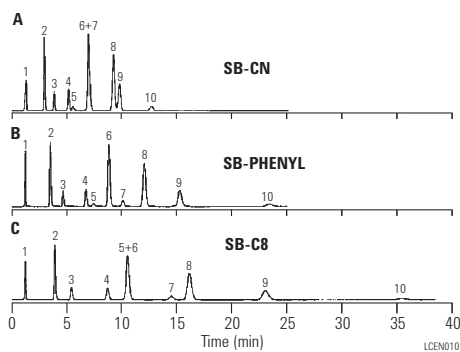
Mobile Phase: 35% ACN, 65% Water

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Herbicides



1. Bentazon
2. Tebuthiuron
3. Simazine
4. Atrazine
5. Prometon
6. Diuron
7. Propazine
8. Propanil
9. Prometryne
10. Metolachlor

**Herbicide/pesticide standards:  
Effect of bonded phase**

**Column:** Eclipse XDB-C8  
993967-906  
4.6 x 150 mm, 5 µm

Mobile Phase: Water/Acetonitrile  
Flow Rate: 1.0 mL/min  
Gradient: 20-60% in 15 min  
Temperature: 50 °C  
40 °C  
30 °C  
20 °C

Detector: DAD 240

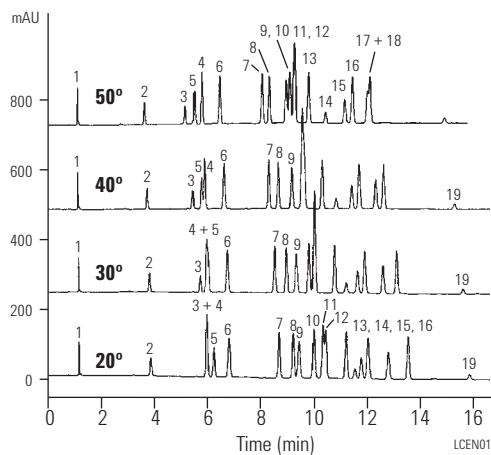
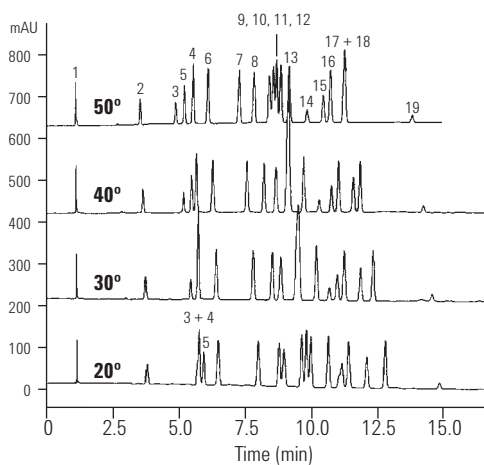
Sample: Herbicide & pesticide standards

**Column:** Eclipse XDB-C18  
993967-902  
4.6 x 150 mm, 5 µm

Mobile Phase: Water/Acetonitrile  
Flow Rate: 1.0 mL/min  
Gradient: 20-60% in 15 min  
Temperature: 50 °C  
40 °C  
30 °C  
20 °C

Detector: DAD 240

Sample: Herbicide & pesticide standards



1. Desethyldeisopropylatrazine
2. Desethylatrazine
3. Benzthiazuron
4. Hexazinon
5. Metoxuron
6. Simazine
7. Methabenzthiazuron
8. Simazine
9. Atrazine
10. Isoproturon
11. Diuron
12. Monoluron
13. Metobromuron
14. Metazachlor
15. Propazine
16. Sebutylazine
17. Terbutylazine
18. Linuron
19. Metolachlor



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

### Separation of EPA 610 PAH Mix

**Column:** Eclipse PAH  
959990-318  
3.0 x 250 mm, 5 µm

**Mobile Phase:** A: Water  
B: Acetonitrile  
Initial %B = 40

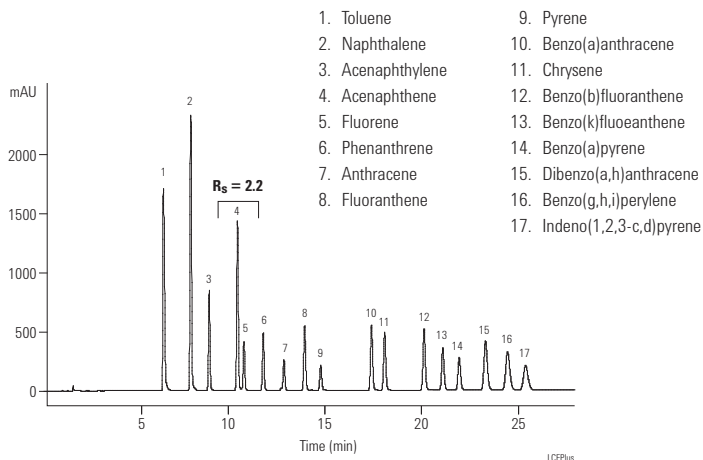
**Flow Rate:** 0.85 mL/min

**Gradient:**

Time (Min)	%B
0.00	45
17.5	100
24.0	100
25.5	40
27.5	40
Stop Time = 25.0	

**Temperature:** 25 °C

**Detector:** 220, 4 nm No Ref.; Stop time = 26.0 min



### Polycyclic aromatic hydrocarbons according to EPA Method 610

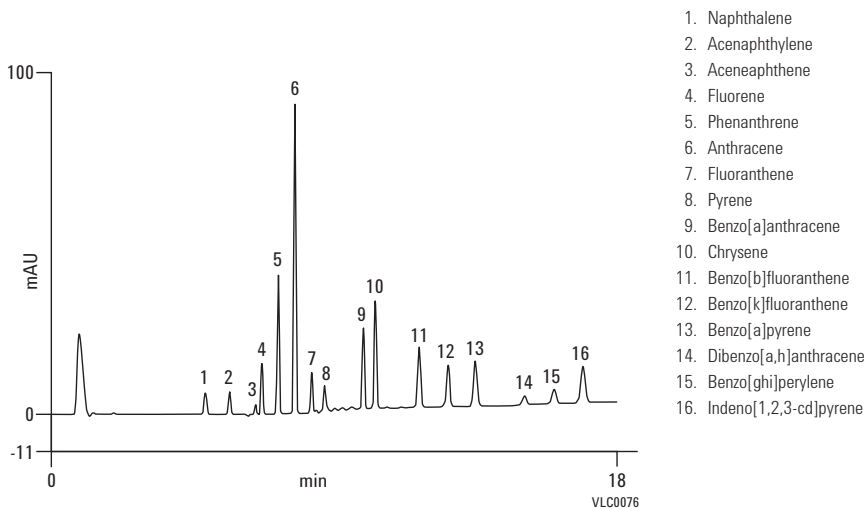
**Column:** Pursuit PAH  
A7001100X046  
4.6 x 100 mm, 3 µm

**Sample:** NIST 16473 Standard

**Mobile Phase:** A: ACN:water, 25:75  
B: ACN

**Flow Rate:** 2.0 mL/min

**Detector:** UV, 254 nm



**NEW!**

**Rapid method development for 18 PAH compounds with an Agilent RRHD Eclipse PAH column**

**Column:** ZORBAX RRHD Eclipse PAH  
959758-918  
2.1 x 100 mm, 1.8 µm

**Mobile Phase:** A: Water  
B: Acetonitrile

**Flow Rate:** 0.84 mL/min

**Gradient:** 40-100% B, gradient time ( $t_g$ ) varies from 1 to 20 min;  
isocratic hold at 100% B for 2 min,  
re-equilibrate column at 40% B for 3 min

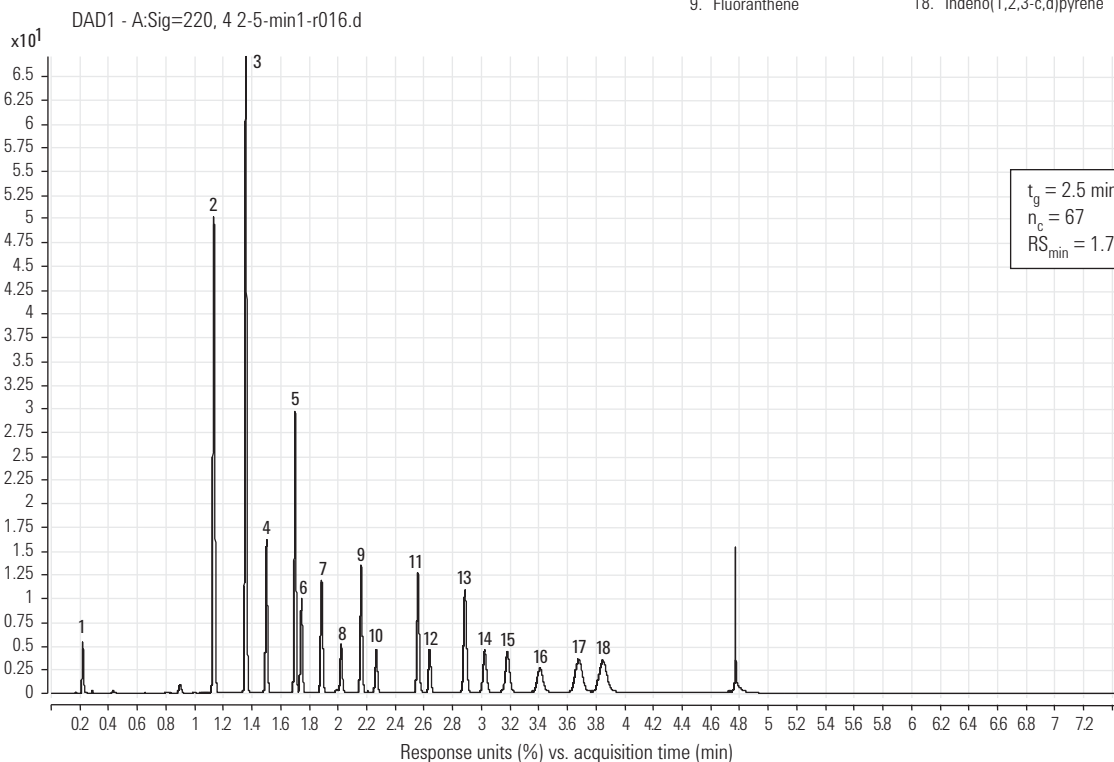
**Temperature:** 25 °C

**Detector:** Agilent 1290 Infinity LC

**MS Conditions:** Sig = 220, 4 nm; Ref = Off

**Sample:** 0.5 µL injection of diluted Agilent PAH Mixture  
(P/N 8500-6035) spiked with thiourea as a  $v_0$  marker

- |                             |                             |
|-----------------------------|-----------------------------|
| 1. Thiourea ( $V_0$ marker) | 10. Pyrene                  |
| 2. Toluene                  | 11. Benzo(a)anthracene      |
| 3. Naphthalene              | 12. Chrysene                |
| 4. Acenaphthylene           | 13. Benzo(b)fluoranthene    |
| 5. Acenaphthene             | 14. Benzo(k)fluoranthene    |
| 6. Fluorene                 | 15. Benzo(a)pyrene          |
| 7. Phenanthrene             | 16. Dibenzo(a,h)anthracene  |
| 8. Anthracene               | 17. Benzo(g,h,i)perylene    |
| 9. Fluoranthene             | 18. Indeno(1,2,3-c,d)pyrene |



Gradient times are rapidly screened for the separation of 18 compounds.

### Separation of 20 PAHs on Eclipse PAH

**Column:** Eclipse PAH  
959964-918  
4.6 x 100 mm, 1.8 µm

**Mobile Phase:** A: Water  
B: Acetonitrile

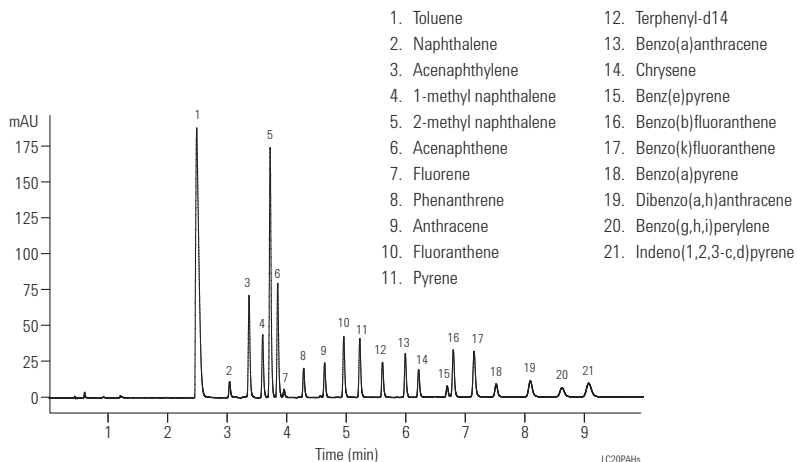
**Flow Rate:** 1.8 mL/min

**Gradient:**

Time (Min)	% B
0	40
6	100
9.5	100
10	40
Stop Time = 12	

**Temperature:** 25 °C

**Detector:** 230, 8 nm No Ref.; Data rate 0.2 s, micro flow cell



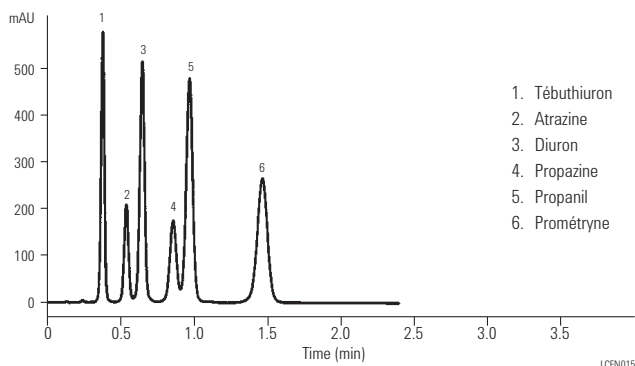
### Herbicides: Rapid separation

**Column:** Eclipse XDB-C18  
933975-902  
4.6 x 30 mm, 3.5 µm

**Mobile Phase:** MeOH:H<sub>2</sub>O (60:40)

**Flow Rate:** 2 mL/min

**Temperature:** Ambient



### Phenoxyacid herbicides

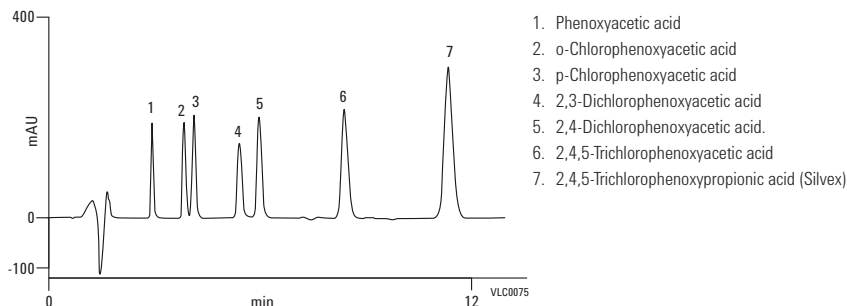
**Column:** Pursuit XRs C8  
A6010150X046  
4.6 x 150 mm, 5 µm

**Mobile Phase:** MeCN:water+0.1% HCOOH, 50:50

**Flow Rate:** 1.0 mL/min

**Temperature:** Ambient

**Detector:** UV, 220 nm



**Triazine pesticides on Bonus-RP and Alkyl C8 phase**

**Column:** ZORBAX Bonus-RP  
883668-901  
4.6 x 150 mm, 5 µm

Mobile Phase: MeOH: 0.1% TFA (70:30)\*

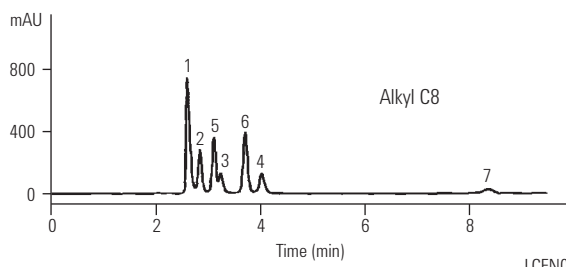
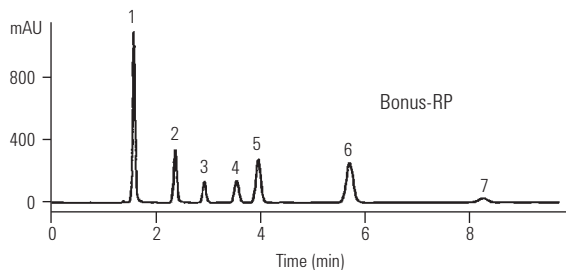
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: Triazine pesticides, 2 µL

1. Prometryne
2. Tebuthiuron
3. Atrazine
4. Propazine
5. Diuron
6. Propanil
7. Dacthal



\* For low pH work with Bonus-RP, a TFA mobile phase is often preferred over phosphate, and is compatible with LC/MS.

**Phenols, substituted**

**Column:** ZORBAX SB-C18  
883975-902  
4.6 x 150 mm, 5 µm

Mobile Phase: 20% ACN/80% 0.01 M H<sub>3</sub>PO<sub>4</sub> to 45% ACN in 7.5 min

Flow Rate: 1.5 mL/min

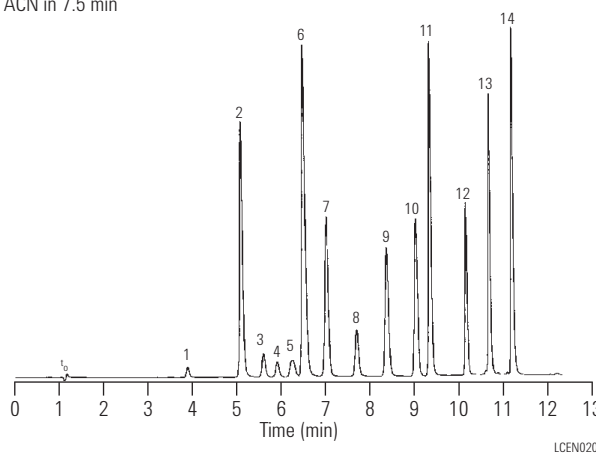
Gradient: 80% ACN in 2.0 min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Phenols

1. Phenol
2. 4-Nitrophenol
3. m-Cresol
4. o-Cresol
5. 2-Chlorophenol
6. 2,4-Dinitrophenol
7. 2-Nitrophenol
8. 2,4-Dimethylphenol
9. 4-Chloro-3-methylphenol
10. 2,4-Dichlorophenol
11. 2-Methyl-4,6-dinitrophenol
12. 2,4,6-Trichlorophenol
13. 2,3,4,6-Tetrachlorophenol
14. Pentachlorophenol





### Plant hormones: Rapid gradient elution separation

**Column:** ZORBAX Rx/SB-C8  
866953-906  
4.6 x 75 mm, 3.5 µm

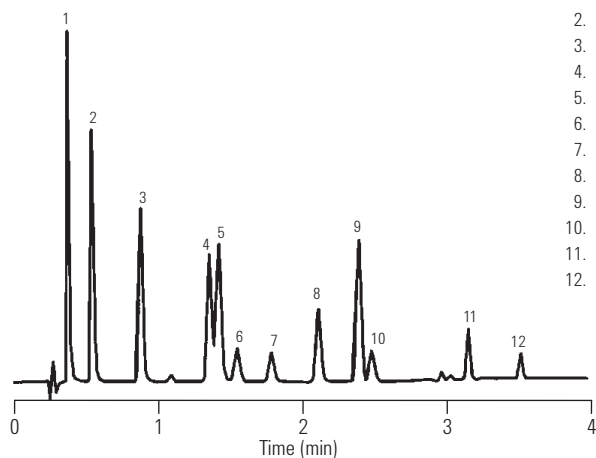
**Mobile Phase:** A: Water with 0.1% TFA  
B: Acetonitrile with 0.1% TFA

**Flow Rate:** 3.0 mL/min

**Temperature:** 60 °C

**Detector:** UV, 245 nm

**Sample:** Plant hormones



1. Kinetin
2. n-6-Benzyl adenine
3. 3-Indole acetic acid
4. 1-Naphthyl acetamide
5. 3-Indole propionic acid
6. o-Chlorophenoxy acetic acid
7. p-Chlorophenoxy acetic acid
8. 3-Indole butyric acid
9. 1-Naphthyl acetic acid
10. o-Chlorophenoxy propionic acid
11. 3,4,5-Trichlorophenoxy acetic acid
12. 3,4,5-Trichlorophenoxy propionic acid

LCEN022

### VX nerve agent metabolites by LC/MS-IS standard (C13 labeled)

**Column:** ZORBAX NH2  
860700-708  
2.1 x 50 mm, 5 µm

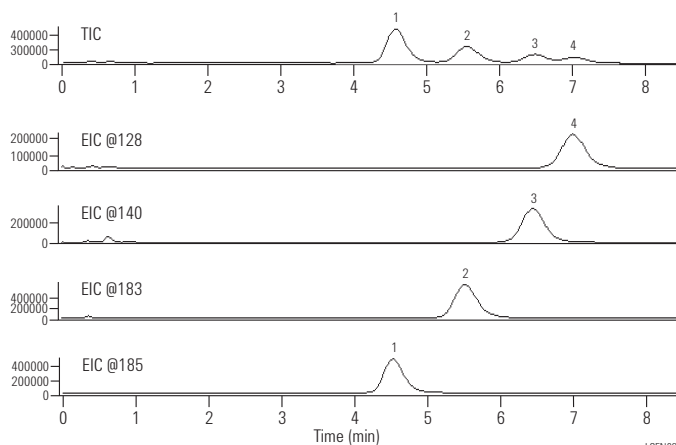
**Mobile Phase:** 1:1 (20 mM Ammonium Acetate pH 4.5/Acetonitrile)

**Flow Rate:** 0.5 mL/min, 1 µL injection (prepared std in ACN)

**Temperature:** 35 °C

**Detector:** ESI-Negative Ion, Gas Flow 12 L/min, Nebulizer 60 psi

Sample	MW
1. Cyclohexyl methylphosphonic acid	178
2. Pinacolyl methylphosphonic acid	180
3. Isopropyl methylphosphonic acid	138
4. Ethyl methylphosphonic acid	124



LCEN025



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

# Food and Consumer Product Applications

**NEW!**

## Blueberry anthocyanin analysis

**Column A:** Poroshell 120 SB-C18  
687975-902  
4.6 x 75 mm, 2.7 µm

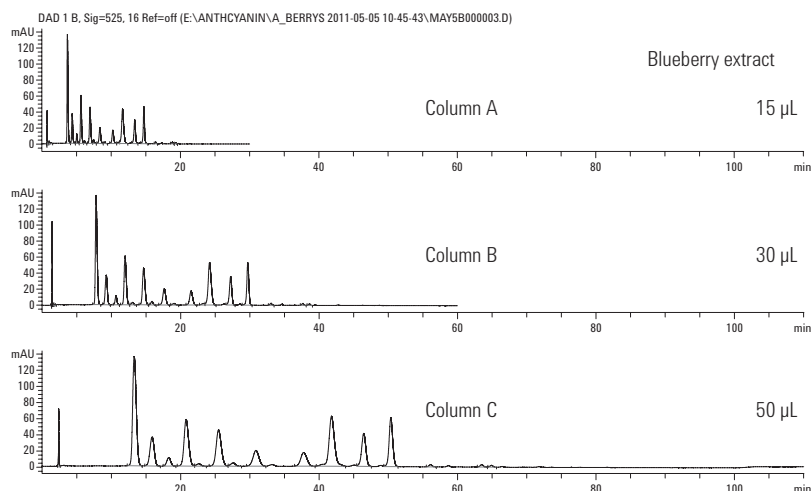
**Column B:** ZORBAX SB-C18  
863953-902  
4.6 x 150 mm, 3.5 µm

**Column C:** ZORBAX SB-C18  
880975-902  
4.6 x 250 mm, 5 µm

Flow Rate: 1 mL/min

Detector: Agilent 1260 Rapid Infinity LC

Blueberry anthocyanin analysis on totally porous and superficially porous StableBond C18 columns. Overlay of anthocyanin method with 250 mm 5 µm, 150 mm 3.5 µm, and 75 mm 2.7 µm at 1 mL/min.



**NEW!**

## Analysis of pesticide residues in green tea

**Column:** Poroshell 120 EC-C18  
695775-902  
2.1 x 100 mm, 2.7 µm

Mobile Phase: A: 5 mM FA in water  
B: 5 mM FA in ACN

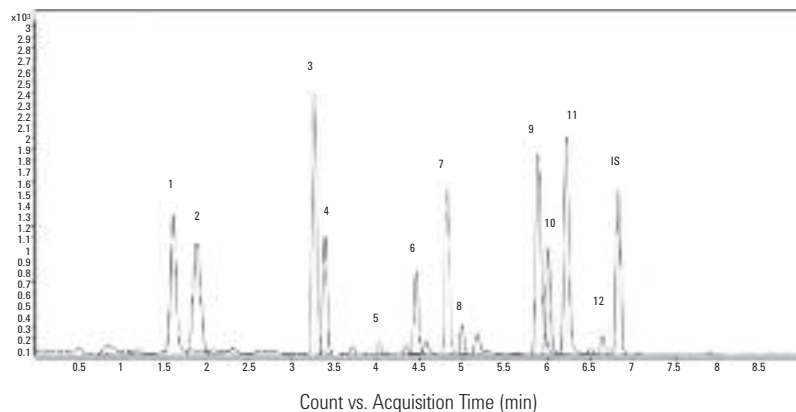
Flow Rate: 0.4 mL/min

Gradient: 5% B in 1 min, 50% B in 3 min,  
90% B in 7 min, 90% B in 8 min,  
5% B in 8.2 min, 5% B in 9 min

Temperature: 30 °C

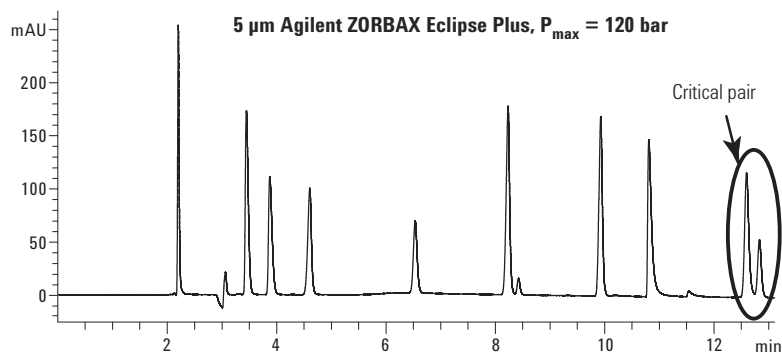
MRM chromatograms of 50 ng/g fortified sample processed by EN method.

- |                  |                     |
|------------------|---------------------|
| 1. Acephate      | 7. Propoxur         |
| 2. Pymetrozine   | 8. Carbaryl         |
| 3. Carbendazim   | 9. Cyprodinil       |
| 4. Thiabendazole | 10. Ethoprophos     |
| 5. Imidacloprid  | 11. Penconazole     |
| 6. Imazalil      | 12. Kresoxim-methyl |
|                  | IS TPP              |



**NEW!**

An overlay of the original ZORBAX Eclipse Plus 5  $\mu\text{m}$  method and Agilent Poroshell 120 method.  
 All 11 peaks on Poroshell 120 are resolved by the time the first peak elutes on the original  
 5  $\mu\text{m}$  ZORBAX Eclipse Plus method



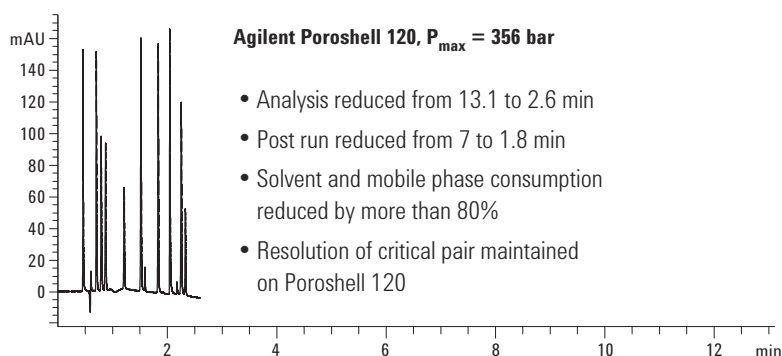
**Column:** Eclipse Plus C18  
 959990-902  
 4.6 x 250 mm, 5  $\mu\text{m}$

**Mobile Phase:** A: 20 mM ammonium acetate, pH 4.80  
 B: acetonitrile

**Flow Rate:** 1.000 mL/min

**Gradient:** 14% B at  $t_0$ , ramp to 52% B in 12.0 min

**Temperature:** 30  $^{\circ}\text{C}$



**Column:** Poroshell 120 EC-C18  
 695975-302  
 3.0 x 100 mm, 2.7  $\mu\text{m}$

**Mobile Phase:** A: 20 mM ammonium acetate, pH 4.80  
 B: acetonitrile

**Flow Rate:** 0.851 mL/min

**Gradient:** 14% B at  $t_0$ , ramp to 52% B in 2.1 min

**Temperature:** 30  $^{\circ}\text{C}$



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!**

**Fast analysis of sulfa drugs**

**Column:** Eclipse Plus C18  
959990-902  
4.6 x 250 mm, 5 µm

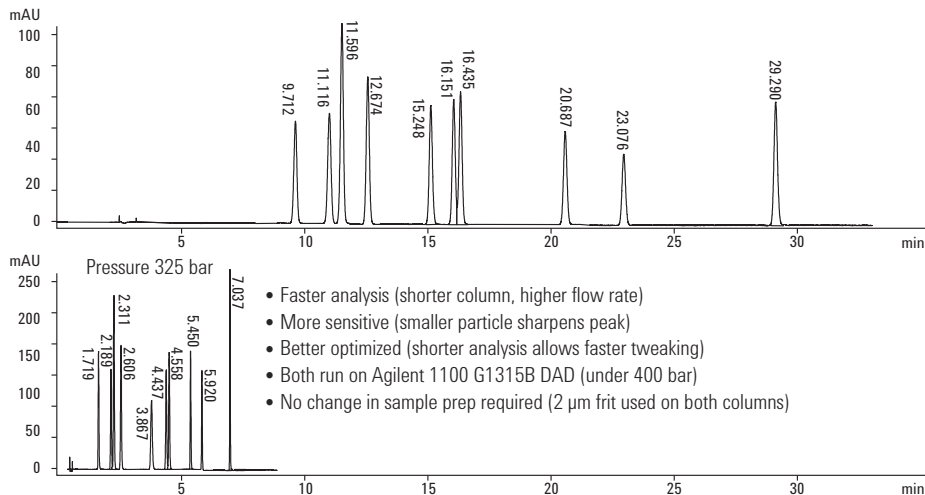
**Column:** Poroshell 120 EC-C18  
695975-902  
4.6 x 100 mm, 2.7 µm

**Gradient:** Formic acid/acetonitrile

**Detector:** Agilent 1100 Series LC

**Sample:** Ten sulfa drugs

A separation of ten sulfa drugs scaled from an Agilent ZORBAX Eclipse Plus C18 column to an Agilent Poroshell 120 EC-C18 column showing analysis time decreased from 30 min to 8 min using a formic acid/acetonitrile gradient.



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!****Determination of anthocyanins in blueberries**

**Column:** ZORBAX RRHD Eclipse Plus C18  
959758-902  
2.1 x 100 mm, 1.8  $\mu$ m

**Column:** ZORBAX RRHD Eclipse Plus Phenyl-Hexyl  
959758-912  
2.1 x 100 mm, 1.8  $\mu$ m

**Column:** ZORBAX RRHD SB-Aq  
858700-914  
2.1 x 100 mm, 1.8  $\mu$ m

**Column:** ZORBAX RRHD SB-Phenyl  
858700-912  
2.1 x 100 mm, 1.8  $\mu$ m

**Mobile Phase:** A: 5% HCOOH in H<sub>2</sub>O  
B: CH<sub>3</sub>CN

**Flow Rate:** 0.65 mL

**Gradient:** 10-50% B in 15 min

**Detector:** Agilent 1290 Infinity LC

**MS Conditions:** DAD: Sig = 525, 8 nm; Ref = Off  
MS2 Scan: ESI + 200-1000  
Scan time: 100 ms, 0.2 amu step  
Fragmentor: 180 V

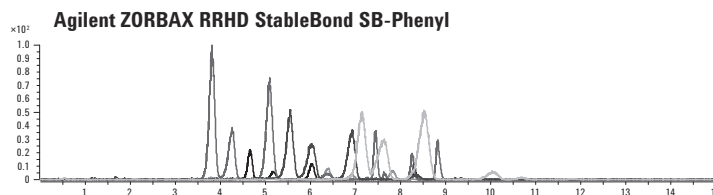
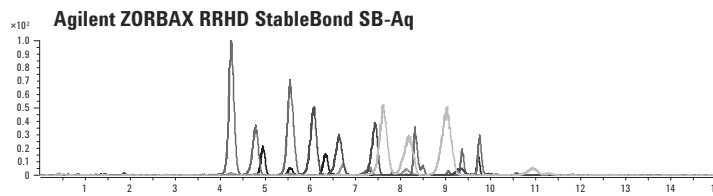
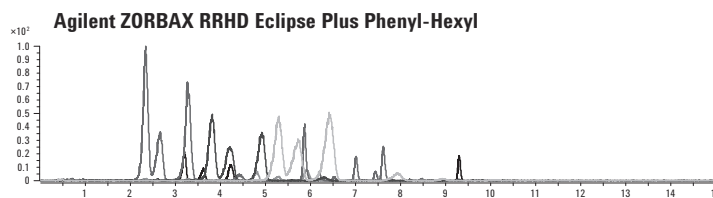
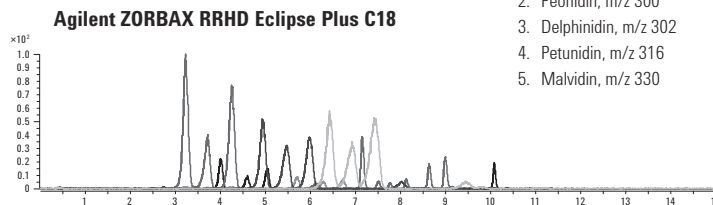
Drying gas: 10 L/min, 350 °C

Nebulizer Pressure: 50 psig

Capillary Voltage: 3500

**Sample:** 5  $\mu$ L injection of blueberry extract

1. Cyanidin, m/z 286
2. Peonidin, m/z 300
3. Delphinidin, m/z 302
4. Petunidin, m/z 316
5. Malvidin, m/z 330



Counts (%) versus Acquisition time (min)

### Separation of Azo Dyes

**Column:** Eclipse Plus Phenyl Hexyl  
959996-912  
4.6 x 100 mm, 5 µm

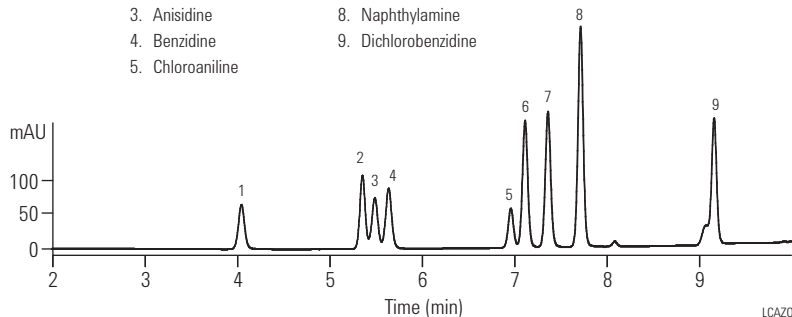
**Mobile Phase:** A: 10 mM Ammonium Acetate, pH 4.7  
B: MeOH

**Flow Rate:** 1.5 mL/min

**Gradient:** Time (Min): %B:  
0 25  
5 50

**Detector:** UV, 254 nm

- |                  |                       |
|------------------|-----------------------|
| 1. Aniline       | 6. o-Tolidine         |
| 2. o-Toluidine   | 7. Dimethoxybenzidine |
| 3. Anisidine     | 8. Naphthylamine      |
| 4. Benzidine     | 9. Dichlorobenzidine  |
| 5. Chloroaniline |                       |



LCAZO

### Anthocyanins from blueberries: High-efficiency high-speed separation

**Column A:** ZORBAX SB-C18  
880975-902  
4.6 x 250 mm, 5 µm

**Column B:** ZORBAX SB-C18  
863953-902  
4.6 x 150 mm, 3.5 µm

**Column C:** ZORBAX SB-C18  
866953-902  
4.6 x 75 mm, 3.5 µm

**Mobile Phase:** A: 3% Phosphoric acid  
B: 100% MeOH

**Flow Rate:** 1.0 mL/min

**Gradient:** As shown

**Temperature:** 30 °C

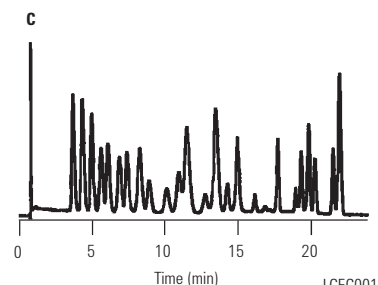
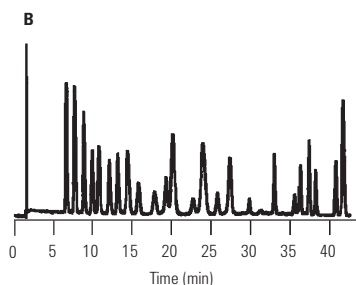
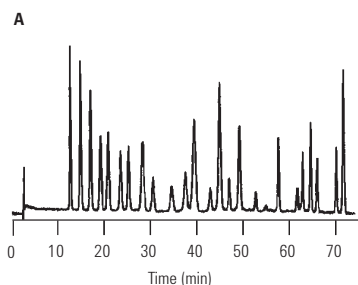
**Detector:** UV, 525 nm

**Sample:** Natural anthocyanins

Time	Percent B
0 min	23% B
35 min	26% B
97 min	60% B

Time	Percent B
0 min	23% B
21 min	26% B
58.2 min	60% B

Time	Percent B
0 min	23% B
10.5 min	26% B
29.1 min	60% B



LCFC001

**Aromatics II**

**Column:** Eclipse XDB-Phenyl  
963967-912  
4.6 x 150 mm, 3.5 µm

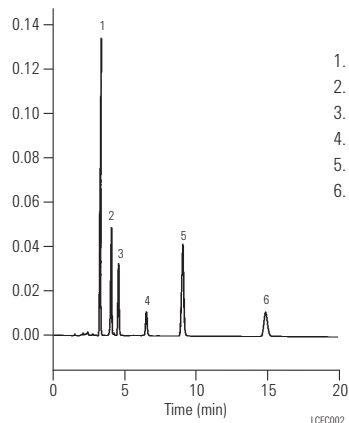
Mobile Phase: H<sub>2</sub>O: MeOH, 40:60

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Aromatic Sample



- 1. Acetophenone
- 2. Cinnamaldehyde
- 3. Eugenol
- 4. Cinnamaldehyde Impurity
- 5. Ethyl cinnamate
- 6. p-Cymene

**Aspartame: Metabolites and applications**

**Column:** ZORBAX SB-C18  
866953-902  
4.6 x 75 mm, 3.5 µm

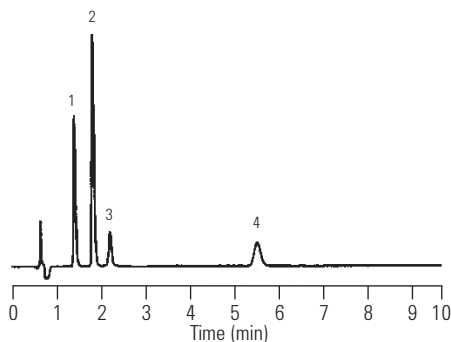
Mobile Phase: 85/15, 0.1% TFA/ACN

Flow Rate: 1.0 mL/min

Temperature: 35 °C

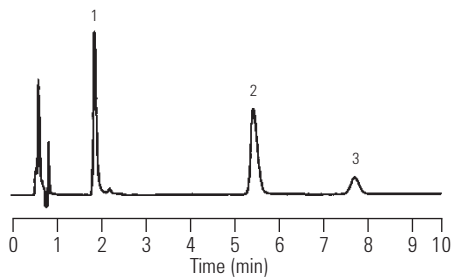
Detector: UV, 210 nm

Sample: Aspartame



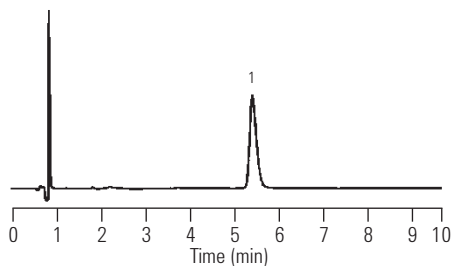
**Aspartame and Its Metabolites**

- 1. Phenylalanine
- 2. 5-benzyl-3,6-dioxo-2-piperazineacetic acid
- 3. Aspartic acid-phenylalanine dipeptide
- 4. Aspartame



**Diet Coke**

- 1. Caffeine
- 2. Aspartame
- 3. Unknown



**Equal Sweetener**

- 1. Aspartame

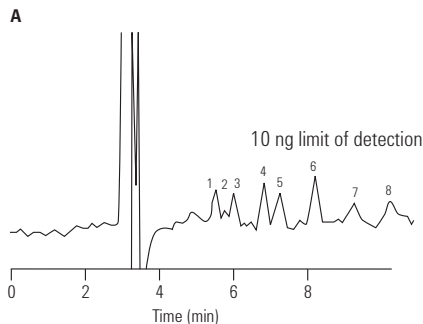
**Carbohydrates: Carbohydrate standards**

**Column:** ZORBAX Carbohydrate Analysis  
843300-908  
4.6 x 150 mm, 5 µm

**Mobile Phase:** 63% CH<sub>3</sub>CN/H<sub>2</sub>O  
**Flow Rate:** 0.5 mL/min

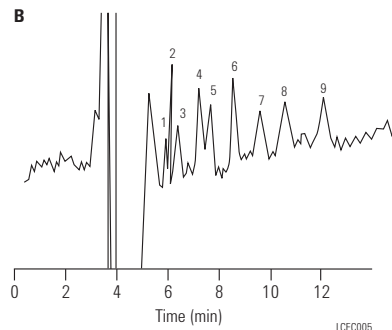
**Detector:** Agilent RID  
**Sample:** Carbohydrate standard:  
A: 25 ng/L, 1 µL injected  
B: 500 pg/L, 50 µL injected

**Carbohydrates: Separation showing high sensitivity**



**Sensitivity of high injection volume (50 µL)**

1. Ribose
2. Rhamnose
3. Xylose
4. Fructose
5. Glucose
6. Sucrose
7. Maltose
8. Lactose
9. Raffinose



**Carbohydrates: Effect of mobile phase strength**

**Column:** ZORBAX NH2  
880952-708  
4.6 x 250 mm, 5 µm

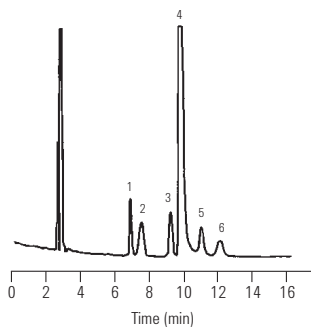
**Mobile Phase:** ACN/Water, as indicated  
**Flow Rate:** 1.0 mL/min

**Temperature:** Ambient

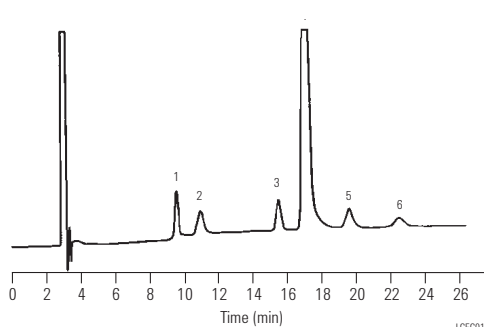
**Detector:** RI

**Sample:** Mono- and Disaccharides

**ACN/H<sub>2</sub>O: 70/30**



**ACN/H<sub>2</sub>O: 75/25**



1. Fructose
2. Glucose
3. Saccharose
4. Palatinose
5. Trehalulose
6. Isomaltose



**Carbohydrates in colas**

**Column:** ZORBAX Carbohydrate Analysis  
843300-908  
4.6 x 150 mm, 5 µm

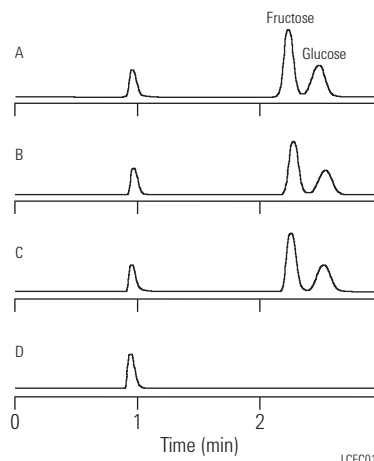
Mobile Phase: 75% ACN:25% H<sub>2</sub>O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: RID

Sample: No dilution  
A: COLA, Fountain  
B: COLA, Can, Brand A  
C: COLA, Brand B  
D: COLA, Brand B, diet



LCFC013

**Carbohydrates: Sugar alcohols**

**Column:** ZORBAX Carbohydrate Analysis  
843300-908  
4.6 x 150 mm, 5 µm

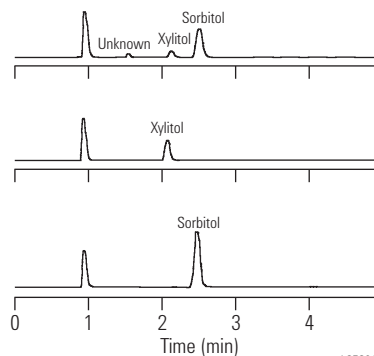
Mobile Phase: 75% ACN:25% H<sub>2</sub>O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: RID

Sample: Chewing gum, sugar-free



LCFC014

**Carbohydrates in juices**

**Column:** ZORBAX Carbohydrate Analysis  
843300-908  
4.6 x 150 mm, 5 µm

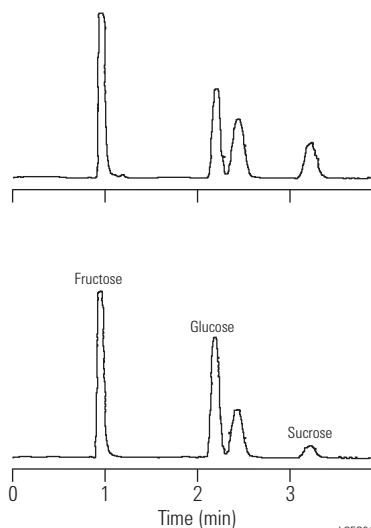
Mobile Phase: 75% ACN/25% H<sub>2</sub>O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: RID

Sample: Diluted to 0.1X in 50:50 ACN:H<sub>2</sub>O



**Apple Drink**

36.8% Fructose  
24.9% Sucrose  
38.3% Glucose

**Apple Juice**

58.7% Fructose  
9.9% Sucrose  
33.4% Glucose

LCFC016

### Carbohydrates in milk

**Column:** ZORBAX Carbohydrate Analysis  
843300-908  
4.6 x 150 mm, 5 µm

Mobile Phase: 75% ACN/25% H<sub>2</sub>O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

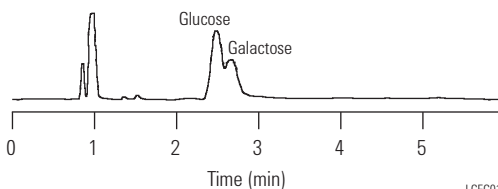
Detector: RID

Sample: Partitioned between CH<sub>2</sub>Cl<sub>2</sub>: H<sub>2</sub>O

Milk (2%)



100% Lactose-Free Milk



LCFC015

### Flavoring agents

**Column:** ZORBAX SB-Phenyl  
860975-912  
2.1 x 50 mm, 5 µm

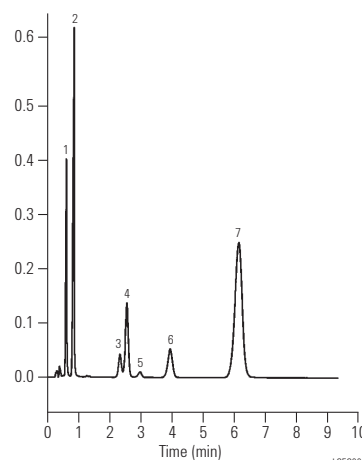
Mobile Phase: 0.3% TFA: ACN, 65:35

Flow Rate: 0.3 mL /min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Cool mint Listerine sample



1. Unknown
2. Benzoic acid
3. Methyl salicylate
4. Carvone
5. Unknown
6. Thymol
7. Anethole

LCFC006

### Food colors, FD&C

**Column:** ZORBAX Eclipse XDB-C18  
935967-902  
4.6 x 50 mm, 3.5 µm

Mobile Phase: A: 0.1% TFA, pH to 4.4 with TEA, B: MeOH

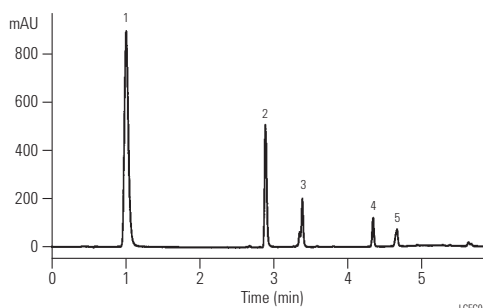
Flow Rate: 1.0 mL/min

Gradient: 17 to 100% B/4 min

Temperature: Ambient

Detector: UV, 254 nm

- |                  |                 |        |
|------------------|-----------------|--------|
| 1. Yellow #5     | C16H9N4Na3O9S2  | MW=534 |
| 2. Red #40       | C18H14N2Na2O8S2 | MW=496 |
| 3. Blue #1       | C37H34N2Na2O9S3 | MW=760 |
| 4. Propylparaben | C10H12O3        | MW=180 |
| 5. Red #3        | C20H414Na2O5    | MW=878 |



LCFC007

**Neutraceuticals: Extract from green tea**
**Column:** ZORBAX SB-C8  
863953-906

**4.6 x 150 mm, 3.5 µm**
**Mobile Phase:** 75% 0.1% Trifluoroacetic acid: 25% Methanol

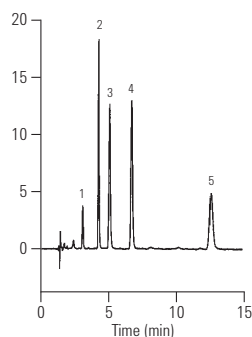
**Injection:** 1 mL/min

**Temperature:** 40 °C

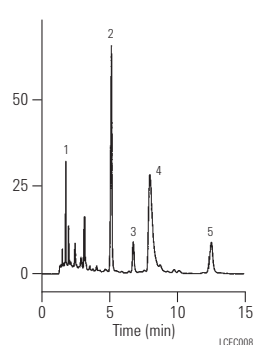
**Detector:** UV, 280 nm

**Sample:** Green tea extract, 5 µL

Catechin Mixture



Green Tea Extract



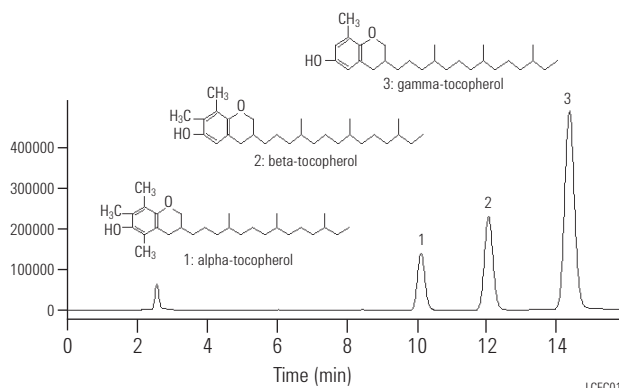
1. Epigallocatechin
2. Epicatechin
3. Epigallocatechin gallate
4. Catechol
5. Epicatechin gallate

**Tocopherols by LC/MS with APPI**
**Column:** Eclipse XDB-C18  
993967-302

**3.0 x 150 mm, 5 µm**
**Mobile Phase:** 97% MeOH: 3% 10 mM CH<sub>3</sub>COONH<sub>4</sub>
**Flow Rate:** 0.5 mL/min

**Temperature:** 40 °C

**MS Conditions:** MS: Agilent 1100MSD SL  
 Ionization: APPI (Positive)  
 Scan range: m/z 100-500  
 Vcap: 1500 V  
 SIM ion: base peak  
 Drying gas: 7 L/min at 350 °C  
 Nebulizer gas: 60 psi  
 Vaporizer temp: 350 °C  
 Fragmentor: 140 V  
 EM gain: 4

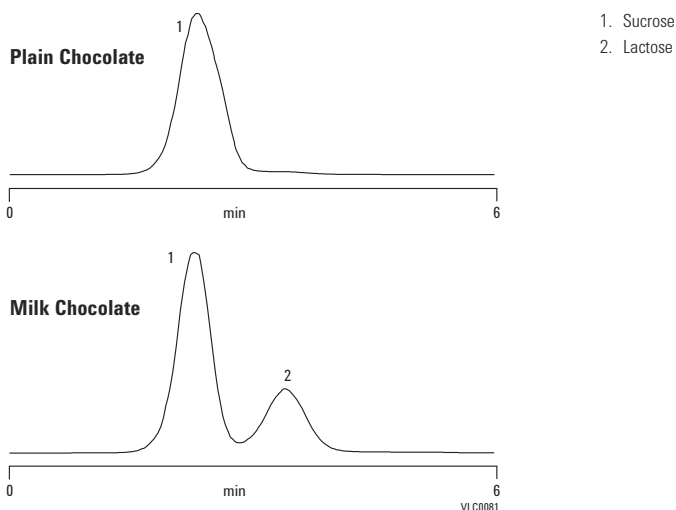
**Sample Volume:** 10 µL


For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Sugars in plain and milk chocolate**

**Column:** Hi-Plex Pb  
 PL1170-6820  
 7.7 x 300 mm, 8 µm

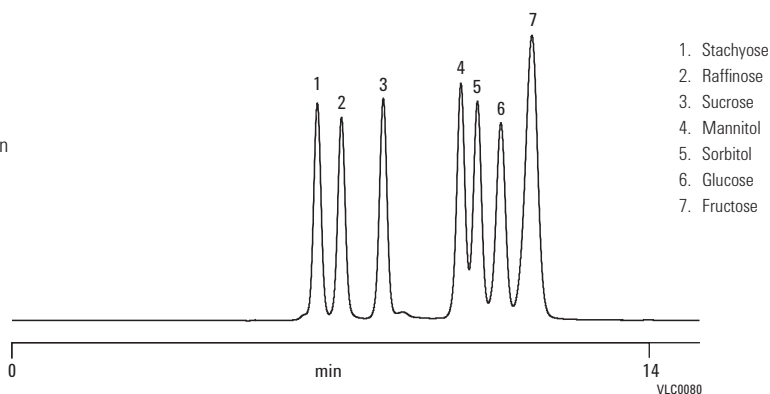
Mobile Phase: Water  
 Flow Rate: 0.6 mL/min  
 Temperature: 80 °C  
 Detector: RI



**Sugars**

**Column:** Hi-Plex K  
 PL1170-6860  
 7.7 x 300 mm, 8 µm

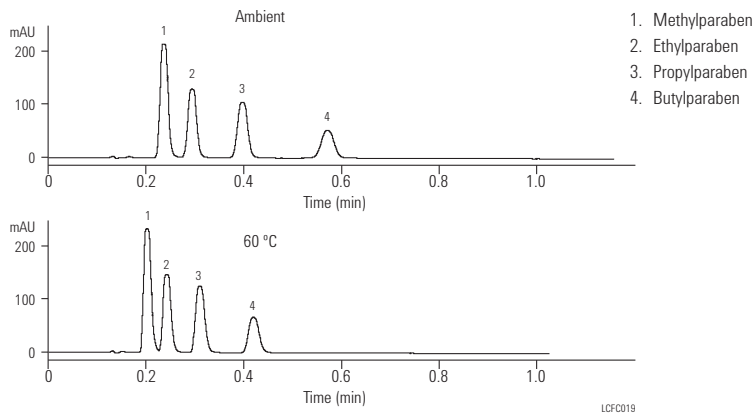
Sample: Sugars mixture (all 10 mg/mL), 20 µL injection  
 Mobile Phase: Water  
 Flow Rate: 0.6 mL/min  
 Temperature: 85 °C  
 Detector: 356-LC RI



**Parabens: High speed separation**

**Column:** ZORBAX SB-C18 Rapid Resolution  
 Cartridge  
 833975-902  
 4.6 x 30 mm, 3.5 µm

Mobile Phase: 0.1% H<sub>3</sub>PO<sub>4</sub>:ACN, (50:50)  
 Flow Rate: 2 mL/min  
 Temperature: Top: ambient, bottom: 60 °C  
 Detector: UV, 254 nm with standard flow cell (13 µL)  
 Sample: Parabens, 1 µL



**Separation of vitamin D2/D3**

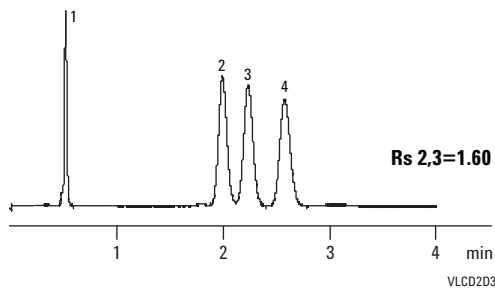
**Column:** Eclipse PAH  
959941-918  
4.6 x 50 mm, 1.8 µm

Mobile Phase: 92% MeOH, 8% water

Flow Rate: 2 mL/min

Temperature: 40 °C

Detector: 325 nm for VA/280 nm for VD and VE



1. Vitamin A
2. Vitamin D2
3. Vitamin D3
4. Vitamin E (a-VE)

**Fat-soluble vitamins on ZORBAX Eclipse XDB-C8**

**Column:** Eclipse XDB-C8  
993967-906  
4.6 x 150 mm, 5 µm

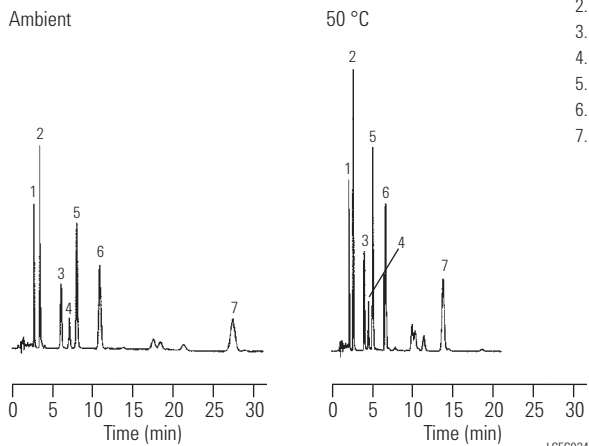
Mobile Phase: 5/95 Water/MeOH

Flow Rate: 1.0 mL/min

Temperature: A: Ambient  
B: 50 °C

Detector: UV, 280 nm

Sample: Fat-soluble vitamins



1. Retinol
2. Retinol acetate
3. Vitamin D3
4. γ-Tocopherol
5. α-Tocopherol
6. Tocopherol acetate
7. Retinol palmitate

**Water-soluble vitamins**

**Column:** ZORBAX SB-C8  
883975-906  
4.6 x 150 mm, 5 µm

Mobile Phase: A: 50 mM Sodium Phosphate, pH 2.5/MeOH (90/10)  
B: 50 mM Sodium Phosphate, pH 2.5/MeOH (10/90)

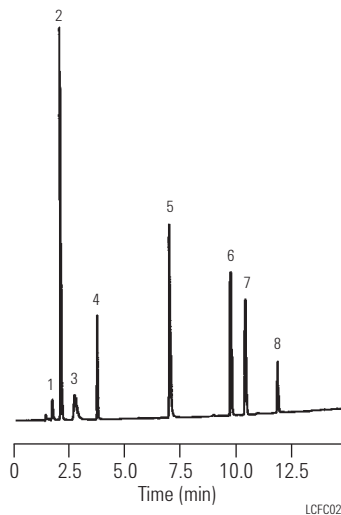
Flow Rate: 1.0 mL/min

Gradient: 0-70% B in 18 min

Temperature: Ambient

Detector: UV, 245 nm

Sample: Water-soluble vitamins



1. B<sub>1</sub>-Thiamine
2. Vitamin C
3. B<sub>3</sub>-Niacin
4. B<sub>6</sub>-Pyridoxine
5. Pantothenic acid
6. Folic acid
7. B<sub>12</sub>-Cyanocobalamin
8. B<sub>2</sub>-Riboflavin

**Water-soluble vitamins:  
High speed separation using ion-pairing**

**Column:** ZORBAX Rx/SB-C8  
866953-906  
4.6 x 75 mm, 3.5 µm

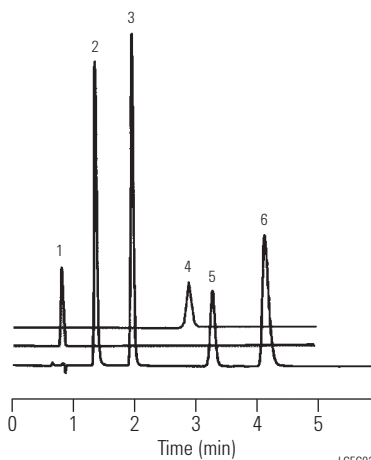
Mobile Phase: 10 mM Hexane Sulfonate with 0.1%  
Phosphoric Acid: MeOH (74:26)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 245 nm

Sample: Water-soluble vitamins



- 1. Vitamin C
- 2. B<sub>3</sub>-Niacin
- 3. B<sub>6</sub>-Pyridoxine
- 4. Folic acid
- 5. B<sub>2</sub>-Riboflavin
- 6. B<sub>1</sub>-Thiamine

**Water-soluble vitamins using the USP 23  
method**

**Column:** ZORBAX SB-C18  
880975-902  
4.6 x 250 mm, 5 µm

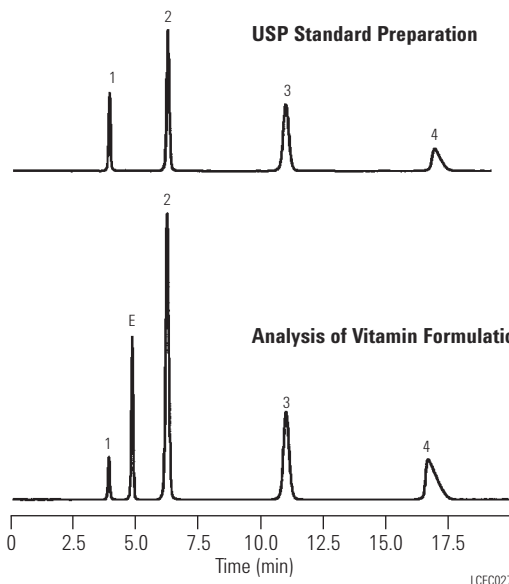
Mobile Phase: 7.2 mM Hexane Sulfonate/MeOH/Acetic Acid  
(73/27/1) (ratio to 101)

Flow Rate: 1.0 mL/min

Temperature: 30 °C

Detector: UV, 280 nm

Sample: Water-soluble vitamins



- 1. B<sub>3</sub>-Niacin
- 2. B<sub>6</sub>-Pyridoxine
- 3. B<sub>2</sub>-Riboflavin
- 4. B<sub>1</sub>-Thiamine
- E. Excipient

**Water-soluble B vitamins separated on ZORBAX SB-Aq**

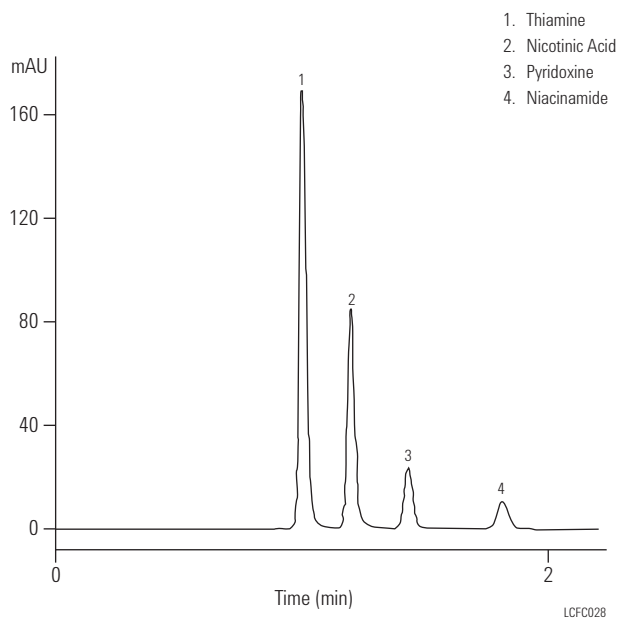
**Column:** ZORBAX SB-Aq  
883975-914  
4.6 x 150 mm, 5 µm

Mobile Phase: 5% MeOH/95% water (0.1% TFA)

Flow Rate: 2.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm



**Sunscreen ingredients:  
Perform conventional, fast and ultra-fast separations on the same column family**

**Column A:** Eclipse XDB-C18  
993967-902  
4.6 x 150 mm, 5 µm  
6 µL inj

**Column B:** Eclipse XDB-C18  
961967-902  
4.6 x 100 mm, 3.5 µm  
4 µL inj

**Column C:** Eclipse XDB-C18  
927975-902  
4.6 x 50 mm, 1.8 µm  
2 µL inj

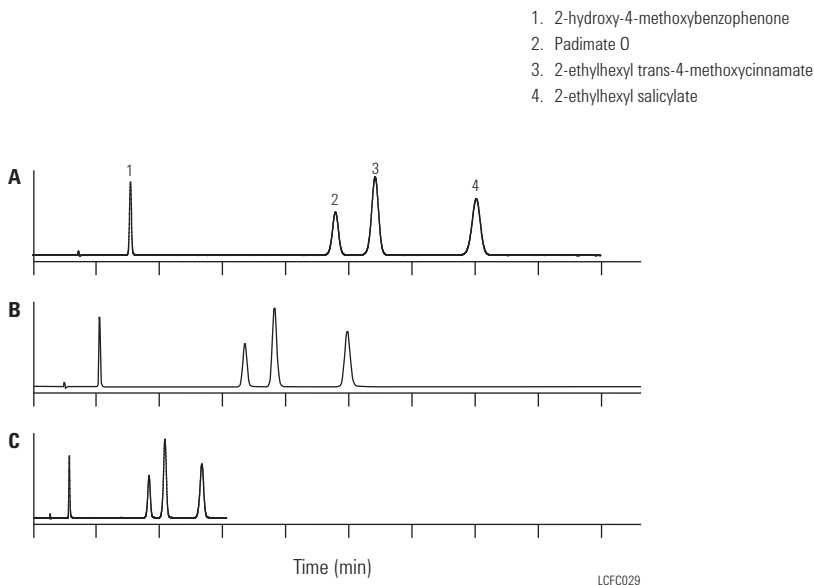
Mobile Phase: A: 15% water  
B: 85% MeOH

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Sunscreens



**Fast vitamin E analysis on Rapid Resolution HT**

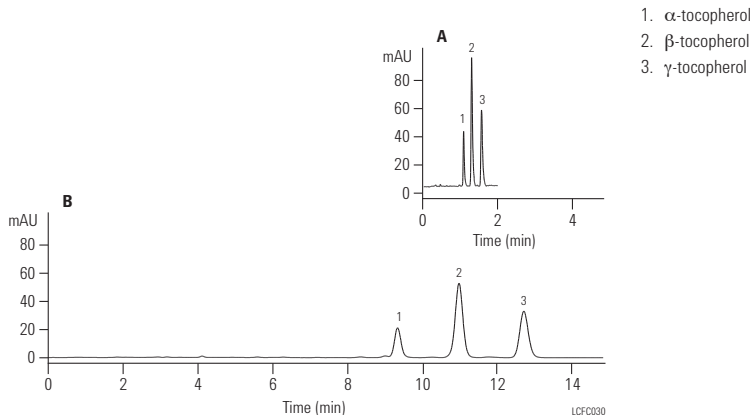
**Column A:** Eclipse XDB-C18  
927975-902  
4.6 x 50 mm, 1.8 μm

**Column B:** Eclipse XDB-C18  
993967-902  
4.6 x 150 mm, 5 μm

Mobile Phase: A: 5% water  
B: 95% MeOH

Flow Rate: 3 mL/min, 1 mL/min

Temperature: Ambient



**Theobromine in beverages**

**Column:** ZORBAX SB-C18  
827975-902  
4.6 x 50 mm, 1.8 μm

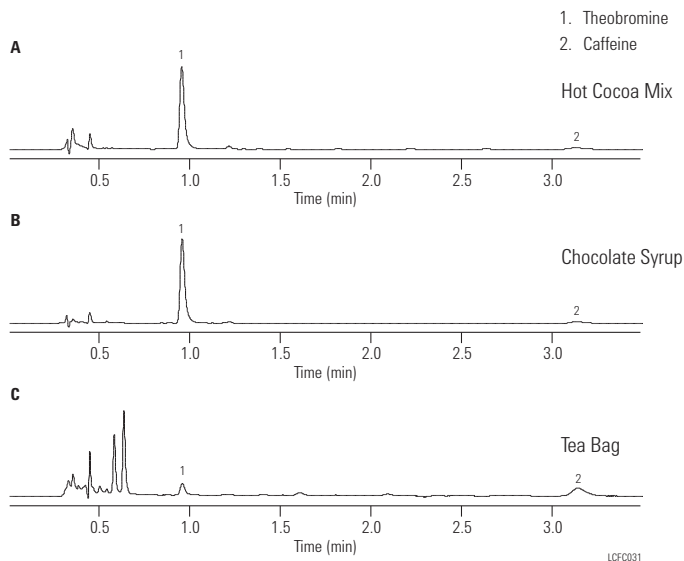
Mobile Phase: A: 92% 0.1% formic acid  
B: 8% 0.1% formic acid in ACN

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV, 254 nm, flow cell 2 μL,  
3 mm flow path

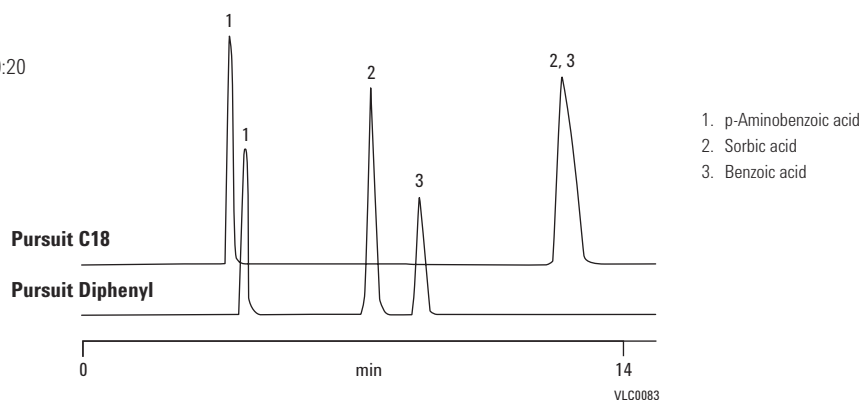
Sample: Theobromine





**Benzoic acid/sorbic acid**

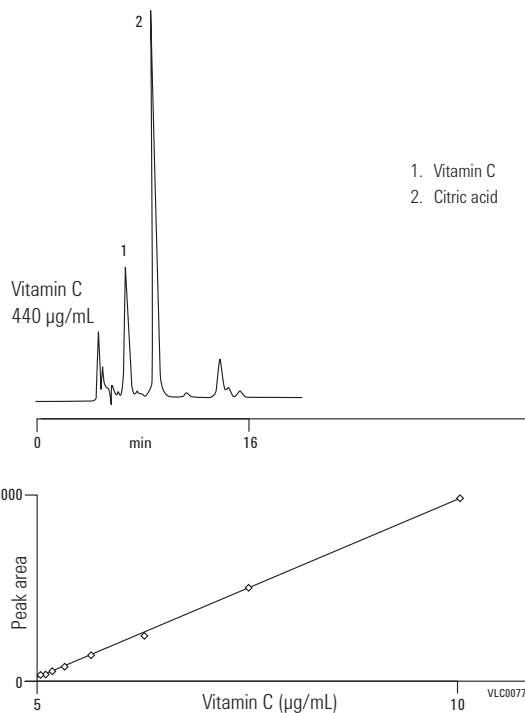
Mobile Phase: 0.1% formic acid in water:  
0.1% formic acid in MeCN, 80:20  
Flow Rate: 0.7 mL/min  
Detector: UV, 254 nm



**Quantification and qualification of vitamin C and citric acid in fresh grapefruit juice**

Column: **PLRP-S 100Å**  
**PL1512-5500**  
**4.6 x 250 mm, 5 µm**

Sample: Diluted 1:50 in eluent  
Mobile Phase: 0.2M NaH<sub>2</sub>PO<sub>4</sub>, pH 2.14  
Flow Rate: 0.5 mL/min  
Detector: UV, 220 nm



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Rose wine**

**Column:** Hi-Plex H  
 PL1170-6830  
 7.7 x 300 mm, 8 µm

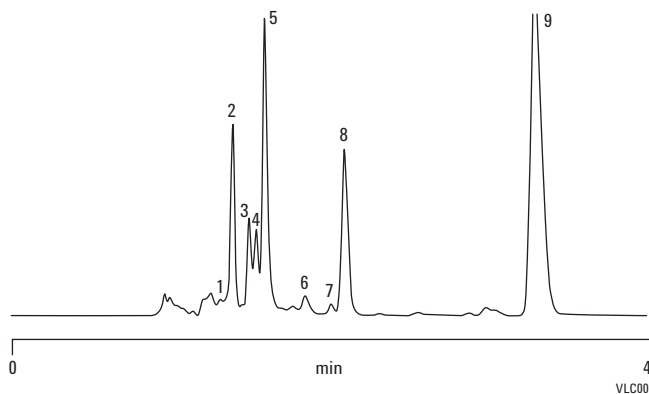
Mobile Phase: 0.004M H<sub>2</sub>SO<sub>4</sub>

Flow Rate: 0.4 mL/min

Pressure: 13 bar

Temperature: 75 °C

Detector: RI



1. Citric acid
2. Tartaric acid
3. Glucose
4. Malic acid
5. Fructose
6. Succinic acid
7. Lactic acid
8. Glycerol
9. Ethanol

**Sports drink**

**Column:** Hi-Plex Na  
 PL1171-6140  
 7.7 x 300 mm, 10 µm

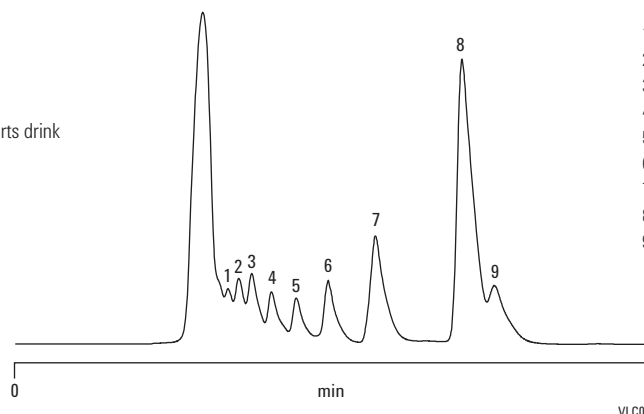
Sample: High energy orange flavor non-carbonated sports drink

Mobile Phase: Water

Flow Rate: 0.3 mL/min

Temperature: 80 °C

Detector: RI



1. Dp8
2. Dp7
3. Dp6
4. Dp5
5. Dp4
6. Dp3
7. Dp2
8. Dp1 (Glucose)
9. Fructose

**Oligosaccharides**

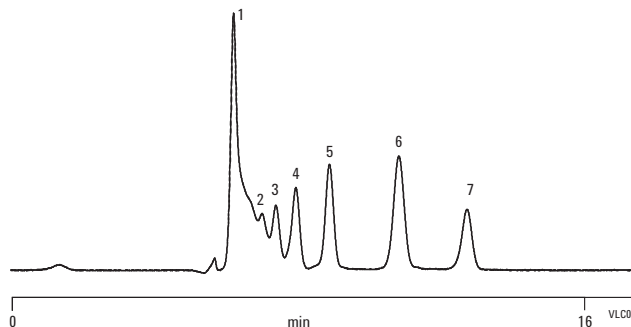
**Column:** Hi-Plex Ca (Duo)  
 PL1F70-6850  
 6.5 x 300 mm, 8 µm

Mobile Phase: DI water

Flow Rate: 0.5 mL/min

Temperature: 90 °C

Detector: RI



1. Higher MW sugars
2. DP5
3. DP4
4. DP3
5. DP2
6. DP1
7. Fructose

# Pharmaceutical Applications

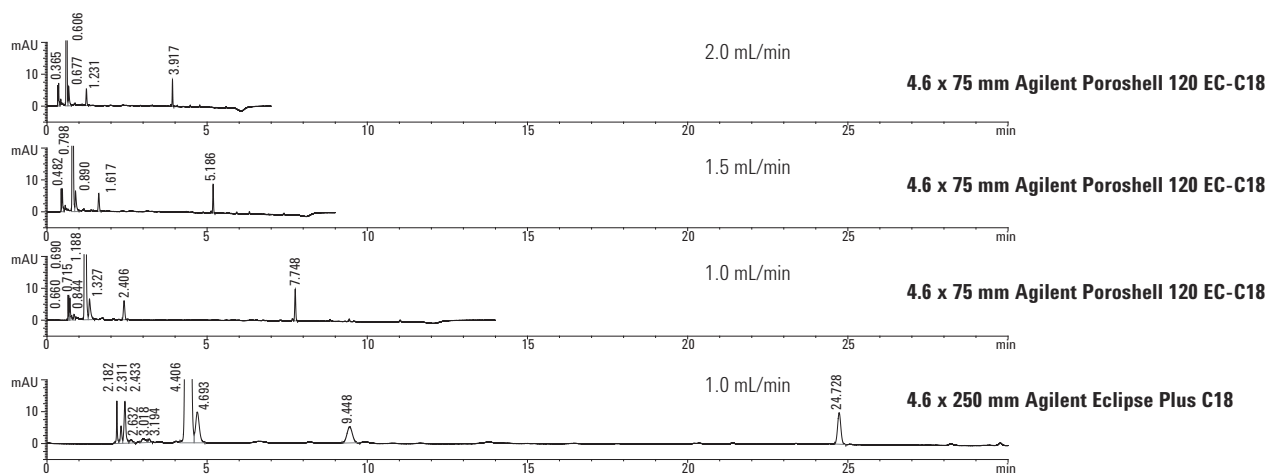
**NEW!**

## Fast analysis of cefepime and related impurities

**Column:** Poroshell 120 EC-C18  
697975-902  
4.6 x 75 mm, 2.7 µm

**Column:** Eclipse Plus C18  
959990-902  
4.6 x 250 mm, 5 µm

Detector: Agilent 1200 Infinity Series



**NEW!**

## Naproxen analysis

**Column A:** Eclipse Plus C18  
959993-902  
4.6 x 150 mm, 5 µm

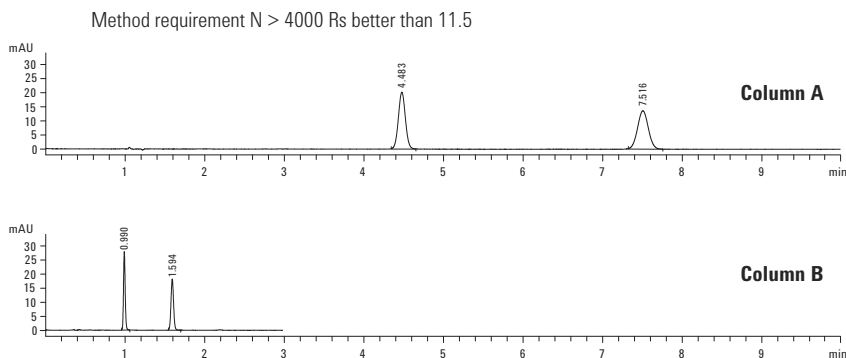
**Column B:** Poroshell 120 EC-C18  
699975-902  
4.6 x 50 mm, 2.7 µm

Mobile Phase: 50:49:1 MeCN:H<sub>2</sub>O:Glacial acetic acid

Flow Rate: 1.2 mL/min

Injection: Column A: 20 µL  
Column B: 6.7 µL

Injection: Naproxen



4-fold reduction in analysis time for this method when transferring to Poroshell 120.

**NEW!**

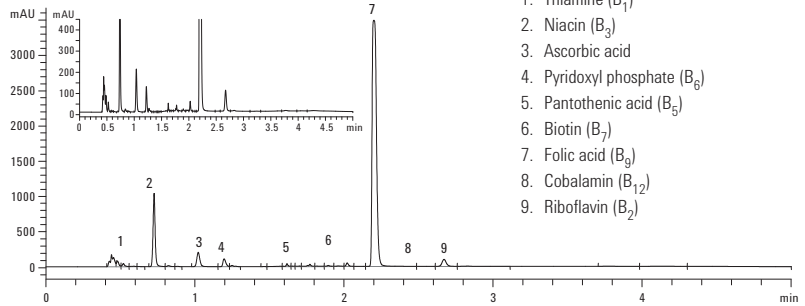
**Analysis of water soluble vitamins in multivitamin tablets**

**Column:** Poroshell 120 EC-C18  
697975-902  
4.6 x 75 mm, 2.7 µm

Flow Rate: 1.5 mL/min

Gradient: 0 min-1% B, 0.5 min-12% B,  
0.52 min-30% B,  
3.5 min-30% B, 4.5 min-1% B

Injection: 5 µL



1. Thiamine (B<sub>1</sub>)
2. Niacin (B<sub>3</sub>)
3. Ascorbic acid
4. Pyridoxyl phosphate (B<sub>6</sub>)
5. Pantothenic acid (B<sub>5</sub>)
6. Biotin (B<sub>7</sub>)
7. Folic acid (B<sub>9</sub>)
8. Cobalamin (B<sub>12</sub>)
9. Riboflavin (B<sub>2</sub>)

**NEW!**

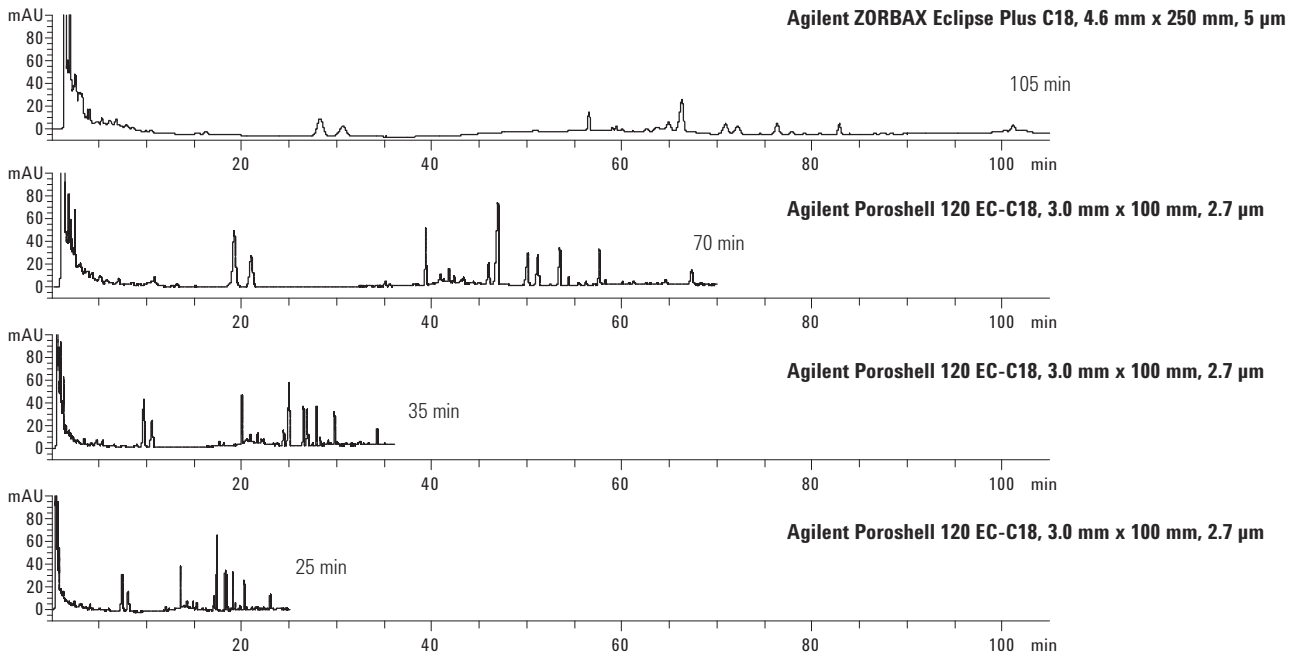
**Fast method for ginseng analyses scaled from a traditional method**

**Column:** Eclipse Plus C18  
959993-902  
4.6 x 150 mm, 5 µm

**Column:** Poroshell 120 EC-C18  
695975-302  
3.0 x 100 mm, 2.7 µm

Detector: 1200 Infinity Series

Sample: Ginsenoside



**NEW!**

**Separation of 8 steroids**

**Column A:** Poroshell 120 EC-C18  
695775-902  
2.1 x 100 mm, 2.7 µm

**Column B:** Poroshell 120 SB-C18  
685775-902  
2.1 x 100 mm, 2.7 µm

**Column C:** Poroshell 120 Phenyl-Hexyl  
695775-912  
2.1 x 100 mm, 2.7 µm

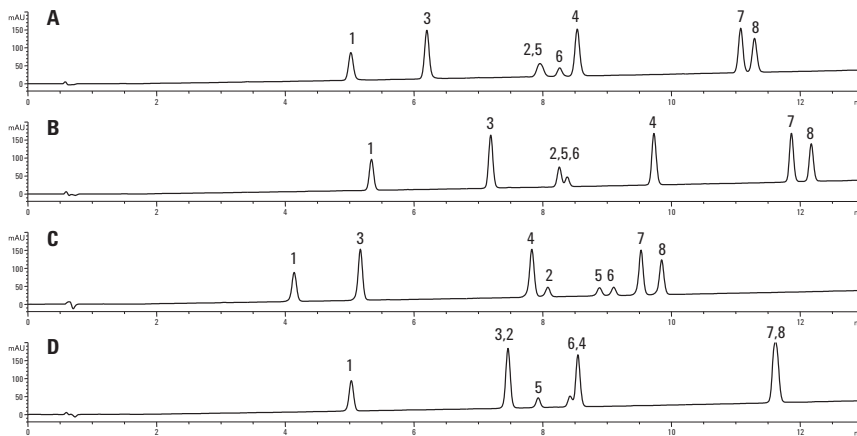
**Column D:** Poroshell 120 Bonus RP  
685775-901  
2.1 x 100 mm, 2.7 µm

Mobile Phase: 0.1% formic acid  
in both water and MeOH

Flow Rate: 0.4 mL/min, 25 °C,  
2.1 x 100 mm 40 °C

Gradient: 40-80% MeOH in 14 min

1. Hydrocortisone
2. β-Estradiol
3. Androstadiene 3,17 dione
4. Testosterone
5. Ethynylestradiol
6. Estrone
7. Norethindrone acetate
8. Progesterone



**NEW!**

**Mixture of beta blockers**

**Column A:** Poroshell 120 Bonus RP  
685775-901  
2.1 x 100 mm, 2.7 µm

**Column B:** Poroshell 120 Phenyl-Hexyl  
695775-912  
2.1 x 100 mm, 2.7 µm

**Column C:** Poroshell 120 EC-C18  
695775-902  
2.1 x 100 mm, 2.7 µm

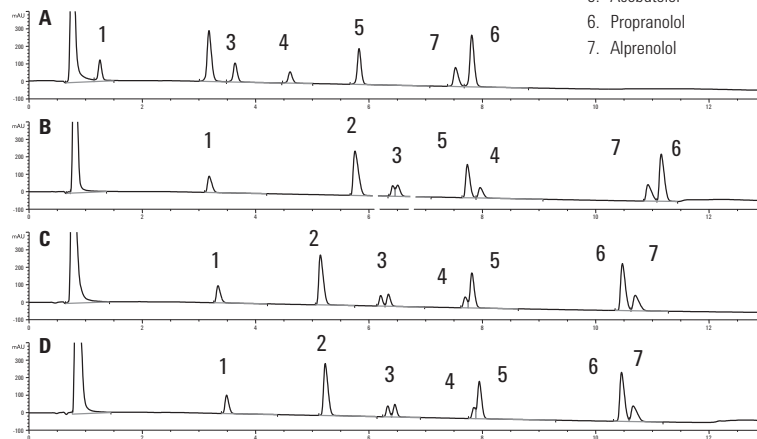
**Column D:** Poroshell 120 SB-C18  
685775-902  
2.1 x 100 mm, 2.7 µm

Mobile Phase: 10 mM pH 3.8 NH<sub>4</sub>HCO<sub>2</sub>, methanol

Flow Rate: 0.35 mL/min

Gradient: 90% B to 30% B over 12 min

1. Atenolol
2. Pindolol
3. Nadolol
4. Metoprolol
5. Acebutolol
6. Propranolol
7. Alprenolol



\* Nadolol is isobaric and elutes as two peaks.

**NEW!**

**Several ZORBAX RRHD 1.8 µm selectivities facilitate method development**

**Column:** ZORBAX RRHD Eclipse Plus C18  
959758-902  
2.1 x 100 mm, 1.8 µm

**Column:** ZORBAX RRHD Eclipse XDB-C18  
981758-902  
2.1 x 100 mm, 1.8 µm

**Column:** ZORBAX RRHD SB-C18  
858700-902  
2.1 x 100 mm, 1.8 µm

**Column:** ZORBAX RRHD Extend-C18  
758700-902  
2.1 x 100 mm, 1.8 µm

**Mobile Phase:** A: H<sub>2</sub>O  
B: CH<sub>3</sub>CN, each with 0.1% HCOOH

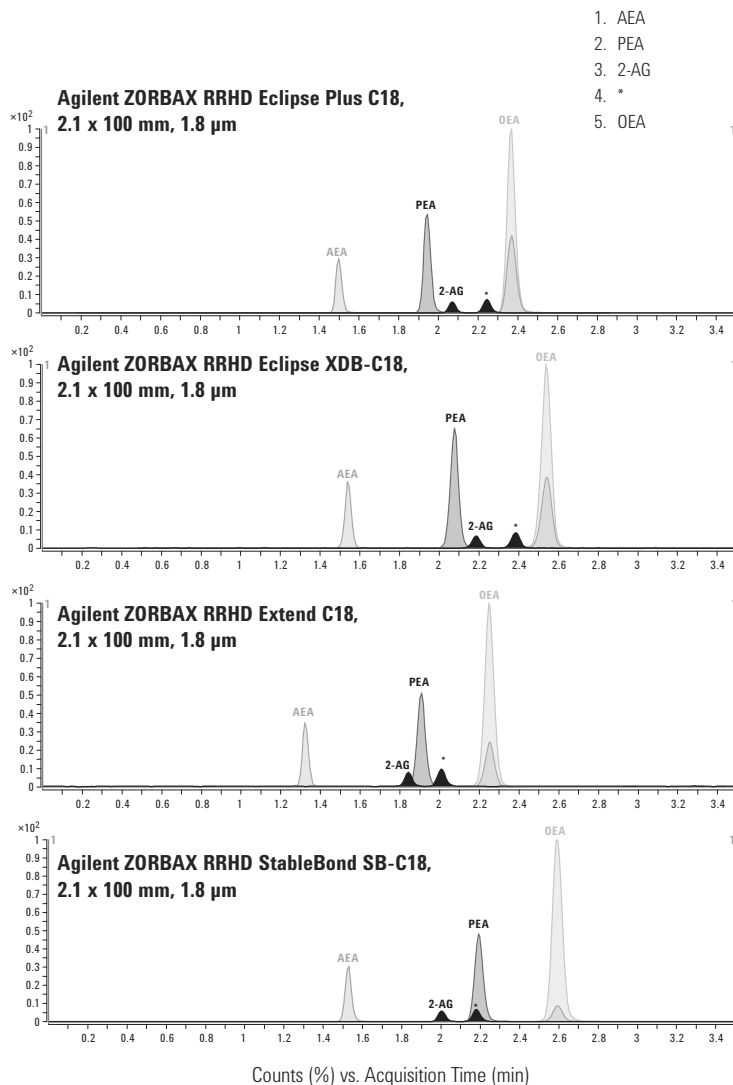
**Detector:** Agilent 1290 Infinity LC with an Agilent 6410 Triple Quadrupole Mass Spectrometer

**MS Conditions:** TCC: 30 °C  
MS Source: Electrospray AP-ESI  
Drying-gas temperature and flow: 325 °C, 12 L/min  
Nebulizer gas pressure: 35 psi  
Capillary voltage: 3000 V

**Sample:** Four endocannabinoid fatty amides:  
Arachidonoylglycerol (AEA)  
2-Arachidonoylglycerol (2-AG)  
Palmitoylethanolamide (PEA)  
Oleoylethanolamide (OEA)

\* The second black peak is an impurity, believed to be 1,3-arachidonoylglycerol, a rearrangement of 2-AG

The selectivity of four Agilent ZORBAX RRHD C18 columns is compared using a method for endocannabinoids.



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Fast analysis 11 common compounds found in analgesics**

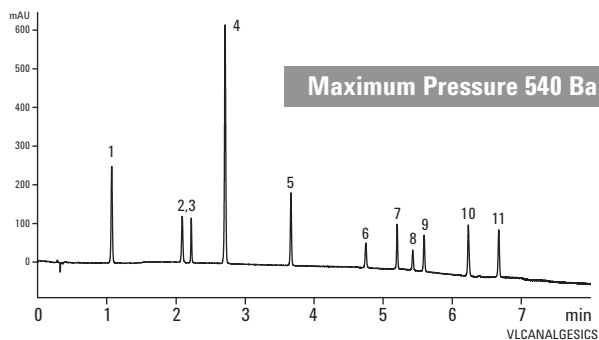
**Column:** Poroshell 120 EC-C18  
695975-902  
4.6 x 100 mm, 2.7 µm

**Mobile Phase:** A : Water + 0.1% formic acid  
B: ACN

**Flow Rate:** 3.5 mL/min

**Temperature:** 40 °C

**Detector:** DAD 254 nm



1. Acetaminophen
2. Caffeine
3. 2-Acetamidophenol
4. Acetamide
5. Phenacetin
6. Sulindac
7. Piroxicam
8. Tolmetin
9. Ketoprofen
10. Diflusalinal
11. Diclofenac

**Faster analysis of USP Method for simvastatin tablet**

**Column A:** Eclipse Plus C18  
959990-902  
4.6 x 250 mm, 5 µm

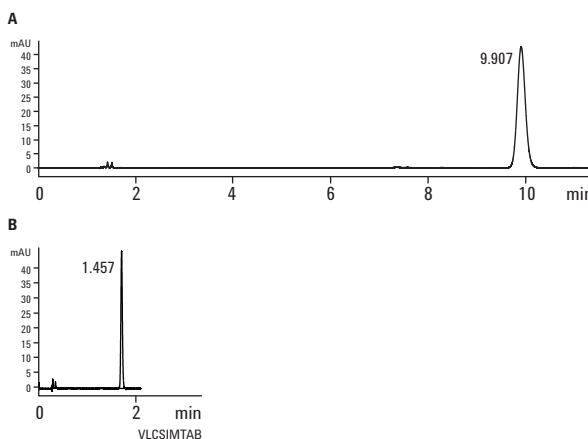
**Column B:** Poroshell 120 EC-C18  
697975-902  
4.6 x 75 mm, 2.7 µm

**Mobile Phase:** 65% CH<sub>3</sub>CN,  
35% 3.9 g/L NaH<sub>2</sub>PO<sub>4</sub> (pH 4.5)

**Flow Rate:** 1.5 mL/min for 5 µm column  
2.8 mL/min for 2.7 µm Poroshell 120 column

**Temperature:** 45 °C

**Detector:** DAD Sig = 238, 8  
Ref = 360, 100 nm



	USP Requirement	5 µm (1.5 mL/min)	2.7 µm (2.8 mL/min)
<b>T<sub>R</sub></b>	N/A	9.907	1.457
<b>k'</b>	> 3.0	5.962	5.122
<b>N</b>	> 4500	16939	14439
<b>T<sub>f</sub></b>	< 2.0	1.09	1.10

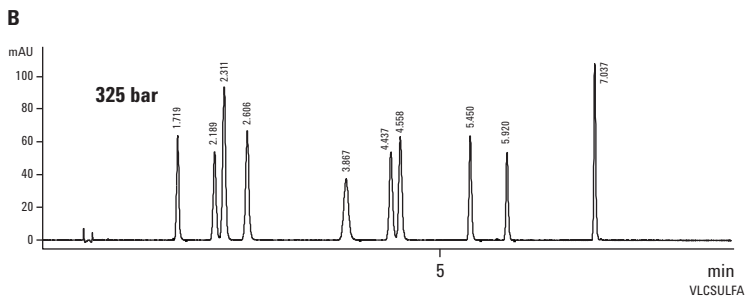
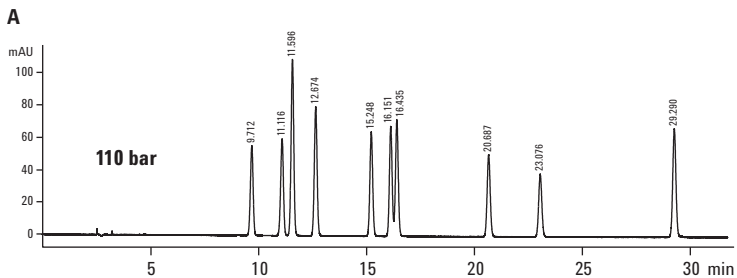
**Faster separation of sulfa drugs**

**Column A:** Eclipse Plus C18  
 959990-902  
 4.6 x 250 mm, 5 µm  
 Time 0 33 35  
 %B 8 33 33

**Column B:** Poroshell 120 EC-C18  
 695975-902  
 4.6 x 100 mm, 2.7 µm  
 Time 0 12 13.2  
 %B 8 33 33

Mobile Phase: A: 0.1% formic acid in Water  
 B: 0.1% formic acid in ACN

Flow Rate: 1 mL/min



**Separation of pharmaceutical cardiac drugs**

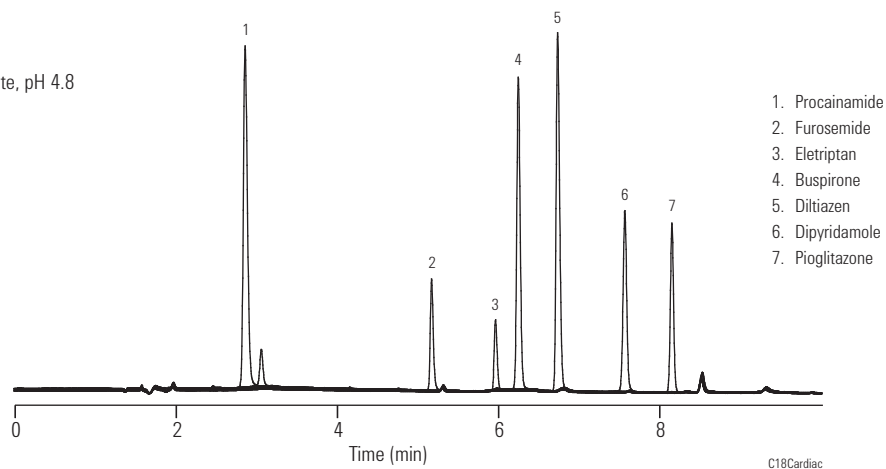
**Column:** Eclipse Plus C18  
 959996-902  
 4.6 x 100 mm, 5 µm

Mobile Phase: A: 20 mM Ammonium Acetate, pH 4.8  
 B: ACN

Flow Rate: 1 mL/min

Gradient: 10-90% in 10 min

Detector: UV, 254 nm





### Fast and ultra-fast analysis of basic compounds

**Column:** Eclipse Plus C18  
959941-902  
4.6 x 50 mm, 1.8  $\mu$ m

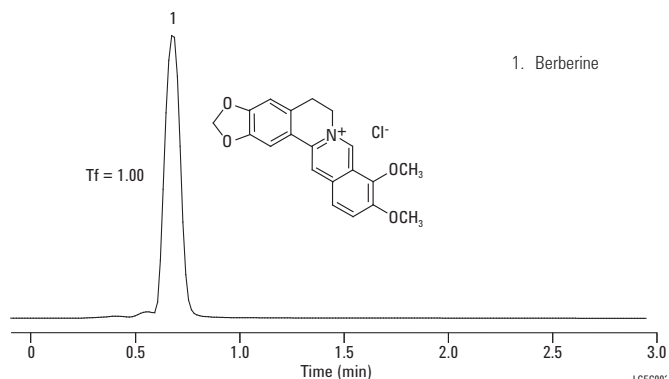
**Mobile Phase:** A: 50% 8 mM  $K_2HPO_4$ , pH 7  
B: 50% ACN

**Flow Rate:** 1.0 mL/min

**Temperature:** Ambient

**Detector:** UV, 254 nm

**Sample:** Berberine, 0.4 mg/mL, 2  $\mu$ L



### Xanthines: Higher resolution, same selectivity with RRHT

**Column A:** ZORBAX SB-C18  
846975-902  
4.6 x 50 mm, 5  $\mu$ m

**Column B:** ZORBAX SB-C18  
827975-902  
4.6 x 50 mm, 1.8  $\mu$ m

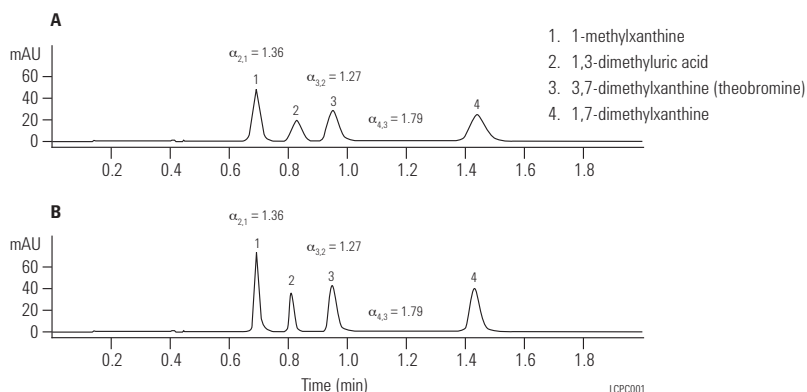
**Mobile Phase:** A: 92% 0.1% formic acid  
B: 8% 0.1% formic acid in ACN

**Flow Rate:** 1.5 mL/min

**Temperature:** Ambient

**Detector:** UV, 254 nm

**Sample:** Xanthines



### Antihistamines: Fast separations on RRHT Extend-C18

**Column A:** ZORBAX Extend-C18  
773450-902  
4.6 x 150 mm, 5  $\mu$ m

**Column B:** ZORBAX Extend-C18  
727975-902  
4.6 x 50 mm, 1.8  $\mu$ m

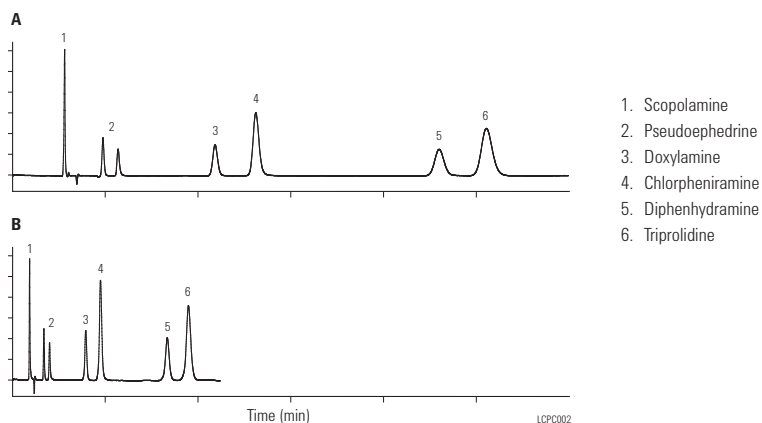
**Mobile Phase:** A: 30% 50 mM pyrrolidine buffer  
B: 70% MeOH

**Flow Rate:** 1.0 mL/min

**Temperature:** Ambient

**Detector:** UV, 220 nm

**Sample:** Antihistamines



**Ibuprofen:**  
Optimizing selectivity with RRHT Columns

**Column A:** SB-C8  
827975-906  
4.6 x 50 mm, 1.8  $\mu$ m

**Column B:** Eclipse XDB-C8  
927975-906  
4.6 x 50 mm, 1.8  $\mu$ m

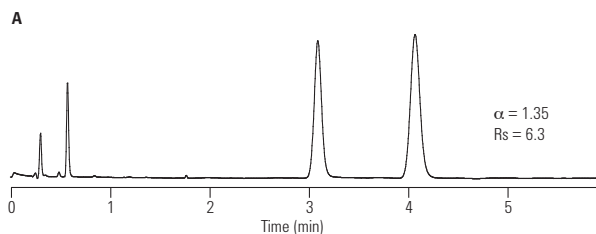
Mobile Phase: A: 63% water  
B: 37% acetonitrile + 1.8 mL H<sub>3</sub>PO<sub>4</sub>

Flow Rate: 2.0 mL/min

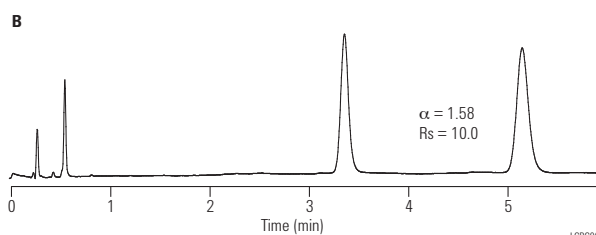
Temperature: Ambient

Detector: UV, 254 nm

Sample: Ibuprofen oral suspension



1. Benzophenone
2. Ibuprofen



LCP003

**Analgesics**

**Column:** Pursuit XRs Diphenyl  
A6020150X046  
4.6 x 150 mm, 5  $\mu$ m

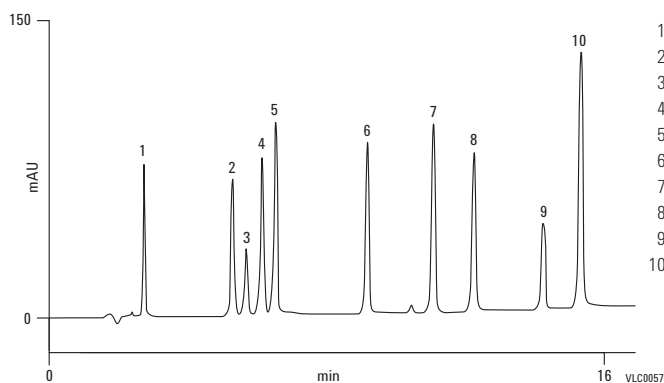
Mobile Phase: A: Water+0.1% HCOOH  
B: MeCN+0.1% HCOOH

Gradient: 25-80% B in 20 min

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. Acetaminophen
2. Acetanilide
3. Salicylic acid
4. Acetylsalicylic acid
5. Phenacetin
6. Carbamazepine
7. Tolmetin
8. Naproxen
9. Ibuprofen
10. Diclofenac

VLC0057



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Anesthetics, local: Bonded phase selectivity**

**Column A:** ZORBAX SB-C18  
883975-902  
4.6 x 150 mm, 5 µm

**Column B:** ZORBAX SB-C8  
883975-906  
4.6 x 150 mm, 5 µm

**Column C:** ZORBAX SB-C3  
883975-909  
4.6 x 150 mm, 5 µm

**Column D:** ZORBAX SB-Phenyl  
883975-912  
4.6 x 150 mm, 5 µm

**Column E:** ZORBAX SB-CN  
883975-905  
4.6 x 150 mm, 5 µm

Mobile Phase: A: 50 mM NaH<sub>2</sub>PO<sub>4</sub> pH 2.5 in 95% H<sub>2</sub>O/5% ACN  
B: 50 mM NaH<sub>2</sub>PO<sub>4</sub> pH 2.5 in 47% H<sub>2</sub>O/53% ACN

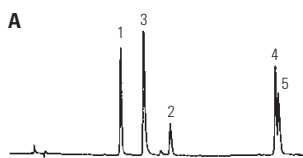
Flow Rate: 1.5 mL/min

Gradient: 0-100% B in 18.8 min

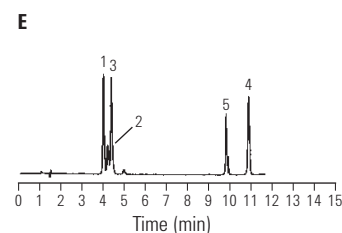
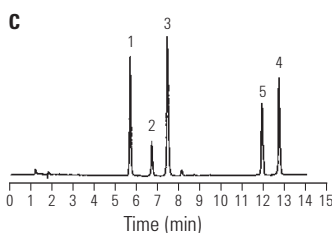
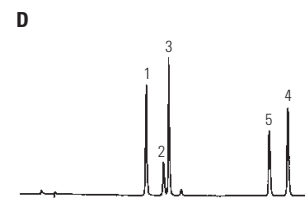
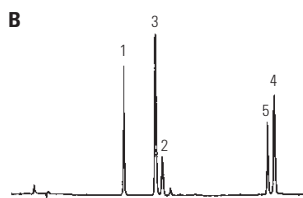
Temperature: 26 °C

Detector: UV, 254 nm

Sample: 10 µL, 10 ug/mL



- 1. Procaine
- 2. Lidocaine
- 3. d-Cinchonine
- 4. Butacaine
- 5. Tetracaine



LCPC005

**Local anesthetics**

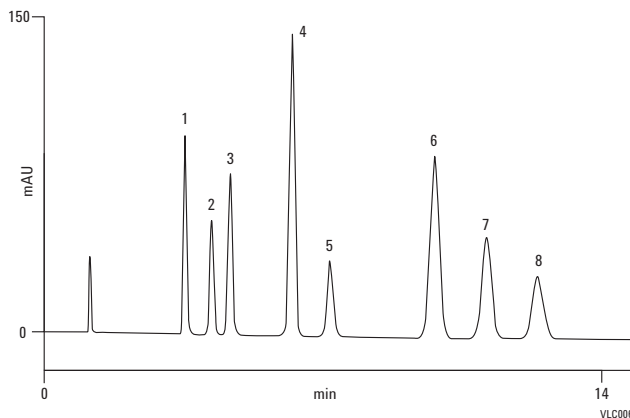
**Column:** Pursuit XRs C8  
A6010150X046  
4.6 x 150 mm, 5 µm

Mobile Phase: 65:35 MeOH:5 mM NH<sub>4</sub>CO<sub>3</sub>, pH 10

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 210 nm



- 1. Benzocaine
- 2. Procaine
- 3. Chlorocaine
- 4. Mepivacaine
- 5. 4-Hydroxypropivacaine
- 6. Cocaine
- 7. Lidocaine
- 8. Ropivacaine

VLC0063

**Antibiotics: High speed separation**

**Column:** ZORBAX Rx/SB-C8  
866953-906  
4.6 x 75 mm, 3.5 µm

Mobile Phase: 8.0% acetonitrile/92% 0.1% aqueous TFA

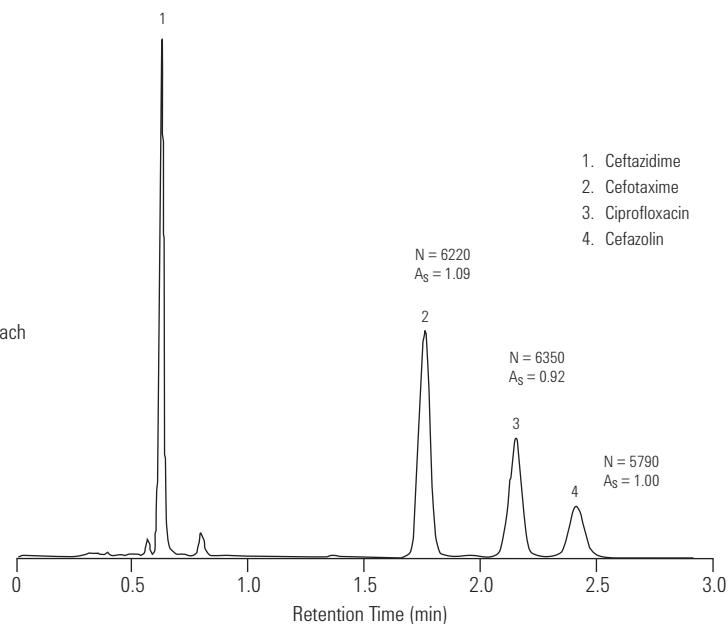
Flow Rate: 3.0 mL/min

Gradient: 45-70% B in 35 min

Temperature: 60 °C

Detector: UV, 260 nm

Sample: 1 µL containing 0.40, 0.36, 0.10 and 0.37 µg each of 1-4 resp.



- 1. Ceftazidime
- 2. Cefotaxime
- 3. Ciprofloxacin
- 4. Cefazolin

LCPC007

**Antibiotics: Lincomycin and Clindamycin by LC-APCI-MS LC-TIC**

**Column:** ZORBAX SB-C18 cartridge  
823700-902  
2.1 x 30 mm, 1.8 µm

Mobile Phase: Gradient: 15-50% B in 1 min, hold for 1.5 min,  
A: 0.2% formic acid pH 2.8  
B: ACN + 0.2% formic acid

Flow Rate: 0.5 mL/min

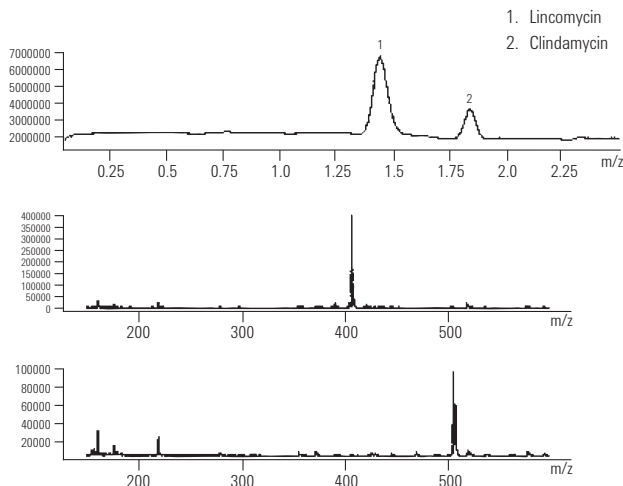
Gradient: Post time: 1.5 min

Temperature: Ambient

Detector: APCI, Positive ion

MS Conditions: Peak width: 0.10 min  
Scan: 150-600 Da, step 0.1  
Fragmentor: 70  
Gas Temp: 350 °C  
Vaporizer: 350 °C  
Drying gas: 12 L/min  
Nebulizer pres: 50 psi  
Vcap: +3000 V  
Corona: 4.0 µA

Sample: Antibiotics, 1 µL



- 1. Lincomycin
- 2. Clindamycin

LCPC008

**Antifungal medications**

**Column:** ZORBAX Bonus-RP  
883668-901  
4.6 x 150 mm, 5 µm

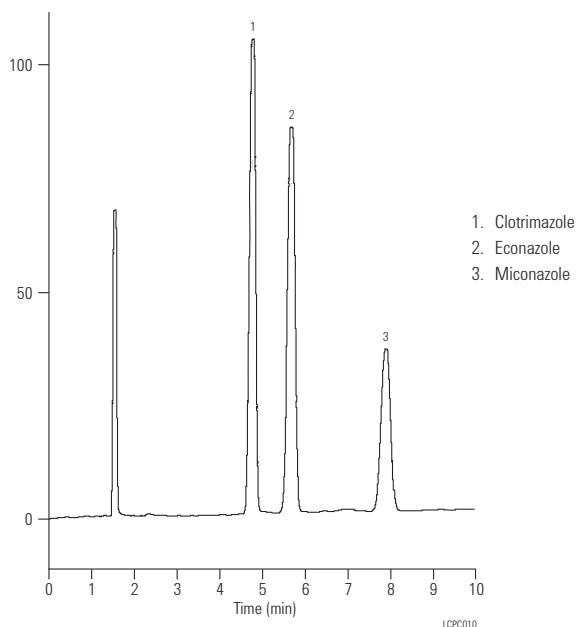
**Mobile Phase:** 35% 25 mM NaH<sub>2</sub>PO<sub>4</sub>, Dibasic (pH 6.5 with H<sub>3</sub>PO<sub>4</sub>):  
65% ACN

**Flow Rate:** 1 mL/min

**Temperature:** Ambient

**Detector:** UV, 220 nm

**Sample:** Antifungals, 2 µL



**Antifungals**

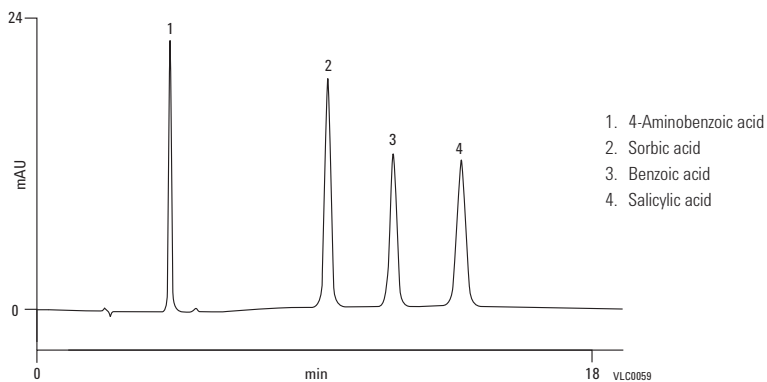
**Column:** Pursuit XRs Diphenyl  
A6020150X046  
4.6 x 150 mm, 5 µm

**Mobile Phase:** Water+0.1% HCOOH:  
MeCN+0.1% HCOOH, 80:20

**Flow Rate:** 1.0 mL/min

**Temperature:** Ambient

**Detector:** UV, 254 nm



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Analgesics: Non-steroidal anti-inflammatory drugs:  
Narrow bore separation**

**Column:** Eclipse XDB-C8  
993700-906  
2.1 x 150 mm, 5 µm

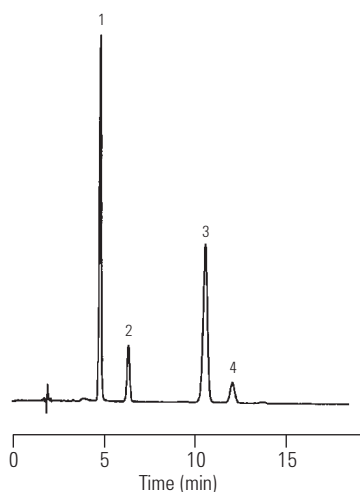
Mobile Phase: 50/50, 25 mM Sodium Phosphate  
(pH 7.0 with Phosphoric Acid), MeOH

Flow Rate: 0.2 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: 2 µL, 10 ug/mL



NSAID	pK <sub>a</sub>
1. Phenacetin	2.2
2. Tolmetin	3.5
3. Phenylbutazone	4.4
4. Fenoprofen	4.5

LCPC011

**Separation of small molecule anorectics**

**Column A:** ZORBAX Bonus-RP  
883668-901  
4.6 x 150 mm, 5 µm

**Column B:** Traditional Alkyl C8 Phase

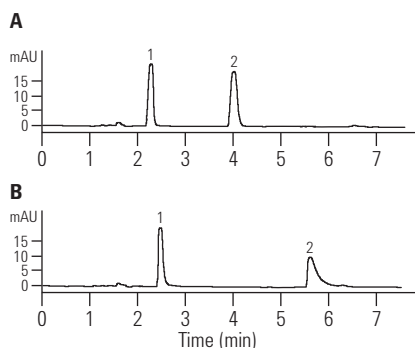
Mobile Phase: 25 mM K<sub>2</sub>HPO<sub>4</sub>, pH 7.2/MeOH: ACN (50:50), 45/55

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Anorectics "Fen-phen", 5 µL



1. Phentermine
2. Fenfluramine

LCBP004



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Aromatic acids/benzoic acids:  
Selectivity differences**

**Column A:** ZORBAX SB-C8  
880975-906  
4.6 x 250 mm, 5 µm

**Column B:** ZORBAX SB-Phenyl  
880975-912  
4.6 x 250 mm, 5 µm

**Column C:** ZORBAX SB-CN  
880975-905  
4.6 x 250 mm, 5 µm

Mobile Phase: 30-45% methanol in 25 mM Na Phosphate, pH 2.5

A: 45% Methanol

B: 40% Methanol

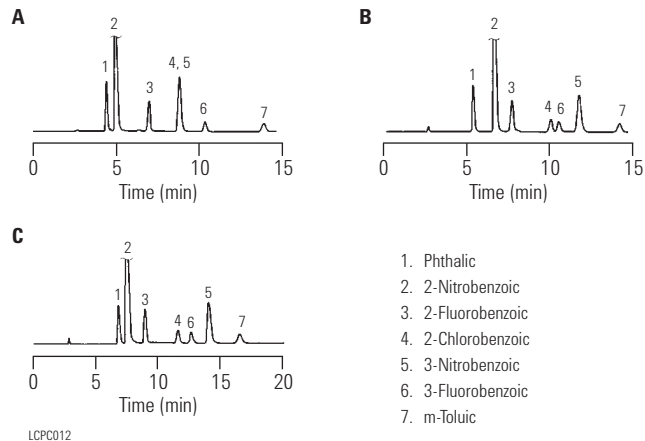
C: 30% Methanol

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Benzoic acids



**Catecholamines/biogenic amines:  
Rapid separation using ion-pair reagents**

**Column:** ZORBAX Rx/SB-C8  
866953-906  
4.6 x 75 mm, 3.5 µm

Mobile Phase: 0.14 M sodium phosphate,  
20 mM EDTA,  
0.75 mM octyl sulfonate,  
9% methanol pH 3.5

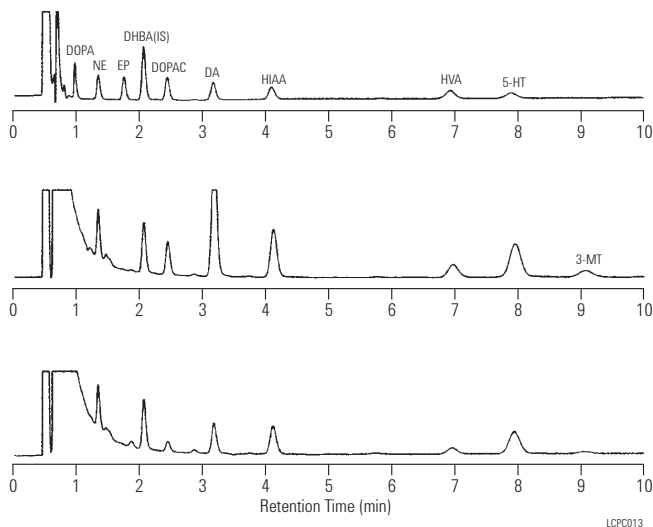
Flow Rate: 1.5 mL/min

Temperature: 26 °C

Detector: 0.75 V vs Ag/AgCl with electro-chemical detection

Sample: 10 µg/mL each standard; volume  
20 µL (2 g tissue sample)  
A: Standards (2pmol; DHBA 5pmol)  
B: Mouse Srium  
C: Mouse Neocortex

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| 1. DOPA-Dihydroxyphenylalanine       | 6. HIAA-Hydroxyindoleacetic acid |
| 2. DHBA-Dihydroxybenzyl amine        | 7. EP-Epinephrine                |
| 3. DOPAC-Dihydroxyphenyl acetic acid | 8. HVA-Homovanillic acid         |
| 4. NE-Norepinephrine                 | 9. 5-HT-Hydroxytryptamine        |
| 5. DA-Dopamine                       | 10. 3-MT-Methoxytyrosine         |



### Chiral ethiazide (diuretic drug) separation

**Column:** Ultron ES-OVM Chiral  
702111651  
4.6 x 150 mm, 5 µm

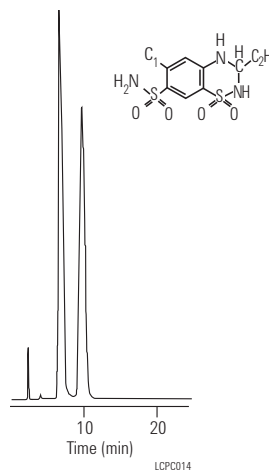
Mobile Phase: 20 mM KH<sub>2</sub>PO<sub>4</sub> (pH 4.6)

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 220 nm

Sample: 20 µL containing 0.35 µg Ethiazide



### Chiral separation of fluoxetine enantiomers (Prozac)

**Column:** Ultron ES-OVM Chiral  
702111651  
4.6 x 150 mm, 5 µm

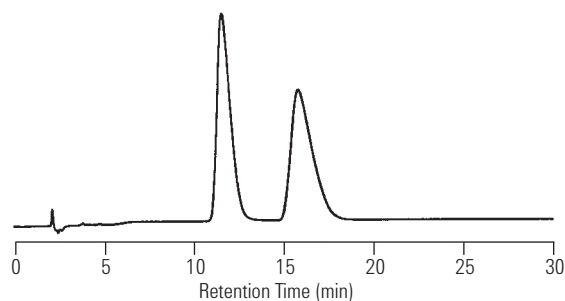
Mobile Phase: 25/75 (v/v) EtOH / 20 mM KH<sub>2</sub>PO<sub>4</sub>, pH 5.5  
(adjusted with NaOH)

Flow Rate: 0.8 mL/min

Temperature: Ambient

Detector: UV, 225 nm

Sample: Mixture fluoxetine (Prozac) enantiomers



*Courtesy of D.S. Ristry and V.S. Sharp, Eli Lilly and Co.*



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)



### Goldenseal and related alkaloids on Rapid Resolution Eclipse XDB-C18

**Column:** Eclipse XDB-C18  
963967-902  
4.6 x 150 mm, 3.5 µm

**Mobile Phase:** 68% 30 mM ammonium acetate,  
14 mM TEA, pH ~4.85  
32% Acetonitrile

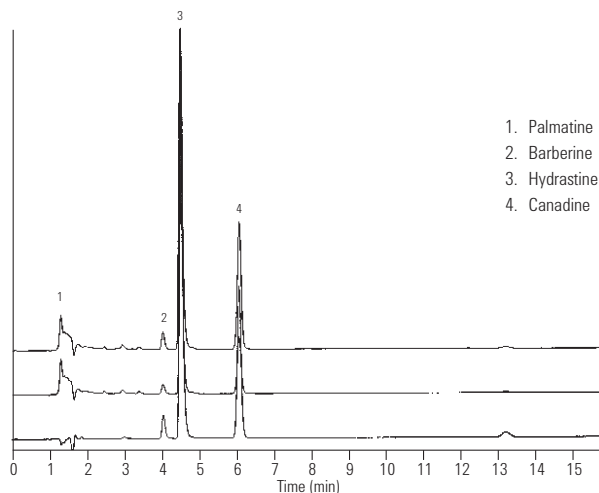
**Flow Rate:** 1.0 mL/min

**Temperature:** 30 °C

**Detector:** 230 nm

**Sample:** Goldenseal and related alkaloids

Alkaloids, such as the active components in Goldenseal and other related plants, are quickly and accurately separated using isocratic conditions on an Eclipse XDB-C18 Rapid Resolution column.



LCPC016

### Components of green tea separated on Rapid Resolution StableBond SB-C8

**Column:** ZORBAX SB-C8  
863953-906  
4.6 x 150 mm, 3.5 µm

**Mobile Phase:** 75% 0.1% TFA : 25% MeOH

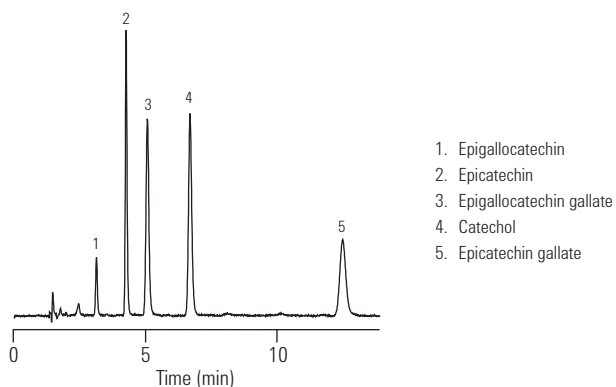
**Flow Rate:** 1.0 mL/min

**Temperature:** 40 °C

**Detector:** 280 nm

**Sample:** Green tea

Nutraceuticals, such as the components of green tea, are quickly separated on a StableBond SB-C8 Rapid Resolution column.



LCPC018

### Chiral separation of hexobarbital

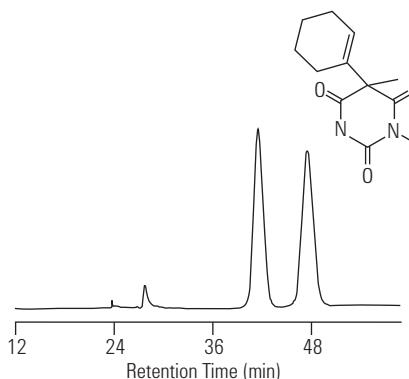
**Column:** Chiradex  
79925CB-584  
4.0 x 250 mm, 5 µm

**Mobile Phase:** Methanol/water, 20:80

**Flow Rate:** 1.0 mL/min

**Detector:** UV, 220 nm

**Sample:** Hexobarbital



LCPC017

### Chiral separation of S- and R-Norfluoxetine

**Column:** **Ultron ES-OVM Chiral**  
**724111653**  
**4.6 x 250 mm, 10 µm**

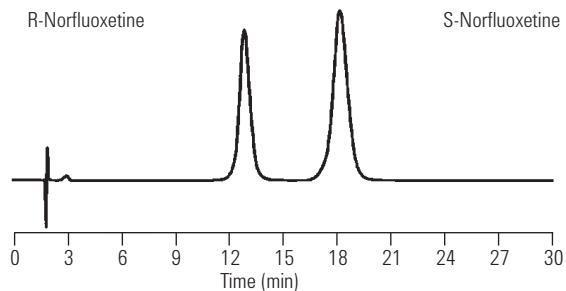
Mobile Phase: 6/94 (v/v) MeOH / 20 mM KH<sub>2</sub>PO<sub>4</sub>

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 225 nm

Sample: 50 µg/mL of 2:3 mixture R- : S-Norfluoxetine



*Courtesy of D.S. Ristry and V.S. Sharp, Eli Lilly and Co.*

LCPC019

### Chiral separation of salbutamol

**Column:** **Ultron ES-Pepsin**  
**822111631A**  
**4.6 x 150 mm, 5 µm**

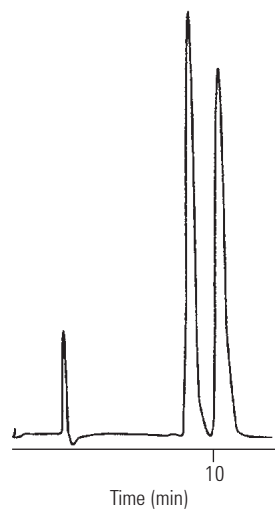
Mobile Phase: 20 mM phosphate buffer, pH 6.0

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 220 nm

Sample: 20 µL containing 0.35 µg salbutamol mixture



LCPC020



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

### Chiral separation of tolperison enantiomers

**Column:** **Ultron ES-OVM Chiral**  
**702111651**  
**4.6 x 150 mm, 5 µm**

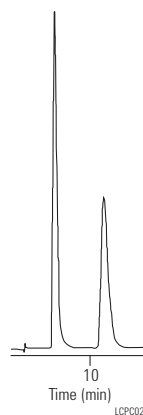
Mobile Phase: 20 mM KH<sub>2</sub>PO<sub>4</sub> (pH 5.5), C<sub>2</sub>H<sub>5</sub>OH (100/4 v/v)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 220 nm, 0.04 AUFS

Sample: Tolperison, 5 µL



### Chiral separation of atenolol

**Column:** **Ultron ES-Pepsin**  
**822111631A**  
**4.6 x 150 mm, 5 µm**

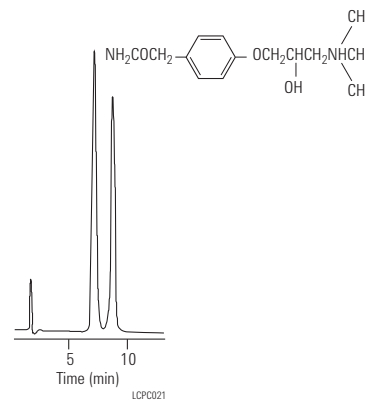
Mobile Phase: 20 mM phosphate buffer, pH 6.0/Ethanol (99/1)

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 220 nm, 0.04 AUFS

Sample: 1.5 µL, 0.25 mg/mL, atenolol racemic mixture



### Cocaine and metabolites

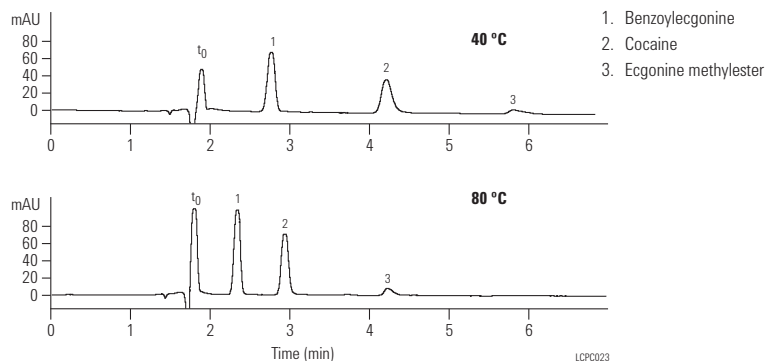
**Column:** **ZORBAX Rx-SIL**  
**883975-901**  
**4.6 x 150 mm, 5 µm**

Mobile Phase: MeOH: NH<sub>4</sub> Acetate, 25 mM, pH 6 (70:30)

Flow Rate: 1.0 mL/min

Temperature: 40 and 80 °C

Detector: UV, 210 nm



**Aspirin and cough remedy**

**Column:** Eclipse XDB-C8  
993967-906  
4.6 x 150 mm, 5 µm

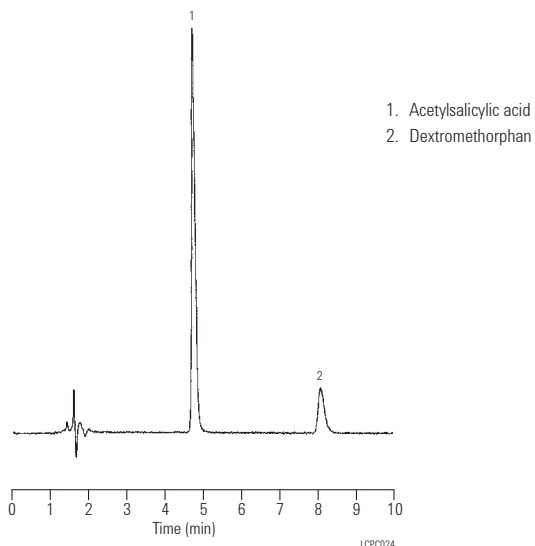
Mobile Phase: (75:25) 25 mM Na<sub>2</sub>HPO<sub>4</sub> (pH 3.0): ACN

Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: UV, 254 nm

Sample: 5 µL, 10 µg/mL



**Cough formula mixture:  
Fast and efficient separation**

**Column A:** ZORBAX SB-CN  
866953-905  
4.6 x 75 mm, 3.5 µm

**Column B:** ZORBAX SB-CN  
883975-905  
4.6 x 150 mm, 5 µm

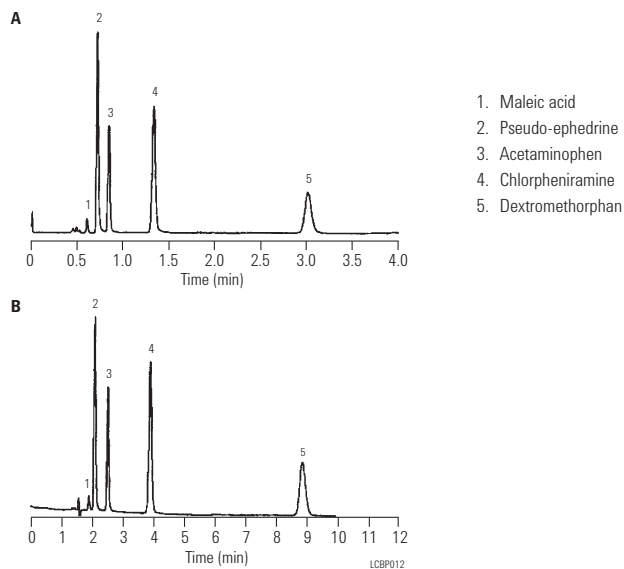
Mobile Phase: 20/80, Acetonitrile/150 mM Na Citrate, pH 2.6

Flow Rate: 1.5 mL/min, 1.0 mL/min

Temperature: 35 °C

Detector: UV, 270 nm

Sample: 2 µL, cough formula



**Guaifenesin: USP analysis of guaifenesin**

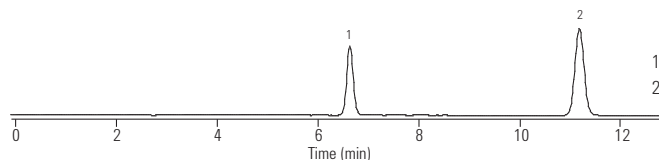
Mobile Phase: 40% Methanol:60% Water:1.5% Glacial Acetic Acid

Flow Rate: 1.0 mL/min

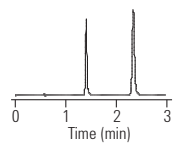
Temperature: 25 °C

Sample: Guaifenesin  
A: 8 µL  
B: 2 mL

Column:	Eclipse XDB-C18 990967-902 4.6 x 250 mm, 5 µm	Peak	TR	N	Rs
		1	6.63	12,737	0
		2	11.19	18,552	15.8



1. Guaifenesin: 0.04 mg/mL  
2. Benzoic Acid: 0.10 mg/mL



Column:	Eclipse XDB-C18 922975-902 4.6 x 50 mm, 1.8 µm	Peak	TR	N	Rs
		1	1.4	11,421	0
		2	2.33	12,909	12.3

LCPC025

Minimum Resolution Required = 3.0

**Metronidazole: Updating USP methods**

**Column A:** ZORBAX C8  
883952-706  
4.6 x 150 mm, 5 µm

**Column B:** Eclipse XDB-C8  
993967-906  
4.6 x 150 mm, 5 µm

**Column C:** Eclipse XDB-C8  
963967-906  
4.6 x 150 mm, 3.5 µm

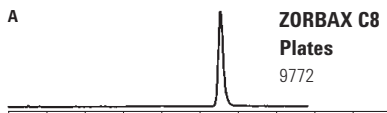
Mobile Phase: 80/20, Water/Methanol

Flow Rate: 1.0 mL/min

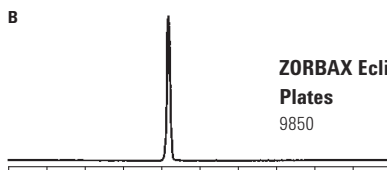
Temperature: Ambient

Detector: UV, 254 nm

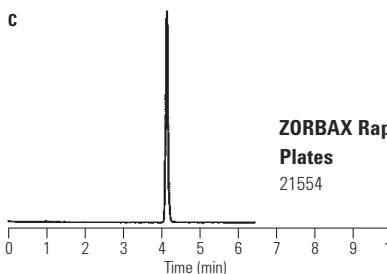
Sample: Metronidazole



USP TF 1.30 Particle Size 5 µm



USP TF 0.98 Particle Size 5 µm



USP TF 1.13 Particle Size 3.5 µm

LCPC026

**Morphine and metabolites:  
Extracted blood plasma sample separation**

**Column:** ZORBAX SB-C18  
863953-902  
4.6 x 150 mm, 3.5 µm

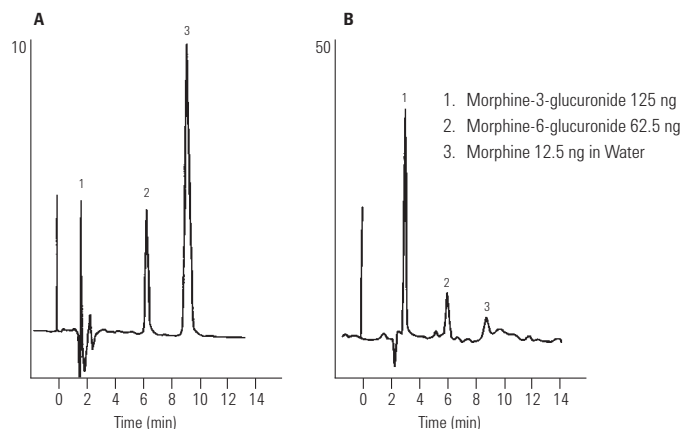
Mobile Phase: 97/3 70 mM KH<sub>2</sub>PO<sub>4</sub> + 1 mM EDTA/ACN, pH 4.5

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: A: Electrochemical, 720 mV  
B: Fluorescence, Ex = 285 nm, Em = 352 nm

Sample: 50 µL  
Morphine-3-glucuronide 125 ng  
Morphine-6-glucuronide 62.5 ng  
Morphine 12.5 ng in Water



Courtesy of J. Visser, Center for Pharmacy, Univ. Groningen, The Netherlands.

LCPC027

**Opiates (drugs of abuse) by LC/MS**

**Column:** ZORBAX SB-AQ  
830990-914  
2.1 x 150 mm, 3.5 µm

Mobile Phase: A: Acetonitrile with 0.1% formic acid  
B: Water with 0.1% formic acid

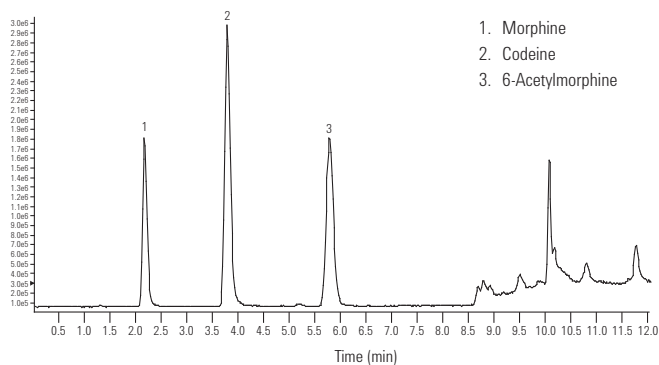
Flow Rate: 0.25 mL/min

Gradient: 0 min 10% B  
5 min 35% B  
5.1 min 100% B

MS Conditions: Time of Flight (TOF)  
Standard with calibrant delivery system  
providing constant low flow of ~ 2 µM purine  
and HP-921 calibrant to dual ESI for  
continuous auto-calibration

Sample: Opiates

XIC of +TOF MS



LCPC028



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**NEW!**

**Comparing HILIC and RPLC of morphine using Agilent ZORBAX RRHD columns with UHPLC/MS**

**Column:** Agilent ZORBAX Eclipse Plus C18  
2.1 x 100mm, 5 µm  
(Custom column)

**Column:** ZORBAX RRHD HILIC Plus  
959758-901  
2.1 x 100 mm, 1.8 µm

**Mobile Phase:** A: 10 mM NH<sub>4</sub>HCO<sub>2</sub>, pH 3.2  
B: CH<sub>3</sub>CN/100 mM NH<sub>4</sub>HCO<sub>2</sub>, pH 3.2 (9:1)  
Column A: 10% B isocratic  
Column B: 70% B isocratic

**Flow Rate:** Column A: 0.4 mL/min  
Column B: 1 mL/min

**Pressure:** Column A: 90 bar  
Column B: 810 bar

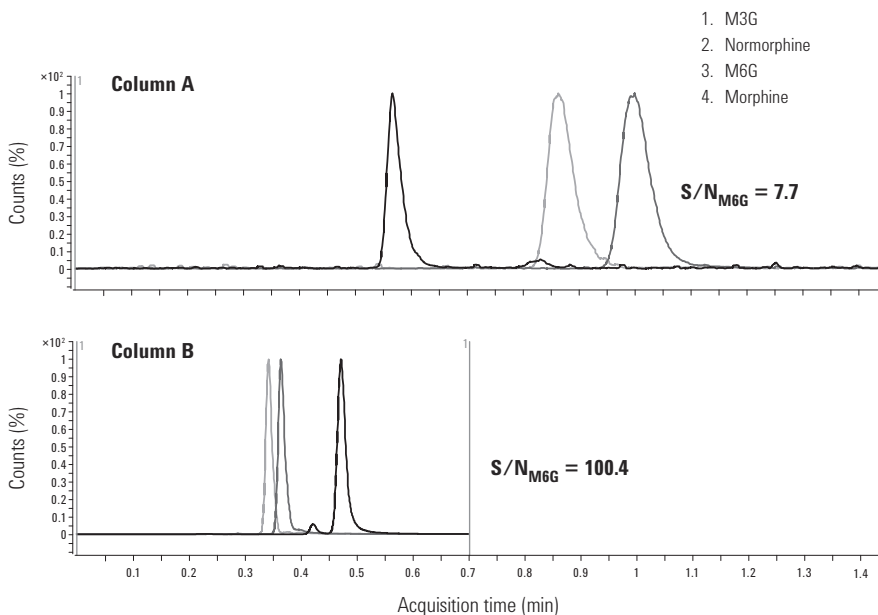
**Temperature:** 25 °C

**Detector:** Agilent 1290 Infinity LC with an  
Agilent 6410A Triple Quadrupole Mass Spectrometer

**MS Conditions:** MS Source: Positive ESI, capillary 4000 V, drying gas temperature, flow rate and nebulizer pressure vary with mobile phase flow rate  
MS Acquisition: Selected ion mode (SIM), delta EMV 200 V, MS dwell time varies with mobile phase flow rate  
Software: Agilent MassHunter versions B.03.01, B.02.00 AND B.03.01 were used for data acquisition, qualitative, and quantitative analyses, respectively

**Sample:** 2 µL injection of 1 µg/mL each of morphine, normorphine, morphine-3-β-D-glucuronide: HILIC sample was prepared in CH<sub>3</sub>CN; RPLC sample was prepared in H<sub>2</sub>O

HILIC mode with UHPLC columns cuts analysis time in half, while improving sensitivity by more than a factor of 10, compared to traditional LC columns in RPLC mode with MS detection.



**Neutraceuticals:  
Hypericin separation in St. John's Wort**

**Column:** Eclipse XDB-C8  
993967-906  
4.6 x 150 mm, 5 µm

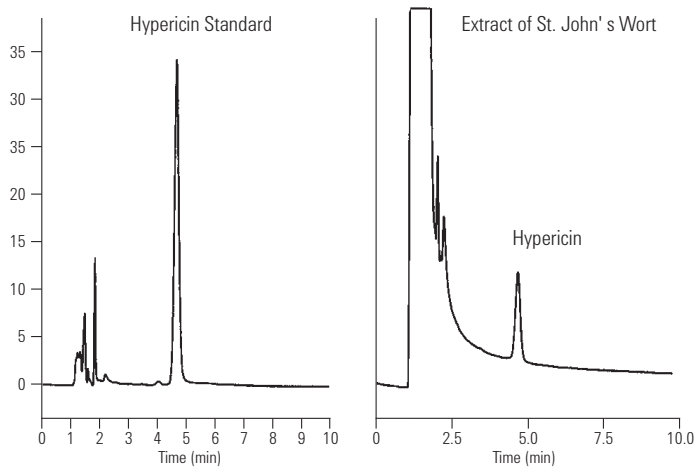
Mobile Phase: 23% 25 mM Na<sub>2</sub>HPO<sub>4</sub>,  
Dibasic (pH 7.0 with H<sub>3</sub>PO<sub>4</sub>); 77% MeOH

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Neutraceuticals



LCP0029

**Pharmaceuticals: Rapid,  
high sensitivity LC and LC/MS of 11 drugs**

**Column:** Eclipse XDB-C18  
925700-902  
2.1 x 50 mm, 1.8 µm

Mobile Phase: A: 10 mM NH<sub>4</sub> Formate (pH = 3.6)  
B: ACN with 10 mM NH<sub>4</sub> Formate

Flow Rate: 0.6 mL/min

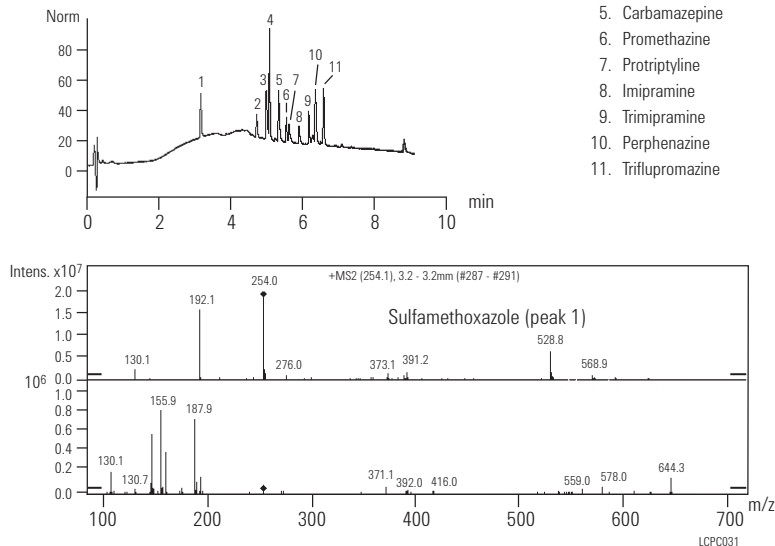
Gradient: 5% B to 70% B in 7.5 min, to 95% B in 8.5 min

Temperature: 65 °C

Detector: UV, 230 nm and MSD Trap SL

MS Conditions: Pos. Dry Gas: 345 °C  
Neb.: 45 psi  
HV Cap: 3500 V  
Range: 100-700  
Average: 5 Spectra  
ICC: 30000  
Charge Con: On  
Smart Par. Settings: Tar Mas: 250 m/z  
Comp. Stab.: 100%  
Trap Drive: 100%  
Frag. Options: Smart Frag: On  
Frag. Width: 10 m/z

1. Sulfamethoxazole
2. Tripelemamine
3. Prednisolone
4. Diphenhydramine
5. Carbamazepine
6. Promethazine
7. Protriptyline
8. Imipramine
9. Trimipramine
10. Perphenazine
11. Triflupromazine



LCP0031



**Hormones/steroids**

**Column:** ZORBAX RRHT SB-C18  
823975-902  
4.6 x 30 mm, 1.8 µm

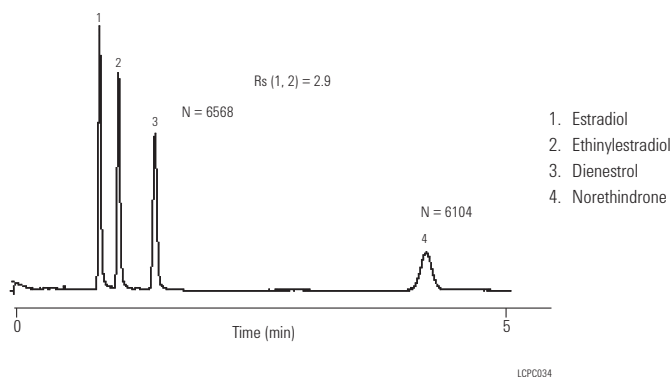
Mobile Phase: 50% 20 mM NaH<sub>2</sub>PO<sub>4</sub>, pH 2.8: 50% ACN

Flow Rate: 1.0 mL/min

Temperature: RT

Detector: UV, 230 nm

Sample: Hormones/steroids



**Steroids: Separation**

**Column:** Eclipse XDB-CN  
993967-905  
4.6 x 150 mm, 5 µm

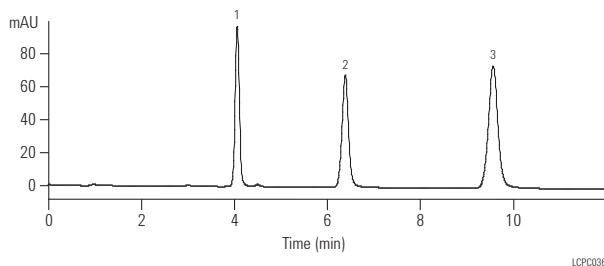
Mobile Phase: 40:60 ACN:Water

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 205 nm

Sample: 1. Norethindrone 0.514 mg/mL  
2. Progesterone 0.407 mg/mL  
3. Mestranol 0.057 mg/mL



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Steroids**

**Column A:** Eclipse XDB-Phenyl  
963967-912  
4.6 x 150 mm, 3.5 µm

**Column B:** Eclipse XDB-C18  
993967-902  
4.6 x 150 mm, 5 µm

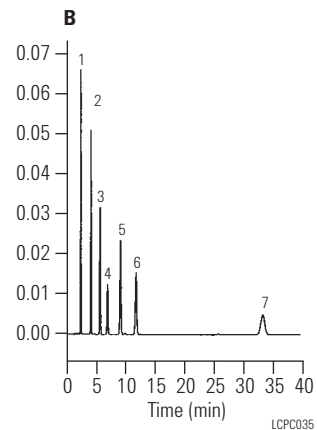
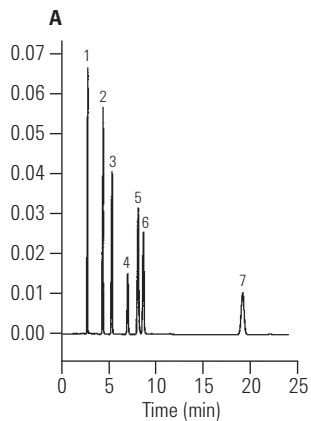
Mobile Phase: H<sub>2</sub>O:ACN, 60:40

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

- Sample:
1. Prednisolone
  2. Corticosterone
  3. 11 -hydroxyprogesterone
  4. Cortisone acetate
  5. Deoxycorticosterone
  6. 17 hydroxyprogesterone
  7. Progesterone



LCPC035



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Triamcinolone – USP analysis of triamcinolone**

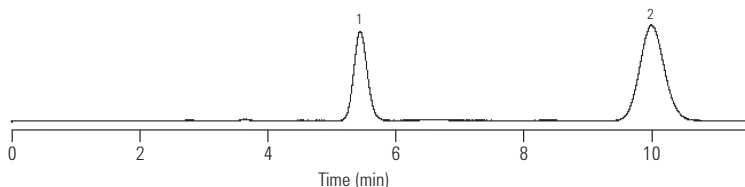
**Column:** Eclipse XDB-C18  
 923975-902  
 4.6 x 30 mm, 1.8 µm

Mobile Phase: 47% Methanol:53% Water

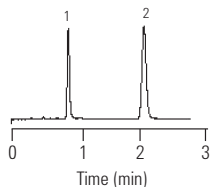
Flow Rate: 1.5 mL/min

Temperature: 25 °C

Sample: Triamcinolone, 1 µL



Peak	TR	N	Rs
1	5.45	3199	0
2	9.99	3212	8.1



1. Triamcinolone: 0.2 mg/mL  
 2. Hydrocortisone: 0.3 mg/mL  
 Minimum Resolution Required = 3.0

Peak	TR	N	Rs
1	0.89	3256	0
2	2.07	4851	11.8

LCPD038

**Separation of highly basic antidepressants above their pKa in free base form (pKa 9.5-9.7)**

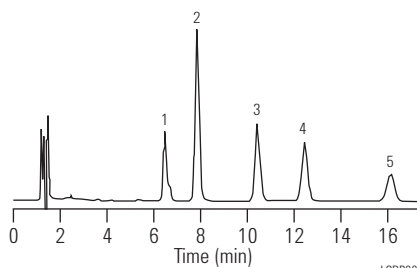
**Column:** ZORBAX Extend-C18  
 773450-902  
 4.6 x 150 mm, 5 µm

Mobile Phase: 75% Methanol / 25% 50 mM Pyrrolidine Buffer, pH 11.5

Flow Rate: 0.5 mL/min

Temperature: 40 °C

Detector: UV, 215 nm



- 1. Doxepin
- 2. Imipramine
- 3. Nortriptyline
- 4. Amitriptyline
- 5. Trimipramine

LCBP007

Basic drugs can often be separated in their charged form at low pH with StableBond or at mid-range pH with Eclipse XDB or Bonus -RP columns. With Extend-C18, you can separate at high pH to improve solubility, improve retention, or obtain different selectivity.

**Antidepressants, tricyclic:  
Comparative separation**

**Column A:** ZORBAX Bonus-RP  
883668-901  
4.6 x 150 mm, 5 µm

**Column B:** Brand A Polar-linked C8

**Column C:** Brand B Polar-linked C18

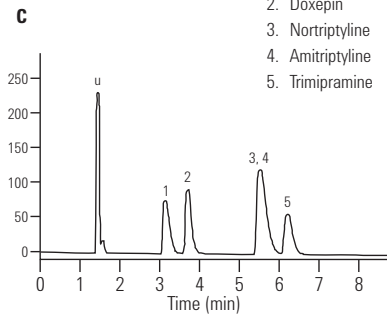
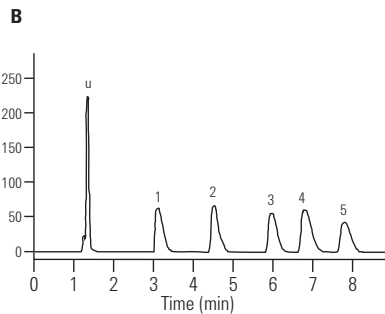
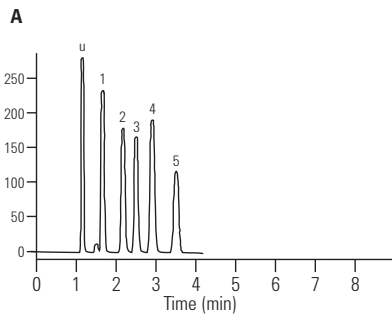
Mobile Phase: ACN: 20 mM Na Citrate, pH 6 (60:40)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Tricyclic antidepressants (u= uracil)



- 1. Propranolol
- 2. Doxepin
- 3. Nortriptyline
- 4. Amitriptyline
- 5. Trimipramine

LCBP011

**Tricyclic antidepressants**

**Column:** Eclipse XDB-C8  
993967-906  
4.6 x 150 mm, 5 µm

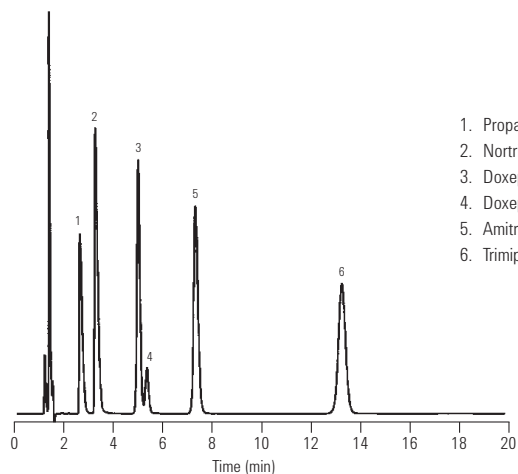
Mobile Phase: 38/62 THF/25 mM Potassium Phosphate, pH7

Flow Rate: 1.0 mL/min

Temperature: 23 °C

Detector: UV, 254 nm

Sample: 10 µL, Antidepressant mix, 10 µg/mL



- 1. Propranolol
- 2. Nortriptyline
- 3. Doxepin
- 4. Doxepin dimer
- 5. Amitriptyline
- 6. Trimipramine

LCPC039

**Tricyclic antidepressants and metabolites:  
Effect of pore size**

**Column A:** ZORBAX SB-C18  
863953-902  
4.6 x 150 mm, 3.5  $\mu$ m

**Column B:** ZORBAX RRHD 300SB-C18  
883995-902  
4.6 x 150 mm, 5  $\mu$ m

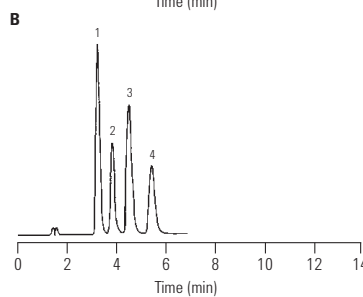
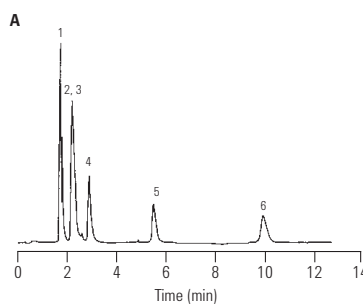
Mobile Phase: 40/60, 25 mM Phosphate Buffer,  
10 mM Triethylamine, pH 6.2/ACN

Flow Rate: 1.2 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: 10  $\mu$ L, Antidepressant mix, 10  $\mu$ g/mL



1. trans- 10-OH - Nortriptyline
2. trans- 10-OH - Amitriptyline
3. cis- 10-OH - Nortriptyline
4. cis- 10-OH - Amitriptyline
5. Nortriptyline
6. Amitriptyline

LCPC040

**Ulcer treatment drugs at intermediate pH**

**Column:** ZORBAX Bonus-RP  
883668-901  
4.6 x 150 mm, 5  $\mu$ m

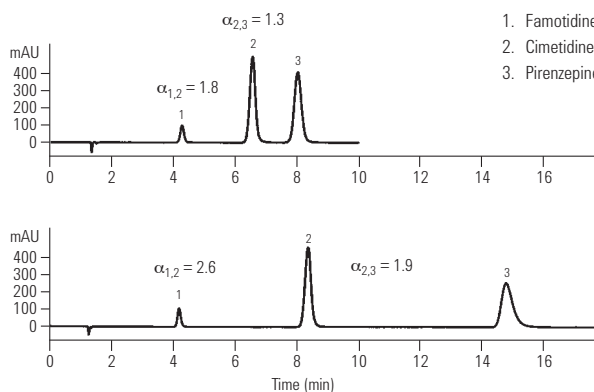
Mobile Phase: Na citrate, 20 mM, pH 6.1: MeOH, (80:20)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 220 nm

Sample: Ulcer treatment drugs



1. Famotidine
2. Cimetidine
3. Pirenzepine

LCPC042



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Urine, LSD analysis by LC/MS**

**Column:** Eclipse XDB-C8  
960967-906  
2.1 x 50 mm, 5 µm

Mobile Phase: 15 : 85, ACN : 10 mM Ammonium Formate, pH 3.7

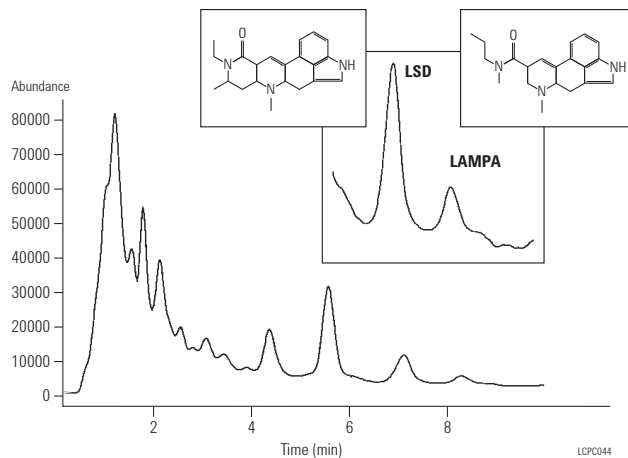
Flow Rate: 0.3 mL/min

Temperature: 30 °C

Detector: MS

MS Conditions: SIM mode, Ions: 324.2, 223.1, 208.1  
Fragmentor (dynamically ramped) 100V at 324.2,  
148V at 223.1, 170V at 208.1

Sample: LSD



Hughes, J.M., C.A. Miller and S.M. Fischer, "Development of a Method for the Forensic Analysis of LSD in Urine", presented at the ASMS, Palm Springs, June 1997.

**USP method:  
Glyburide and internal standard, progesterone**

**Column:** Eclipse XDB-C8  
990967-906  
4.6 x 250 mm, 5 µm

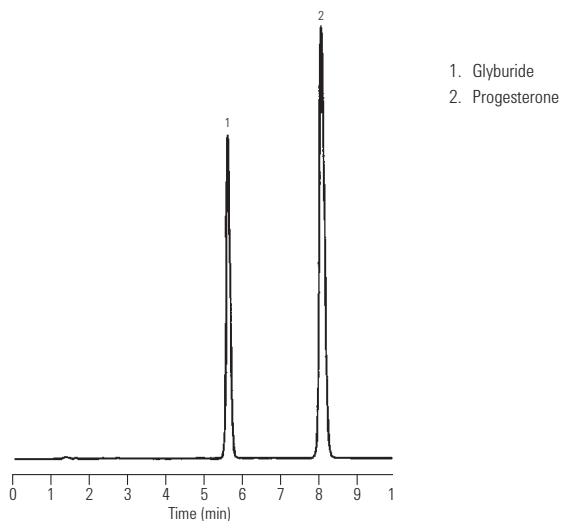
Mobile Phase: 45/55, 50 mM Ammonium Phosphate/ACN, Final pH 5.35

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: 5 µL, 10 ug/mL each of standard



**Dexamethasone, USP method: Rapid analysis**

**Column A:** ZORBAX SB-C8  
880975-906  
4.6 x 250 mm, 5 µm

**Column B:** ZORBAX Rx/SB-C8  
866953-906  
4.6 x 75 mm, 3.5 µm

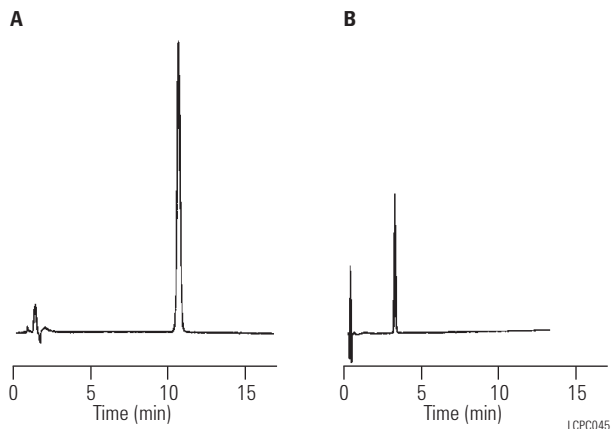
Mobile Phase: A = Water, B = ACN; Isocratic 30% B

Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Dexamethasone  
10 µL and 5 µL, 10 ug/mL



**USP analysis of tetracyclines**

**Column:** PLRP-S 100Å  
PL1512-5500  
4.6 x 250 mm, 5 µm

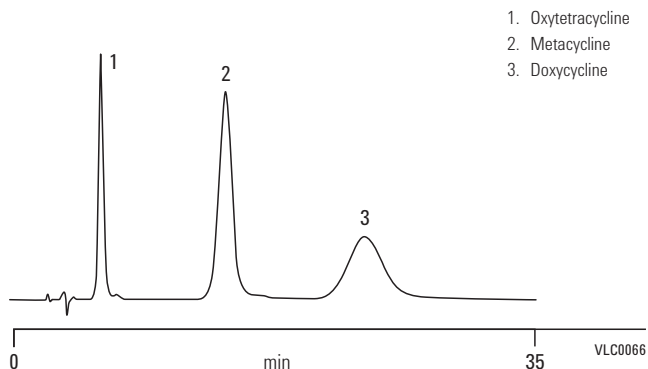
Sample: 20 mg tetracycline in 25 mL 0.01M HCl

Mobile Phase: 60 g 2-Methyl-2-propanol + 200 mL UHP water +  
400 mL 0.2 M K<sub>2</sub>HPO<sub>4</sub> at pH 8 + 50 mL 10 g/L  
tetrabutylammonium hydrogen sulphate at pH 8 +  
10 mL 40 g/L sodium edetate at pH 8, made up to  
1000 mL with water (adjust pH with dilute NaOH)

Flow Rate: 1.0 mL/min

Temperature: 60 °C

Detector: UV, 254 nm



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Warfarin: USP chromatographic purity method using Eclipse XDB-CN**

**Column:** Eclipse XDB-CN  
993967-905  
4.6 x 150 mm, 5 µm

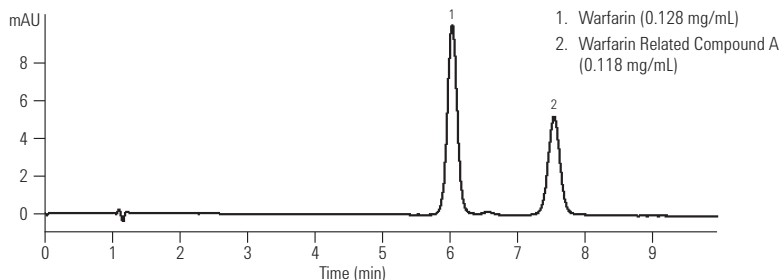
Mobile Phase: 32:68:1 Acetonitrile:Water:Glacial Acetic Acid

Flow Rate: 1.5 mL/min

Temperature: 25 °C

Detector: UV, 260 nm

Sample: Warfarin, 2 µL



LCPC047

**Ten cardiac drugs on Rapid Resolution HT SB-C18**

**Column:** SB-C18  
829975-902  
4.6 x 150 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA, 5% ACN  
B: 0.08% TFA, 95% ACN

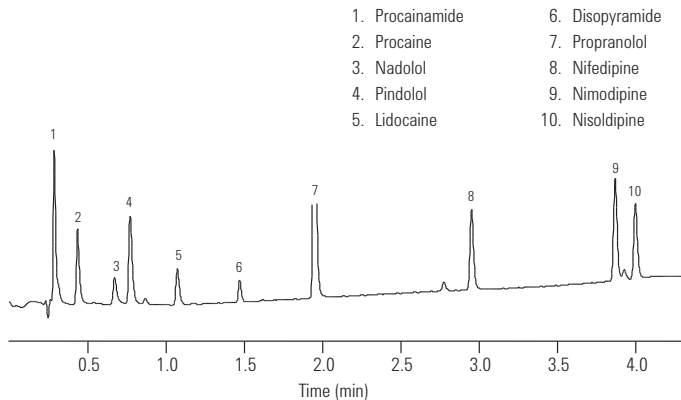
Flow Rate: 2 mL/min

Gradient: 0.0 min 12.5% B  
10.5 min 60% B  
12.0 min 60% B

Temperature: 70 °C

Detector: UV, 230 nm

Sample: Cardiac drugs



LCPC049

**Sulfonamides – Fast analysis with RRHT columns**

**Column:** SB-C18  
824700-902  
2.1 x 30 mm, 1.8 µm

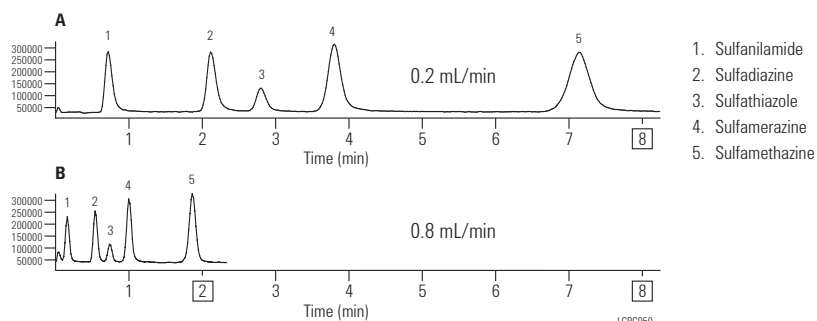
Mobile Phase: A: 90% 0.1% formic acid  
B: 10% 0.1% formic acid in MeOH

Flow Rate: A: 0.2 mL/min  
B: 0.8 mL/min

Temperature: 35 °C

Detector: TIC, Single Quad

Sample: Sulfonamides



LCPC050



**Sulfa drugs**

**Column:** Pursuit XRs Ultra C8  
A7511100X020  
2.0 x 100 mm, 3.0 µm

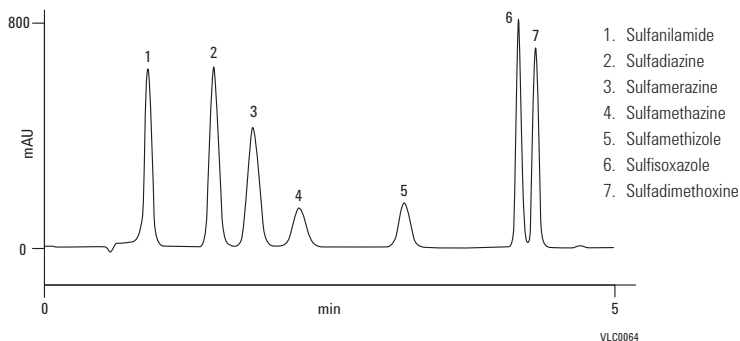
**Mobile Phase:** A: Water+0.1% TFA  
B: MeCN+0.1% TFA

**Gradient:** 10% B for 10 min,  
ramp to 45% B in 1 min and hold for 1 min,  
return to 10% B in 1 min and hold for 1 min

**Flow Rate:** 0.65 mL/min

**Temperature:** Ambient

**Detector:** UV, 254 nm



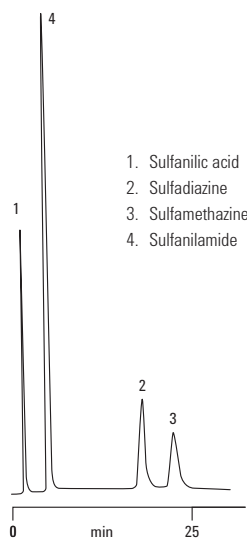
**Sulfa drugs**

**Column:** PLRP-S 100Å  
PL1111-3500  
4.6 x 150 mm, 5 µm

**Mobile Phase:** Potassium sulfate:  
ACN 7:1, pH 2.2

**Flow Rate:** 1.0 mL/min

**Detector:** UV, 254 nm

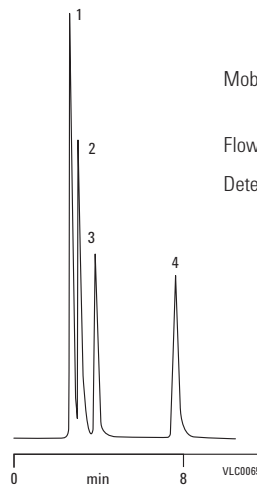


**Column:** PLRP-S 100Å  
PL1111-3500  
4.6 x 150 mm, 5 µm

**Mobile Phase:** Disodium tetraborate: ACN 6:1,  
pH 9.3

**Flow Rate:** 1.0 mL/min

**Detector:** UV, 254 nm



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

**Fast analysis of Pindolol**

**Column A:** ZORBAX SB-CN  
863953-905  
4.6 x 150 mm, 3.5 µm

**Column B:** ZORBAX SB-CN  
827975-905  
4.6 x 50 mm, 1.8 µm

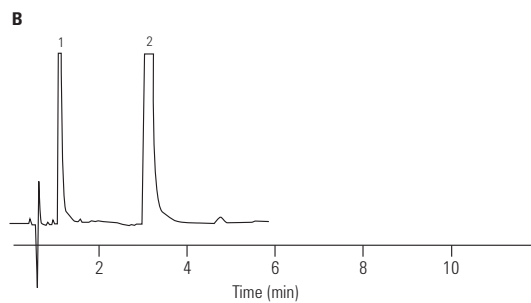
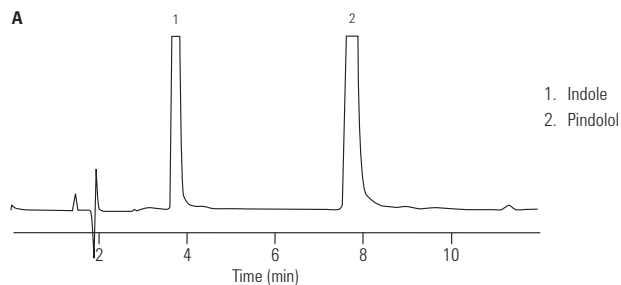
Mobile Phase: A: 70% 50 mM Na Acetate  
B: 30% ACN

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: UV, 219 nm

Sample: Pindolol, 2 µL



LCPC051

**Lamotrigine**

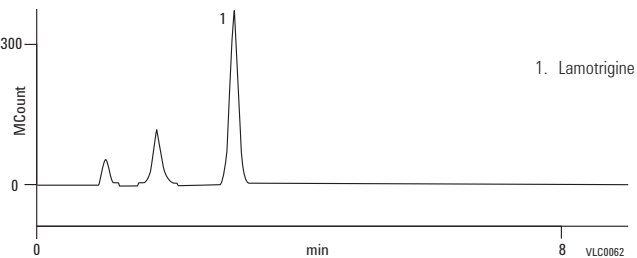
**Column:** Pursuit XRs Ultra C8  
A7511100X020  
2.0 x 100 mm, 3.0 µm

Mobile Phase: ACN:water, 25:90 for 1 min

Flow Rate: 0.2 mL/min

Injection Volume: 5 µL, 50% MeOH

Detector: MS



### Barbiturates

**Column:** PLRP-S 100Å  
PL1512-5500  
4.6 x 250 mm, 5 µm

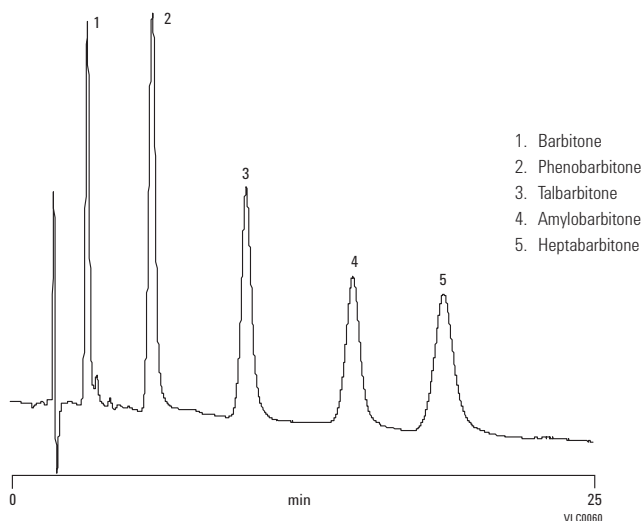
Mobile Phase: Water

Flow Rate: 1.0 mL/min

Temperature: 200 °C

Detector: UV, 220 nm

*Courtesy: Smith, RM, Burgess, RJ, Cheinthavorn, O and Stuttard, JR (1999) Superheated water: a new look at chromatographic eluents for reversed-phase liquid chromatography. LCGC Europe, January 1999, 30-36. Used with permission.*



### Analysis of ciprofloxacin and ciprofloxacin metabolites

**Column:** PLRP-S 100Å  
PL1111-3500  
4.6 x 150 mm, 5 µm

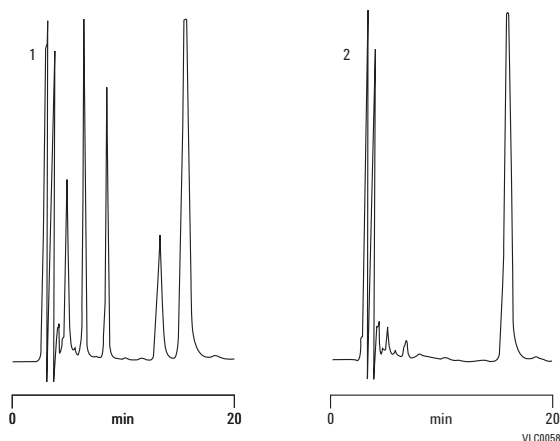
Mobile Phase: 74% 20 mM TCA:22%  
ACN:4% MeOH adjusted to pH 3

Flow Rate: 1.0 mL/min

Detector: UV, 277 nm

*Krol GJ, Noe, AJ and Beerman, D (1986) Liquid chromatographic analysis of ciprofloxacin and ciprofloxacin metabolites in body fluids. Journal of Liquid Chromatography, 9(13), 2897-2919. Reprinted with permission of the publisher (Taylor & Francis Group, www.informaworld.com).*

- Blank urine sample containing known concentrations of internal standard, ciprofloxacin and its metabolites
- Blank urine sample containing only internal standard



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at [www.agilent.com/chem/library](http://www.agilent.com/chem/library)

# Product Index

## Agilent Supplies

<b>Autosamplers</b>	
Injection Valves .....	61
Kits .....	66-67
Loop Capillaries .....	64
Maintenance Schedule .....	61
Metering Device .....	64
Needles and Needle Seats .....	62-63
Trays .....	65
<b>Bio-inert Quaternary</b>	
Autosampler .....	101-102
Column Compartment .....	102
Detectors .....	102
Fittings .....	102
Pumps .....	101
Valves .....	102
<b>Capillaries</b>	
1200 and 1100 Prep LC Systems .....	26
1220/1120 Infinity Series LC Systems .....	33
1260 Bio-inert LC System .....	30
1260/1200/1100 Infinity Series LC Systems .....	23
1290 Infinity Series LC Systems .....	24
1290 Valve Head .....	25-27
Loop .....	32
Miscellaneous .....	27-29
PEEK Coated Fused Silica Capillaries – 100 µL/min Flow .....	32
PEEK Coated Fused Silica Capillaries – 20 µL/min Flow .....	31
PEEK Coated Fused Silica Capillaries for Nano LC .....	31
Chip LC .....	100
<b>Detectors</b>	
80 nL and 500 nL Flow Cell .....	95-96
Diode Array Detector (DAD)/ Multiple Wavelength Detector (MWD) .....	93
Evaporative Light Scattering Detector (ELSD) .....	98
Fluorescence Detector (FLD) .....	99
Lamps .....	90
Maintenance .....	89
Maintenance Kits .....	97
Preparative Flow Cells .....	96
Refractive Index Detector (RID) .....	98
Variable Wavelength Detector (VWD) .....	91-92
<b>Fittings and Unions</b>	
Capillary and Fittings Kits .....	36-39
Fittings .....	40-41
How to Align Connection Properly .....	45
How to Prepare Connection .....	44
How to Tighten Correctly .....	43
<b>Fraction Collectors</b>	
Capillary Kits and Needles .....	70
Collecting Tubes and Trays .....	69
G1364D Micro Fraction Collector .....	71
Maintenance Schedule .....	68
Well Plate Trays .....	69
In-Line Filters .....	12
<b>LC/MS</b>	
Chemicals .....	107
Cleaning Supplies .....	108
Foreline Pump .....	107

Gas Purifiers .....	108
Instrument Supplies .....	105-106
Maintenance Schedule .....	103
Preventive Maintenance Kit .....	104
Quiet Cover .....	109
<b>Standards</b>	
Analyzer Kit .....	110
Calibrant Mixes .....	110
Kits .....	110
Tools .....	108
Loop Capillaries .....	32
<b>Pumps</b>	
1290 Infinity LC Pump Supplies .....	51
Frits and Adapters .....	54
Inlet Valves .....	49
Kits .....	59-60
Outlet Valves .....	49
Pistons and Seals .....	50
Purge Valves .....	48
Routine Maintenance .....	47
Safety Caps .....	55
Seal Wash .....	52
Solvent Filters .....	54
Solvent Reservoir .....	53
Vacuum Degassers .....	58
Rack for LC Systems .....	14
Solvent Filters/Degassers .....	13
Standards .....	15
Thermostatted Column Compartment Capillary Kits .....	83-88
Tools .....	11
Troubleshooting .....	546-549
<b>Tubing</b>	
Accessories .....	35
PEEK .....	34
Rigid Capillary Tubing .....	35
Unions .....	42
<b>Valves</b>	
Injection Valves .....	73
Maintenance Notes .....	72
<b>Manual Injection Valves</b>	
with Position Sensing Switches .....	76-77
Sample Loops .....	78-79
<b>Switching Valves</b>	
External Switching Valve .....	74
Internal Switching Valve .....	75
<b>Syringes for Manual Injection</b>	
Fitted Plungers .....	80
PTFE-Tipped Plungers .....	81
<hr/>	
<b>Applications</b>	
BioPharmaceutical .....	552
Chemical/Industrial .....	580
Environmental .....	583
Food and Consumer Products .....	594
Pharmaceutical .....	611

## CE and CE/MS

Alignment Interface .....	190
<b>CE/MS Accessories</b>	
Adapter Kit .....	194
Capillaries .....	195
Sprayer Kit .....	195
<b>Capillaries</b>	
Alignment Interface .....	190
Bulk Fused-Silica .....	181
CEP Coated .....	185
Capillary Cassette .....	190
Capillary Electrochromatography (CEC) .....	188-189
Cross-linked and Bonded µSIL .....	186-187
<b>Extended Light Path</b>	
(Bubble Cell) Bare Fused-Silica .....	179-180
Polyvinyl Alcohol (PVA) Coated .....	182-184
Standard Bare Fused-Silica .....	178
Universal Bare Fused-Silica .....	181
Capillary Cassette .....	190
High Sensitivity Detection Cell .....	191-192
<b>Instrument Supplies</b>	
Instrument Supplies .....	199
<b>Solution Kits</b>	
Cation .....	173
Forensics .....	175
Inorganic Anion .....	171-172
Organic Acids .....	174
µPAGE .....	176-177
<b>Standards &amp; Reagents</b>	
CZE Buffers for Charged Analytes .....	196
CZE Buffers for Proteins .....	197
Capillary Conditioning Solutions .....	196
MEKC Buffers for Neutral and Charged Analytes .....	197
Plating Bath Analysis Buffer .....	197
Ultra Pure CE Water .....	196
µPAGE Buffer Solutions and Oligo Standards .....	197
System Start-up and Test Kits .....	198
Troubleshooting .....	201-203
Vial Rack .....	200
Vials and Caps .....	199
Window Etching Tool .....	200

## Columns for Biomolecule Separations

<b>Affinity Chromatography</b>	
Agilent Bio-Monolith Protein A .....	434-435
Multiple Affinity Removal System .....	438-440
Multiple Affinity Removal System Starter Kits .....	441
Protein Fractionation System .....	437
Proteomic Reagents .....	442
mRP-C18 High-Recovery Protein .....	442-443
<b>Analysis Scale</b>	
Capillary and Nano .....	452
MicroBore (1.0 mm id) .....	461
ZORBAX Bio-SCX Series II .....	458
<b>Citations</b>	
PL-SAX .....	487
PL-SCX .....	487
PLRP-S .....	486-487
Poroshell 300 .....	486
ZORBAX 300 .....	485

Column Selection	
Amino Acid Analysis.....	362
Broad Distribution.....	363
DNA and RNA Oligonucleotide.....	360
Natural and Synthetic Peptides.....	358
Peptide Mapping.....	356
Protein.....	353
Ion-Exchange Chromatography	
Agilent Bio IEX.....	402
Agilent Bio MAb.....	399
Agilent Bio-Monolith.....	412-413
PL-SAX Strong Anion-Exchange.....	406
PL-SCX Strong Cation-Exchange.....	410
Literature.....	477-484
Method Development	
Bio Ion-Exchange Column.....	447
High Sensitivity Capillary Column.....	451
Reversed-Phase LC/MS Column.....	446
SEC Column.....	449-450
ZORBAX Columns.....	444
Purification - Prep HPLC	
PL-SAX and PL-SCX.....	472-473
PLRP-S.....	467-468
Peptide Purification	
VariPure IPE.....	476
VariTide RPC.....	475
ZORBAX PrepHT.....	466
Reversed-Phase HPLC	
PLRP-S.....	387
Poroshell 120.....	385
Poroshell 300.....	380-381
ZORBAX 300Extend-C18.....	376
ZORBAX 300StableBond.....	367
ZORBAX Eclipse	
Amino Acid Analysis (AAA).....	394-395
ZORBAX RRHD 300-Diphenyl.....	374
Size Exclusion Chromatography (SEC)	
Agilent Bio SEC-3.....	418
Agilent Bio SEC-5.....	424
ProSEC 300S.....	428
ZORBAX GF-250 and GF-450.....	431

## Columns for Small Molecule Separations

Column Selection	
Column and Mobile Phase Guidelines.....	211-213
Method Development.....	220-221
Quick Guide to Reversed-Phase.....	207-209
Small Molecule Overview.....	218-219
Fast Columns for Reversed-Phase HPLC/UHPLC	
Fast Guards for UHPLC.....	246
Poroshell 120.....	228
ZORBAX Rapid Resolution	
High Definition (RRHD) 1.8 µm.....	233
ZORBAX Rapid Resolution	
High Throughput (RRHT) 1.8 µm.....	239
Guard Columns.....	223-224
Kits for Analytical HPLC	
ZORBAX Method Development Kits.....	284-285
ZORBAX Method Validation Kits.....	286-288
Oligo Solutions	
StratoSpheres DNA Cartridges.....	347
TOP Cartridges.....	348-349

Other HPLC Techniques	
Hi-Plex for Carbohydrate Analysis.....	340
ZORBAX HILIC Plus.....	324
ZORBAX Ion-Exchange.....	333
ZORBAX Normal-Phase.....	326-328
Preparative HPLC	
Bulk Materials.....	321
Load & Lock.....	322
Polaris Prep.....	321
Prep LC.....	311-312
Pursuit and Pursuit XRs Prep.....	319
ZORBAX PrepHT.....	314
Reversed-Phase HPLC	
HC-C18(2).....	304-305
PLRP-S.....	306
Polaris.....	298
Pursuit.....	287-288
TC-C18(2).....	304-305
ZORBAX 80Å Extend-C18.....	274
ZORBAX 80Å StableBond.....	264
ZORBAX Bonus-RP.....	278
ZORBAX Eclipse PAH.....	254
ZORBAX Eclipse Plus.....	248
ZORBAX Eclipse XDB.....	256
ZORBAX Original.....	283
ZORBAX Rx.....	272
USP Designations.....	343-346

## CrossLab Supplies

Autosampler Maintenance.....	119
Autosampler Syringes.....	116-118
CTC HPLC Autosamplers	
Autosampler Syringes.....	169
Capillaries and Tubing.....	130
Detector Lamps.....	113
Dionex HPLC Systems	
Autosampler Supplies.....	158
Autosampler Syringes.....	157
Buffer Loops.....	160
Capillaries.....	166-168
Detector Lamps.....	157
Fittings, Ferrules and Unions.....	168
In-Line Filters.....	168
Performance Maintenance Kits.....	161-165
Pump Maintenance Procedure.....	126
Pump Supplies.....	158-159
Sample Loops.....	160
Tubing.....	168
Valve Replacement Parts.....	159
Fittings.....	131
In-Line Filters.....	132
Performance Maintenance Kits.....	129
Pump Maintenance.....	124
Pump Supplies.....	122-123
Sealing Mats.....	115
Shimadzu HPLC Systems	
Autosampler Syringes.....	150
Capillaries.....	154
Detector Lamps.....	150
Fittings, Ferrules and Unions.....	155
In-Line Filters.....	156
Performance Maintenance Kits.....	154

Pump Maintenance Procedure.....	125
Pump Supplies.....	151-152
Sample Loops.....	153
Tubing.....	155
Valve Replacement Parts.....	152-153
Troubleshooting.....	133-136
Valve Supplies.....	127-128
Waters HPLC Systems	
Autosampler Syringes.....	137-138
Capillaries.....	148
Detector Lamps.....	137
Detector Supplies.....	142
Fittings, Ferrules and Unions.....	149
Performance Maintenance Kits.....	144-158
Pump Maintenance Procedure.....	124
Pump Supplies.....	139-142
Sample Loops.....	143
Valve Replacement Parts.....	142
Well Plates.....	115

## GPC/SEC Columns and Standards

Aqueous	
PL aquagel-OH Analytical.....	525
PL aquagel-OH Preparative.....	528
Column Accessories.....	529
Organic	
PLgel Individual Pore Size.....	505
PLgel MIXED.....	498-501
PLgel MIXED-LS.....	502
PLgel MiniMix.....	504
PLgel Preparative.....	506
Polymer Standards	
EasiCal.....	536
EasiVial.....	532
Polyacrylic Acid.....	545
Polyethylene Glycol/Oxide.....	541-542
Polymethylmethacrylate.....	539-540
Polysaccharides.....	543-544
Polystyrene.....	537-538
Setting Up a GPC/SEC System.....	491-495
Special Application	
EnviroPrep.....	507
MesoPore.....	520
OligoPore.....	521
PL HFIPgel.....	509
PL Rapide.....	510-511
PLgel Olexis.....	508
PlusPore.....	514-515
PolarGel.....	512
PolyPore.....	516
ResiPore.....	518

## Part Number Index

0100-0549	107	0101-1250	79	1535-4045	74-75, 77	443905-902	313
0100-0900	42	0101-1251	79	1535-4046	77	443910-901	313
0100-0969	105	0101-1252	79	1535-4860	79	443910-902	313
0100-1259	41	0101-1253	77	1535-4970	104, 107	446905-101	313
0100-1516	40, 92, 96, 99, 106	0101-1254	77	1535-5045	77	446905-102	313
0100-1543	195	0101-1255	77	1535-5082	77	446905-301	313
0100-1597	107	0101-1258	75	160-2644-5	181	446905-302	313
0100-1631	40	0101-1267	61, 73	160-2650-5	181	446905-901	313
0100-1710	11, 58	0101-1268	61, 73	160-2660-5	181	446905-902	313
0100-1847	42	0101-1288	74-75	190-0131	181	446910-102	313
0100-1849	61, 73	0101-1360	75	190-0231	181	449905-101	313
0100-1850	75, 77	0101-1362	75	190-0331	181	449905-102	313
0100-1851	61, 73-75, 77, 101-102	0101-1385	61, 73	190-0431	181	449905-301	313
0100-1852	75	0101-1409	74-75, 77, 102	191-1311	177	449905-302	313
0100-1853	61, 73	0101-1415	74-75	191-3211	177	449905-501	313
0100-1854	75, 108	0101-1416	61, 73, 101	191-5211	177	449905-502	313
0100-1855	75, 104, 108	0101-1417	74-75, 77	192-1311	176	449905-901	313
0100-1859	77	0101-1421	74-75	192-3211	176	449905-902	313
0100-1860	77	0101-1422	61, 73	192-5211	176	449910-902	313
0100-1921	79	0101-2415	61, 73	194-8111	186	5001-3702	82
0100-1922	79	01018-22707	48	196-7203	186	5001-3726	14
0100-1923	79	01018-23702	11	197-7202	186	5001-3743	52
0100-1924	79	01018-60025	54	199-2602	186	5021-1816	28
0100-2051	104, 108	01018-68722	59	204310	442	5021-1817	28
0100-2086	41	01048-87302	28	2140-0585	199	5021-1818	28
0100-2087	75	01078-87302	32, 64	2140-0590	90	5021-1819	28-29
0100-2088	61, 73	01078-87305	28	2140-0600	99	5021-1820	27
0100-2089	75	01080-68702	15	2140-0813	90	5021-1821	27
0100-2175	40	01080-68704	15	2140-0820	90	5021-1822	27
0100-2231	61, 73	01080-83202	40	280959-904	12	5021-1823	27, 92
0100-2233	75	01090-27609	12	280959-907	12	5021-1845	262, 270
0100-2298	42	01090-68702	12	3150-0509	13	5021-1866	11
0100-2304	106	01090-68703	12	3150-0576	13	5022-2133	42
0100-2410	35	01090-87304	28	3150-0577	13	5022-2141	195
0100-2441	42	01090-87306	23, 33	3150-0619	199	5022-2144	42
0101-0376	79	01090-87610	23	3150-0944	54	5022-2145	42
0101-0377	79	01090-87611	23	3162-0178	106	5022-2146	95
0101-0378	79	01100-68700	11	3162-1056	107	5022-2155	58
0101-0379	79	05971-80103	106	3162-1057	107	5022-2159	27
0101-0620	77	05980-60051	108	400510	442	5022-2165	12
0101-0623	77	0890-1727	107	410910-101	313	5022-2166	12
0101-0921	61, 73	0890-1761	34	410910-102	313	5022-2175	64
0101-1050	61, 73	0890-1762	34	410910-301	313	5022-2184	42, 95
0101-1219	79	0890-1763	34, 102	410910-302	313	5022-2185	12
0101-1226	79	0890-1915	34, 106	410910-501	313	5022-2188	51
0101-1227	79	0905-1163	199	410910-502	313	5022-2192	48, 54
0101-1228	79	0905-1175	52	413910-101	313	5022-6503	82
0101-1229	79	0905-1192	48	413910-102	313	5022-6509	29
0101-1230	79	0905-1294	64	413910-301	313	5022-6510	29
0101-1231	77	0905-1420	51	413910-302	313	5022-6531	69
0101-1232	77	0905-1516	54	413910-501	313	5022-6532	69
0101-1233	77	0905-1599	64	413910-502	313	5022-6533	69
0101-1234	79	0905-1717	64	419910-301	313	5022-6534	69
0101-1235	79	0905-1718	52	419910-302	313	5022-6536	41
0101-1236	79	0905-1719	51	419910-501	313	5022-6538	65, 69
0101-1237	79	0905-1731	101	419910-502	313	5022-6539	65, 69
0101-1238	79	12102300	349	420212-901	313	5022-6541	71
0101-1239	79	12102301	349	420212-902	313	5022-6542	71
0101-1240	79	126-1012	187	420420-901	313	5022-6543	71
0101-1241	79	126-1013	187	420910-901	313	5022-6544	71
0101-1242	79	126-1713	187	420910-902	313	5022-6546	71
0101-1243	79	127-1012	187	440905-901	313	5023-0208	71
0101-1244	79	127-1712	187	440905-902	313	5023-0209	71
0101-1245	79	127-1713	187	440910-901	313	5023-0213	71
0101-1246	79	1400-0563	107	440910-902	313	5023-0214	71
0101-1247	79	14251921	349	443905-101	313	5023-0215	71
0101-1248	79	1460-2571	104-105, 108	443905-102	313	5023-0238	71
0101-1249	79	1520-0401	195	443905-901	313	5023-0271	12

5023-0282.....	11	5061-3362.....	35	5064-8264.....	373, 460	5065-9978.....	34, 52
5023-1803.....	42	5062-2418.....	40	5064-8265.....	373, 460	5067-1540.....	41
5041-2168.....	54, 199	5062-2461.....	23	5064-8266.....	373, 460	5067-1547.....	41
5042-1385.....	69	5062-2462.....	23-24, 33-34, 99	5064-8267.....	373, 460	5067-1551.....	12
5042-1386.....	69	5062-2463.....	34, 99	5064-8268.....	373, 460	5067-1553.....	12
5042-1388.....	69	5062-2478.....	395	5064-8269.....	263	5067-1555.....	12
5042-1389.....	69	5062-2479.....	395	5064-8270.....	373, 460	5067-1557.....	41
5042-6454.....	69	5062-2483.....	34, 58	5064-8271.....	263	5067-1558.....	41
5042-6458.....	69	5062-2484.....	52	5064-8273.....	12	5067-1562.....	12
5042-6459.....	69	5062-2486.....	11	5064-8286.....	263	5067-1565.....	54
5042-6461.....	34	5062-8517.....	54, 199	5064-8287.....	263	5067-1581.....	77
5042-6462.....	34	5062-8522.....	23, 92	5064-8288.....	263	5067-1582.....	100
5042-6463.....	34	5062-8524.....	172, 175	5064-8291.....	263	5067-1584.....	100
5042-6470.....	69	5062-8529.....	192	5064-8293.....	64	5067-1585.....	100
5042-6476.....	15	5062-8534.....	58	5064-8294.....	373, 460	5067-1595.....	84
5042-6478.....	199	5062-8535.....	23, 33, 92	5064-8295.....	373, 460	5067-1596.....	85
5042-6491.....	199	5062-8541.....	40	5064-8296.....	263	5067-1597.....	85
5042-6500.....	40	5062-8544.....	199	5064-8297.....	263	5067-4104.....	77
5042-8502.....	69	5062-8562.....	49	5064-8298.....	263	5067-4105.....	77
5042-8507.....	52	5062-8571.....	196	5064-8300.....	373, 460	5067-4107.....	75
5042-8517.....	42, 71	5062-8572.....	196	5065-4402.....	69	5067-4108.....	75
5042-8518.....	42, 71	5062-8573.....	196	5065-4410.....	41	5067-4111.....	75
5042-8519.....	42, 71	5062-8574.....	197	5065-4420.....	15	5067-4112.....	75
5042-8922.....	58	5062-8575.....	172, 196	5065-4421.....	53	5067-4113.....	75
5042-8954.....	52	5062-8576.....	172, 174, 196	5065-4422.....	41, 95	5067-4114.....	61, 73
5042-8957.....	196	5062-8577.....	196	5065-4423.....	41	5067-4117.....	74-75
5042-9954.....	11	5062-8578.....	172-175, 196	5065-4426.....	40	5067-4118.....	74-75
5042-9967.....	11	5062-8587.....	64	5065-4427.....	460	5067-4121.....	75
5043-0221.....	56	5062-8588.....	82	5065-4454.....	40	5067-4124.....	51
5043-0222.....	56	5063-6502.....	77	5065-4459.....	373, 460	5067-4131.....	74, 101
5043-0223.....	56	5063-6506.....	63	5065-4460.....	373, 460	5067-4132.....	74-75
5043-0224.....	56	5063-6510.....	174	5065-4461.....	373, 460	5067-4134.....	74-75
5043-0225.....	56	5063-6511.....	172	5065-4462.....	373, 460	5067-4137.....	75
5043-0226.....	56	5063-6512.....	188	5065-4463.....	373, 460	5067-4141.....	77
5043-0227.....	56	5063-6513.....	188	5065-4464.....	379, 460	5067-4142.....	74-75
5043-0228.....	57	5063-6514.....	198	5065-4465.....	379, 460	5067-4144.....	74-75
5043-0229.....	57	5063-6515.....	198	5065-4466.....	379, 460	5067-4146.....	74-75
5043-0230.....	57	5063-6520.....	198	5065-4467.....	379, 460	5067-4148.....	74-75
5043-0231.....	57	5063-6526.....	82	5065-4468.....	384, 460	5067-4158.....	77
5043-0232.....	56-57	5063-6531.....	53	5065-4498.....	66	5067-4159.....	74-75, 102
5043-0233.....	57	5063-6535.....	188	5065-4499.....	60	5067-4170.....	75
5043-0234.....	56	5063-6536.....	188	5065-4500.....	12	5067-4174.....	48
5043-0235.....	57	5063-6540.....	188	5065-9901.....	12	5067-4202.....	77
5043-0236.....	57	5063-6541.....	188	5065-9908.....	110	5067-4601.....	83-85
5043-0237.....	57	5063-6544.....	188	5065-9910.....	373, 460	5067-4607.....	29
5043-0238.....	57	5063-6586.....	50, 64	5065-9911.....	373, 460	5067-4608.....	28-29
5043-0239.....	57	5063-6589.....	51, 64	5065-9912.....	458, 460	5067-4609.....	29
5043-0242.....	56	5063-6591.....	40	5065-9913.....	373, 460	5067-4633.....	37
5043-0243.....	56	5063-6592.....	95	5065-9914.....	373, 460	5067-4638.....	12
5043-0255.....	57	5063-6593.....	41, 95	5065-9915.....	373, 460	5067-4646.....	38, 84, 86
5043-0272.....	56	5063-6597.....	15, 99	5065-9922.....	60	5067-4647.....	25
5043-0300.....	56	5063-6598.....	58	5065-9923.....	373, 460	5067-4648.....	28
5043-0828.....	56	5063-6599.....	58	5065-9924.....	373, 460	5067-4649.....	25
5043-0829.....	56	5064-8203.....	173	5065-9926.....	29	5067-4650.....	25
5043-0830.....	56	5064-8205.....	173	5065-9927.....	29	5067-4651.....	25
5043-0831.....	56	5064-8206.....	173	5065-9931.....	28	5067-4653.....	26
5043-0832.....	56	5064-8208.....	175	5065-9932.....	28	5067-4657.....	24
5061-3303.....	40, 99	5064-8209.....	175	5065-9933.....	28-29	5067-4658.....	24
5061-3304.....	39	5064-8211.....	11	5065-9935.....	27	5067-4659.....	24
5061-3315.....	39	5064-8220.....	15	5065-9937.....	36	5067-4660.....	24
5061-3327.....	99	5064-8236.....	197	5065-9938.....	36	5067-4661.....	51
5061-3328.....	99	5064-8253.....	271	5065-9939.....	37	5067-4662.....	67
5061-3329.....	99	5064-8254.....	271	5065-9942.....	458, 460	5067-4669.....	24
5061-3330.....	395	5064-8255.....	271	5065-9947.....	37, 82	5067-4670.....	24
5061-3331.....	395	5064-8256.....	271	5065-9948.....	35, 41	5067-4678.....	50
5061-3332.....	395	5064-8257.....	271	5065-9950.....	35, 41	5067-4682.....	38, 86
5061-3333.....	395	5064-8258.....	271, 460	5065-9952.....	52	5067-4684.....	25
5061-3334.....	395	5064-8259.....	373, 460	5065-9963.....	28	5067-4685.....	28
5061-3335.....	395	5064-8260.....	271	5065-9964.....	27	5067-4686.....	25
5061-3337.....	395	5064-8261.....	271	5065-9967.....	40	5067-4687.....	25
5061-3339.....	395	5064-8262.....	271	5065-9971.....	34, 42	5067-4688.....	28
5061-3361.....	35	5064-8263.....	373, 460	5065-9976.....	34	5067-4689.....	26

## PART NUMBER INDEX

5067-4695.....	50, 64, 101-102	5069-3637.....	412	5188-6557.....	439	5190-2433.....	405
5067-4697.....	51	5069-3639.....	435	5188-6558.....	439	5190-2434.....	405
5067-4699.....	59	5080-5400.....	108	5188-6559.....	439	5190-2435.....	405
5067-4703.....	32, 64	5133001.....	349	5188-6560.....	439	5190-2436.....	405
5067-4710.....	32, 64	5133005.....	349	5188-6562.....	439	5190-2439.....	405
5067-4716.....	51	5180-4108.....	40, 99	5188-8283.....	441	5190-2440.....	405
5067-4717.....	51	5180-4114.....	40, 99	5188-8825.....	439	5190-2441.....	405
5067-4728.....	48-49	5181-1507.....	199	5188-8826.....	439	5190-2442.....	405
5067-4729.....	39, 87	5181-1512.....	199	5190-0443.....	110	5190-2443.....	405
5067-4730.....	87	5181-1513.....	199	5190-0469.....	110	5190-2444.....	405
5067-4733.....	40	5181-1541.....	71	5190-0488.....	15	5190-2445.....	405
5067-4735.....	25	5181-8836.....	200	5190-0551.....	110	5190-2446.....	405
5067-4737.....	28	5182-0567.....	199	5190-0554.....	110	5190-2447.....	405
5067-4738.....	40	5182-1530.....	90	5190-0555.....	110	5190-2448.....	405
5067-4739.....	40	5182-9697.....	199	5190-0556.....	110	5190-2451.....	405
5067-4741.....	42, 102	5182-9710.....	106	5190-0917.....	90, 199	5190-2452.....	405
5067-4744.....	25	5183-2021.....	285	5190-0924.....	11	5190-2453.....	405
5067-4745.....	25	5183-2022.....	285	5190-1401.....	108	5190-2454.....	405
5067-4746.....	26	5183-4619.....	199	5190-1431.....	284	5190-2455.....	405
5067-4767.....	88	5183-4623.....	199	5190-1432.....	284	5190-2456.....	405
5067-4769.....	88	5183-4624.....	285	5190-1433.....	284	5190-2459.....	405
5067-4777.....	29	5183-4625.....	285	5190-1434.....	284	5190-2460.....	405
5067-4778.....	29	5183-4626.....	285	5190-1435.....	284	5190-2461.....	405
5067-4779.....	29	5183-4627.....	285	5190-1436.....	284	5190-2462.....	405
5067-4780.....	29	5183-4669.....	200	5190-1443.....	104	5190-2463.....	405
5067-4781.....	29	5183-4670.....	200	5190-1480.....	80	5190-2464.....	405
5067-4782.....	29	5185-5807.....	285	5190-1484.....	80	5190-2465.....	405
5067-4798.....	58	5185-5808.....	285	5190-1485.....	80	5190-2466.....	405
5067-4800.....	87	5185-5809.....	285	5190-1486.....	80-81	5190-2467.....	405
5067-5103.....	38, 88	5185-5810.....	285	5190-1492.....	81	5190-2468.....	405
5067-5104.....	25	5185-5920.....	269, 372, 463	5190-1494.....	80	5190-2471.....	405
5067-5106.....	25	5185-5921.....	261	5190-1499.....	81	5190-2472.....	405
5067-5107.....	25	5185-5922.....	282	5190-1501.....	80	5190-2473.....	405
5067-5109.....	26	5185-5923.....	277	5190-1505.....	81	5190-2474.....	405
5067-5110.....	26	5185-5968.....	384, 463	5190-1508.....	80	5190-2475.....	405
5067-5111.....	26	5185-5984.....	439	5190-1512.....	81	5190-2476.....	405
5067-5112.....	26	5185-5985.....	439	5190-1515.....	80	5190-2479.....	405
5067-5113.....	26	5185-5986.....	441	5190-1520.....	81	5190-2480.....	405
5067-5120.....	28	5185-5987.....	441	5190-1522.....	80	5190-2481.....	405
5067-5189.....	39	5185-5988.....	441	5190-1526.....	81	5190-2482.....	405
5067-5378.....	58	5185-5990.....	441	5190-1558.....	81	5190-2483.....	405
5067-5380.....	58	5185-5991.....	441	5190-1560.....	81	5190-2484.....	405
5067-5383.....	58	5188-2743.....	13	5190-1561.....	81	5190-2485.....	405
5068-0001.....	75	5188-2744.....	13	5190-1562.....	81	5190-2486.....	405
5068-0002.....	75	5188-2745.....	13	5190-1564.....	81	5190-2487.....	405
5068-0004.....	48	5188-2746.....	13	5190-1571.....	81	5190-2488.....	405
5068-0005.....	48	5188-5217.....	439	5190-2401.....	401	5190-2491.....	405
5068-0006.....	74-75	5188-5218.....	439	5190-2402.....	401	5190-2492.....	405
5068-0007.....	61, 73	5188-5230.....	439	5190-2403.....	401	5190-2493.....	405
5068-0008.....	74-75	5188-5231.....	442	5190-2404.....	401	5190-2494.....	405
5068-0011.....	74-75	5188-5249.....	441	5190-2405.....	401	5190-2495.....	405
5068-0012.....	74-75	5188-5250.....	441	5190-2406.....	401	5190-2496.....	405
5068-0040.....	74-75, 102	5188-5251.....	441	5190-2407.....	401	5190-2499.....	405
5068-0041.....	74-75, 102	5188-5252.....	441	5190-2408.....	401	5190-2500.....	405
5068-0044.....	74-75	5188-5253.....	441	5190-2411.....	401	5190-2501.....	423
5068-0045.....	74-75, 102	5188-5254.....	441	5190-2412.....	401	5190-2502.....	423
5068-0052.....	77	5188-5289.....	439	5190-2413.....	401	5190-2503.....	423
5068-0053.....	77	5188-5321.....	69	5190-2414.....	401	5190-2504.....	423
5068-0060.....	74-75, 77, 101-102	5188-5322.....	69	5190-2415.....	401	5190-2505.....	423
5068-0067.....	74-75	5188-5332.....	439	5190-2416.....	401	5190-2506.....	423
5068-0076.....	74-75	5188-5333.....	439	5190-2419.....	401	5190-2507.....	423
5068-0077.....	74-75	5188-5334.....	439	5190-2420.....	401	5190-2508.....	423
5068-0082.....	77	5188-5336.....	439	5190-2421.....	405	5190-2509.....	423
5068-0093.....	74-75	5188-5341.....	439	5190-2422.....	405	5190-2510.....	423
5068-0095.....	74-75	5188-6408.....	439	5190-2423.....	405	5190-2511.....	423
5068-0097.....	74-75	5188-6409.....	439	5190-2424.....	405	5190-2512.....	423
5068-0115.....	75	5188-6410.....	439	5190-2425.....	405	5190-2513.....	423
5068-0116.....	75	5188-6411.....	439	5190-2426.....	405	5190-2514.....	423
5068-0122.....	48	5188-6510.....	442	5190-2427.....	405	5190-2515.....	423
5068-0123.....	48	5188-6511.....	442	5190-2428.....	405	5190-2516.....	427
5069-3635.....	412	5188-6523.....	110	5190-2431.....	405	5190-2517.....	427
5069-3636.....	412	5188-6529.....	15	5190-2432.....	405	5190-2518.....	427



5190-2519	427	687975-302	229	726975-302	243, 277	8001-0405	150
5190-2520	427	687975-902	229	726975-902	243, 276	8001-0406	150
5190-2521	427	689775-902	229	727700-902	243, 277	8001-0501	151
5190-2522	427	689775-906	229	727975-302	243, 277	8001-0502	151
5190-2523	427	689775-914	229	727975-902	243, 276	8001-0503	151
5190-2524	427	689975-302	229	728700-902	243, 277	8001-0504	151
5190-2525	427	689975-306	229	728975-302	243, 277	8001-0506	152
5190-2526	427	689975-314	229	728975-902	243, 276	8001-0509	154
5190-2527	427	689975-902	229	735700-902	277	8001-0510	152
5190-2528	427	689975-906	229	735953-902	276	8001-0511	152
5190-2529	427	689975-914	229	735954-302	276	8001-0512	152
5190-2530	427	691775-902	229	746450-902	276	8001-0513	152
5190-2531	427	691775-906	229	75400001	349	8001-0514	151
5190-2532	427	691975-302	229	75700001	349	8001-0515	151
5190-2533	427	691975-306	229	7571901C	349	8001-0516	152
5190-2534	427	691975-902	229	75719025	349	8001-0517	154
5190-2535	427	691975-906	229	75719050	349	8001-0519	152
5190-2536	427	693768-901	229	7572915B	349	8001-0520	152
5190-2537	427	693775-901	325	7572915C	349	8001-0521	152
5190-2538	427	693775-902	229, 386	7573915B	349	8001-0522	151
5190-2539	427	693775-906	229	7573915C	349	8001-0527	152
5190-2540	427	693775-912	229	757700-302	238, 277	8001-0528	152
5190-2541	427	693968-301	229	757700-902	238, 277	8001-0529	152
5190-2542	427	693968-901	229	758700-302	238, 277	8001-0530	152
5190-2543	427	693975-301	325	758700-902	238, 277	8001-0531	152
5190-2544	427	693975-302	229, 386	759700-302	238	8001-0532	152
5190-2545	427	693975-306	229	759700-902	238, 277	8001-0533	151
520518-904	305	693975-312	229	760450-902	277	8001-0534	151
520518-905	305	693975-901	325	761600-902	277	8001-0535	152
588905-902	305	693975-902	229, 386	761753-902	277	8001-0601	153
588915-902	305	693975-906	229	761775-902	379	8001-0603	153
588925-902	305	693975-912	229	761973-902	379	8001-0604	153
588935-902	305	695768-901	229	763600-902	277	8001-0607	153
590-3003	200	695775-901	325	763750-902	379	8001-0608	153
590-4000	177, 197	695775-902	229, 386	763953-902	276	8001-0609	153
590-4001	177, 197	695775-906	229	763954-302	276	8001-0610	154
590-4005	177, 197	695775-912	229	763973-902	379	8001-0612	153
59980-20134	107	695968-301	229	764953-302	276	8001-0613	153
59987-20033	107	695968-901	229	764953-902	276	8001-0614	153
59987-20040	105	695975-302	229, 386	765600-902	277	8001-0615	152
6040-0798	107	695975-306	229	765750-902	379	8001-0701	150
6040-0834	104, 107	695975-312	229	765973-902	379	8001-0702	150
660750-902	210, 384	695975-901	325	766953-902	276	8001-0703	150
660750-906	384	695975-902	210, 229, 386	770050-902	277, 318	8001-0704	150
660750-909	384	695975-906	229	770100-902	277, 318	8001-0705	150
661750-902	384, 463	695975-912	229	770150-902	277, 318	8001-0801	153
661750-906	384, 463	697775-902	229	770450-302	276	8001-0802	153
661750-909	384, 463	697775-906	229	770450-902	276	8001-0803	155
670750-902	384	697975-302	229	770995-902	379	8001-0805	155
671750-902	384, 463	697975-306	229	773450-302	276	8001-0806	155
681775-902	229	697975-902	210, 229	773450-902	276	8001-0807	155
681975-302	229	697975-906	229	773700-902	277	8001-0808	156
681975-902	229	699768-901	229	773995-902	379	8001-0809	153
683775-902	229, 386	699775-901	325	79835-87638	29	8001-0810	154
683775-906	229	699775-902	229	79841-87610	27	8001-0812	153
683775-914	229	699775-906	229	7995108-344	262	8001-0813	155
683975-302	229, 386	699775-912	229	7995108-585	262	8001-0814	153
683975-306	229	699968-301	229	7995108-595	262	8001-0816	155
683975-314	229	699968-901	229	7995118-344	262	8001-0817	155
683975-902	229, 386	699975-301	325	7995118-504	262, 270	8001-0818	154
683975-906	229	699975-302	229	7995118-585	262	8001-0819	155
683975-914	229	699975-306	229	7995118-595	262	8001-0821	154
685775-902	229, 386	699975-312	229	7995208-344	270	8001-0822	154
685775-906	229	699975-901	325	7995208-585	270	8001-0823	155
685775-914	229	699975-902	229	7995208-595	270	8001-0824	155
685975-302	229, 386	699975-906	229	7995218-344	270	8001-8020	154
685975-306	229	699975-912	229	7995218-585	270-271	8002-0401	157
685975-314	229	722975-902	245	7995218-595	270	8002-0402	157
685975-902	229, 386	724700-902	243, 277	7995230-344	262	8002-0403	157
685975-906	229	724975-302	243, 277	8001-0401	150	8002-0404	157
685975-914	229	724975-902	243, 276	8001-0402	150	8002-0405	157
687775-902	229	726700-902	243, 277	8001-0403	150	8002-0406	157

## PART NUMBER INDEX

8002-0407	157	8002-0917	161	8005-0911	145	820950-908	330
8002-0408	157	8002-0918	162	8005-0912	145	820950-911	433
8002-0412	157	8002-0919	162	8005-0913	144	820950-912	283
8002-0413	157	8002-0921	168	8005-0914	146	820950-913	273
8002-0414	157	8002-0923	164	8005-0915	144	820950-914	273
8002-0415	157	8002-0924	164	8005-0916	144	820950-915	269
8002-0501	158	8005-0414	138	8005-0925	145	820950-916	269
8002-0502	158	8005-0416	138	8005-0926	145	820950-917	269
8002-0515	158	8005-0417	138	8005-0927	146	820950-918	372
8002-0516	159	8005-0418	138	8005-0928	144	820950-919	329
8002-0517	159	8005-0419	138	8005-0929	145	820950-920	269
8002-0601	158	8005-0420	138	8005-0930	144	820950-921	372
8002-0602	159	8005-0422	138	8010-0440	169	820950-922	269
8002-0603	159	8005-0423	138	8010-0441	137, 169	820950-923	372
8002-0604	159	8005-0508	141	8010-0442	137, 169	820950-924	283, 372
8002-0605	159	8005-0512	142	8010-0443	137, 169	820950-925	261
8002-0607	159	8005-0513	141	8010-0444	137, 169	820950-926	261
8002-0608	159	8005-0514	139	8010-0445	137, 169	820950-927	261
8002-0610	165	8005-0515	140	8010-0446	137, 169	820950-928	282
8002-0611	165	8005-0516	140	8010-0448	137, 169	820950-930	277
8002-0701	157	8005-0523	140	8010-0449	169	820950-931	394
8002-0702	157	8005-0524	141	8010-0450	137, 169	820950-932	379
8002-0703	157	8005-0525	141	8010-0455	137, 169	820950-933	269
8002-0704	157	8005-0526	141	8010-0456	137, 169	820950-935	261, 329
8002-0705	157	8005-0527	140	8010-0457	137, 169	820950-936	253
8002-0706	157	8005-0528	142, 145	8010-0458	137, 169	820950-937	253
8002-0802	168	8005-0529	140	8010-0459	137, 169	820950-938	253
8002-0803	168	8005-0530	140	8010-0460	137, 169	820950-939	253, 255
8002-0805	168	8005-0531	140	8010-0467	137, 169	820999-901	225, 253, 255, 261, 269, 273, 277, 282-283, 305, 329-330, 334, 372, 379, 384, 394, 433
8002-0806	168	8005-0532	142	8010-0468	137, 169		
8002-0808	158	8005-0533	140	820212-911	433		
8002-0809	158	8005-0535	139	820212-914	273, 318		
8002-0810	158	8005-0536	139	820212-915	269, 273, 317	821075-918	384
8002-0811	160	8005-0537	141	820212-918	317, 373, 466	821075-920	384
8002-0815	167	8005-0538	139	820212-919	318, 329	821075-924	384
8002-0816	167	8005-0539	140	820212-920	269, 317	821125-915	269, 273
8002-0817	167	8005-0540	140	820212-921	317, 373, 466	821125-918	372
8002-0818	166	8005-0541	139	820212-924	317, 373, 466	821125-919	329
8002-0819	166	8005-0601	142	820212-925	261, 318	821125-924	269, 372
8002-0820	166	8005-0602	142	820212-926	261, 318	821125-926	261
8002-0821	166	8005-0603	142	820212-928	282, 318	821125-928	282
8002-0822	166	8005-0604	142	820212-930	277, 318	821125-930	277
8002-0823	166	8005-0605	142	820212-933	269, 317	821125-932	379
8002-0824	166	8005-0702	137	820385-901	318	821125-933	269
8002-0825	166	8005-0704	137	820400-901	261, 269, 273, 277, 282-283, 313, 317-318, 329-330, 373, 433, 466	821125-935	261, 329
8002-0826	166	8005-0705	137			821125-936	253
8002-0831	166	8005-0812	148	820444-901	261, 269, 273, 277, 282, 313, 317-318, 329-330, 373, 433, 466	821125-937	253
8002-0832	166	8005-0822	148			821125-938	253
8002-0833	166	8005-0823	148	820555-901	245, 263, 270	821125-939	253, 255
8002-0834	166	8005-0824	148	820675-111	330, 433	821700-902	245, 270
8002-0835	167	8005-0825	148	820675-112	261	821700-932	245, 270
8002-0837	166	8005-0826	148	820675-115	269, 273, 283	821725-901	238, 243, 246, 253
8002-0856	160	8005-0835	148-149	820675-119	329-330	821725-902	238, 244, 246, 269
8002-0857	160	8005-0836	149	820675-124	269, 283, 372	821725-903	238, 243, 246, 261
8002-0858	160	8005-0837	149	820700-902	244, 269	821725-904	238, 244, 246, 269
8002-0859	160	8005-0838	143, 149, 156	820700-905	244, 269	821725-911	229, 246
8002-0860	160	8005-0839	143	820700-906	244, 269	821725-912	229, 246
8002-0901	164	8005-0840	143	820700-912	244, 269	821725-913	229, 246
8002-0902	164	8005-0841	143	820750-901	243, 246, 252	821725-914	229, 246
8002-0903	164	8005-0842	143	820750-902	244, 246, 267	821975-902	245, 270
8002-0904	163	8005-0843	143	820750-903	243, 246, 260	821975-932	245, 270
8002-0905	164	8005-0844	143	820750-904	244, 246, 267	822700-902	270
8002-0906	163	8005-0845	143	820750-909	244, 246, 260	822700-932	270
8002-0907	161	8005-0846	143	820750-911	229, 246	822975-902	244-245, 270
8002-0908	161	8005-0901	146	820750-912	229, 246	822975-906	245, 270
8002-0909	162	8005-0902	146	820750-913	229, 246	822975-932	270
8002-0910	162	8005-0903	146	820750-914	229, 246	823700-902	245, 270
8002-0911	161	8005-0904	146	820950-901	330	823700-932	245, 270
8002-0912	162	8005-0905	147	820950-902	283	823750-901	238, 243, 246, 253
8002-0913	163	8005-0906	147	820950-905	283, 330	823750-902	238, 244, 246, 268
8002-0915	165	8005-0907	146	820950-906	283	823750-903	238, 243, 246, 260
8002-0916	165	8005-0908	147			823750-904	238, 244, 246, 268

823750-911	229, 246	829975-302	244, 268	858700-314	238	863750-906	372
823750-912	229, 246	829975-305	244, 268	858700-902	238, 268	863953-902	267
823750-913	229, 246	829975-306	244, 268	858700-905	238, 268	863953-905	267
823750-914	229, 246	829975-312	244, 268	858700-906	238, 268	863953-906	267
823975-902	245, 270	829975-902	244, 267	858700-912	238, 268	863953-912	267
823975-932	245, 270	829975-905	244, 267	858700-914	238	863953-914	267
824700-902	244, 269	829975-906	244, 267	858750-902	372	863954-302	267
824700-905	244, 269	829975-912	244, 267	858750-906	372	863954-305	267
824700-906	244, 269	829975-914	244, 267	858750-909	372	863954-306	267
824700-912	244, 269	830668-901	244, 281	858750-944	372, 374, 375	863954-312	267
824700-914	244, 269	830975-906	244, 267	858768-901	238, 281	863954-314	267
824975-302	244, 268	830990-902	268	859700-302	238, 268	863967-302	273
824975-305	244, 268	830990-906	268	859700-306	238, 268	863967-902	273
824975-306	244, 268	830990-914	268	859700-902	238, 268	863973-902	210, 372
824975-902	244, 267	831975-902	270	859700-905	238, 268	863973-905	372
824975-905	244, 267	831975-906	270	859700-906	238, 268	863973-906	372
824975-906	244, 267	831975-932	270	859700-912	238, 268	863973-909	372
824975-912	244, 267	831975-936	270	859700-914	238	863974-302	372
824975-914	244, 267	832975-902	267	859768-901	238, 281	863974-306	372
825700-902	245, 270	832975-906	267	860700-304	334	863974-309	372
825700-932	245, 270	833975-902	270	860700-704	334	864668-301	281
825975-902	245, 270	833975-906	270	860700-708	330	864668-901	281
825975-932	245, 270	833975-912	270	860950-902	372	865600-902	269
826700-902	244, 269	833975-932	270	860950-905	372	865600-906	269
826700-906	244, 269	833975-936	270	860950-906	372	865608-901	282
826975-302	244, 268	834975-902	267	860950-909	372	865630-902	372, 463
826975-306	244, 268	834975-906	267	860975-902	268	865630-906	372, 463
826975-902	244, 267	835668-901	281	860975-905	268	865750-902	372
826975-906	244, 267	835975-902	267	860975-906	268	865750-906	372
827668-301	244, 281	835975-905	267	860975-909	268	865973-902	210, 372
827668-901	244, 281	835975-906	267	860975-912	268	865973-905	372
827700-901	244, 329	835975-912	267	860975-914	268	865973-906	372
827700-902	244, 269	835975-914	267	861600-902	269	865973-909	372
827700-905	244, 269	840140-901	261, 269, 273, 283, 329-330, 372, 433	861600-906	269	8660-0827	108
827700-906	244, 269			861608-901	282	866668-901	281
827700-912	244, 269	840300-908	330	861630-902	372, 463	866735-902	268
827700-914	244, 269	843300-908	330	861700-901	282	866953-302	267
827768-901	244, 282	846952-704	334	861753-902	268	866953-902	267
827975-301	244, 329	846975-202	267	861753-905	268	866953-905	267
827975-302	244, 268	846975-902	267	861753-906	268	866953-906	267
827975-305	244, 268	846975-906	267	861753-912	268	866953-912	267
827975-306	244, 268	846975-914	267	861753-914	268	866953-914	267
827975-312	244, 268	8500-1867	107	861767-902	273	866967-902	273
827975-314	244, 268	8500-2236	107	861768-901	282	868050-901	282, 318
827975-901	244	8500-4410	195	861775-902	372	868100-901	282, 318
827975-902	244, 267, 329	8500-6762	15	861775-906	372	868150-901	282, 318
827975-905	244, 267	8500-6782	196	861953-902	267	870050-902	269, 317
827975-906	244, 267	8500-6785	174	861953-905	267	870050-906	269, 317
827975-912	244, 267	8500-6786	197	861953-906	267	870050-914	269, 317
827975-914	244, 267	8500-6787	197	861953-912	267	870100-902	269, 317
828668-301	244, 281	8500-6797	172	861953-914	267	870100-906	269, 317
828668-901	244, 281	8500-6900	174	861954-302	267	870100-914	269, 317
828700-901	244, 329	8500-6917	110	861954-305	267	870150-902	269, 317
828700-902	244, 269	857700-302	238, 268	861954-306	267	870150-906	269, 317
828700-905	244, 269	857700-305	238, 268	861954-309	267	870150-914	269, 317
828700-906	244, 269	857700-306	238, 268	861954-312	267	8710-0004	108
828700-912	244, 269	857700-312	238, 268	861954-314	267	8710-0510	99, 108
828700-914	244, 269	857700-314	238	861967-302	273	8710-0806	108
828768-901	244, 282	857700-902	238, 268	861967-902	273	8710-1534	95
828975-301	244, 329	857700-905	238, 268	861971-901	281	8710-1615	108
828975-302	244, 268	857700-906	238, 268	861973-306	372	8710-1622	108
828975-305	244, 268	857700-912	238, 268	861973-902	372	8710-1924	11, 48
828975-306	244, 268	857700-914	238	861973-906	372	8710-1930	11, 35, 58, 108
828975-309	244, 268	857750-902	372	863600-902	269	8710-1931	11, 35
828975-312	244, 268	857750-906	372	863600-905	269	8710-2699	108
828975-314	244, 268	857750-909	372	863600-906	269	871700-902	268
828975-901	244, 329	857750-944	372, 375	863608-901	282	871700-906	268
828975-902	244, 267	857768-901	238, 281	863630-902	372, 463	871700-914	268
828975-905	244, 267	858700-302	238, 268	863630-906	372, 463	872700-902	268
828975-906	244, 267	858700-305	238, 268	863668-301	281	872700-906	268
828975-912	244, 267	858700-306	238, 268	863668-901	281	873700-902	270
828975-914	244, 267	858700-312	268	863700-901	282	873700-906	270

## PART NUMBER INDEX

873700-932	270	880995-206	372	895150-909	317, 373, 466	933975-902	262
873700-936	270	880995-209	372	897150-102	317, 373, 466	933975-906	262
874700-902	268	880995-902	372	897150-106	317, 373, 466	933975-932	262
874700-906	268	880995-905	372	897150-109	317, 373, 466	933975-936	262
875700-902	270	880995-906	372	897250-102	317, 373, 466	934967-902	260
875700-906	270	880995-909	372	897250-105	317, 373, 466	934967-906	260
875700-932	270	881750-902	372	897250-106	317, 373, 466	935967-902	260
875700-936	270	883668-301	281	897250-109	317, 373, 466	935967-906	260
877150-102	269, 317	883668-901	281	921700-902	245, 263	935967-912	260
877150-106	269, 317	883700-704	334	921700-932	245, 263	946975-902	260
877150-114	269, 317	883700-714	334	921975-902	245, 263	946975-906	260
877250-101	318, 329	883700-901	329	921975-932	245, 263	959701-902	253
877250-102	269, 317	883700-902	273	922700-902	245, 262	959701-906	253
877250-105	269, 317	883700-905	268	922700-932	245, 262	959701-912	253
877250-106	269, 317	883700-906	268	922975-902	243, 245, 262	959701-918	253, 255
877250-112	269, 317	883700-909	268	922975-906	245, 262	959731-902	243, 253
877250-114	269, 317	883700-912	268	922975-932	245, 262	959731-906	243, 253
877952-101	317, 330	883700-922	268	923700-902	245, 263	959731-912	243, 253
877952-102	283, 317	883725-901	281	923700-932	245, 263	959733-902	253
877952-105	283, 317, 330	883750-902	372	923975-902	245, 262	959733-906	253
877952-106	283, 317	883750-905	372	923975-932	245, 262	959733-912	253
877952-108	317, 330	883750-906	372	924700-902	243, 261	959741-902	243, 253
877967-102	273, 318	883750-909	372	924700-906	243, 261	959741-906	243, 253
877974-901	433	883952-302	283	924975-302	243, 260	959741-912	243, 253
877974-910	433	883952-701	330	924975-306	243, 260	959741-918	243, 253, 255
878150-101	282, 318	883952-702	283	924975-902	243, 260	959743-901	325
878250-101	282, 318	883952-703	334	924975-906	243, 260	959743-902	253
880668-301	281	883952-704	334	925700-902	245, 263	959743-906	253
880668-901	281	883952-705	330	925700-932	245, 263	959743-912	253
880952-201	330	883952-706	283	925975-902	245, 262	959746-902	253
880952-202	283	883952-708	330	925975-932	245, 262	959746-906	253
880952-203	334	883952-710	283	926700-902	243, 261	959757-301	238, 325
880952-204	334	883952-712	283	926700-906	243, 261	959757-302	238, 252
880952-205	330	883952-714	334	926975-302	243, 260	959757-306	238, 252
880952-206	283	883967-302	273	926975-306	243, 260	959757-312	238
880952-208	330	883967-901	273	926975-902	243, 260	959757-901	238, 325
880952-302	283	883967-902	273	926975-906	243, 260	959757-902	210, 238, 253
880952-701	330	883975-202	267	927700-902	243, 261	959757-906	238, 253
880952-702	283	883975-302	267	927700-906	243, 261	959757-912	238
880952-703	334	883975-305	267	927975-302	243, 260	959758-301	238, 325
880952-704	334	883975-306	267	927975-306	243, 260	959758-302	238, 252
880952-705	330	883975-309	267	927975-902	243, 260	959758-306	238, 252
880952-706	283	883975-312	267	927975-906	243, 260	959758-312	238
880952-708	330	883975-314	267	928700-902	243, 261	959758-901	238, 325
880952-710	283	883975-901	329	928700-906	243, 261	959758-902	238, 253
880952-712	283	883975-902	267	928975-302	243, 260	959758-906	238, 253
880952-714	334	883975-905	267	928975-306	260	959758-912	238
880967-201	267, 273	883975-906	267	928975-902	243, 260	959759-302	238, 252
880967-202	273	883975-909	267	928975-906	260	959759-306	238, 252
880967-302	273	883975-912	267	9300-1747	199	959759-901	238, 325
880967-901	273	883975-914	267	9300-1748	199	959759-902	238, 253
880967-902	273	883995-902	210, 372	9301-0407	99	959759-906	238, 253
880975-201	329	883995-905	372	9301-0656	53	959759-912	238
880975-202	267	883995-906	372	9301-0722	200	959763-902	253
880975-205	267	883995-909	372	9301-0895	13	959763-906	253
880975-209	267	884950-507	283	9301-0978	199	959763-912	253
880975-212	267	884950-526	283	9301-1291	106	959764-902	243, 253
880975-302	267	884950-543	283	9301-1337	58	959764-906	243, 253
880975-305	267	884950-567	267	9301-1420	53	959764-912	243, 253
880975-306	267	884950-577	281	9301-1421	53	959764-918	243, 253, 255
880975-309	267	884973-701	433	9301-1446	99	959790-918	253, 255
880975-312	267	884973-901	433	9301-1450	53	959793-901	325
880975-314	267	884973-902	433	9301-6341	53	959793-902	253
880975-901	329	884975-202	267	9301-6342	53	959793-906	253
880975-902	267	895050-902	317, 373, 466	930990-902	260	959793-912	253
880975-905	267	895050-906	317, 373, 466	930990-906	260	959793-918	253, 255
880975-906	267	895050-909	317, 373, 466	931975-902	262	959794-902	243
880975-909	267	895100-902	317, 373, 466	931975-906	262	959931-902	243, 252
880975-912	267	895100-906	317, 373, 466	931975-932	262	959931-906	243, 252
880975-914	267	895100-909	317, 373, 466	931975-936	262	959931-912	243, 252
880995-202	372	895150-902	317, 373, 466	932967-902	260	959931-918	243, 252, 255
880995-205	372	895150-906	317, 373, 466	932967-906	260	959933-902	252

959933-906	252	961967-905	260	993967-905	260, 329	A2001150X046	300
959933-912	252	961967-906	260	993967-906	260	A2001200X030	301
959936-902	252	963400-902	394	993967-912	260	A2001250C046	302
959936-906	252	963600-902	261	A2000020X020	301	A2001250X020	301
959936-912	252	963600-906	261	A2000030X020	301	A2001250X030	301
959941-302	243, 252	963954-302	260	A2000030X046	300	A2001250X046	300
959941-306	243, 252	963954-305	260	A2000050X020	301	A2001MG	303
959941-312	243, 252	963954-306	260	A2000050X030	301	A2001MG1	303
959941-902	243, 252	963954-312	260	A2000050X046	300	A2002250X046	300
959941-906	243, 252	963967-902	260	A2000100C020	302	A2002250X212	300, 321
959941-912	243, 252	963967-905	260	A2000100C030	302	A2002250X500	300
959941-918	243, 252, 255	963967-906	260	A2000100C046	302	A2002MG	303
959943-901	325	963967-912	260	A2000100R030	302	A2003020X020	301, 332
959943-902	252	965600-902	261	A2000100R046	302	A2003030X020	301, 332
959943-906	252	965600-906	261	A2000100T030	302	A2003050X020	301, 332
959943-912	252	966400-902	394	A2000100T046	302	A2003050X030	301, 332
959943-918	252, 255	966735-902	261	A2000100X020	301	A2003050X046	300, 332
959946-902	252	966954-302	260	A2000150X030	301	A2003100X212	300, 331
959946-906	252	966967-902	260	A2000100X046	300	A2003100X020	301, 332
959951-902	243, 252	966967-905	260	A2000100X212	300	A2003100X030	301, 332
959961-302	252	966967-906	260	A2000100X300	300	A2003100X046	300, 332
959961-306	252	966967-912	260	A2000125X040	301	A2003125X040	301, 332
959961-312	252	970050-902	261, 318	A2000150C046	302	A2003150X020	301, 332
959961-901	325	970050-906	261, 318	A2000150R030	302	A2003150X030	301, 332
959961-902	252	970100-902	261, 318	A2000150R046	302	A2003150X040	301, 332
959961-906	252	970100-906	261, 318	A2000150T030	302	A2003150X046	300, 331-332
959961-912	252	970150-902	261, 318	A2000150T046	302	A2003250X020	301, 332
959961-918	252, 255	970150-906	261, 318	A2000150X020	301	A2003250X030	301, 332
959963-302	252	971700-902	261	A2000150X030	301	A2003250X040	301, 332
959963-306	252	971700-906	261	A2000150X040	301	A2003250X046	300, 332
959963-312	252	972700-902	261	A2000150X046	300	A2003250X212	300, 321, 331
959963-902	210, 252	972700-906	261	A2000150X212	300	A2003MG	303, 332
959963-906	252	973700-902	262	A2000200X046	300	A2003MG2	303, 332
959963-912	252	973700-906	262	A2000250C030	302	A2004250X212	300, 321, 331
959963-918	252, 255	973700-932	262	A2000250C046	302	A2004250X500	300, 331
959964-302	243, 252	973700-936	262	A2000250R046	302	A2004MG	303, 332
959964-306	243, 252	974700-902	261	A2000250T046	302	A2004MG2	303, 332
959964-312	243, 252	974700-906	261	A2000250X020	301	A2005020X020	301, 332
959964-902	243, 252	975700-902	262	A2000250X030	301	A2005030X020	301, 332
959964-906	243, 252	975700-906	262	A2000250X040	301	A2005050X020	301, 332
959964-912	243, 252	975700-932	262	A2000250X046	300	A2005050X030	301, 332
959964-918	243, 252, 255	975700-936	262	A2000250X100	300, 321	A2005050X046	301, 332
959990-318	252, 255	977150-102	261, 318	A2000250X212	300, 321	A2005100X020	301, 332
959990-902	252	977150-106	261, 318	A2000MG	303	A2005100X030	301, 332
959990-906	252	977250-102	261, 318	A2000MG2	303	A2005100X046	300, 332
959990-912	252	977250-106	261, 318	A2001020X020	301	A2005150X020	301, 332
959990-918	252, 255	981757-302	238, 260	A2001030X020	301	A2005150X030	301, 332
959993-302	252	981757-902	238, 261	A2001030X030	301	A2005150X046	300, 332
959993-306	252	981758-302	238, 260	A2001030X046	301	A2005250X020	301, 332
959993-902	252	981758-902	238, 261	A2001050C020	302	A2005250X046	300-301, 332
959993-906	252	981759-302	238, 260	A2001050R020	302	A2005MG	303, 332
959993-912	252	981759-902	238, 261	A2001050T020	302	A2005MG2	303, 332
959993-918	252, 255	990967-202	260	A2001050X020	301	A2006030X020	301
959994-902	243	990967-206	260	A2001050X030	301	A2006050X020	301
959996-902	252	990967-302	260	A2001050X046	301	A2006050X046	300
959996-906	252	990967-305	260	A2001075X046	300	A2006100X020	301
959996-912	252	990967-306	260	A2001100C020	302	A2006100X030	301
959996-918	252, 255	990967-312	260	A2001100R030	302	A2006100X046	300
960967-902	260	990967-902	260	A2001100R046	302	A2006150X020	301
960967-905	260	990967-905	260, 329	A2001100T030	302	A2006150X030	301
960967-906	260	990967-906	260	A2001100T046	302	A2006150X046	300
960967-912	260	990967-912	260	A2001100X020	301	A2006250X020	301
961400-302	394	993400-902	394	A2001100X030	301	A2006250X030	301
961600-902	261	993700-902	260	A2001100X046	300	A2006250X046	300
961600-906	261	993700-905	260, 329	A2001150C020	302	A2006250X100	300, 321
961753-902	261	993700-906	260	A2001150C046	302	A2006250X212	300
961753-905	261	993700-912	260	A2001150R020	302	A2006MG	303
961753-906	261	993967-302	260	A2001150R046	302	A2006MG2	303
961967-302	260	993967-305	260	A2001150T020	302	A2007030X020	301
961967-306	260	993967-306	260	A2001150T046	302	A2007030X030	300
961967-312	260	993967-312	260	A2001150X020	301	A2007050X020	301
961967-902	260	993967-902	260	A2001150X030	301	A2007050X030	301

# PART NUMBER INDEX

A2007050X046	301	A2014250X046	300, 332	A3000150T046	294	A3030250X046	291
A2007100X020	301	A2014MG	303, 332	A3000150X020	292	A3030250X100	291, 320
A2007100X030	301	A2014MG2	303, 332	A3000150X030	291	A3030MG	294
A2007100X046	300	A2020050X020	301	A3000150X039	291	A3030MG2	294
A2007150X020	301	A2020050X046	300	A3000150X046	291	A3031030X020	292
A2007150X030	301	A2020100X030	301	A3000150X100	291	A3031050R020	294
A2007150X046	300	A2020125X040	301	A3000150X212	292	A3031050T020	294
A2007250X020	301	A2020150X020	301	A3000250C020	293	A3031050X020	292
A2007250X030	301	A2020150X030	301	A3000250C030	293	A3031100C046	293
A2007250X046	300	A2020150X040	301	A3000250C046	293	A3031100X020	292
A2007MG	303	A2020150X046	300	A3000250X020	292	A3031100X046	291
A2007MG2	303	A2020250X020	301	A3000250X030	291	A3031150C046	293
A2008250X100	300	A2020250X030	301	A3000250X040	291	A3031150R046	294
A2008250X212	300	A2020250X040	301	A3000250X046	291	A3031150T046	294
A2008MG	303	A2020250X046	300	A3000250X100	291, 320	A3031150X020	292
A2010050X020	301	A2020250X100	300, 321	A3000250X212	292	A3031150X046	291
A2010100X030	301	A2020250X212	300	A3000300X039	291	A3031250C046	293
A2010100X046	300	A2020MG	303	A3000MG	294	A3031250X046	291
A2010125X040	301	A2020MG2	303	A3000MG1	294	A3031MG	294
A2010150X020	301	A2021050X020	301	A3000MG2	294	A3031MG2	294
A2010150X030	301	A2021050X030	301	A3001020X020	292	A3032100X046	291
A2010150X040	301	A2021050X046	301	A3001030X020	292	A3032150X046	291
A2010150X046	300	A2021050X100	300	A3001030X046	291	A3032250X046	291
A2010250X030	301	A2021075X020	301	A3001050C020	293	A3032250X100	291, 320
A2010250X040	301	A2021100X020	301	A3001050C046	293	A3032250X212	292, 320
A2010250X046	300	A2021150X020	301	A3001050R046	294	A3032250X500	292
A2010250X100	321	A2021150X030	301	A3001050T046	294	A3040030X020	292
A2010250X212	300, 321	A2021250X020	301	A3001050X020	292	A3040050X020	292
A2010MG	303	A2021250X046	300	A3001050X030	292	A3040050X046	291
A2010MG2	303	A2021MG	303	A3001050X046	291	A3040100X020	292
A2011030X030	301	A2021MG2	303	A3001100C020	293	A3040100X046	291
A2011050X020	301	A2030050X020	301	A3001100C030	293	A3040100X212	292
A2011075X046	300	A2030100X030	301	A3001100C046	293	A3040150X020	292
A2011100X046	300	A2030125X040	301	A3001100R030	294	A3040150X030	291
A2011150X020	301	A2030150X020	301	A3001100T030	294	A3040150X046	291
A2011150X046	300	A2030150X030	301	A3001100X020	292	A3040250X030	291
A2011250X020	301	A2030150X040	301	A3001100X030	291	A3040250X046	291
A2011MG	303	A2030150X046	300	A3001100X046	291	A3040250X100	320
A2011MG2	303	A2030250X020	301	A3001150C020	293	A3040MG	294
A2013020X020	301, 332	A2030250X030	301	A3001150C030	293	A3040MG1	294
A2013030X020	301, 332	A2030250X040	301	A3001150C046	293	A3040MG2	294
A2013050X020	301, 332	A2030250X046	300	A3001150R030	294	A3041020X020	292
A2013050X046	300, 332	A2030250X100	300, 321	A3001150T030	294	A3041030X020	292
A2013100X020	301, 332	A2030250X212	300, 321	A3001150X020	292	A3041050X020	292
A2013100X030	301, 332	A2030MG	303	A3001150X030	291	A3041050X030	292
A2013100X046	300, 332	A2031050X020	301	A3001150X046	291	A3041050X046	291
A2013125X040	301, 332	A2031050X030	301	A3001250X020	292	A3041100X020	292
A2013150X020	301, 332	A2031050X046	301	A3001250X030	291	A3041100X030	291
A2013150X030	301, 332	A2031100X020	301	A3001250X046	291	A3041150X046	291
A2013150X040	301, 332	A2031150X020	301	A3001MG	294	A3041150X020	292
A2013150X046	300, 332	A2031250X020	301	A3001MG2	294	A3041150X030	291
A2013250X020	301, 332	A2031250X046	300	A3002100X046	291	A3041150X046	291
A2013250X030	301, 332	A2031MG2	303	A3002150X046	291	A3041200X020	292
A2013250X040	301, 332	A3000020X020	292	A3002150X212	292	A3041250X020	292
A2013250X046	300, 332	A3000030X020	292	A3002250X046	291	A3041250X046	291
A2013250X100	300, 321, 331	A3000050X020	292	A3002250X100	291	A3041MG	294
A2013250X212	300, 321, 331	A3000050X046	291	A3002250X212	292	A3041MG1	294
A2013MG	303, 332	A3000100C020	293	A3002250X500	292	A3041MG2	294
A2013MG2	303, 332	A3000100C030	293	A3002300X039	291	A3050020X020	292
A2014020X020	301, 332	A3000100C046	293	A3002MG	294	A3050030X020	292
A2014030X020	301, 332	A3000100R030	294	A3002MG2	294	A3050050X020	292
A2014050X020	301, 332	A3000100T030	294	A3030050X020	292	A3050050X046	291
A2014050X030	301, 332	A3000100X020	292	A3030100C046	293	A3050100X020	292
A2014050X046	301, 332	A3000100X030	291	A3030100X020	292	A3050100X030	291
A2014100X020	301, 332	A3000100X046	291	A3030100X046	291	A3050100X046	291
A2014100X030	301, 332	A3000125X040	291	A3030150C020	293	A3050150X030	291
A2014100X046	300, 332	A3000150C020	293	A3030150C046	293	A3050150X046	291
A2014150X020	301, 332	A3000150C030	293	A3030150R046	294	A3050150X100	291
A2014150X030	301, 332	A3000150C046	293	A3030150T046	294	A3050150X212	292
A2014150X046	300, 332	A3000150R030	294	A3030150X020	292	A3050250X046	291
A2014250X020	301, 332	A3000150R046	294	A3030150X046	291	A3050250X100	291, 320
A2014250X030	301, 332	A3000150T030	294	A3030250C046	293	A3050250X212	292

A3050MG.....	294	A6004250X212.....	296, 320, 331	A7000100R030.....	294	G1313-27302.....	65
A3050MG2.....	294	A6004250X300.....	296, 320, 331	A7000100T030.....	294	G1313-43204.....	63
A3051020X020.....	292	A6004250X500.....	296, 320, 331	A7000150C046.....	293	G1313-43216.....	35
A3051030X020.....	292	A6004MG.....	297	A7000150R046.....	294	G1313-44510.....	65
A3051050X020.....	292	A6005050X020.....	296, 331	A7000150T046.....	294	G1313-44512.....	65
A3051050X030.....	292	A6005050X046.....	295, 331	A7000150X046.....	291	G1313-44513.....	65
A3051050X046.....	291	A6005100X046.....	295, 331	A7000250C046.....	293	G1313-60004.....	65
A3051100X020.....	292	A6006050X046.....	295, 331	A7000250R046.....	294	G1313-68709.....	66
A3051100X030.....	291	A6006100X021.....	296, 331	A7000250T046.....	294	G1313-68711.....	67
A3051100X046.....	291	A6006100X046.....	295, 331	A7000250X046.....	291	G1313-68719.....	66
A3051150X020.....	292	A6010050X020.....	296	A7000MG3.....	297	G1313-68730.....	66
A3051150X030.....	291	A6010100X020.....	296	A7001100C046.....	293	G1313-87102.....	62
A3051150X046.....	291	A6010100X030.....	295	A7001100R030.....	294	G1313-87201.....	62
A3051250X046.....	291	A6010100X046.....	295	A7001100R046.....	294	G1313-87202.....	62
A3051MG.....	294	A6010100X212.....	320	A7001100T030.....	294	G1313-87203.....	62
A3051MG2.....	294	A6010150X020.....	296	A7001100T046.....	294	G1313-87300.....	34
A6000030X020.....	296	A6010150X030.....	295	A7001100X020.....	292	G1313-87303.....	32, 64
A6000030X212.....	296	A6010150X040.....	295	A7001100X030.....	291	G1313-87304.....	23, 82
A6000050X020.....	296	A6010150X046.....	295	A7001100X046.....	291	G1313-87305.....	23, 33, 82
A6000050X046.....	295	A6010150X212.....	320	A7001150C046.....	293	G1314-60081.....	91-92
A6000050X100.....	295	A6010250X030.....	295	A7001150R046.....	294	G1314-60082.....	91-92
A6000050X212.....	296, 320	A6010250X040.....	295	A7001150T046.....	294	G1314-60083.....	91-92
A6000050X300.....	296	A6010250X046.....	295	A7001MG3.....	297	G1314-60086.....	91-92
A6000100X020.....	296	A6010250X300.....	320	A7501030X020.....	297	G1314-60087.....	91-92
A6000100X030.....	295	A6010MG.....	297	A7501050X020.....	297	G1314-60100.....	90
A6000100X046.....	295	A6010MG2.....	297	A7501100X020.....	297	G1314-60101.....	90
A6000100X212.....	296, 320	A6011050X020.....	296	A7501100X030.....	297	G1314-60182.....	91-92
A6000100X300.....	296, 320	A6011050X030.....	295	A7501150X020.....	297	G1314-60183.....	91-92
A6000150X020.....	296	A6011050X046.....	295	A7501150X030.....	297	G1314-60186.....	91-92
A6000150X030.....	295	A6011100X020.....	296	A7511030X020.....	297	G1314-60187.....	91-92
A6000150X040.....	295	A6011100X030.....	295	A7511050X020.....	297	G1314-65052.....	91, 97
A6000150X046.....	295	A6011100X046.....	295	A7511100X020.....	297	G1314-65054.....	91, 97
A6000150X100.....	295	A6011150X020.....	296	A7511150X030.....	297	G1314-65056.....	97
A6000150X212.....	296, 320	A6011150X030.....	295	A7521030X020.....	297	G1314-65061.....	91, 97
A6000150X300.....	296, 320	A6011MG.....	297	A7521050X020.....	297	G1314-87301.....	92
A6000250X020.....	296	A6011MG2.....	297	A7521100X020.....	297	G1314-87302.....	92
A6000250X030.....	295	A6012250X212.....	296	BHT-4.....	104, 108	G1315-27705.....	96
A6000250X040.....	295	A6020050X020.....	296	BMT-4.....	108	G1315-45003.....	11, 95
A6000250X046.....	295	A6020050X046.....	295	G1103-60001.....	90	G1315-60011.....	94-95
A6000250X100.....	295	A6020100X030.....	295	G1156-68711.....	83	G1315-60012.....	94-95
A6000250X212.....	296, 320	A6020100X046.....	295	G1156-68712.....	83	G1315-60015.....	94-95
A6000250X300.....	296, 320	A6020100X212.....	296, 320	G1156-68713.....	83	G1315-60016.....	94, 96
A6000MG.....	297	A6020150X020.....	296	G1156-68714.....	83	G1315-60017.....	94, 96
A6000MG2.....	297	A6020150X030.....	295	G1160-68706.....	83	G1315-60018.....	94, 96
A6001020X020.....	296	A6020150X046.....	295	G1310-68730.....	59	G1315-60022.....	94-95
A6001030X030.....	295	A6020150X300.....	296	G1310-68731.....	59	G1315-60024.....	94-95
A6001030X046.....	295	A6020250X020.....	296	G1310-68741.....	59	G1315-60025.....	94-95
A6001050X020.....	296	A6020250X030.....	295	G1310-68742.....	59	G1315-67301.....	96
A6001050X030.....	295	A6020250X046.....	295	G1311-60003.....	53	G1315-67302.....	96
A6001050X046.....	295	A6020250X100.....	295	G1311-60006.....	12	G1315-68703.....	31
A6001100X010.....	296	A6020250X212.....	296, 320	G1311-60009.....	48	G1315-68708.....	31-32
A6001100X020.....	296	A6020MG.....	297	G1311-68705.....	60	G1315-68712.....	97
A6001100X030.....	295	A6020MG2.....	297	G1311-68710.....	59	G1315-68713.....	91, 97
A6001100X046.....	295	A6021030X020.....	296	G1311-68711.....	59	G1315-68715.....	96-97
A6001150X010.....	296	A6021030X046.....	295	G1312-60020.....	49	G1315-68716.....	94, 96
A6001150X020.....	296	A6021050X020.....	296	G1312-60025.....	49	G1315-68724.....	94, 96
A6001150X030.....	295	A6021050X030.....	295	G1312-60061.....	48	G1315-68725.....	96-97
A6001150X046.....	295	A6021050X046.....	295	G1312-60066.....	49	G1315-80001.....	96
A6001250X020.....	296	A6021100X010.....	296	G1312-60067.....	49	G1315-80002.....	96
A6001250X046.....	295	A6021100X020.....	296	G1312-67305.....	23	G1315-80003.....	96
A6001MG.....	297	A6021100X030.....	295	G1312-67500.....	23	G1315-80004.....	96
A6001MG2.....	297	A6021100X046.....	295	G1312-68711.....	59	G1315-87101.....	96
A6002050X046S.....	295	A6021150X020.....	296	G1312-68716.....	53	G1315-87302.....	95
A6002150X300.....	320	A6021150X030.....	295	G1312-68726.....	60	G1315-87303.....	23
A6002250X046.....	295	A6021150X046.....	295	G1312-68730.....	60	G1315-87305.....	96
A6002250X100.....	295, 320	A6021150X100.....	295	G1312-68741.....	59	G1315-87306.....	95
A6002250X212.....	296, 320	A6021250X020.....	296	G1312-68755.....	60	G1315-87311.....	23, 33, 92, 99
A6002250X300.....	320	A6021250X046.....	295	G1312-87303.....	23	G1315-87312.....	23
A6002250X500.....	296, 320	A6021MG.....	297	G1312-87304.....	23	G1315-87313.....	96
A6002MG.....	297	A6021MG2.....	297	G1312-87305.....	28	G1315-87318.....	96
A6004250X046.....	295, 331	A6022250X500.....	320	G1312-87306.....	28	G1315-87319.....	95
A6004250X100.....	295, 331	A7000100C030.....	293	G1312-87330.....	54	G1315-87321.....	95

## PART NUMBER INDEX

G1315-87323.....	96	G1364-68723.....	70	G1600-60211.....	178	G1947-20029.....	105
G1315-87325.....	95	G1364-81701.....	71	G1600-60230.....	190	G1947-60103.....	105
G1315-87328.....	96	G1364-83205.....	71	G1600-60232.....	180	G1956-20302.....	106
G1315-87333.....	96	G1364-84516.....	69	G1600-60233.....	180	G1956-80000.....	106
G1315-87338.....	96	G1364-84521.....	69	G1600-60310.....	190	G1958-60098.....	105
G1315-87339.....	95	G1364-84522.....	69	G1600-60311.....	178	G1958-60136.....	105
G1316-27301.....	28	G1364-84523.....	69	G1600-60330.....	190	G1960-80039.....	107
G1316-60001.....	82	G1364-84524.....	69	G1600-60332.....	180	G1960-80060.....	105
G1316-67005.....	75	G1364-84525.....	69	G1600-60400.....	194	G1969-20302.....	106
G1316-67006.....	75	G1364-84531.....	69	G1600-60411.....	178	G1969-60086.....	108
G1316-67007.....	75	G1364-84532.....	69	G1600-60419.....	184	G1969-85000.....	110
G1316-67009.....	75	G1364-86711.....	71	G1600-61132.....	180	G1969-85001.....	107
G1316-68708.....	83	G1364-87201.....	70	G1600-61211.....	178	G1969-85003.....	15, 107
G1316-68710.....	83	G1364-87202.....	70	G1600-61219.....	184	G1969-85010.....	110
G1316-68711.....	83	G1364-87304.....	70-71	G1600-61232.....	173, 180	G1969-85020.....	110
G1316-68716.....	38, 82	G1364-87305.....	70-71	G1600-61239.....	184	G1969-85026.....	107
G1316-68721.....	83	G1364-87306.....	70-71	G1600-61311.....	178	G1972-60025.....	71
G1316-68744.....	82	G1367-60001.....	69	G1600-61332.....	180	G1978-85000.....	15, 107
G1316-80002.....	82	G1367-68730.....	66	G1600-61411.....	178	G1982-85001.....	15
G1316-80003.....	82	G1367-68734.....	66	G1600-61419.....	184	G1982-85002.....	15
G1316-80004.....	82	G1367-68741.....	66	G1600-62132.....	180	G1982-85003.....	15
G1316-83200.....	82	G1367-87012.....	63	G1600-62211.....	172, 178	G2228-68700.....	59
G1316-87300.....	23, 33, 82	G1367-87017.....	63	G1600-62232.....	180	G2250-04500.....	65
G1316-87303.....	27, 82	G1367-87101.....	62	G1600-62311.....	174, 178	G2250-04501.....	65
G1316-87305.....	27	G1367-87102.....	62	G1600-62318.....	185	G2250-04502.....	65
G1316-87306.....	28	G1367-87200.....	62, 70	G1600-62332.....	180	G2250-04503.....	65
G1316-87309.....	23	G1367-87201.....	62	G1600-62402.....	199	G2250-04504.....	65
G1316-87312.....	27	G1367-87202.....	63	G1600-62411.....	178	G2255-68700.....	65, 69
G1316-87313.....	27	G1367-87300.....	32, 64	G1600-62700.....	190	G2255-68709.....	65
G1316-87314.....	27	G1367-87304.....	28	G1600-63200.....	192	G2255-68710.....	65
G1316-87316.....	27	G1375-87301.....	31	G1600-63211.....	178	G2255-68720.....	65
G1316-87317.....	27	G1375-87302.....	31	G1600-63311.....	178	G2255-68730.....	65
G1316-87318.....	27	G1375-87303.....	32, 64	G1600-63411.....	178	G2258-23201.....	54
G1316-87319.....	27	G1375-87304.....	31	G1600-64211.....	175, 178	G2258-60003.....	64
G1316-87321.....	28	G1375-87305.....	32	G1600-64232.....	180	G2258-60011.....	65
G1316-87323.....	28	G1375-87306.....	32	G1600-64311.....	178	G2258-68710.....	63
G1321-60005.....	99	G1375-87308.....	32	G1600-64332.....	180	G2258-87102.....	63
G1321-60007.....	99	G1375-87309.....	31-32	G1600-64411.....	178	G2258-87307.....	34
G1321-60015.....	99	G1375-87310.....	31	G1600-67201.....	199	G2258-87310.....	34
G1322-67300.....	58	G1375-87311.....	32	G1600-67219.....	184, 195	G2258-87311.....	34
G1322-68705.....	58, 60	G1375-87312.....	32	G1600-67220.....	195	G2258-87312.....	34
G1328-87600.....	23	G1375-87315.....	32, 64	G1600-67311.....	194-195	G2258-87313.....	34
G1329-60011.....	65	G1375-87320.....	31	G1600-67312.....	195	G2258-87314.....	34
G1329-68718.....	67	G1375-87321.....	31	G1600-67319.....	184, 195	G2258-87315.....	34
G1329-68727.....	67	G1375-87322.....	31	G1600-68319.....	184, 192	G2258-87316.....	34
G1329-68736.....	67	G1375-87323.....	31	G1600-68714.....	192	G2260-68711.....	32, 64
G1329-68737.....	67	G1375-87324.....	31	G1600-68715.....	192	G2260-87101.....	63
G1329-80001.....	62	G1375-87325.....	31	G1600-68716.....	192	G2260-87201.....	63
G1329-87012.....	62	G1375-87326.....	34	G1600-68723.....	192	G2260-87300.....	26
G1329-87017.....	62	G1375-87327.....	31	G1603A.....	194	G2260-87301.....	26
G1329-87101.....	62	G1376-60003.....	53	G1607-20030.....	195	G2421-60001.....	110
G1329-87103.....	62	G1376-60005.....	59	G1607-60000.....	195	G2423A.....	107
G1329-87300.....	23	G1376-68705.....	60	G1607-60001.....	195	G2424A.....	107
G1329-87302.....	32, 64	G1376-68707.....	60	G1607-60041.....	195	G2425A.....	107
G1353-68750.....	75	G1376-68710.....	60	G1607A.....	195	G2426A.....	107
G1361-22402.....	50	G1377-44900.....	63	G160U-60419.....	184	G2427A.....	105
G1361-23204.....	54	G1377-87000.....	63	G160U-61219.....	184	G2428A.....	105
G1361-23205.....	54	G1377-87001.....	63	G160U-61239.....	184	G2431A.....	110
G1361-60012.....	49	G1377-87002.....	63	G160U-61419.....	184	G2432A.....	110
G1361-60022.....	53	G1377-87201.....	63	G1946-00034.....	107	G2441-80010.....	106
G1361-67302.....	26	G1377-87300.....	32, 64	G1946-20215.....	108	G2453-85050.....	107
G1361-68707.....	60	G1377-87310.....	32, 64	G1946-20301.....	105	G2453-85060.....	107
G1361-68710.....	60	G1379-67310.....	58	G1946-60037.....	105	G2455-85001.....	15
G1362-68706.....	98	G1600-23223.....	199	G1946-60098.....	105	G2571-80103.....	106
G1362-68709.....	98	G1600-60002.....	190	G1946-60157.....	108	G3199B.....	109
G1362-87300.....	98	G1600-60007.....	199	G1946-60180.....	108	G4203-68708.....	11
G1362-87301.....	98	G1600-60013.....	194	G1946-80009.....	105	G4204-40000.....	51
G1364-27107.....	71	G1600-60027.....	192	G1946-80019.....	106	G4204-40005.....	51
G1364-60021.....	71	G1600-60033.....	199	G1946-80049.....	108	G4204-60004.....	51
G1364-68706.....	71	G1600-60132.....	180	G1946-80054.....	108	G4204-60022.....	49
G1364-68711.....	70	G1600-60150.....	190	G1946-85004.....	107	G4208-68700.....	11
G1364-68712.....	70	G1600-60210.....	190	G1946-85021.....	107	G4212-60007.....	94



G4212-60008.....	94	G5611-67300.....	30	PL1110-6320.....	505	PL1210-6120.....	506
G4212-60011.....	94	G5611-67301.....	30	PL1110-6400.....	508	PL1210-6120EPA.....	507
G4212-60022.....	51	G5611-68710.....	37	PL1110-6500.....	500	PL1210-6125.....	506
G4212-60032.....	94	G5611-68741.....	59, 101	PL1110-6504.....	500	PL1210-6130.....	506
G4212-60038.....	94	G5615-60005.....	102	PL1110-6515.....	505	PL1210-6140.....	506
G4212-68001.....	51	G5615-60017.....	102	PL1110-6520.....	505	PL1210-6150.....	506
G4216-68711.....	67	G5615-60018.....	102	PL1110-6525.....	505	PL1210-6160.....	506
G4218-20000.....	98	G5615-60022.....	102	PL1110-6530.....	505	PL1212-1102.....	470
G4218-20001.....	98	G5616-60050.....	30, 102	PL1110-6540.....	505	PL1212-1103.....	470
G4218-20002.....	98	G5664-86703.....	102	PL1110-6550.....	505	PL1212-3100.....	470
G4218-20003.....	98	G5664-86706.....	102	PL1111-3500.....	310, 393	PL1212-3101.....	470
G4218-20004.....	98	G5667-40500.....	102	PL1113-1300.....	518	PL1212-3702.....	470
G4218-40000.....	98	G5667-60310.....	32	PL1113-1320.....	521	PL1212-3703.....	470
G4218-40010.....	98	G5667-60320.....	64, 102	PL1113-1325.....	520	PL1212-3800.....	470
G4218-40011.....	98	G5667-60500.....	30	PL1113-1500.....	516	PL1212-3801.....	470
G4218-40100.....	98	G5667-60501.....	30	PL1113-3100.....	511	PL1212-6100.....	470
G4218-40110.....	98	G5667-60502.....	30	PL1113-3120.....	511	PL1212-6101.....	470
G4218-40130.....	98	G5667-60503.....	30	PL1113-3300.....	511	PL1212-6200.....	470
G4218-40150.....	98	G5667-60504.....	30	PL1113-3500.....	511	PL1212-6201.....	470
G4218-40220.....	98	G5667-60505.....	30	PL1113-6300.....	518	PL1212-6400.....	470
G4218-60100.....	98	G5667-87017.....	63, 102	PL1113-6325.....	520	PL1212-6401.....	470
G4218-68010.....	98	G5667-87200.....	63, 101	PL1113-6500.....	516	PL1212-6800.....	470
G4218-85000.....	15, 98	G6011A.....	109	PL1113-6520.....	521	PL1212-6801.....	470
G4220-20012.....	11	G6012A.....	109	PL1114-1900HFIP.....	509	PL1213-6520.....	521
G4220-24013.....	52	G6013A.....	109	PL1114-6900HFIP.....	509	PL1220-6130.....	528
G4220-26210.....	52	G6014A.....	109	PL1117-1800.....	512	PL1245-1102.....	474
G4220-60006.....	51	G7100-60002.....	190	PL1117-1830.....	512	PL1245-1103.....	411, 474
G4220-60007.....	53	G7100-60007.....	199	PL1117-6800.....	512	PL1245-3102.....	474
G4220-60012.....	51	G7100-60033.....	199	PL1117-6830.....	512	PL1245-3103.....	411, 474
G4220-60015.....	51	G7100-60150.....	190	PL1120-3830.....	511	PL1245-3702.....	411, 474
G4220-60016.....	51	G7100-60210.....	190	PL1120-6520.....	525	PL1245-3703.....	411, 474
G4220-60022.....	49	G7100-60230.....	190	PL1120-6830.....	525	PL1249-1120.....	525, 528
G4220-60028.....	49	G7100-60310.....	190	PL1145-1802.....	474	PL1249-6100.....	528
G4220-60035.....	51	G7100-60330.....	190	PL1145-1803.....	474	PL1249-6140.....	528
G4220-63010.....	52	G7100-60400.....	190, 194	PL1147-1501.....	428	PL1249-6150.....	528
G4220-63015.....	52	G7100-62700.....	190	PL1147-6501.....	428	PL1251-1102.....	409, 474
G4226-60021.....	65	G7100-68705.....	200	PL1149-1530.....	525	PL1251-1103.....	409, 474
G4226-60310.....	32, 64	G7100-68723.....	192	PL1149-1840.....	525	PL1251-3102.....	409, 474
G4226-67001.....	67	PCG931AAKIT.....	322	PL1149-3800.....	511	PL1251-3103.....	409, 474
G4226-68735.....	66	PCG932AAKIT.....	322	PL1149-6240.....	525	PL1251-3702.....	409, 474
G4226-87012.....	63	PCG933AAKIT.....	322	PL1149-6250.....	525	PL1251-3703.....	409, 474
G4226-87020.....	63	PCG93LL500X25.....	322	PL1149-6260.....	525	PL1310-0001.....	529
G4226-87201.....	63	PCG93LL500X25WJ.....	322	PL1149-6800.....	525	PL1310-0002.....	529
G4240-23705.....	100	PCG93LL500X50.....	322	PL1149-6801.....	525	PL1310-0005.....	529
G4240-25206.....	100	PCG93LL500X50WJ.....	322	PL1149-6820.....	525	PL1310-0007.....	529
G4240-43200.....	100	PCG93LL500X75.....	322	PL1149-6840.....	525	PL1310-0008.....	529
G4240-87300.....	100	PCG93LL500X75WJ.....	322	PL1149-6850.....	525	PL1310-0012.....	529
G4240-87301.....	100	PCG93LLSTAND123.....	322	PL1149-6860.....	525	PL1310-0016.....	310, 342, 393
G4240-87302.....	100	PL1012-5A05.....	475	PL1151-1802.....	474	PL1310-0036.....	529
G4240-87303.....	100	PL1013-2100.....	511	PL1151-1803.....	474	PL1310-0048.....	529
G4240-87304.....	100	PL1013-2120.....	511	PL1151-3802.....	474	PL1312-1300.....	393, 463
G4240-87309.....	100	PL1013-2300.....	511	PL1151-3803.....	474	PL1312-1301.....	463
G4240-87310.....	100	PL1013-2500.....	511	PL1170-1810.....	342	PL1312-1500.....	393, 463
G4280-60031.....	48	PL1020-2830.....	511	PL1170-1820.....	342	PL1312-1501.....	463
G4280-60033.....	48	PL1049-2800.....	511	PL1170-1830.....	342	PL1312-1502.....	393, 463
G4280-60061.....	48	PL1110-1120.....	500, 502	PL1170-1840.....	342	PL1312-1503.....	463
G4280-68710.....	60, 66	PL1110-1220.....	500, 502	PL1170-1850.....	342	PL1312-1802.....	393, 463
G4280-68730.....	60, 66	PL1110-1320.....	500	PL1170-1860.....	342	PL1312-1803.....	463
G4280-68750.....	60, 66	PL1110-1400.....	508	PL1170-2820.....	342	PL1312-3300.....	393, 463
G4280-68770.....	60, 66	PL1110-1520.....	500	PL1170-2823.....	342	PL1345-1502.....	411, 463
G4296-68715.....	11	PL1110-6100.....	500	PL1170-6810.....	342	PL1345-1503.....	411, 463
G5611-21503.....	51, 64, 101-102	PL1110-6100LS.....	502	PL1170-6820.....	342	PL1351-1502.....	409, 463
G5611-26210.....	52, 101	PL1110-6115.....	505	PL1170-6830.....	342	PL1351-1503.....	409, 463
G5611-60020.....	49, 101	PL1110-6120.....	505	PL1170-6840.....	342	PL1410-0101.....	529
G5611-60025.....	49, 101	PL1110-6125.....	505	PL1170-6860.....	342	PL1410-0200.....	529
G5611-60061.....	48, 101	PL1110-6130.....	505	PL1171-1140.....	342	PL1410-0301.....	529
G5611-60067.....	49, 101	PL1110-6140.....	505	PL1171-6140.....	342	PL1410-0501.....	529
G5611-60500.....	30	PL1110-6150.....	505	PL1210-1120.....	506	PL1412-4100.....	471
G5611-60501.....	30	PL1110-6160.....	505	PL1210-3120EPA.....	507	PL1412-4101.....	471
G5611-60502.....	30	PL1110-6200.....	500	PL1210-6100.....	506	PL1412-4102.....	471
G5611-60503.....	30	PL1110-6200LS.....	502	PL1210-6104.....	506	PL1412-4103.....	471
G5611-63010.....	101	PL1110-6300.....	500	PL1210-6115.....	506	PL1412-4200.....	471

## PART NUMBER INDEX

PL1412-4201.....	471	PL1512-3702.....	470	PL1712-3703.....	470	PL2010-0104.....	537
PL1412-4400.....	471	PL1512-3703.....	470	PL1712-3800.....	470	PL2010-0105.....	537
PL1412-4401.....	471	PL1512-3800.....	310, 393, 470	PL1712-3801.....	470	PL2010-0200.....	535
PL1412-4702.....	471	PL1512-3801.....	310, 393, 470	PL1712-6800.....	470	PL2010-0201.....	535
PL1412-4703.....	471	PL1512-3802.....	310, 393	PL1712-6801.....	470	PL2010-0202.....	535
PL1412-4A05.....	475	PL1512-3803.....	310, 393	PL1745-3102.....	474	PL2010-0203.....	535
PL1412-4K00.....	471	PL1512-5100.....	470	PL1745-3103.....	411, 474	PL2010-0300.....	535
PL1412-4K01.....	471	PL1512-5101.....	470	PL1745-3702.....	474	PL2010-0301.....	535
PL1412-4K02.....	471	PL1512-5102.....	470	PL1745-3703.....	411, 474	PL2010-0400.....	535
PL1412-6100.....	471	PL1512-5103.....	470	PL1751-3102.....	409, 474	PL2010-0401.....	535
PL1412-6101.....	471	PL1512-5200.....	470	PL1751-3103.....	409, 474	PL2010-0402.....	535
PL1412-6102.....	471	PL1512-5201.....	470	PL1751-3702.....	409, 474	PL2010-0403.....	535
PL1412-6103.....	471	PL1512-5400.....	470	PL1751-3703.....	409, 474	PL2010-0501.....	536
PL1412-6200.....	471	PL1512-5401.....	470	PL1812-3102.....	470	PL2010-0505.....	536
PL1412-6201.....	471	PL1512-5500.....	310, 393	PL1812-3103.....	470	PL2010-0601.....	536
PL1412-6400.....	471	PL1512-5501.....	310, 393	PL1812-6100.....	470	PL2010-0605.....	536
PL1412-6401.....	471	PL1512-5702.....	470	PL1812-6101.....	470	PL2012-0001.....	538
PL1412-6702.....	471	PL1512-5703.....	470	PL1812-6200.....	470	PL2012-0005.....	538
PL1412-6703.....	471	PL1512-5800.....	310, 393, 470	PL1812-6201.....	470	PL2012-0010.....	538
PL1412-6800.....	471	PL1512-5801.....	310, 393, 470	PL1812-6400.....	470	PL2012-1001.....	538
PL1412-6801.....	471	PL1512-5802.....	310, 393	PL1812-6401.....	470	PL2012-1005.....	538
PL1412-6A05.....	475	PL1512-5A05.....	475	PL1812-6800.....	470	PL2012-1010.....	538
PL1412-6K00.....	471	PL1514-1900HFIP.....	509	PL1812-6801.....	470	PL2012-2001.....	538
PL1412-6K01.....	471	PL1514-5900HFIP.....	509	PL1845-2102.....	474	PL2012-2005.....	538
PL1412-6K02.....	471	PL1545-1502.....	411	PL1845-2103.....	411, 474	PL2012-2010.....	538
PL1417-0800.....	512	PL1545-1503.....	411	PL1845-3102.....	411, 474	PL2012-3001.....	538
PL1417-0830.....	512	PL1545-1802.....	411	PL1845-3103.....	411, 474	PL2012-3005.....	538
PL1445-4102.....	411, 474	PL1545-1803.....	411	PL1851-2102.....	409, 474	PL2012-3010.....	538
PL1445-4103.....	474	PL1545-3102.....	411, 474	PL1851-2103.....	409, 474	PL2012-4001.....	538
PL1445-4702.....	411, 474	PL1545-3103.....	411, 474	PL1851-3102.....	409, 474	PL2012-4005.....	538
PL1445-4703.....	411, 474	PL1545-3702.....	411, 474	PL1851-3103.....	409, 474	PL2012-4010.....	538
PL1445-6102.....	411, 474	PL1545-3703.....	411, 474	PL1912-1300.....	310, 393	PL2012-5001.....	538
PL1445-6103.....	411, 474	PL1545-3802.....	411	PL1912-1301.....	310, 393	PL2012-5005.....	538
PL1445-6702.....	411, 474	PL1545-3803.....	411	PL1912-1500.....	310, 393	PL2012-5010.....	538
PL1445-6703.....	411, 474	PL1545-5102.....	411, 474	PL1912-1501.....	310, 393	PL2012-6001.....	538
PL1451-4102.....	409, 474	PL1545-5103.....	411, 474	PL1912-1502.....	310, 393	PL2012-6005.....	538
PL1451-4103.....	409, 474	PL1545-5702.....	474	PL1912-1503.....	310, 393	PL2012-6010.....	538
PL1451-4702.....	409, 474	PL1545-5703.....	411, 474	PL1912-1801.....	310, 393	PL2012-7001.....	538
PL1451-4703.....	409, 474	PL1547-1501.....	428	PL1912-1802.....	310, 393	PL2012-7005.....	538
PL1451-6102.....	409, 474	PL1547-5501.....	428	PL1912-1803.....	310, 393	PL2012-7010.....	538
PL1451-6103.....	409, 474	PL1551-1502.....	409	PL1912-1803.....	310, 393	PL2012-8001.....	538
PL1451-6702.....	409, 474	PL1551-1503.....	409	PL1912-3300.....	310, 393	PL2012-8005.....	538
PL1451-6703.....	409, 474	PL1551-1802.....	409	PL1912-3301.....	310, 393	PL2012-8010.....	538
PL1510-1100.....	504	PL1551-1803.....	409	PL1912-3500.....	310, 393	PL2012-9001.....	538
PL1510-1200.....	504	PL1551-3102.....	409, 474	PL1912-3501.....	310, 393	PL2012-9005.....	538
PL1510-1300.....	504	PL1551-3103.....	409, 474	PL1912-3802.....	310, 393	PL2012-9010.....	538
PL1510-1500.....	504	PL1551-3702.....	409, 474	PL1912-3803.....	310, 393	PL2013-1001.....	538
PL1510-1504.....	504	PL1551-3703.....	409, 474	PL1912-5500.....	310, 393	PL2013-1005.....	538
PL1510-5100.....	504	PL1551-3802.....	409	PL1912-5501.....	310, 393	PL2013-1010.....	538
PL1510-5200.....	504	PL1551-3803.....	409	PL1912-5801.....	310, 393	PL2013-2001.....	538
PL1510-5300.....	504	PL1551-5102.....	409, 474	PL1945-1502.....	411	PL2013-2005.....	538
PL1510-5500.....	504	PL1551-5103.....	409, 474	PL1945-1503.....	411	PL2013-2010.....	538
PL1510-5504.....	504	PL1551-5702.....	409, 474	PL1945-1802.....	411	PL2013-3001.....	538
PL1512-1300.....	310, 393	PL1551-5703.....	409, 474	PL1945-1803.....	411	PL2013-3005.....	538
PL1512-1301.....	310, 393	PL1570-5810.....	342	PL1945-3802.....	411	PL2013-3010.....	538
PL1512-1500.....	310, 393	PL1612-1801.....	310, 393	PL1945-3803.....	411	PL2013-4001.....	538
PL1512-1501.....	310, 393	PL1670-0810.....	342	PL1951-1502.....	409	PL2013-4005.....	538
PL1512-1502.....	310, 393	PL1670-0820.....	342	PL1951-1503.....	409	PL2013-4010.....	538
PL1512-1503.....	310, 393	PL1670-0830.....	342	PL1951-1802.....	409	PL2013-5001.....	538
PL1512-1801.....	310, 393	PL1670-0840.....	342	PL1951-1803.....	409	PL2013-5005.....	538
PL1512-1802.....	310, 393	PL1670-0850.....	342	PL1951-3802.....	409	PL2013-5010.....	538
PL1512-1803.....	310, 393	PL1670-0860.....	342	PL1951-3803.....	409	PL2013-6001.....	538
PL1512-3100.....	470	PL1671-0140.....	342	PL1C12-2502.....	393	PL2013-6005.....	538
PL1512-3101.....	470	PL1712-3100.....	470	PL1E10-3120EPA.....	507	PL2013-6010.....	538
PL1512-3102.....	470	PL1712-3101.....	470	PL1E10-6120EPA.....	507	PL2013-7001.....	538
PL1512-3103.....	470	PL1712-3102.....	470	PL1E12-5A05.....	475	PL2013-7005.....	538
PL1512-3200.....	470	PL1712-3103.....	470	PL1F70-6830.....	342	PL2013-7010.....	538
PL1512-3201.....	470	PL1712-3200.....	470	PL1F70-6850.....	342	PL2013-8001.....	538
PL1512-3300.....	310, 393	PL1712-3201.....	470	PL2010-0100.....	537	PL2013-8005.....	538
PL1512-3301.....	310, 393	PL1712-3400.....	470	PL2010-0101.....	537	PL2013-8010.....	538
PL1512-3401.....	470	PL1712-3401.....	470	PL2010-0102.....	537	PL2013-9001.....	538
PL1512-3501.....	310, 393	PL1712-3702.....	470	PL2010-0103.....	537	PL2013-9005.....	538

PL2013-9010.....	538	PL2023-6005.....	540	PL2083-2010.....	542	PL2144-2000.....	545
PL2014-0001.....	538	PL2023-6010.....	540	PL2083-3001.....	542	PL2144-2001.....	545
PL2014-0005.....	538	PL2023-7001.....	540	PL2083-3005.....	542	PL2144-3000.....	545
PL2014-0010.....	538	PL2023-7005.....	540	PL2083-3010.....	542	PL2144-3001.....	545
PL2014-1001.....	538	PL2023-7010.....	540	PL2083-4001.....	542	PL3540-C603VP.....	476
PL2014-1005.....	538	PL2023-8001.....	540	PL2083-4005.....	542	PL3540-D603VP.....	476
PL2014-1010.....	538	PL2023-8005.....	540	PL2083-4010.....	542	PL3540-P603VP.....	476
PL2014-2001.....	538	PL2023-8010.....	540	PL2083-5001.....	542	PL3549-3603VP.....	476
PL2014-2005.....	538	PL2023-9001.....	540	PL2083-5005.....	542	PL3554-1602dAbz.....	347
PL2014-2010.....	538	PL2023-9005.....	540	PL2083-5010.....	542	PL3554-1602dCac.....	347
PL2014-3001.....	538	PL2023-9010.....	540	PL2083-6001.....	542	PL3554-1602dCbz.....	347
PL2014-3005.....	538	PL2024-0001.....	540	PL2083-6005.....	542	PL3554-1602dGdmf.....	347
PL2014-3010.....	538	PL2024-0005.....	540	PL2083-6010.....	542	PL3554-1602dGibu.....	347
PL2014-4001.....	538	PL2024-0010.....	540	PL2083-7001.....	542	PL3554-1602dT.....	347
PL2014-4005.....	538	PL2024-1001.....	540	PL2083-7005.....	542	PL3554-4602dAbz.....	347
PL2014-4010.....	538	PL2024-1005.....	540	PL2083-7010.....	542	PL3554-4602dCac.....	347
PL2014-6001.....	538	PL2024-1010.....	540	PL2083-8001.....	542	PL3554-4602dCbz.....	347
PL2014-6005.....	538	PL2024-2001.....	540	PL2083-8005.....	542	PL3554-4602dGdmf.....	347
PL2014-6010.....	538	PL2024-2005.....	540	PL2083-8010.....	542	PL3554-4602dGibu.....	347
PL2014-7001.....	538	PL2024-2010.....	540	PL2083-9001.....	542	PL3554-4602dT.....	347
PL2014-7005.....	538	PL2070-0200.....	535	PL2083-9005.....	542	RMSN-2.....	108
PL2014-7010.....	538	PL2070-0201.....	535	PL2083-9010.....	542	RMSN-4.....	108
PL2014-8001.....	538	PL2070-0202.....	535	PL2084-0001.....	542		
PL2014-8005.....	538	PL2070-0203.....	535	PL2084-0005.....	542		
PL2014-8010.....	538	PL2070-1001.....	542	PL2084-0010.....	542		
PL2014-9001.....	538	PL2070-1005.....	542	PL2084-1001.....	542		
PL2014-9005.....	538	PL2070-1010.....	542	PL2084-1005.....	542		
PL2014-9010.....	538	PL2070-2001.....	542	PL2084-1010.....	542		
PL2020-0200.....	535	PL2070-2005.....	542	PL2084-2001.....	542		
PL2020-0201.....	535	PL2070-2010.....	542	PL2084-2005.....	542		
PL2020-0202.....	535	PL2070-3001.....	542	PL2084-2010.....	542		
PL2020-0203.....	535	PL2070-3005.....	542	PL2090-1000.....	544		
PL2022-2001.....	540	PL2070-3010.....	542	PL2090-3000.....	544		
PL2022-2005.....	540	PL2070-4001.....	542	PL2090-4000.....	544		
PL2022-2010.....	540	PL2070-4005.....	542	PL2090-5000.....	544		
PL2022-3001.....	540	PL2070-4010.....	542	PL2090-6000.....	544		
PL2022-3005.....	540	PL2070-5001.....	542	PL2090-8000.....	544		
PL2022-3010.....	540	PL2070-5005.....	542	PL2091-1000.....	544		
PL2022-5001.....	540	PL2070-5010.....	542	PL2091-2000.....	544		
PL2022-5005.....	540	PL2070-6001.....	542	PL2091-3000.....	544		
PL2022-5010.....	540	PL2070-6005.....	542	PL2091-4000.....	544		
PL2022-6001.....	540	PL2070-6010.....	542	PL2142-3000.....	545		
PL2022-6005.....	540	PL2070-7001.....	542	PL2142-3001.....	545		
PL2022-6010.....	540	PL2070-7005.....	542	PL2142-5000.....	545		
PL2022-7001.....	540	PL2070-7010.....	542	PL2142-6000.....	545		
PL2022-7005.....	540	PL2070-8001.....	542	PL2142-6001.....	545		
PL2022-7010.....	540	PL2070-8005.....	542	PL2142-7000.....	545		
PL2022-8001.....	540	PL2070-8010.....	542	PL2142-7001.....	545		
PL2022-8005.....	540	PL2070-9001.....	542	PL2142-8000.....	545		
PL2022-8010.....	540	PL2070-9005.....	542	PL2142-8001.....	545		
PL2022-9001.....	540	PL2070-9010.....	542	PL2143-0000.....	545		
PL2022-9005.....	540	PL2071-0001.....	542	PL2143-0101.....	545		
PL2022-9010.....	540	PL2071-0005.....	542	PL2143-2000.....	545		
PL2023-0001.....	540	PL2071-0010.....	542	PL2143-2001.....	545		
PL2023-0005.....	540	PL2071-1001.....	542	PL2143-3000.....	545		
PL2023-0010.....	540	PL2071-1005.....	542	PL2143-3001.....	545		
PL2023-1001.....	540	PL2071-1010.....	542	PL2143-4000.....	545		
PL2023-1005.....	540	PL2071-2001.....	542	PL2143-4001.....	545		
PL2023-1010.....	540	PL2071-2005.....	542	PL2143-5000.....	545		
PL2023-2001.....	540	PL2071-2010.....	542	PL2143-5001.....	545		
PL2023-2005.....	540	PL2071-3001.....	542	PL2143-6000.....	545		
PL2023-2010.....	540	PL2071-3005.....	542	PL2143-6001.....	545		
PL2023-3001.....	540	PL2071-3010.....	542	PL2143-7000.....	545		
PL2023-3005.....	540	PL2080-0200.....	535	PL2143-7001.....	545		
PL2023-3010.....	540	PL2080-0201.....	535	PL2143-8000.....	545		
PL2023-4001.....	540	PL2080-0202.....	535	PL2143-8001.....	545		
PL2023-4005.....	540	PL2080-0203.....	535	PL2143-9000.....	545		
PL2023-4010.....	540	PL2083-1001.....	542	PL2143-9001.....	545		
PL2023-5001.....	540	PL2083-1005.....	542	PL2144-0000.....	545		
PL2023-5005.....	540	PL2083-1010.....	542	PL2144-0101.....	545		
PL2023-5010.....	540	PL2083-2001.....	542	PL2144-1000.....	545		
PL2023-6001.....	540	PL2083-2005.....	542	PL2144-1001.....	545		

# Application Title Index

12 phenols analyzed  
using a longer (4.6 x 100 mm)  
Agilent Poroshell 120 EC-C18 column.....231

## A

Adrenocorticosteroids  
on Pursuit PFP and C18 .....290

Agilent Bio SEC-3  
column length comparison, 150 mm .....422

Agilent Bio SEC-3  
column length comparison, 300 mm .....422

Alberta Peptide Institute test mix.....308, 390

Alcohols and aliphatic compounds .....582

Alkyd resin.....519

Amino acid standard separation  
on Eclipse Plus C18.....564

Amitrol in water by LC/MS, 0.05 ppb .....585

An overlay of the original ZORBAX  
Eclipse Plus 5 µm method and Agilent  
Poroshell 120 method. All 11 peaks on  
Poroshell 120 are resolved by the time  
the first peak elutes on the original 5 µm  
ZORBAX Eclipse Plus method .....595

Analgesics.....618

Analgesics: Non-steroidal anti-inflammatory  
drugs: Narrow bore separation .....622

Analysis of Biocides in Hand Sanitizer .....580

Analysis of Bovine Serum Albumin by light  
scattering using ProSEC 300S columns.....429

Analysis of carbohydrates  
on Hi-Plex H columns .....340

Analysis of choline kinase on PL-SAX 4000Å.....407

Analysis of ciprofloxacin  
and ciprofloxacin metabolites.....643

Analysis of diazepam on Rx-C18.....272

Analysis of fruit juice.....338

Analysis of low molecular weight polystyrene  
and oligomer fractions collected from  
OligoPore preparative columns .....522

Analysis of oxidized insulin chains.....553

Analysis of pesticide residues in green tea .....594

Analysis of representative whey proteins .....408

Analysis of sugars with high sodium matrix .....341

Analysis of sweeteners on Hi-Plex Ca columns.....340

Analysis of water soluble vitamins  
in multivitamin tablets .....612

Analytical separation of  
low molecular weight polystyrene .....522

Anesthetics, local: Bonded phase selectivity.....619

Anilines, substituted: Rapid separation .....585

Anthocyanins from blueberries:  
High-efficiency high-speed separation .....598

Antibiotics: High speed separation .....620

Antibodies: Fast separation of IgM  
and IgG antibodies .....565

Antidepressants, tricyclic:  
Comparative separation .....636

Antifungal medications .....621

Antifungals .....290, 621

Antihistamines: Fast separations  
on RRHT Extend-C18 .....617

Antibiotics: Lincomycin and Clindamycin  
by LC-APCI-MS LC-TIC .....620

Aromatic acids/benzoic acids:  
Selectivity differences .....623

Aromatics II.....599

Aspartame: Metabolites and applications.....599

Aspirin and cough remedy .....628

## B

BSA tryptic digest on RRHT.....577

Barbiturates.....643

Baseline expansion of a separation  
of protein standards.....414

Basic antihistamines  
on Extend-C18 at high pH.....275

Benzoic acid/sorbic acid .....609

Bio-Monolith DEAE column monitors  
phage production during fermentation.....415

Blueberry anthocyanin analysis .....594

Brij 35 .....581

## C

Calibration curves .....505

Calibration of the ProSEC 300S  
column with globular proteins .....429

Capillary columns for HPLC  
analyses with UV and MS detection .....455

Carbohydrates in colas.....601

Carbohydrates in juices.....601

Carbohydrates in milk.....602

Carbohydrates: Carbohydrate standards.....600

Carbohydrates:  
Effect of mobile phase strength.....600

Carbohydrates: Sugar alcohols.....601

Catecholamines.....578

Catecholamines/biogenic amines:  
Rapid separation using ion-pair reagents.....623

Charge isoform analysis  
of monoclonal antibodies.....401

Chiral ethiazide (diuretic drug) separation .....624

Chiral separation of S- and R-Norfluoxetine .....626

Chiral separation of atenolol.....627

Chiral separation of  
fluoxetine enantiomers (Prozac) .....624

Chiral separation of hexobarbital.....625

Chiral separation of salbutamol .....626

Chiral separation of tolperison enantiomers .....627

Cocaine and metabolites .....627

Column reproducibility – 200 injections of  
reduced monoclonal antibody using an  
Agilent ZORBAX RRHD 300SB-C3 column.....555

Column stability testing at pH 3 and 60 °C.....257

Column stability testing at pH 7.0 .....258

Columns for sample clean-up.....507

Comparing HILIC and RPLC of morphine  
using Agilent ZORBAX RRHD columns  
with UHPLC/MS .....631

Comparison of Aβ peptide RP-HPLC  
separations at low and high pH.....573

Comparison of Agilent Bio SEC-3  
and competitor column in the analysis  
of a monoclonal antibody.....420

Comparison of PolyPore  
with conventional individual  
pore size GPC columns .....517

Comparison of phenols separation  
with Poroshell 120.....584

Components of green tea separated  
on Rapid Resolution StableBond SB-C8 .....625

Consistent ion-exchange  
MAb separation .....400, 562

Corn syrup, Hi-Plex.....339

Cough formula mixture:  
Fast and efficient separation .....628

Cough/cold remedies on ZORBAX 300SCX .....334

Crude bradykinin prep load .....469

Crude peptide screen.....476

## D

DNPH: Derivatized Aldehydes  
obtained from air.....584

Deoxynucleosides: Using rapid resolution  
3.5 µm columns.....577

Determination of anthocyanins in blueberries .....597

Dexamethasone, USP method: Rapid analysis.....639

Differences in composition of  
two alkyl naphthalene sulfonates .....527

Dimethyl-C18/amide, Bonus-RP .....280

## E

EasiVial PS-H .....533

Eclipse Plus C18 vs. C8 .....250

Eclipse Plus C8 is less retentive  
than Eclipse Plus C18 .....251

Eliminate tailing and maximize resolution  
with Eclipse Plus Columns.....250

Environmental phenols on Poroshell 120.....230

Epoxy resin .....501

Excellent separation of two phenol  
formaldehyde resins with PolarGel-M.....513

Exceptional Lot-to-lot Reproducibility.....426

Exceptional separating power .....403

Exploiting chemical stability –  
NH<sub>4</sub>OH concentration.....308, 390

Explosives and related compounds:  
Qualitative and quantitative analysis.....586

Explosives from soil extract .....587

Extend-C18 provides good peak shape  
at low pH .....276

## F

Fast analysis 11 common compounds  
found in analgesics .....615

Fast analysis of cefepime  
and related impurities .....217, 611

Fast analysis of Pindolol .....642

Fast analysis of sulfa drugs.....596

Fast and ultra-fast analysis  
of basic compounds.....251, 617

- Fast LC/MS/MS analysis of group 4 pharmaceuticals from EPA 1694 .....583
- Fast method for ginseng analyses scaled from a traditional method.....612
- Fast separation of recombinant human erythropoietin.....553
- Fast separation of reduced monoclonal antibody.....375
- Fast vitamin E analysis on Rapid Resolution HT .....608
- Fast, high-resolution separation of peptides and proteins with Poroshell 300SB-C18.....572
- Faster analysis of USP Method for simvastatin tablet.....615
- Faster separation of sulfa drugs.....616
- Faster separations using Agilent weak cation-exchange columns.....560
- Fat-soluble vitamins on ZORBAX Eclipse XDB-C8.....605
- Five different bonded phases provide selectivity options.....266
- Flavoring agents.....602
- Food colors, FD&C.....602
- Four different 300SB bonded phases optimize separation of large polypeptides.....371
- Fraction analysis – the concentration overload purification .....469
- G**
- Glycosylated proteins: Large Molecules on Poroshell 300SB-C18 and 300SB.....565
- Goldenseal and related alkaloids on Rapid Resolution Eclipse XDB-C18.....625
- Good peak shape over a wide pH range with ZORBAX Eclipse XDB.....257
- Gradient optimizations for ultra-fast analysis of reduced monoclonal antibody .....556
- Guaifenesin: USP analysis of guaifenesin.....629
- H**
- HPLC of 25 bp DNA ladder .....307, 388
- HPLC separation of 12 phenols performed in just 5 minutes – and under 400 bar – using an Agilent Poroshell 120 EC-C18 column .....231
- HSA tryptic digest on ZORBAX Rapid Resolution HT 1.8 µm.....566
- Heparin.....526
- Herbicide/pesticide standards: Effect of bonded phase .....588
- Herbicides on different bonded phases.....587
- Herbicides: Rapid separation.....591
- High Resolution of 24 Amino Acids Using ZORBAX Eclipse AAA Protocol.....396
- High purity and high recovery with ZORBAX PrepHT columns.....315
- High resolution and fast analysis on RRHT Eclipse PAH column.....254
- High resolution normal-phase separation of octylphenoxy ethanol surfactant on ZORBAX CN.....327
- High resolution separation of a Poly-T-Oligonucleotide size standard spiked with 10-mer, 15-mer, 30-mer and 50-mer (main peaks).....408
- High sensitivity with capillary columns .....453
- Higher resolution of intact monoclonal antibody...368
- Higher resolution of oxidation study .....354, 368
- Hormones/steroids.....633
- Human serum: Low abundance protein isolation and identification from 1-D gel band by LC/MS .....454, 566
- Hyaluronic acid.....527
- Hydrophilic purine/pyrimidine separation.....579
- I**
- Ibuprofen: Optimizing selectivity with RRHT Columns.....618
- Improved peak shape of basic compounds using Bonus-RP .....279
- Improved reproducibility of monoclonal antibodies.....369
- Improved resolution with smaller particle size with Agilent weak cation-exchange columns.....559
- Increase peak capacity with RRHT columns.....240
- Increased resolution for peptide mapping...357, 369
- Intact MAb monomer and dimer separation .....355, 419, 563
- L**
- LC/MS analysis of angiotensin on Extend-C18 .....377
- LC/MS performance test mix for Polaris C8-A .....299
- Lamotrigine .....642
- Large fibrous proteins.....309, 392
- Liquid chromatography phase test mixture (LPTM) on Pursuit C8 .....290
- Local anesthetics.....619
- Long life at high pH with 300Extend-C18.....378
- Long life at high pH with Extend-C18.....275
- Long lifetime of RRHT columns at elevated temperatures.....241
- M**
- Mechanical stability of Pursuit XRs.....289
- Metronidazole: Updating USP methods.....629
- Microbore HPLC for sensitive peptide analysis...462
- MicroBore Poroshell 300 columns provide maximum sensitivity for LC/MS.....382
- Mixture of beta blockers.....613
- Monoclonal IgG1 chains: Separation on Poroshell 300SB-C8 .....383, 567
- Morphine and metabolites: Extracted blood plasma sample separation.....630
- N**
- Naproxen analysis .....611
- Natural products – capsaicin and dihydrocapsaicin on Pursuit XRs C18.....319
- Neutraceuticals: Extract from green tea.....603
- Neutraceuticals: Hypericin separation in St. John's Wort.....632
- New levels of sensitivity and resolution.....235
- Nucleosides, purines and pyrimidines .....564
- Nucleosides: Separation of deoxy and ribonucleosides.....568
- Nucleotides: Separation of mononucleotides...568
- O**
- Oligosaccharides.....610
- Opiates (drugs of abuse) by LC/MS.....630
- Optimize separations with Eclipse XDB selectivity options.....259
- Optimizing protein separations with Agilent weak cation-exchange columns.....558
- Organic acid analysis.....338
- Organic acids separated on ZORBAX SB-Aq.....581
- Overlay of UV and Light Scattering 90° for a Sample of γ-globulins, Illustrating Monomer, Dimer, Trimer, and Aggregate Peaks.....430
- Overlay of UV and light scattering 90° for a sample of γ-globulins, illustrating monomer, dimer, and trimer peaks .....430
- P**
- pH gradient elution for improved separation of monoclonal antibody charged variants.....561
- PLgel LS column .....503
- PLgel Olexis reveals true modalities across the range of polyolefins.....508
- Parabens: High speed separation.....604
- Peak shape and efficiency are better with ZORBAX Eclipse Plus.....249
- Peptide RP-HPLC/ESI-MS using NH4OH mobile phase yields both positive and negative ion spectra.....573
- Peptides/proteins: Effect of elevated temperature.....370, 571
- Peptides/proteins: Equivalent gradient separations.....571
- Peptides: Effect of TFA concentration.....370, 569
- Peptides: Separation of antitensins I, II, III with TFA and NH4OH .....570
- Peptides: Separation of antitensins I, II, III with TFA and NH4OH .....632
- Phenols, substituted .....592
- Phenoxyacid herbicides .....591
- Plant hormones: Rapid gradient elution separation.....593
- Plasticized PVC.....501
- Polyamides .....509
- Polycyclic aromatic hydrocarbons according to EPA Method 610.....589
- Polyester .....519
- Polyesterimide .....520
- Polyethylene Glycol/Oxide standards .....542
- Polyethylene glycols .....307, 388
- Polymethylmethacrylate in DMF.....517
- Polymethylmethacrylate standards.....540
- Polyol.....501
- Polyphenylene Sulfides.....500
- Polystyrene standards .....538
- Polyurethanes.....520
- Polyvinyl alcohol .....526, 528
- Pore size choice: Mouse IgG .....421
- Pore size choice: Proteins.....421
- Poroshell 120 EC-C18 for fast UHPLC separations .....232
- Poroshell 300 columns separate proteins and peptides in seconds .....381

- Preparative fractionation of a culture filtrate containing amyloglucosidases on Agilent PL-SAX 4000A .....473
- Preparative scale purification of Leuprolide by concentration overload .....359
- Preparative separation of low molecular weight polystyrene .....522
- Protein digest analysis .....552
- Protein elution pattern on ZORBAX Poroshell 300SB-C8 .....384
- Proteins in a complex sample by 2-D HPLC with Nano HPLC columns .....457
- Proteins: Effect of bonded phase .....575
- Proteins: Effect of bonded phase, RP .....575
- Pullulan polysaccharide standards .....544
- Purification of a 25-mer trityl-off oligonucleotide and analytical quantitation of the fraction using PLRP-S 100Å, 4.6 x 50 mm .....469
- Purification of a large oligonucleotide .....473
- 
- Q**
- Quantification and qualification of vitamin C and citric acid in fresh grapefruit juice .....609
- 
- R**
- Rapid analysis of an analgesic tablet, selectivity differences at pH 2.7 and pH 7 .....250
- Rapid method development for 18 compounds with an Agilent RRHD Eclipse PAH column .....590
- Rapid Resolution HT (RRHT) provides double the efficiency of Rapid Resolution columns .....240
- Reduce analysis time dramatically with Rapid Resolution HT columns .....241
- Reduce peptide map analysis time by 90% with Poroshell 300SB .....382
- Resin analysis by rapid GPC .....511
- Rose wine .....610
- 
- S**
- SB-CN optimizes retention and resolution .....266
- Scale-up from analytical to prep .....321
- Selectivity changes for basic compounds with Eclipse XDB and StableBond .....258
- Selectivity comparison of TFA and NH<sub>4</sub>OH for peptide RP-HPLC\ESI-MS analysis .....574
- Selectivity comparison of TFA and NH<sub>4</sub>OH Selectivity comparison: C18 columns .....236
- Selectivity comparison: Phenyl columns .....237
- Selectivity for urea pesticides .....259
- Selectivity in peptide RP-LC .....389
- Selectivity test mix for Polaris columns .....299
- Separation of 20 PAHs on Eclipse PAH .....591
- Separation of 8 steroids .....613
- Separation of azo dye degradation products .....583
- Separation of Azo Dyes .....598
- Separation of EPA 610 PAH Mix .....589
- Separation of a tryptic digest on ZORBAX MicroBore 300SB-C18 .....461
- Separation of basic peptides on Bonus-RP versus traditional Alkyl phase .....569
- Separation of charge variants of human IgG1 with pH gradient .....355
- Separation of group 4 analytes in EPA 1694 on ZORBAX HILIC Plus column .....325
- Separation of heated, stressed MAb .....563
- Separation of highly basic antidepressants above their pKa in free base form (pKa 9.5-9.7) .....635
- Separation of licorice root on RRHD columns .....234
- Separation of pharmaceutical cardiac drugs .....616
- Separation of polypeptides in under 1 minute .....572
- Separation of protein standards on Agilent 3 µm ion-exchange columns by cation-exchange chromatography .....403
- Separation of recombinant human erythropoietin (rEPO) .....562
- Separation of small molecule anorectics .....622
- Separation of vitamin D2/D3 .....605
- Separation optimization for ultra-fast analysis of reduced and alkylated monoclonal antibody .....554
- Several ZORBAX RRHD 1.8 µm selectivities facilitate method development .....614
- Short-chain ZORBAX 300SB-C3 is stable at low pH, high temperature .....371
- Shorter chain ZORBAX SB-CN is also stable at low pH (pH 2.0, 50 °C) .....265
- Space .....265
- Sports drink .....610
- StableBond SB-C18 shows excellent stability at low pH and high temperature .....265
- Standard ion-exchange protein separation .....407, 576
- Standard protein separation .....410
- Standard proteins by reversed-phase .....576
- Starches .....500
- Steroids .....634
- Steroids: Easy scalability using Agilent Prep columns .....312
- Steroids: Separation .....633
- Sub 1 minute separations with RRHD columns .....235
- Sugars .....604
- Sugars in plain and milk chocolate .....604
- Sulfa drugs .....641
- Sulfonamides – Fast analysis with RRHT columns .....640
- Sunscreen ingredients: Perform conventional, fast and ultra-fast separations on the same column family .....607
- Superior loadability on Agilent Prep C18 with basic compounds .....312
- 
- T**
- Temperature as a tool to enhance mass transfer and improve resolution of oligonucleotides in ion-pair reversed-phase HPLC .....391, 579
- Ten cardiac drugs on Rapid Resolution HT SB-C18 .....640
- Theobromine in beverages .....608
- Tocopherols by LC/MS with APPI .....603
- Triamcinolone – USP analysis of triamcinolone .....635
- Triazine pesticides on Bonus-RP and Alkyl C8 phase .....592
- Tricyclic antidepressants .....636
- Tricyclic antidepressants and benzodiazepines .....289
- Tricyclic antidepressants and metabolites: Effect of pore size .....637
- Triton X-114: Decreasing run-time by changing bonded phase .....580
- Two samples of melamine resin analyzed by PolarGel-L .....513
- 
- U**
- UHPLC efficiency at HPLC pressures .....230
- Ultra-high speed and high resolution of intact monoclonal antibodies .....557
- USP analysis of tetracyclines .....639
- USP method: Glyburide and internal standard, progesterone .....638
- USP method for sorbitol .....341
- USP methods for sugar alcohols .....339
- Ulcer treatment drugs at intermediate pH .....637
- Urine, LSD analysis by LC/MS .....638
- Use ZORBAX Extend-C18 for alternate selectivity at high pH .....378, 567
- 
- V**
- VX nerve agent metabolites by LC/MS-IS standard (C13 labeled) .....593
- Virtually eliminate retention time variations .....400
- 
- W**
- Warfarin: USP chromatographic purity method using Eclipse XDB-CN .....640
- Water-soluble B vitamins separated on ZORBAX SB-Aq .....607
- Water-soluble vitamins .....605
- Water-soluble vitamins using the USP 23 method .....606
- Water-soluble vitamins: High speed separation using ion-pairing .....606
- Weak cation-exchange chromatography for P128 therapeutic protein sample on the Agilent 1260 Bio-inert Quaternary LC system using different cation-exchange columns .....404
- Whey proteins in dairy samples – milk .....391, 578
- 
- X**
- Xanthines: Higher resolution, same selectivity with RRHT .....617
- 
- Z**
- ZORBAX Bio-SCX Series II provides more retention of small peptides .....459
- ZORBAX Bonus-RP is stable at low and mid pH .....279
- ZORBAX Bonus-RP provides unique selectivity .....280
- ZORBAX Eclipse Plus: Best peak shape in the industry without tailing .....249
- ZORBAX Nano columns for high sensitivity protein digest analysis by LC/MS .....453

# Compound Index

<b>A</b>			
Acebutolol.....	613		
Acenaphthene.....	589-591		
Acenaphthylene.....	589-591		
Acephate.....	594		
Acetaldehyde – DNPH.....	584		
Acetamide.....	615		
2-Acetamidophenol.....	235, 615		
Acetaminophen.....	235, 250, 615, 618, 628		
Acetanilide.....	235, 618		
Acetate.....	174-175		
Acetic Acid.....	581		
Acetone.....	582		
Acetone – DNPH.....	584		
Acetophenone.....	599		
6-Acetylmorphine.....	628		
Acetylsalicylic acid.....	235, 250, 618, 628		
Acrolein – DNPH.....	584		
Adenine.....	564, 579		
Adenosine.....	564, 568		
Adonitol.....	339		
Adrenaline.....	578		
Alanine.....	396, 564		
Alanine-3-Glycine-4.....	308, 390		
Albuterol.....	325, 583		
Alprenolol.....	613		
2-Amino-5-azotoluene.....	183		
4-Aminobenzoic acid.....	290, 621		
p-Aminobenzoic acid.....	609		
3-Amino-benzonitrile.....	585		
7-Aminoclonazepam.....	289		
2-Amino-4,6-dinitrotoluene.....	586-587		
4-Amino-2,6-dinitrotoluene.....	587		
4-Amino-4,6-dinitrotoluene.....	586		
7-Aminoflunitrazepam.....	289		
2-Aminonaphthalene.....	183		
2-Amino-4-nitrotoluene.....	586-587		
2-Amino-6-nitrotoluene.....	586-587		
4-Amino-2-nitrotoluene.....	586		
Amitriptyline.....	258, 289, 635-637		
cis-10-OH -Amitriptyline.....	637		
trans-10-OH -Amitriptyline.....	637		
Ammonium.....	173		
Amylbenzene.....	299		
Amylobarbitone.....	643		
Anadamine.....	236		
Androstadiene 3,17 dione.....	613		
Anethole.....	602		
Angiotensin I.....	308, 377, 389-390, 462, 570		
Angiotensin II.....	194, 308, 370, 377, 381, 389-390, 462, 570-572		
Angiotensin III.....	308, 377, 389-390, 570		
Aniline.....	183, 583, 598		
p-Cl-Aniline.....	183		
Anisidine.....	598		
p-Anisidine.....	585		
Anthracene.....	189, 589-591		
α-1-Antichymotrypsin.....	454, 566		
Antithrombin-III.....	454, 566		
Apomyoglobin.....	572		
Aprotinin.....	403		
Arabinose.....	341		
Arabitol.....	339		
2-Arachinoylglycerol.....	381		
Arginine.....	396, 564		
Arsenate.....	175		
Arsenite.....	175		
Ascorbic acid.....	612		
Asparagine.....	396, 596		
Aspartame.....	232, 290, 299, 599		
Aspartic acid.....	396, 596		
Aspartic acid-phenylalanine dipeptide.....	599		
Atenolol.....	613		
Atrazine.....	587-588, 591		
Azide.....	172, 175, 421		
<b>B</b>			
Barberine.....	625		
Barbital.....	258		
Barbitone.....	643		
Beclomethasone.....	290		
Bendroflumethiazide.....	189		
Bentazon.....	587		
Benzaldehyde – DNPH.....	584		
Benz(e)pyrene.....	591		
Benzidine.....	183, 583, 598		
1,2-Benzisothiazol-3(2H)-one.....	580		
Benzisothiazol-3(2H)-one.....	235		
Benzo(a)anthracene.....	589-591		
Benzo(a)pyrene.....	589-591		
Benzo(b)fluoranthene.....	589-591		
Benzocaine.....	619		
Benzo(g,h,i)perylene.....	589-591		
Benzoic acid.....	232, 290, 389, 580, 602, 609, 621, 629		
Benzo(k)fluorene.....	589-591		
Benzophenone.....	618		
Benzoyllecgonine.....	627		
Benzthiazuron.....	588		
n-6-Benzyl adenine.....	593		
5-Benzyl-3,6-dioxo-2-piperazineacetic acid.....	599		
Berberine.....	251, 617		
Biosynthetic human insulin.....	384		
Biotin (B7).....	612		
Biphenyl.....	189		
Bovine carbonic anhydrase.....	407, 576		
Bromide.....	172		
BSA.....	382, 425-426, 432, 576-577		
Bumetanide.....	189		
Buspirone.....	616		
Butacaine.....	266, 619		
tert-butanol.....	582		
2-Butanone (MEK) – DNPH.....	584		
Butylbenzene.....	299		
Butylparaben.....	189, 241, 604		
n-Butyraldehyde – DNPH.....	584		
<b>C</b>			
Caffeine.....	232, 235, 250, 258, 276, 299, 316, 334, 599, 608, 615		
Calcium.....	173		
Calmodulin.....	571		
Canadine.....	625		
Carbamazepine.....	618, 632		
Carbaryl.....	594		
Carbendazim.....	235, 580, 594		
Carbonate.....	175		
Carbonic Anhydrase.....	370-371, 381-382, 408, 571-572		
Carvone.....	602		
Catalase.....	432		
Catechol.....	230-231, 584, 603, 625		
Cefazolin.....	620		
Cefepime.....	217		
Cefotaxime.....	620		
Ceftazidime.....	620		
Celecoxib.....	235		
Cephaclor.....	280		
Cephalexin.....	280		
Cephoxitin.....	280		
Cephuroxime.....	280		
Chlorate.....	172		
Chloride.....	172, 174-175		
Chloroaniline.....	583, 598		
m-Chloroaniline.....	585		
o-Chloroaniline.....	585		
p-Chloroaniline.....	585		
2-Chlorobenzoic.....	623		
Chlorocaine.....	619		
4-Chloro-3-methylphenol.....	592		
5-Chloro-2-methyl-4-isothiazolin-3-one.....	235		
2-Chlorophenol.....	592		
o-Chlorophenoxyacetic acid.....	591, 593		
p-Chlorophenoxyacetic acid.....	591, 593		
o-Chlorophenoxy propionic acid.....	593		
Chlorothiazide.....	189		
Chlorpheniramine.....	275, 279, 617, 628		
Chlorthalidone.....	189		
Chrysene.....	589-591		
Chymotrypsinogen A.....	410		
Cimetidine.....	325, 583, 637		
d-Cinchonine.....	266, 619		
Cinnamaldehyde.....	599		
Ciprofloxacin.....	620		
Citrate.....	174		
Citric Acid.....	338, 396, 581, 609-610		
Clindamycin.....	620		
Clomipramine.....	289		

Clonazepam ..... 289  
 Clotrimazole ..... 621  
 Cobalamin (B12) ..... 612  
 Cocaine ..... 619, 627  
 Codeine ..... 630  
 Corticosterone ..... 290  
 Cortisone ..... 290, 299  
 Cortisone acetate ..... 290  
 m-Cresol ..... 590  
 o-Cresol ..... 230-231, 584, 592  
 p-Cresol ..... 230-231, 584  
 Crotonaldehyde – DNPH ..... 584  
 Cyanide ..... 175  
 Cyanidin ..... 237, 597  
 Cyanocobalamin (B12) ..... 605  
 p-Cymene ..... 599  
 Cyprodinil ..... 594  
 Cysteine ..... 396  
 Cytidine ..... 568  
 Cytochrome C ..... 183, 382, 370-371, 400, 403,  
 410, 558-560, 571, 572, 576  
 Cytodine ..... 564  
 Cytosine ..... 564, 579

**D**

Daidzen ..... 266  
 Dehydroacetic acid ..... 232  
 Delphinidin ..... 237, 597  
 2' Deoxycytidine ..... 568  
 2' Deoxyguanosine ..... 568  
 2' Deoxyinosine ..... 568  
 Desethylatrazine ..... 588  
 Desethyldeisopropylatrazine ..... 588  
 Desipramine ..... 289  
 Dextromethorphan ..... 628  
 Diazepam ..... 272, 289  
 Dibenzo(a,h)anthracene ..... 589-591  
 Dichlorobenzidine ..... 583, 598  
 3,3-Dichlorobenzidine ..... 183  
 2,4-Dichlorophenol ..... 592  
 2,3-Dichlorophenoxyacetic acid ..... 591  
 2,4-Dichlorophenoxyacetic acid ..... 591  
 Diclofenac ..... 235, 615, 618  
 Dienestrol ..... 633  
 Diethylstilbestrol ..... 265  
 Diflusal ..... 235, 615  
 Dihydroxy benzylamine ..... 623  
 Dihydroxyphenyl acetic acid ..... 623  
 Dihydroxyphenyl alanine ..... 623  
 Diltiazem ..... 616  
 Dimethoxybenzidine ..... 598  
 3,3'-Dimethoxybenzidine ..... 583  
 Dimethylbenzidine ..... 583  
 2,3-Dimethyl phenol ..... 230-231, 530  
 2,4-Dimethyl phenol ..... 592  
 2,5-Dimethyl phenol ..... 230-231, 530  
 3,4-Dimethyl phenol ..... 231, 584  
 1,3-Dimethyluric acid ..... 617  
 Dimethylxanthine ..... 276

1,7-Dimethylxanthine ..... 617  
 3,7-Dimethylxanthine (theobromine) ..... 617  
 1,3-Dinitrobenzene ..... 586-587  
 2,4-Dinitrophenol ..... 592  
 2,4-Dinitrotoluene ..... 586-587  
 2,6-Dinitrotoluene ..... 586-587  
 Dioctyl phthalate ..... 290, 299  
 Diphenhydramine ..... 275, 617, 632  
 Diphenylamine ..... 586  
 Dipropyl phthalate ..... 241  
 Dipropylththalate ..... 250  
 Dipyridamole ..... 616  
 Disopyramide ..... 640  
 Diuron ..... 259, 587-588, 591  
 Dopamine ..... 578, 623  
 Doxepin ..... 258, 289, 635-636  
 Doxycycline ..... 639  
 Doxylamine ..... 275, 279, 617  
 Dulcitol ..... 339

**E**

Epinephrine ..... 623  
 Ecgonine methylester ..... 627  
 Econazole ..... 621  
 Eletriptan ..... 616  
 Epagalocatechin ..... 603  
 Epicatechin ..... 603, 625  
 Epicatechin gallate ..... 603, 625  
 Epigallocatechin ..... 625  
 Epigallocatechin gallate ..... 603, 625  
 Estradiol ..... 633  
 β -Estradiol ..... 613  
 Estriol ..... 266  
 Estrone ..... 613  
 Ethanol ..... 582, 610  
 Ethinylestradiol ..... 633  
 Ethoprophos ..... 594  
 Ethyl cinnamate ..... 599  
 2-Ethylhexyl *trans*-4-methoxycinnamate ..... 607  
*bis*-(2-Ethylhexyl) phthalate ..... 507  
 Ethylhexyl salicylate ..... 259  
 2-Ethylhexyl salicylate ..... 607  
 Ethylparaben ..... 189, 272, 604  
 Eugenol ..... 599  
 Excipient ..... 606

**F**

Famotidine ..... 637  
 Fenfluramine ..... 622  
 Fenoprofen ..... 622  
 Fenuron ..... 259  
 Fibrinogen ..... 309, 392  
 Flunitrazepam ..... 289  
 Fluocinolone acetoneide ..... 290  
 Fluoranthene ..... 189, 589-591  
 Fluorene ..... 189, 589-591  
 Fluoride ..... 172, 175  
 2-Fluorobenzoic ..... 623

3-Fluorobenzoic ..... 623  
 Fluorocytosine ..... 579  
 Folic acid ..... 605-606, 612  
 Formaldehyde – DNPH ..... 584  
 Formate ..... 174  
 Fructose ..... 338, 340, 600, 604, 610  
 Fumaric Acid ..... 581  
 Furosemide ..... 616

**G**

Galactose ..... 340  
 Genistein ..... 266  
 γ-Globulin ..... 421  
 Glucagon ..... 384  
 Glucose ..... 338, 340-341, 600, 604, 610  
 Glutamine ..... 396, 564  
 Glutamate ..... 175  
 Gly3-Gly4 (Nα-acetylated) ..... 308, 390  
 Glyburide ..... 638  
 Glycerol ..... 610  
 Glyceryl Guaicolate ..... 334  
 Gluconate ..... 396, 564  
 Glycine ..... 389, 396, 564  
 Guaifenesin ..... 629  
 Guanine ..... 564, 579  
 Guanosine ..... 564, 568

**H**

Heptabarbitione ..... 643  
 Hexaldehyde – DNPH ..... 584  
 Hexazinon ..... 588  
 Hexogen (RDX) ..... 586-587  
 Hexyl ..... 586  
 Histidine ..... 396, 564  
 Homocyclonite ..... 586  
 Homovanillic acid ..... 623  
 Holotransferrin ..... 572  
 Hydrastine ..... 625  
 Hydrochlorothiazide ..... 189  
 Hydrocortisone ..... 312, 613, 635  
 Hydroflumethiazide ..... 189  
 Hydroquinone ..... 230-231, 584  
 Hydroxyindoleacetic acid ..... 623  
 2-Hydroxy-4-methoxybenzophenone ..... 607  
 4-Hydroxypropivacaine ..... 619  
 Hydroxyproline ..... 396, 564  
 5- Hydroxytryptamine ..... 623

**I**

Ibuprofen ..... 235, 396, 618  
 IgA ..... 421  
 IgG2a, I HOPC-1 ..... 565  
 IgM, MOPC-104E ..... 565  
 Imazalil ..... 594  
 Imidacloprid ..... 594  
 Imipramine ..... 289, 632, 635  
 Indeno(1,2,3-c,d)pyrene ..... 589-591



Indole.....	642	Methanol.....	582	Norethindrone.....	633
3-Indole acetic acid.....	593	3-Methoxytyrosine.....	623	Norethindrone acetate.....	613
3-Indole butyric acid.....	593	Methionine.....	396, 564	Normorphine.....	631
3-Indole propionic acid.....	593	Methoxyaniline.....	583	Nortriptyline.....	250, 258, 289, 635-637
Inosine.....	568	4-Methoxybenzenesulfonamide.....	289	<i>cis</i> -10-OH-Nortriptyline.....	637
Insulin.....	370-371, 381-382, 462, 571-572	Methoxychlor, 200 mg/L.....	507	<i>trans</i> -10-OH-Nortriptyline.....	637
Iodide.....	172	Methyl-3-aminothiophene-2-carboxylate.....	289	Norvaline.....	396, 564
<i>iso</i> -erythritol.....	339	2-Methyl-4,6-dinitrophenol.....	592		
Isoleucine.....	564	4,4-Methylene- <i>bis</i> -2-chloroaniline.....	183		
Isomaltose.....	600	2-Methyl-4-isothiazolin-3-one.....	235		
Isopropanol.....	582	1-Methyl naphthalene.....	591		
Isoproturon.....	588	2-Methyl naphthalene.....	591		
		2-Methyl-5-nitroaniline.....	183		
<b>K</b>		Methyl paraben.....	189, 235, 580, 604		
Kathon 1A.....	580	Methyl prednisolone.....	290		
Kathon 1B.....	580	Methyl salicylate.....	602		
Ketoprofen.....	235, 615	1-Methylxanthine.....	617		
Kinetin.....	593	Metobromuron.....	588		
Kresoxim-methyl.....	594	Metolachlor.....	587-588		
		Metoprolol.....	613		
		Metoxuron.....	588		
<b>L</b>		Miconazole.....	621		
$\alpha$ -Lactalbumin.....	391, 408, 578	Molybdate (VI).....	172		
Lactate.....	174-175	Monolinuron.....	259, 588		
Lactic Acid.....	581, 338, 610	Monuron.....	259		
Lactoglobulin A.....	183	Morphine.....	630-631		
Lactoglobulin B.....	183	Morphine-6-glucuronide.....	630		
$\beta$ -Lactoglobulin (A chain).....	391, 408, 578	Morphine-3-glucuronide.....	630		
$\beta$ -Lactoglobulin (B chain).....	391, 408, 432, 578	Myoglobin.....	370-371, 381-382, 407, 410, 421, 432, 571-572, 576		
Lactose.....	340, 600, 602				
Lamotrigine.....	642				
Leucine.....	396, 564	<b>N</b>			
Leucine Enkephalin.....	194, 370, 571-572	Nadolol.....	613, 640		
Lidocaine.....	266, 619, 640	Naphthalene.....	189, 241, 589-591		
Lincomycin.....	620	1-Naphthol.....	230-231, 584		
Linuron.....	259, 588	1-Naphthyl acetamide.....	593		
Lysine.....	396, 564	1-Naphthyl acetic acid.....	593		
Lysozyme.....	183, 370-371, 381-382, 400, 403, 410, 558-560, 571-572, 576	Naphthylamine.....	583, 598		
		Naproxen.....	241, 618		
<b>M</b>		Neurotensin.....	381, 571-572		
Magnesium.....	173	Niacin (B3).....	605-606, 612		
Malate.....	174	Niacinamide.....	607		
Maleate.....	275	Nicotinic Acid.....	607		
Maleic acid.....	628	Nifedipine.....	315, 640		
Malic acid.....	610	Nimodipine.....	315, 640		
Maltose.....	600	Nisoldipine.....	315, 640		
Maltotriose.....	340	Nitrate.....	172, 175		
Malvidin.....	237, 597	Nitrite.....	172, 175		
Mannitol.....	339-341, 604	2-Nitrobenzoic.....	623		
Mefanamic acid.....	241	3-Nitrobenzoic.....	623		
Mepivacaine.....	619	2-Nitrophenol.....	230-231, 584, 592		
Metacycline.....	639	4-Nitrophenol.....	230-231, 584, 592		
Metazachlor.....	588	2-Nitrotoluene.....	586-587		
Met-Enkephalin.....	194, 571-572	3-Nitrotoluene.....	586-587		
Metformin.....	325, 583	4-Nitrotoluene.....	586-587		
Methabenzthiazuron.....	588	Noradrenaline.....	578		
Methacrolein –DHCP.....	584	Nordiazepam.....	289		
		Nordoxepin.....	289		
		Norepinephrine.....	623		

**O**

Octogen (HMX).....	587
Octylmethoxycinnamate.....	250
Oleylethanolamide (OEA).....	328, 614
Orotic Acid.....	568
Ovalbumin.....	381, 407, 412, 421, 558-560, 572, 576
Oxalate.....	174
Oxalic acid.....	338, 389
Oxybenzone.....	250, 259
Oxytetracycline.....	639
Oxytocin.....	462

**P**

Padimate-O.....	259, 607
Palatinose.....	600
Palmatine.....	625
Palmitoylethanolamide.....	236, 614
Pantothenic acid.....	605, 612
Parvalbumin.....	371
Penconazole.....	594
Pencycuron.....	259
Pentachlorophenol.....	592
<i>iso</i> -Pentane.....	565
Pentylparaben.....	189
Peonidin.....	237, 597
Perphenazine.....	632
Perylene.....	507
Petunidin.....	237, 597
Phenacetin.....	235, 615, 618, 622
Phenanthrene.....	189, 589-591
Phenobarbitone.....	643
Phenol.....	231, 240, 249, 299, 584, 592
Phenoxyacetic acid.....	591
2-Phenoxyethanol.....	235, 580
Phentermine.....	622
Phenylalanine (PHE).....	396, 564, 599
Phenylbutazone.....	622
Phenylephrine.....	334
Phosphate.....	174-175
Phthalic acid.....	623
<i>p</i> -hydroxybenzoic acid.....	232
Picric acid.....	586
Pindolol.....	613, 640, 642
Pioglitazone.....	616
Pirenzepine.....	637
Piroxicam.....	235, 615
Poly-DL-alanine.....	425
Potassium.....	173

Prednisolone .....290, 632  
 Prednisolone acetate.....290  
 Procainamide.....616, 640  
 Procaine .....266, 619, 640  
 Progesterone .....613, 638  
 Promethazine.....632  
 Prometon .....587  
 Prométryne.....587, 591  
 Propanil .....587, 591  
 n-Propanol .....582  
 Propanolol .....636  
 Propazine.....587-588, 591  
 Propionaldehyde – DNPH .....584  
 Propoxur .....594  
 Propranolol .....241, 613, 636, 640  
 Propylparaben .....189, 604  
 Protriptyline.....396, 564, 632  
 Pseudoephedrine.....275, 617, 628  
 Pymetrozine .....594  
 Pyrene .....589-591  
 Pyridine .....249, 389  
 Pyridoxine.....605-607  
 Pyridoxyl phosphate (B6) .....612  
 Pyrillamine.....334  
 Pyroglutamate .....174  
 Pyruvate.....174

**Q**

Quercetin .....266

**R**

Raffinose .....340, 600, 604  
 Ranitidine.....325, 583  
 Reserpine.....290, 299  
 Resorcinol.....230-231, 584  
 Retinol .....605  
 Retinol acetate.....605  
 Retinol palmitate .....605  
 Rhamnose .....600  
 Riboflavin (B2).....605-606, 612  
 Ribonuclease (RNase).....371, 381, 571-572  
 Ribonuclease A.....370, 400, 403, 425-426, 558-560, 571-572, 576  
 Ribose.....600  
 Ropivacaine.....619

**S**

Saccharin.....232  
 Saccharose .....600  
 Salicylic acid .....235, 290, 618, 621  
 Sarcosine.....396, 564  
 Scopolamine .....275, 617  
 Sebutylazine.....588  
 Selenate.....175  
 Serine .....396, 564  
 Simazine .....587-588  
 Sodium .....173

Sorbic acid.....290, 609, 621  
 Sorbitol.....338-341, 604  
 Stachyose .....340, 604  
 Succinate .....174  
 Succinic Acid.....338, 581, 610  
 Sucrose .....338, 340-341, 600, 604  
 Sulfachloropyridazine .....616  
 Sulfadiazine .....249, 616, 640-641  
 Sulfadimethoxine.....616, 641  
 Sulfamerazine.....249, 616, 640-641  
 Sulfamethazine .....616, 640-641  
 Sulfamethizole.....616, 641  
 Sulfamethoxazole .....249, 258, 616, 632  
 Sulfamethoxyipyridazine .....616  
 Sulfanilamide.....249, 640-641  
 Sulfanilic acid .....641  
 Sulfapyridine.....616  
 Sulfate .....172, 174-175  
 Sulfathiazole .....249, 616, 640  
 Sulfisoxazole.....641  
 Sulfmethazine.....249  
 Sulfur .....507  
 Sulindac .....235, 615

**T**

Talbarbitone .....643  
 Tartarate.....175  
 Tartaric acid.....338, 610  
 Tebutiuron .....587  
 Terbutylazine.....588  
 Terphenyl-d14 .....591  
 o-Terphenyl.....299  
 Testosterone .....312, 613  
 Tetracaine .....266, 619  
 2,3,4,6-Tetrachlorophenol.....592  
 Tetryl .....586-587  
 Theobromine.....276, 316, 608  
 Theophylline .....276, 316, 334  
 Thiabendazole .....594  
 Thiamine pyrophosphate (TPP) .....594  
 Thiamine (B1).....607, 612  
 Thiocyanate .....172  
 Thiosulfate .....172  
 Thiourea .....189, 590  
 Threonine (THR) .....396, 564  
 Thymidine.....564  
 Thymine .....564, 579  
 Thymol .....602  
 Thyroglobulin .....421, 425-426, 432  
 α-Tocopherol.....605, 608  
 β-Tocopherol .....608  
 γ-Tocopherol .....605, 608  
 Tocopherol acetate.....605  
 o-Tolidine.....598  
 Tolmetin .....235, 615, 618, 622  
 m-Tolualdehyde – DNPH.....584  
 Toluene.....240, 299, 589-591  
 m-Toluic .....623  
 m-Toluidine .....585

o-Toluidine .....183, 583, 598  
 Trehalulose .....600  
 Triamcinolone .....290, 635  
 Triamcinolone acetonide .....290  
 2,4,6-Trichlorophenol.....592  
 2,4,5-Trichlorophenoxyacetic acid.....591  
 3,4,5-Trichlorophenoxyacetic acid.....593  
 2,4,5-Trichlorophenoxypropionic acid (Silvex).....591  
 3,4,5-Trichlorophenoxypropionic acid .....593  
 Triflupromazine.....632  
 Trimipramine .....258, 289, 632, 635-636  
 1,3,5-Trinitrobenzene.....586-587  
 2,4,6-Trinitrotoluene .....586-587  
 Tripelennamine.....632  
 Triphenylene.....299  
 Triprolidine.....275, 279, 617  
 Tryptophan (TRP).....396, 459, 564  
 Tyrosine (TYR) .....396, 459, 564  
 Tebutiuron.....591

**U**

Uracil.....240-241, 258, 299, 425-426, 564, 579  
 Uridine.....564, 568

**V**

Valeraldehyde – DNPH .....584  
 Valine .....396, 564  
 Valine3-Glycine4 (Nα-acetylated) .....308, 390  
 Valine3-Valine4 (Nα-acetylated) .....308, 390  
 Valine-tyrosine-valine .....572  
 Vitamin A.....605  
 Vitamin B12 .....421  
 Vitamin C .....605-606, 609  
 Vitamin D2.....605  
 Vitamin D3.....605  
 Vitamin E (a-VE).....605

**W**

Warfarin .....640

**X**

Xanthosine-5'-monophosphate (XMP) .....568  
 Xylitol.....339  
 Xylose.....600

# Ordering Information

## Easy Ordering Terms and Conditions

### Discounts and Delivery

Agilent Technologies specializes in fast delivery. In the US, if you call before 2 PM EST, we will ship your order that day. You may also request overnight express delivery before 6 PM EST and you will have your order the next day. Volume discounts on a variety of individual products are offered when the entire quantity is shipped to one address at one time.

A shipping and handling fee will be added to your order unless the purchase is over \$2000 US for orders place online or over \$4000 for orders place via phone. Special shipping (i.e., overnight in the US) is available in most regions at an additional cost.

Agilent is required to collect all state and local sales taxes unless the buyer's tax-exempt certificate is on file with Agilent Technologies. Please be prepared to provide a copy if it is not on file, when placing your order.

Please check with your Agilent Customer Service Representative, local Authorized Distributor, or the Agilent website for current prices, special offers, promotions and discounts when placing your order.

### Satisfaction Guaranteed

If you are not satisfied with your Agilent product within the first 60 days, you may return your purchase in its original condition for a full refund or credit. A return policy statement is included in every Agilent shipment and posted under Product Information on the website. In the US and Canada, please call for a Return Authorization form and return instructions at **1-800-227-9770**. If your Agilent product was purchased from a distributor, please contact the distributor.

### Shipping Damages

If items are damages in transit, please follow the instructions below:

- If a shipment is visibly damaged upon arrival, do not accept it until the person making the delivery has endorsed the bill of lading with statement for the extent of the damage.
- If any damage is found after unpacking, retain all cartons and inner packaging and immediately request an inspection from the carrier.
- Notify the Agilent Customer Contact Center at **1-800-227-9770** about the damaged shipment so that we can make the appropriate sales adjustment and/or provide you with return instructions (Sales order number, product number and quantity damaged will be needed).

## Easy Ways To Order

- Phone: **1-800-227-9770** (option 1, 1) in the US and Canada – Mon-Fri, 8AM to 8PM EST
- Fax: **1-302-633-8901** in the US
- Email: **cag\_sales-na@agilent.com** in the US and Canada
- Online: **www.agilent.com/chem** in the US and Canada

## Payment Options

- In the US, Visa, MasterCard, Discover and American Express are accepted with a minimum order of \$20 (not applicable in all countries).
- Email [ePay@agilent.com](mailto:ePay@agilent.com) to make an electronic payment using the ACH/EFT (Automated Clearing House/Electronic Funds Transfer) method.
- Establish a charge account through your Agilent Customer Service Representative or Your Local Agilent sales office. An account number will be assigned to you for charging your purchases. Payment terms are net 30 days from the invoice date. All orders are subject to credit approval.

We will be happy to supply a price quote via, phone, email or fax if you need it in writing.

## Warranties

All Agilent Technologies products in this catalog are designed and manufactured to stringent standards under the Agilent quality system registered to ISO 9001. At Agilent, we back every product with a 90-day warranty and a money-back guarantee. If Agilent receives notice of defects during the warranty period. Agilent shall, at its option, either repair or replace products which prove to be defective. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, the buyer shall be entitled to a refund of the purchase price upon return of the product to Agilent. The warranty period for each product begins on the day of shipment.

This warranty shall not apply to any defect, failure, or damage caused by improper use or improper or inadequate maintenance or care. This warranty is exclusive and no other warranty, whether written or oral, is expressed or implied. Agilent specifically disclaims the implied warranties of merchantability and fitness for particular purposes. The remedies provided herein are the buyer's sole and exclusive remedies. In no event shall Agilent be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) whether based on contract, tort, or any other legal theory.

## Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



Order Date	Purchase Order or Credit Card Number & Expiration	Taxable Y or N?	Yes	No
Name:	If No, please provide Certificate #			
Title:				
Phone:		Fax:		
Company:		Email:		
	Shipping Address	Billing Address		
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
Part Number	Description	Quantity	Price	Total Cost
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
<b>For Assistance:</b> Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada) <b>Email Node:</b> cag_sales-na@agilent.com <b>Fax Number:</b> 302-633-8901 U.S. and Canada <b>Note:</b> 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies. 2. Shipping and handling is free for orders over \$2000 US.				

# Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



Order Date	Purchase Order or Credit Card Number & Expiration	Taxable Y or N?	Yes	No
Name:		If No, please provide Certificate #		
Title:				
Phone:		Fax:		
Company:		Email:		
		Shipping Address		Billing Address
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
Part Number	Description	Quantity	Price	Total Cost
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
<p><b>For Assistance:</b> Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada)</p> <p><b>Email Node:</b> cag_sales-na@agilent.com</p> <p><b>Fax Number:</b> 302-633-8901 U.S. and Canada</p> <p><b>Note:</b> 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies.                  2. Shipping and handling is free for orders over \$2000 US.</p>				

# Agilent Technologies Order Form

Outside the U.S. and Canada, please contact your local Agilent office or Authorized Distributor when ordering.



<b>Order Date</b>	<b>Purchase Order or Credit Card Number &amp; Expiration</b>	<b>Taxable Y or N?</b>	<b>Yes</b>	<b>No</b>
Name:		<b>If No, please provide Certificate #</b>		
Title:				
Phone:		Fax:		
Company:		Email:		
	<b>Shipping Address</b>	<b>Billing Address</b>		
Company:				
Street:				
Room/Bldg/Dept:				
City:				
State/Province/Country:				
Zip/Postal Code:				
Deliver to:				
<b>Part Number</b>	<b>Description</b>	<b>Quantity</b>	<b>Price</b>	<b>Total Cost</b>
Special Instructions:			Subtotal:	
			Tax:	
			Total:	
<p><b>For Assistance:</b> Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada)</p> <p><b>Email Node:</b> cag_sales-na@agilent.com</p> <p><b>Fax Number:</b> 302-633-8901 U.S. and Canada</p> <p><b>Note:</b> 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies. 2. Shipping and handling is free for orders over \$2000 US.</p>				





**For more information**

Buy online:

[www.agilent.com/chem/store](http://www.agilent.com/chem/store)

Contact us:

[www.agilent.com/chem/contactus](http://www.agilent.com/chem/contactus)

This information is subject to change without notice.

© Agilent Technologies, Inc. 2012  
Printed in Canada October 31, 2012  
5991-1059EN



Scan the QR code  
with your smartphone  
for more information



The Measure of Confidence



**Agilent Technologies**