

Stationary Phase: **ARC-18**

**Raptor**<sup>™</sup>  
LC Columns

*Selectivity Accelerated*

**Ahead of the Curve for Large,  
Multiclass Lists by Mass Spec**



**RESTEK**<sup>®</sup>

Pure Chromatography

**BGB** GC | LC  
MS | CE

# The Raptor™ ARC-18 Column

With Raptor™ LC columns, Restek chemists became the first to combine the speed of superficially porous particles (also known as SPP or “core-shell” particles) with the resolution of highly selective USLC® technology. This new breed of chromatographic column allows you to more easily achieve peak separation and faster analysis times without expensive UHPLC instrumentation.

The birth of Restek’s Raptor™ SPP LC column line began with the innovative Biphenyl phase, but it has quickly grown to include a new Restek® phase: the ARC-18. Designed and intended specifically for use on LC-MS/MS systems, the Raptor™ ARC-18 column features a well-balanced retention profile without the drawbacks of using an ordinary C18 in the harsh, acidic mobile phases needed for mass spectrometry (MS). Even after extended use in these low-pH ( $\leq 2.0$ ) conditions, the sterically protected ARC-18 offers consistent retention, peak shape, and response for charged bases, neutral acids, small polar compounds, and more.

For the rapid analysis of large, multiclass assays by LC-MS/MS, the acid-resistant Raptor™ ARC-18 truly is *ahead of the curve*.

## Column Description:



### Stationary Phase Category:

C18, octadecylsilane (L1)

### Ligand Type:

Sterically protected C18

### Particle:

2.7  $\mu\text{m}$  or 5  $\mu\text{m}$  superficially porous silica (SPP or “core-shell”)

### Pore Size:

90 Å

### Surface Area:

150  $\text{m}^2/\text{g}$  (2.7  $\mu\text{m}$ )  
or 100  $\text{m}^2/\text{g}$  (5  $\mu\text{m}$ )

### Recommended Usage:

pH Range: 1.0–8.0

Maximum Temperature: 80 °C

Maximum Pressure: 600 bar / 8,700 psi (2.7  $\mu\text{m}$ )  
or 400 bar / 5,800 psi (5  $\mu\text{m}$ )

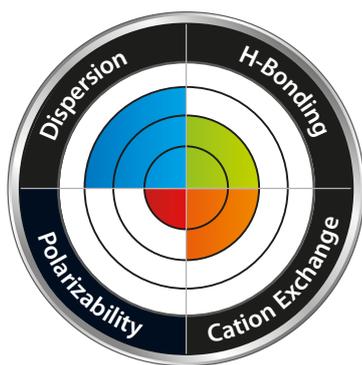
### Properties:

- Well-balanced retention profile.
- Sterically protected to resist harsh, low-pH mobile phases.
- Ideal for use with sensitive detectors like mass spec.

### Switch to an ARC-18 when:

- You are analyzing large, multiclass lists by LC-MS/MS.
- Strongly acidic (pH 1–3) mobile phases are required.

## Column Interaction Profile:



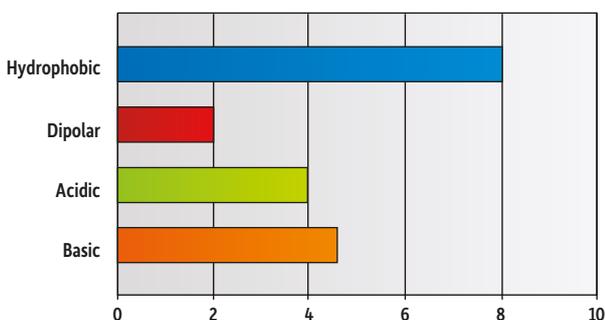
### Defining Solute Interaction:

- Dispersion

### Complementary Solute Interactions:

- Hydrogen bonding
- Cation exchange

## Solute Retention Profile:

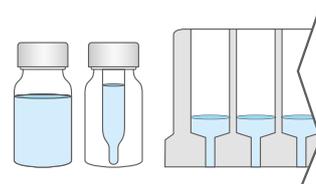


### Target Analyte Structure:

- Hydrocarbons

### Target Analyte Functionalities:

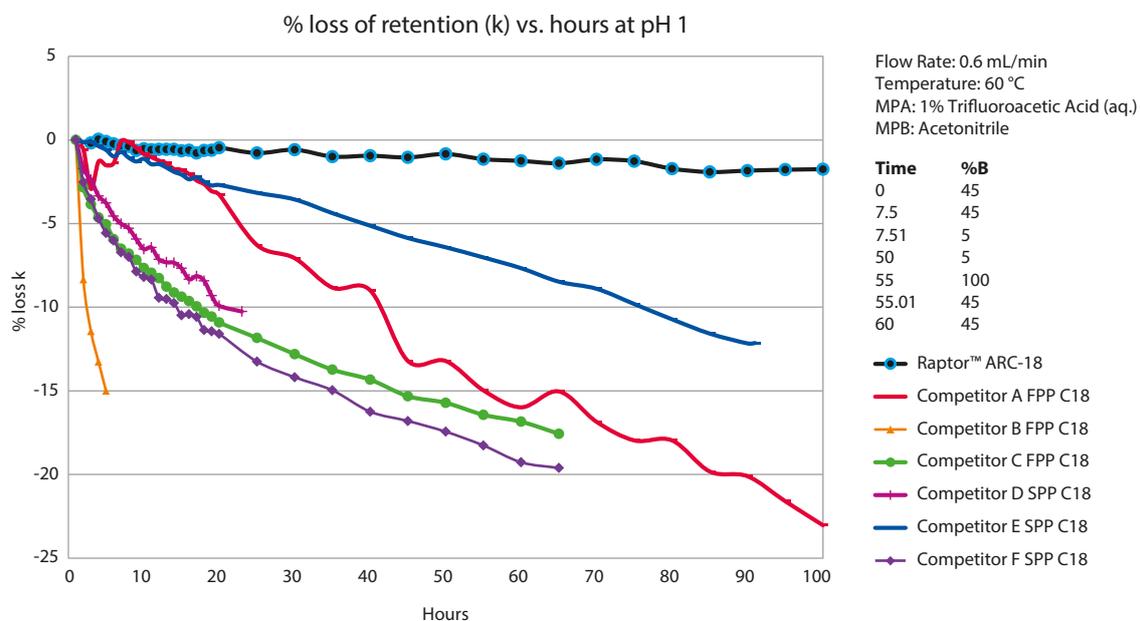
- Hydrophobic compounds
- Protonated bases



## A New Proprietary Bonded Phase Born for LC-MS/MS

The new Raptor™ ARC-18 column was designed to stand up to even the harshest acidic MS conditions. It utilizes a proprietary bonding procedure that arranges our sterically protected ligand to resist acid hydrolysis and, therefore, also resist phase degradation and bleed. This cutting-edge column lets you increase ionization and boost sensitivity in your mass spec by using low-pH mobile phases—without the fear of retention drift over time. ARC-18 columns maintain a stable retention profile (Figure 1) in mobile phases well under pH 2.0.

**Figure 1:** Steric protection helps the Raptor™ ARC-18 column endure low-pH MS mobile phases without sacrificing retention.



Part of the USLC® column set!

RESTEK®  USLC®  
 Ultra Selective Liquid Chromatography™

Learn more about USLC® technology, phase profiles, and more at [www.restek.com/uslc](http://www.restek.com/uslc)

## The New Standard for Reproducibility for SPP Core-Shell Columns

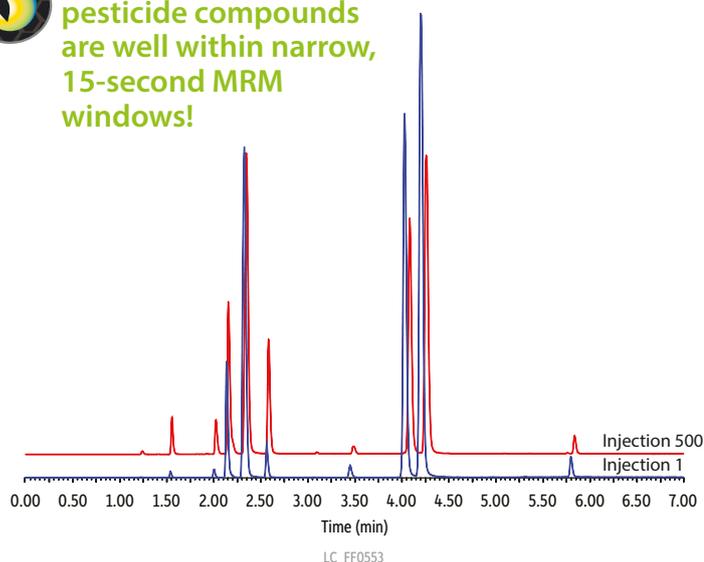
To keep your productivity high and your lab expenses low, we know that Raptor™ ARC-18 columns must produce exceptional selectivity and fast analysis times not just once, but every time. Ruggedness and repeatability are essential, which is why from the silica and the bonding technique, to the packing process and upgraded hardware, every decision that went into creating this column was made to ensure superlative reproducibility, from injection to injection (Figure 2) and from lot to lot (Figure 3). We also adopted new quality control (QC) specifications to guarantee the retention time stability you need for worry-free analyses.

One of the greatest advantages of an SPP column is the ability to operate at higher linear velocities without losing efficiency as you would with a conventional fully porous particle column. But, these higher velocities can also generate higher backpressures that rob you of performance. Like all Raptor™ columns, our new ARC-18 can handle increased pressures, and handle them longer than other manufacturers' SPP columns, to help you achieve **Selectivity Accelerated** while offering outstanding reproducibility and maintaining efficiency—even in aggressive MS conditions.

**Figure 2:** Even after hundreds of injections with a highly acidic mobile phase like 0.2% formic acid, a Raptor™ ARC-18 column will provide consistent, reliable data.

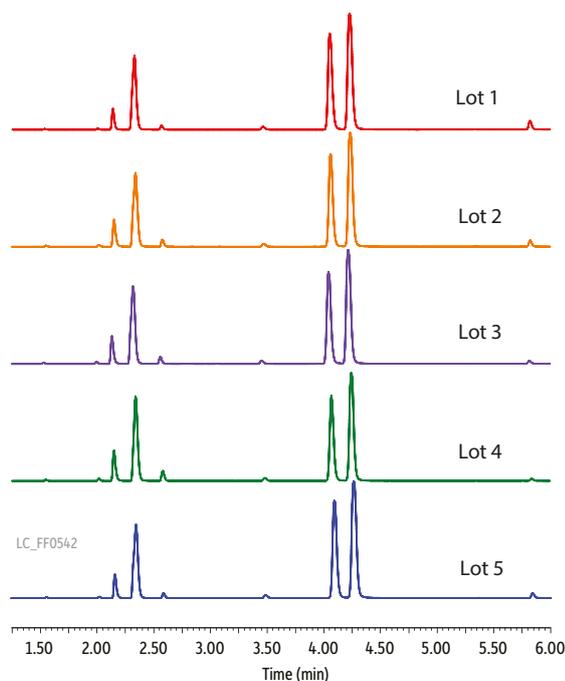


After 500 injections, pesticide compounds are well within narrow, 15-second MRM windows!



**Column:** Raptor™ ARC-18 (cat.# 9314A12); Dimensions: 100 mm x 2.1 mm ID; Particle Size: 2.7 µm; Temp.: 50 °C; **Sample:** LC multiresidue pesticide standard #1 (cat.# 31972); Diluent: Water; Conc.: 20 ng/mL; Inj. Vol.: 5 µL; **Mobile Phase:** A: Water + 2 mM ammonium formate + 0.2% formic acid, B: Methanol + 2 mM ammonium formate + 0.2% formic acid; **Gradient (%B):** 0.00 min (5%), 2.00 min (60%), 4.00 min (75%), 6.00 min (100%), 7.00 min (100%), 7.01 min (5%), 9.50 (5%); **Flow:** 0.4 mL/min; **Detector:** Waters Xevo TQ-S; Ion Source: Waters Zspray™ ESI; Ion Mode: ESI+; Mode: MRM; **Instrument:** Waters ACQUITY UPLC® I-Class

**Figure 3:** From one lot to the next, every Raptor™ ARC-18 column you purchase will perform the same.



Excellent lot-to-lot reproducibility helps ensure longevity for critical workflows.

**Column:** Raptor™ ARC-18 (cat.# 9314A12); Dimensions: 100 mm x 2.1 mm ID; Particle Size: 2.7 µm; Temp.: 50 °C; **Sample:** LC multiresidue pesticide standard #1 (cat.# 31972); Diluent: Water; Conc.: 20 ng/mL; Inj. Vol.: 5 µL; **Mobile Phase:** A: Water + 2 mM ammonium formate + 0.2% formic acid, B: Methanol + 2 mM ammonium formate + 0.2% formic acid; Max Pressure: 525 bar; **Gradient (%B):** 0.00 min (5%), 2.00 min (60%), 4.00 min (75%), 6.00 min (100%), 7.00 min (100%), 7.01 min (5%), 9.50 (5%); **Flow:** 0.4 mL/min; **Detector:** Waters Xevo TQ-S; Ion Source: Waters Zspray™ ESI; Ion Mode: ESI+; Mode: MRM; **Instrument:** Waters ACQUITY UPLC® I-Class

## Well-Balanced Retention to Quickly Separate Large, Multiclass Analyte Lists

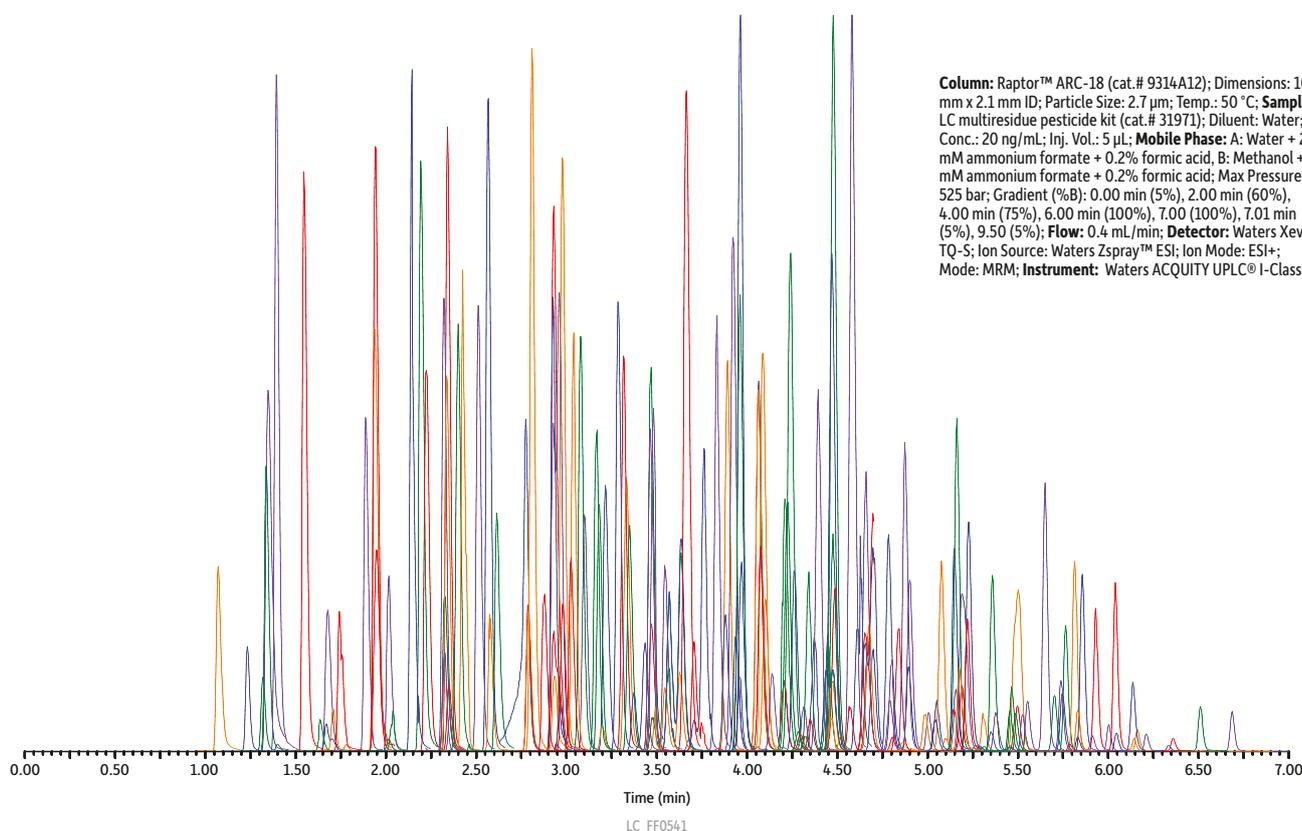
In order to analyze large lists of compounds, especially across multiple classes, your column must be capable of spreading analytes out over the gradient to ensure accurate detector response and quantitation. In designing the Raptor™ ARC-18 column, we adjusted our bonding procedures to form an ideal ligand density that offers balanced retention for the rapid analysis of large, multiclass assays. As shown in Figure 4, even a 204-compound pesticide screen can be reliably completed in just 9.5 minutes. The Raptor™ ARC-18 column exhibits the balanced retention, selectivity, and performance needed for critical multiclass workflows in any industry or lab.

**Figure 4:** With its balanced retention profile, the Raptor™ ARC-18 column is ideally suited to analyze large, cross-class compound lists.



**204 pesticides in just  
9.5 minutes!**

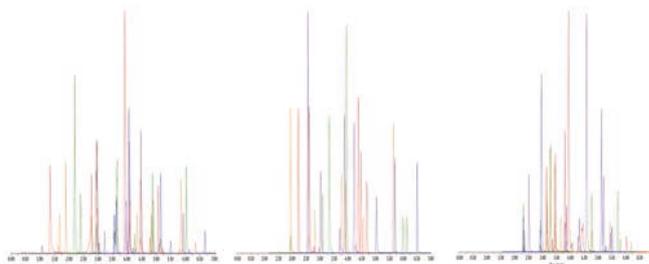
For a complete compound list, visit [www.restek.com/lc-multiresidue](http://www.restek.com/lc-multiresidue) select the LC Multiresidue Pesticide Kit (cat.# 31971).



### Note:

When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating our LC multiresidue pesticide standard kit (cat.# 31971), we extensively studied the 204 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.

To view separate chromatograms of each mix, visit [www.restek.com/lc-multiresidue](http://www.restek.com/lc-multiresidue)



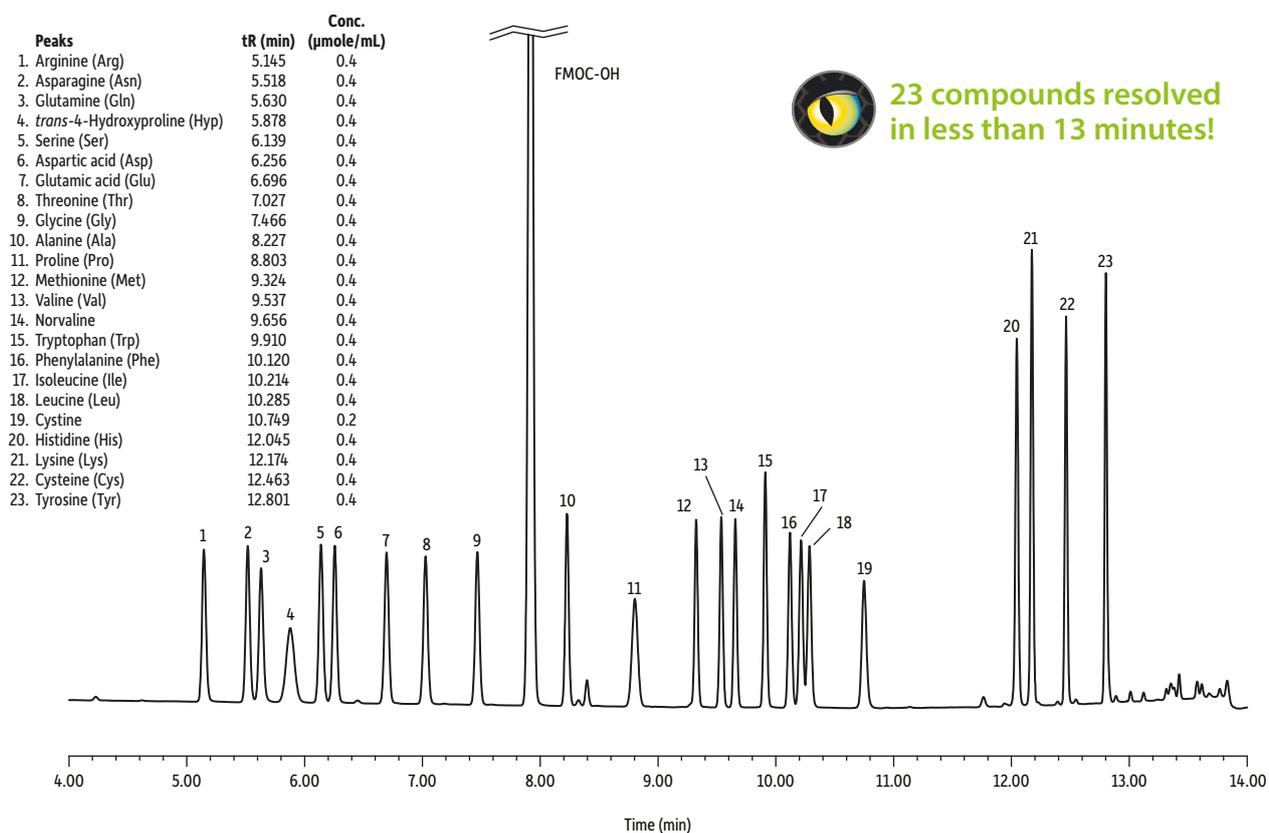
## Speed Up Challenging Analyses with Simple Mobile Phases and Methods

From food safety to bioanalytical work, getting reliable, reproducible data by LC often requires specialty instrumentation or columns, complex mobile phases, or long runs. Instead of wasting time and resources—and making your job harder in the process—you can greatly improve your productivity by selecting a better column for your existing instrumentation. By switching to a Raptor™ ARC-18 column for your LC-MS/MS analyses, you can increase your sample throughput and make your job easier by maintaining, or even improving, your data quality using simple mobile phases and a typical HPLC system. Put the ARC-18 to work in your lab today to experience **Selectivity Accelerated!**

### Amino Acids with Standard Columns on UV or Mass Spec

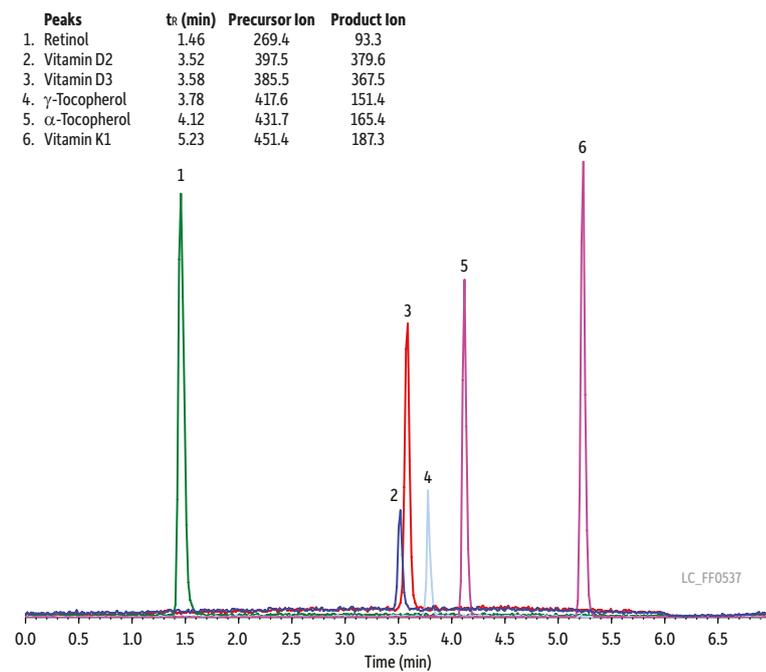
Instead of purchasing specialty amino acid columns or dedicated analyzers, use Raptor™ ARC-18 columns with your standard HPLC and UV detector to perform routine analyses of 23 common amino acids. Using 9-fluorenylmethyl-chloroformate (FMOC) derivatization and simple mobile phases, you can separate, detect, and quantitate amino acids without specialty instrumentation (Figure 5). Because of the ARC-18's compatibility with MS-friendly mobile phases, these UV methods can also be easily transferred to your mass spectrometer. And since it is a Raptor™ column, it will hold up to extended use without losing selectivity or performance.

**Figure 5:** Raptor™ ARC-18 columns exhibit excellent retention and resolution of amino acids derivatized with FMOC, including isomers leucine and isoleucine.



**Column:** Raptor™ ARC-18 (cat.# 9314A1E); Dimensions: 100 mm x 3 mm ID; Particle Size: 2.7 μm; Temp.: 30 °C; **Sample:** Diluent: 0.1 N HCl; Conc.: 0.4 μmole/mL for each amino acid (0.2 μmole/mL for cystine); Inj. Vol.: 1 μL; **Mobile Phase:** A: 0.1% Formic acid + 20 mM ammonium formate in water, B: 0.1% Formic acid + 10 mM ammonium formate in 90:10 acetonitrile:water; **Gradient (%B):** 0.00 min (20%), 6.25 min (40%), 9.00 min (60%), 10.00 min (60%), 13.00 (100%), 13.01 min (20%), 15.00 (20%); **Flow:** 0.8 mL/min; **Detector:** UV/Vis @ 265, 4.8 nm; **Instrument:** Waters Acquity® UPLC H-Class; **Notes:** Derivatization reaction: 50 μL amino acid mix + 100 μL 0.2 N borate buffer (pH 10.0) + 50 μL 15 mM 9-fluorenylmethyl-chloroformate solution + 50 μL acetonitrile; The injection can be performed after 5 minutes of reaction time.

**Figure 6:** The ARC-18 makes quick work of fat-soluble vitamins A, D, E, and K by LC-MS/MS



**Column:** Raptor™ ARC-18 (cat.# 9314A12); Dimensions: 100 mm x 2.1 mm ID; Particle Size: 2.7  $\mu$ m; Temp.: 40 °C; **Sample:** Diluent: Methanol; Conc.: 100 ng/mL; Inj. Vol.: 5  $\mu$ L; **Mobile Phase:** A: 0.1% Formic acid + 5 mM ammonium formate in water, B: 0.1% Formic acid + 5 mM ammonium formate in methanol; Max Pressure: 190 bar; **Gradient (%B):** 0.00 min (90%), 4.0 min (100%), 5.0 min (100%), 5.01 min (90%), 7.0 (90%); **Flow:** 0.5 mL/min; **Detector:** ABSCIEX API 4000™; Ion Source: TurbolonSpray®; Ion Mode: ESI+; Mode: MRM; **Instrument:** Shimadzu UFLCXR

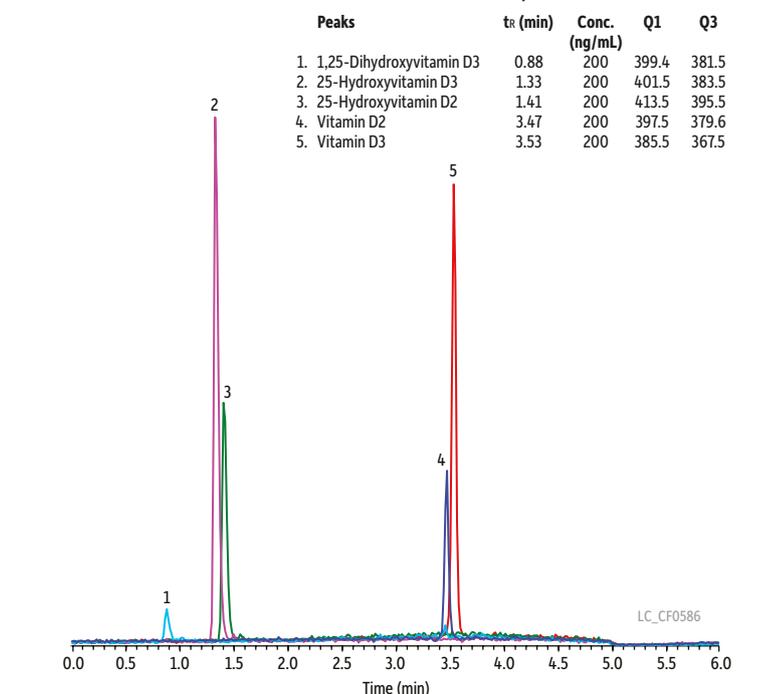
## Fat-Soluble Vitamins and Metabolites with Accelerated Run Times

Separating fat-soluble vitamins by LC can be time-consuming. The Raptor™ ARC-18 column, however, can analyze these difficult compounds using reversed-phased chromatography (RPC) in less time than traditional columns to increase productivity. The ARC-18 also stands up to the low-pH, MS-friendly mobile phases that promote ionization and fast separation while providing the balanced retention profile necessary for this important food safety workflow (Figure 6). Plus, in the bioanalytical arena, the ARC-18 can quantitate the metabolites of vitamin D using the same column and mobile phases (Figure 7).

## Toxic Substances in Agricultural Matrices Using LC

When it comes to analyzing toxic substances in agricultural matrices (e.g., aflatoxins in wheat), speed is of paramount importance. A Raptor™ ARC-18 column retains *and* separates these compounds with simple mobile phases—in a rapid time frame that maximizes your productivity (Figure 8).

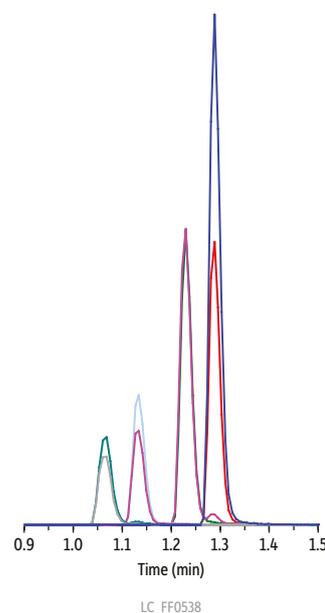
**Figure 7:** The ARC-18 also resolves vitamin D metabolites by LC-MS/MS with the same column and mobile phases



**Column:** Raptor™ ARC-18 (cat.# 9314A12); Dimensions: 100 mm x 2.1 mm ID; Particle Size: 2.7  $\mu$ m; Temp.: 40 °C; **Sample:** Diluent: Methanol; Conc.: 200 ng/mL; Inj. Vol.: 5  $\mu$ L; **Mobile Phase:** A: 0.1% Formic acid + 5 mM ammonium formate in water B: 0.1% Formic acid + 5 mM ammonium formate in methanol; **Gradient (%B):** 0.00 min (90%), 4.00 min (100%), 4.01 min (90%), 6.00 (90%); **Flow:** 0.5 mL/min; **Detector:** ABSCIEX API 4000™; Ion Source: TurbolonSpray®; Ion Mode: ESI+; **Instrument:** Shimadzu UFLCXR

**Figure 8:** The ARC-18 elutes four common aflatoxins in under 1.5 minutes with an overall cycle time of 2.5 minutes!

Peaks	tr (min)	Q1	Q3 Quantifier	Q3 Qualifier
1. Aflatoxin G2	1.07	331.1	245.1	189.1
2. Aflatoxin G1	1.13	329.0	243.1	200.1
3. Aflatoxin B2	1.23	315.0	259.1	287.1
4. Aflatoxin B1	1.29	313.0	285.1	241.1



**Column:** Raptor™ ARC-18 (cat.# 9314A5E); Dimensions: 50 mm x 3.0 mm ID; Particle Size: 2.7  $\mu$ m; Temp.: 45 °C; **Sample:** Diluent: Acetonitrile:water (50:50); Conc.: 100 ng/mL; Inj. Vol.: 10  $\mu$ L; **Mobile Phase:** A: 5 mM Ammonium formate + 0.1% formic acid in water; B: 0.1% Formic acid in methanol; **Gradient (%B):** 0.00 min (95%), 1.50 min (95%), 1.51 min (35%), 2.50 (35%); **Flow:** 0.700 mL/min; **Detector:** Applied Biosystems/MDS Sciex LC-MS/MS; Ion Source: TurbolonSpray®; Ion Mode: ESI+; **Instrument:** Shimadzu UFLCXR

# For Consistent Retention, Peak Shape, and Response with Mass Spec, Grab the Column that Thrives in Low pH Conditions

## Raptor™ ARC-18 LC Columns



Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
<b>2.7 μm Columns</b>			
30 mm	9314A32	9314A3E	9314A35
50 mm	9314A52	9314A5E	9314A55
100 mm	9314A12	9314A1E	9314A15
150 mm	9314A62	9314A6E	9314A65
<b>5 μm Columns</b>			
30 mm	—	931453E	—
50 mm	9314552	931455E	9314555
100 mm	9314512	931451E	9314515
150 mm	9314562	931456E	9314565
250 mm	—	—	9314575

## EXP® Reusable Fittings for HPLC & UHPLC

for 10-32 fittings and 1/16" tubing

Effortlessly achieve 8,700+ psi HPLC seals by hand! (Wrench-tighten to 20,000+ psi.) Hybrid titanium/PEEK seal can be installed repeatedly without compromising your seal.



Description	qty.	cat.#
EXP Hand-Tight Fitting (Nut w/Ferrule)	ea.	25937
EXP Hand-Tight Fitting (Nut w/Ferrule)	10-pk.	25938
EXP Hand-Tight Nut (w/o Ferrule)	ea.	25939

Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Opti- prefix is a registered trademark of Optimize Technologies, Inc.

Experience *Selectivity Accelerated*. Order the Raptor™ ARC-18 today at [www.bgb-info.com/raptor](http://www.bgb-info.com/raptor)



## Raptor™ EXP® Guard Cartridges



Protect your investment and extend the life of our already-rugged LC columns and change guard column cartridges by hand without breaking fluid connections—no tools needed!

## EXP® Direct Connect Holder

Description	qty.	cat.#
EXP Direct Connect Holder for EXP Guard Cartridges (includes hex-head fitting & 2 ferrules)	ea.	25808

## Raptor™ EXP® Guard Column Cartridges

Description	Particle Size	qty.	5 x 2.1 mm cat.#	5 x 3.0 mm cat.#	5 x 4.6 mm cat.#
Raptor ARC-18 EXP Guard Cartridge	2.7 μm	3-pk.	9314A0252	9314A0253	9314A0250
Raptor ARC-18 EXP Guard Cartridge	5 μm	3-pk.	931450252	931450253	931450250

Maximum cartridge pressure: 600 bar / 8,700 psi (2.7 μm) or 400 bar / 5,800 psi (5 μm)  
Raptor™ SPP LC columns combine the speed of SPP with the resolution of USLC® technology. Learn more at [www.restek.com/raptor](http://www.restek.com/raptor)