HUMAN HEALTH

ENVIRONMENTAL HEALTH

UNIVERSAL LC COLUMNS FOR ALL YOUR METHODS

Universal LC Column Guide

PerkinElmer®
For the Better

MAKE YOUR LAB A PLACE WHERE EFFICIENCY MEETS SAVINGS

Switch to Universal LC Columns for All Your Methods

Are you using different types of HPLC columns from various manufacturers in your lab to cover all your application needs?

Nowadays, it's so common to find labs with more than 50 different types of LC columns - with the vast majority being reverse-phase formats. Often, many of these columns have similar features, properties and analytical performance, but vary in price, supplier and manufacturer.

Have you ever thought how your lab and daily work could improve with fewer column types and suppliers for all your LC columns?

With our new Universal LC column line, you can now move to just one column supplier. You can count on our knowledge and expertise to provide the best columns for all your application needs.

Our Universal LC columns are designed as a solution to reduce the column management complexity in your lab, saving you time and money. This new HPLC column family covers a vast range of selectivity allowing you to easily replace your current LC column, while maintaining the same results and level of performance.

Our new wide selection of top quality Universal HPLC selectivity columns for liquid chromatography provide:

- Wide choice of selectivity, dimensions and particle size.
- Same or superior analysis results.
- Easy fit to any HPLC regardless of manufacturer.
- Longevity, performance and reproducibility.
- Simplified column management: one point of contact for all your columns.
- Increased efficiencies with cost savings of up to 20%.
- Match columns quickly with online cross reference tool.
- Overall increased lab productivity.

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UNIVERSAL HPLC COLUMN FAMILY

With our Universal column family you can choose from 50 different phases and more than 20 types of C18 material - with particle sizes ranging from 2 µm to 10 µm. Our wide selection covers the entire spectrum of analytical needs for HPLC applications.

There are three categories of phases available within our column portfolio:

1. Columns for small molecules in modern phases based on ultra-pure silica and new bonding technologies. These columns are designed for the separation of organic molecules with pore sizes ranging from 100 Å to 120 Å. In this group we have eight different C18 columns with different types of bonding and end capping. See Figure 1 for guidance on how to choose one of these C18 columns, depending on your sample polarity and pH.

SMALL MOLECULE COLUMNS						
Column	Phase	Surface Area (m^2/g)	End Cap	pH Range	USP Code	Separation Mode
C18HD	C18 - octadecyl	425	Multi step	1.0-12.0	L1	Reverse
C18	C18 - octadecyl	425	Multi step	1.0-10.0	L1	Reverse
C18XB	C18 - octadecyl	425	Mixed	1.5-8.0	L1	Reverse
C12	C12 - dodecyl	425	One step	1.5-8.0	–	Reverse
PH	Phenyl	425	One step	1.5-7.5	L11	Reverse
HILIC		400	–	1.5-7.0	L3	Hilic
SI	Si - silica	425	–	1.5-7.0	L3	Normal
C18AQ	C18 - octadecyl	320	Mixed	1.5-7.0	L1	Reverse
C18NC	C18 - octadecyl	320	–	1.5-6.5	L1	Reverse
PAH	C18 - octadecyl		Poly - functional	1.5-7.0	L1	Reverse
C8	C8 - octyl	320	One step	2.0-7.0	L7	Reverse
CN	CN - cyano	320	One step	2.0-7.0	L10	Reverse/normal
DIOL	OH - diol	320	–	1.5-6.5	L20	Reverse/normal
NH2	NH2 - amino	320	–	2.0-6.5	L8	Reverse/normal/ion exchange
SCX	SCX	320	–	1.0-7.5	L50	Ion exchange
SAX	SAX	320	–	1.0-7.5	L14	Ion exchange

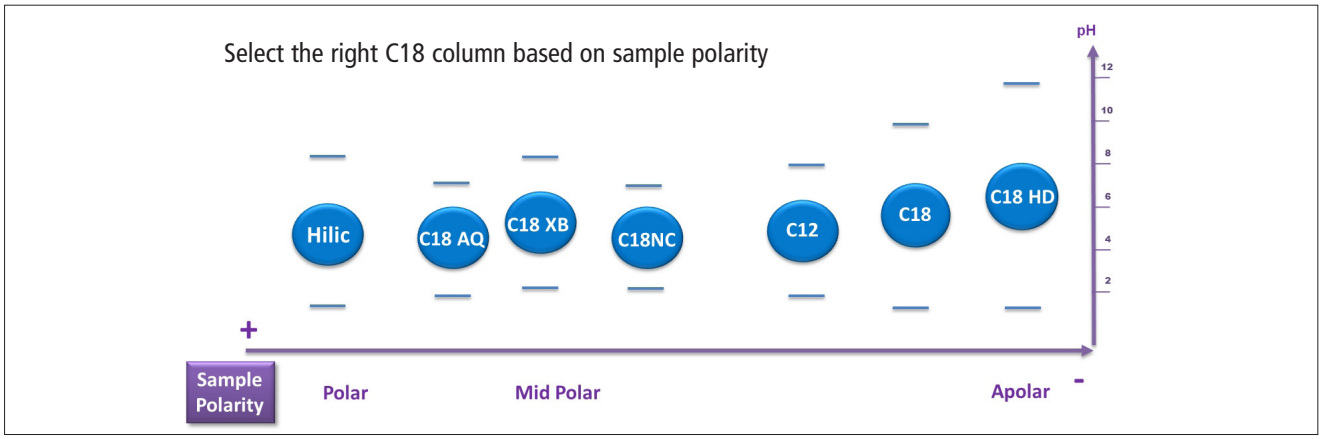

Figure 1. Select the right C18 column based on sample polarity.

2. Columns specifically designed for the separation of biomolecules, like peptides, poly-peptides and small proteins. Pore sizes from 130 Å to 300 Å.

BIO CHROMATOGRAPHY COLUMNS						
Column	Phase	Pore Diameter (Å)	End Cap	pH Range	USP Code	Separation Mode
Bio C18PT	C18 - octadecyl	130	Multi step	1.0-13.0	L1	Reverse
Bio C18	C18 - octadecyl	220	Multi step	1.0-13.0	L1	Reverse
Bio C18AQ2	C18 - octadecyl	220	Mixed	1.0-10.0	L1	Reverse
Bio C8	C8 - octyl	220	Multi step	1.0-13.0	L7	Reverse
Bio C4	C4 - butyl	220	Multi step	1.0-13.0	L26	Reverse
Bio C18PP	C18 - octadecyl	300	One step	1.5-7.0	L1	Reverse
Bio C4PP	C4 - butyl	300	One step	1.5-8.0	L26	Reverse

3. "First generation material" columns. These columns are similar to many popular phases commercially available for years, such as: Nucleosil®, Kromasil®, LichroSpher®, Zorbax®, and Inertsil® to name a few. Equivalences are detailed in the following table.

FIRST GENERATION COLUMNS						
Column	**Phase**	**Surface Area (m^2/g)**	**End Cap**	**pH Range**	**USP Code**	**Equivalent To**
H-C18	C18 - octadecyl	200	Yes	2.0-7.5	L1	Hypersil C18
H-C8	C8 - octyl	200	–	2.0-7.5	L7	Hypersil C8
H-NH2	NH2 - amino	200	Yes	2.0-7.5	L8	Hypersil NH2
H-Si	Si - silica	200	–	2.0-7.5	L3	Hypersil Si
H-BC18	C18 - octadecyl	200	Yes	2.0-8.0	L1	Hypersil BDS
KR-C18	C18 - octadecyl	350	Yes	2.0-7.5	L1	Kromasil C18
KR-C8	C8 - octyl	350	Yes	2.0-7.5	L7	Kromasil C8
KR-Si	Si - silica	350	–	2.0-7.5	L3	Kromasil Si
L-RP18	C18 - octadecyl	350	–	2.0-7.5	L1	Lichrosorb RP18
L-RP8	C8 - octyl	350	–	2.0-7.5	L7	Lichrosorb RP8
L-NH2	NH2 - amino	350	–	2.0-7.5	L8	Lichrosorb NH2
L-Si	Si - silica	350	–	2.0-7.5	L3	Lichrosorb Si
LR-RP18	C18 - octadecyl	370	No	2.0-7.5	L1	Lichrospher RP18
LR-RP18E	C18 - octadecyl	370	Yes	2.0-7.5	L1	Lichrospher RP18E
LR-RP18B	C18 - octadecyl	380	–	2.0-7.5	-	Lichrospher RP Select B
N-C18	C18 - octadecyl	350	Yes	2.0-7.5	L1	Nucleosil C18
N-C8	C8 - octyl	350	Yes	2.0-7.5	L7	Nucleosil C8
N-Si	Si-silica	350	–	2.0-7.5	L3	Nucleosil Si
P-SCX	SCX - Strong cation exchange	350	–	2.0-7.5	L50	Partisil SCX
P-SAX	SAX - Strong cation exchange	350	–	2.0-7.5	L14	Partisil SAX
S-OD1	C18 - octadecyl	220	–	2.0-7.5	L1	Spherisorb ODS-1
S-OD2			Yes	2.0-7.5	L1	Spherisorb ODS-2
S-NH2	NH2 - amino	220	–	2.0-7.5	L8	Spherisorb NH2
S-Si	Si - silica	220	–	2.0-7.5	L3	Spherisorb Si
Z-ODS	C18 - octadecyl	330	Yes	2.0-7.0	L1	Zorbax ODS
Z-C8	C8 - octyl	330	Yes	2.0-7.0	L7	Zorbax C8
Z-CN			–	2.0-7.0	L10	Zorbax CN
Z-NH2	NH2 - amino	330	–	2.0-7.0	L8	Zorbax NH2
Z-Si	Si - silica	330	–	2.0-7.0	L3	Zorbax Si
I-ODS3	C18 - octadecyl	450	Yes	2.0-7.5	L1	Inertsil ODS-3
I-ODS2	C18 - octadecyl	320	Yes	2.0-7.5	L1	Inertsil ODS-2
I-C8-3	C8 - octyl	320	Yes	2.0-7.5	L7	Inertsil C8-3
I-PH-3	Phenyl	450	–	2.0-7.5	L11	Inertsil PH-3
I-CN-3	CN - cyano	450	–	2.0-7.5	L10	Inertsil CN-3
I-C8	C8 - octyl	450	Yes	2.0-7.5	L7	Inertsil C8
I-C4	C4 - butyl	320	Yes	2.0-7.5	L26	Inertsil C4
I-PH	Phenyl	320	Yes	2.0-7.5	L11	Inertsil PH

QUALITY, PERFORMANCE AND REPRODUCIBILITY

We all know how important the selectivity is for the separation of compounds – but just as important is quality and reproducibility. Our Universal HPLC columns are manufactured with high purity silica and superior raw material all under very strict manufacturing processes and packing procedures. This results in a final product with tight specifications and high column-to-column and batch-to-batch reproducibility.

Every Universal column is shipped with a certificate of analysis. See Figure 2.

The quality of the materials and packing procedures also have an effect on column lifetime. Our columns last for thousands of injections with very minimal loss in performance. See Figure 3. The excellent column pH stability also contributes to the robustness and outstanding column life, see Figures 4a and 4b.

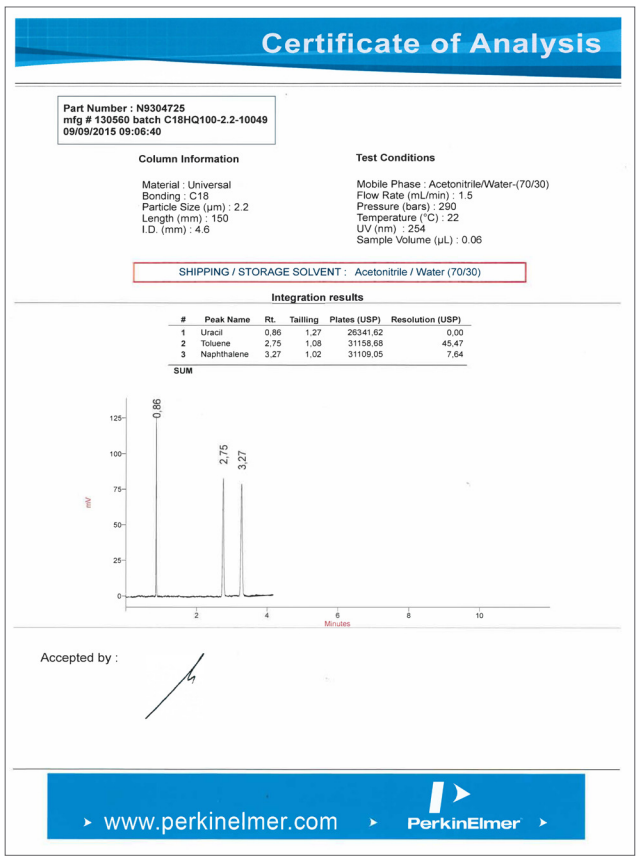

Figure 2. Certificate of analysis.

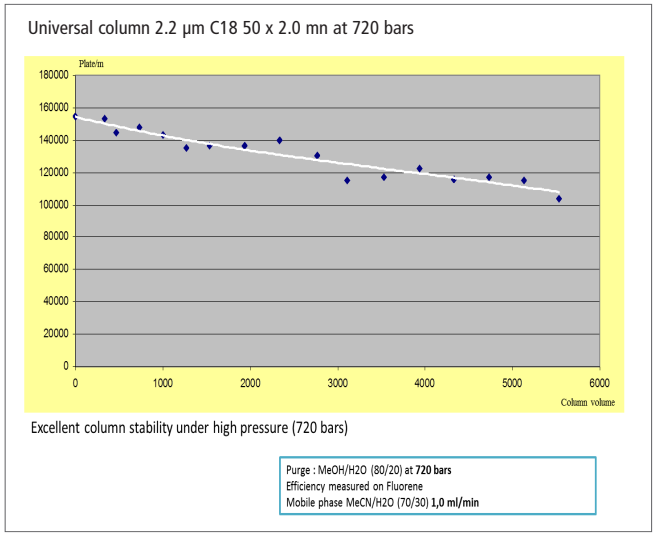

Figure 3. Universal C18 column lifetime.

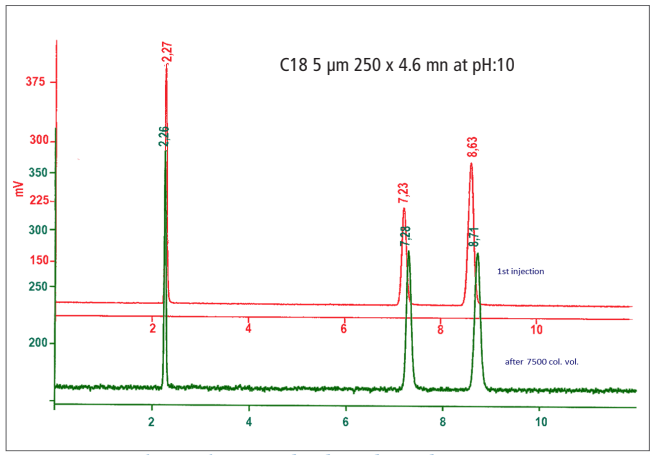

Figure 4a. Universal C18 column tested under acidic conditions.

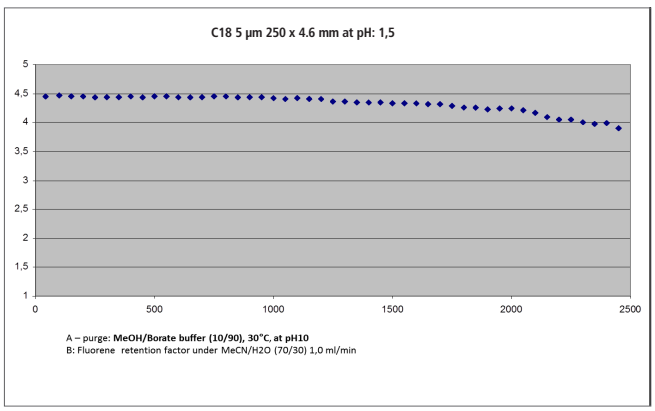

Figure 4b. Universal C18 column test under basic conditions .

EFFICIENCY AND HIGH PACKING QUALITY

Selectivity and efficiency are both crucial to achieve separation. Column efficiency, also known as plate number, is a measure of the dispersion of a peak, and is typically defined by two parameters:

- Peak broadening
- Peak symmetry, usually described by a peak asymmetry factor As

Column efficiency is proportional to column length and is influenced by particle size and packing quality.

LC columns packed with smaller particle sizes are more efficient because the diffusion paths are shorter. This allows a quicker transfer of solutes in and out of the particle, while reducing band broadening.

The series of chromatograms in Figure 5 show the evolution of efficiency vs. column length. When column length increases the plate numbers also increase. However, if we look closely at the plate number per meter (N/m) we notice that it remains stable and there is very little variation (less than 13%). This demonstrates the high quality of our LC column packing.

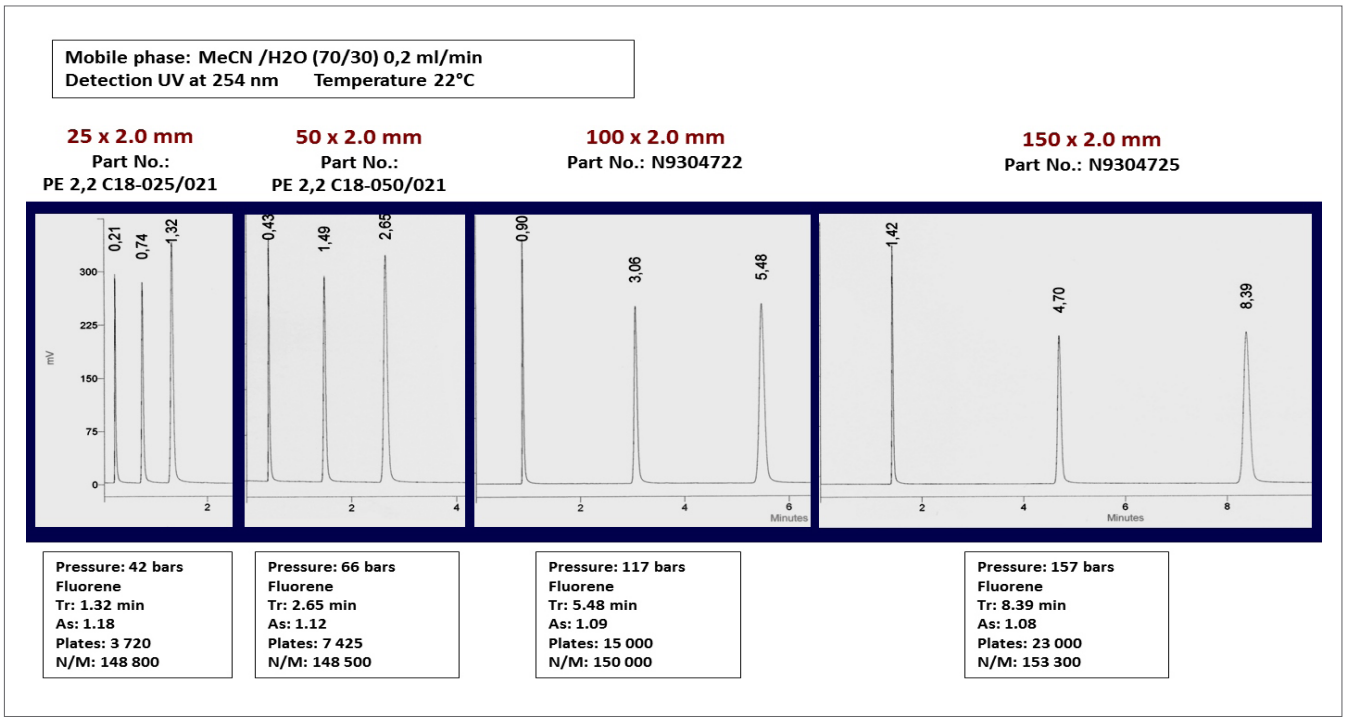

Figure 5. Universal C18 column 2,2 µm high packing efficiency.

COLUMN SELECTIVITY

Selectivity is the ability of an HPLC method to separate two analytes from each other. Selectivity usually is abbreviated with the letter α, and is calculated as: α = k2 / k1 , where k1 and k2 are the retention factors of the first and second peaks, as shown in Figure 6.

It is very important to understand that selectivity is not the same as efficiency or retention, and resolution encompasses these three fundamental parameters of chromatography.

Which parameters influence selectivity?

Selectivity is changed when there is a change in the chemistry of the chromatographic system. In HPLC practice, there are two main variables: the nature of the solvent(s) and the stationary phase (the material inside the column).

The following chromatograms in Figures 7 and 8 show that different brand C18 columns can have the same selectivity, but can also lead to different results.

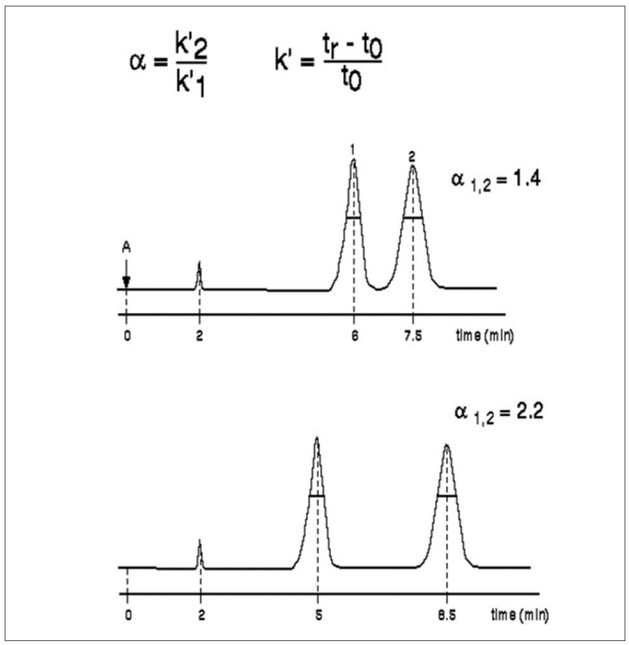

Figure 6. Selectivity.

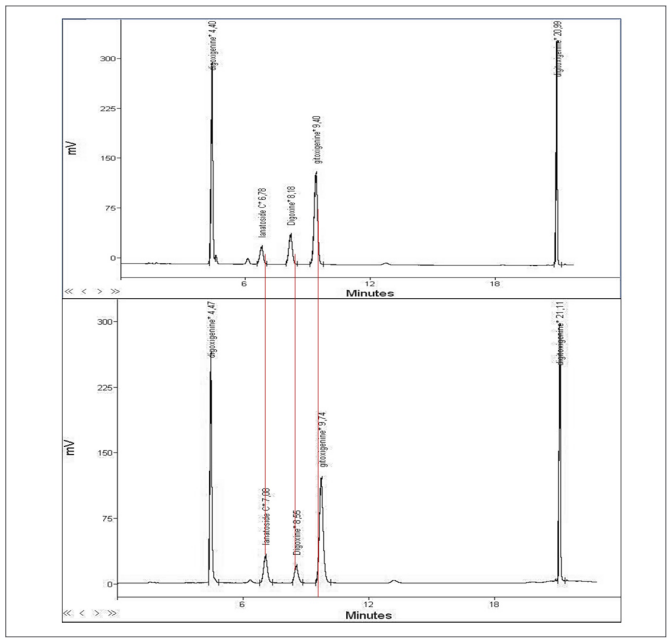

Figure 7. Comparison of a Universal C18 250 x 4,6mm with column C18 LU. Sample: Digitalin A: Digoxigenine, B: Lanatoside C: Digoxine, D: Gitoxigenine, E: Digitoxigenine.

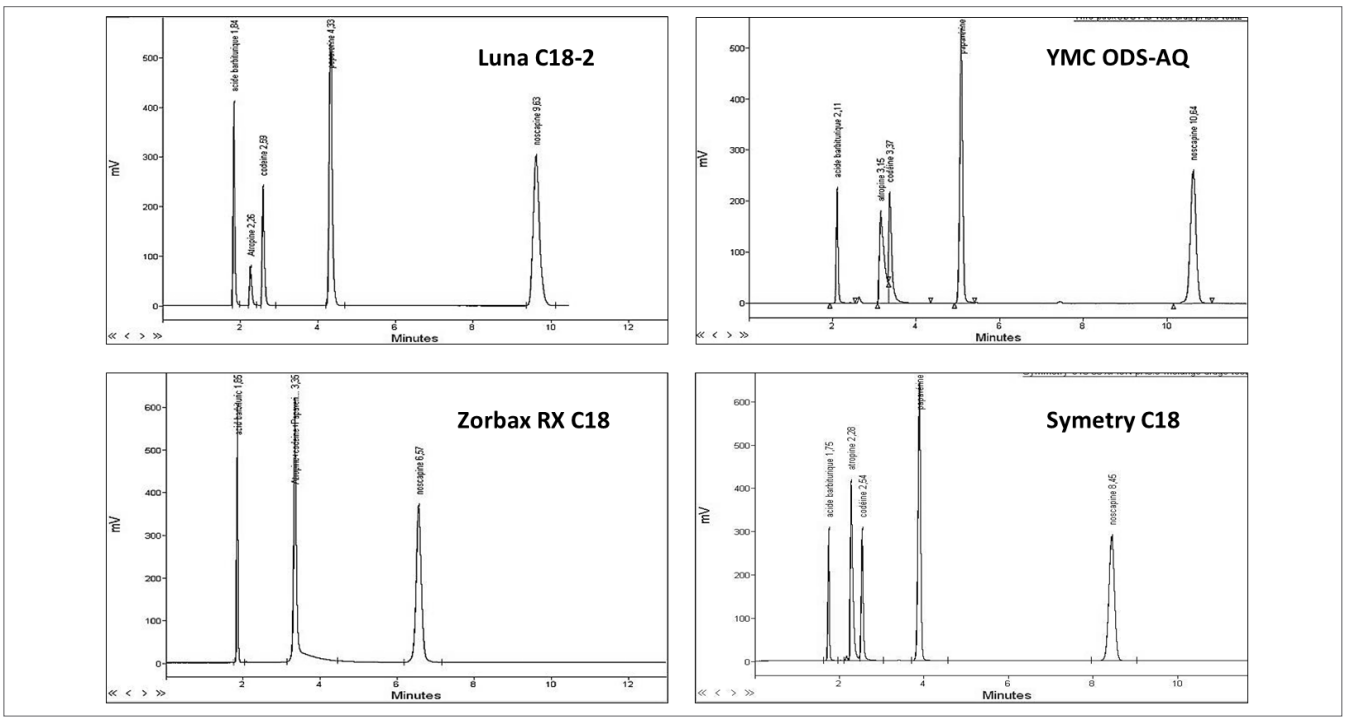

Figure 8. Selectivity on four different C18 columns. Sample: neutral drugs. A: Bartituric Acid, B: Atropire, C: Cadeine, D: Papaverine, E: Nascapine.

ARE ALL C18 COLUMNS EQUIVALENT TO ONE ANOTHER?

C18 or RP18 columns represent more than 60% of all analytical columns used in laboratories. Several hundred types of C18 columns are commercially available with various dimensions, silica and bonding techniques. The specifications of many commercially available columns are rather close - if not identical - to one another. Often, the only real difference is the commercial name itself. In other words, it is possible to replace one brand of C18 column with another brand of C18. However, this change can be challenging. In order to predict if an alternative column will give the same results, there is a need for classification and column characterization. Once characterized, we also need to deal with the range of stationary phases to cover the spectrum of various selectivities.

HOW DO I FIND THE RIGHT COLUMN?

New LC Column Finder Web Tool Makes Your Search Quick and Easy

Most of the commercially available column finder tools present in the market, in order to find the right column, compare chemical/physical properties of the stationary phase - such as Specific Area, Carbon Load, Pore Size, etc. This is a classic approach, useful as a starting point, but very often is not rigorous enough to fully characterize the behavior of a column. Sometimes two columns with similar physical-chemical properties can still produce different chromatographic results depending on the specific analytes, therefore, additional chromatographic evaluation should be performed. Well known chromatographists and scientists as Tanaka, Engelhar, Tchapla, Sander and Wise have developed various tests to characterize C18 columns. Some of these tests are commercially available. Generally, this evaluation relies on the determination of hydrophobicity, shape selectivity, hydrogen bond capacity, ion exchange capacity, and metal content impurities. These chromatography tests generate large amounts of data, but none of the tests are able to elaborate and give an exhaustive view on the column behavior. Therefore, additional steps are needed to transform this data into readable information.

How Our Column Finder Differs

To make the tool quickly classify columns according to their selectivity, we applied a chemometric approach; more specifically a Principal Component Analysis (PCA). PCA is a powerful way of identifying patterns in data, and expressing the results in such a way as to highlight their similarities and differences. This is especially helpful when graphical representation is not available and as a result, patterns are extremely difficult to find in such complex data. These factors make PCA an ideal tool to analyze such data.

Based on this approach, we developed an innovative HPLC column finder web tool to make your alternative column search very easy and extremely accurate.

The Universal LC column finder is based on chemical/physical properties and retention characteristics of more than 200 C18 columns and recommends a similar or very close selectivity alternative columns with a very high degree of confidence. See Figures 9 and 10.

- Finds the right LC column in one minute
- Search with only one of the following options:
  - your current column part number
  - brand and/or bonding/dimensions
- More than 20,000 columns in the database
- Accurate and confident search results at all times

Try our column finder tool today at www.perkinelmer.com/columnfinder

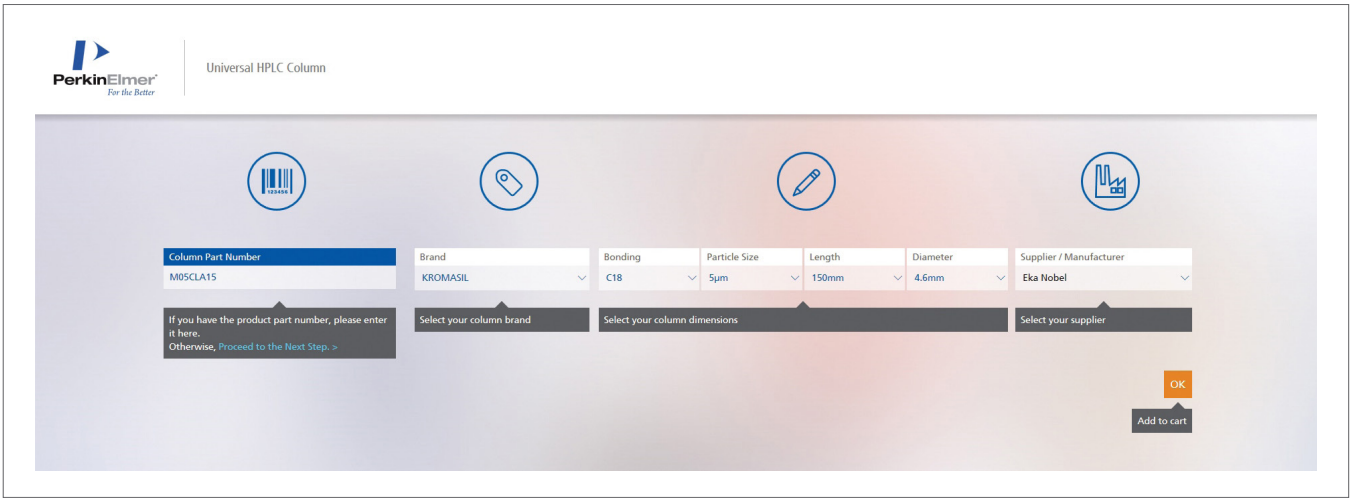

Figure 9. LC columns can be searched by simply entering a part number or column specifications.

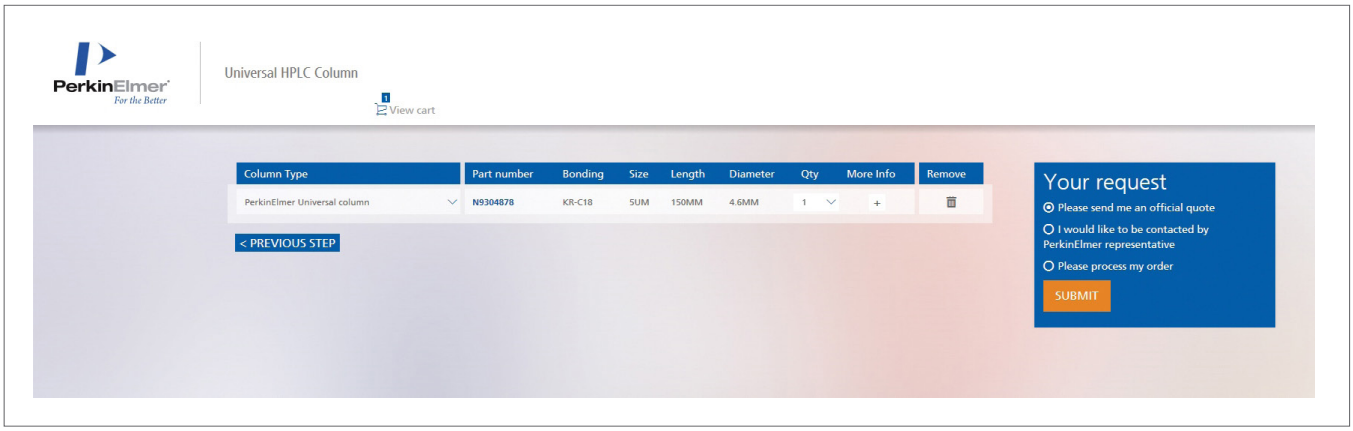

Figure 10. As your search result the finder will display one alternative column.

SUPERIOR LAB EFFICIENCY AND SAVINGS WITH ONE POINT OF CONTACT

Easier LC column management. Lower prices. High quality. What more could you wish for?

At PerkinElmer, we are committed to providing you with the best selection of solutions for all your Chromatography needs, regardless of instrument make, model or manufacturer. The right accessories, consumables, method and application support ensure you will receive the accurate and repeatable results you need - on-time and every time, becoming integral to the success of your laboratory. We listened to your needs and continue to invest in growing our portfolio to bring you a wide selection of validated and tested, best performing, productivity enhancing and cost saving consumables, just as the new Universal LC columns, for all your liquid chromatography systems.

For more information contact your local PerkinElmer representative or email us at consumables@perkinelmer.com

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