

# VIVA™ Wide Pore HPLC Columns

Exceptional Performance for Peptides,  
Proteins, or Other Large Molecules



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## We start with the best wide pore silica...

- Largest available surface area in 250-350Å pores—ideal for larger molecules.
- Excellent base deactivation.
- Viva™ silica manufactured by Restek for consistency.

Conventional reversed phase HPLC packing materials with 60-150Å pores generally are poorly suited for separating peptides, proteins, or other larger biomolecules. The analyte molecules cannot access the surface area within these pores, and the pores can be fouled with large molecular weight debris. Silicas with wider pores address this need for more resolving power: theoretically, larger analytes enter the pores, access more of the surface, and are retained longer, promoting better selectivity.

For analytes with molecular weights larger than 3000, pore diameters of 250-350Å offer the best combination of retention and stability - pores larger than 500Å can make a silica impractically fragile for many applications. A narrow distribution about the mean pore diameter can aid in separating analytes that differ only slightly in hydrodynamic size. A large pore volume allows more analyte molecules into the pores, and provides better separations of complex mixtures. Pore volumes exceeding 1.2mL/g, however, make the silica particles more fragile.

In developing Viva™ wide pore silica, we evaluated materials from other manufacturers, and found some do not possess sufficient pore volume in the pore diameter range needed for effectively separating large molecules. Of the materials we tested, Viva™ 300Å silica has the greatest available surface area in 250-350Å pores (Table I), and the greatest percentage of pores narrowly distributed around the mean diameter (Figure 1).

## ...which makes exceptional HPLC columns...

- Excellent efficiency and peak symmetry.
- Best selectivity and retention among five tested manufacturers' columns.

We compared column efficiency, peak asymmetry, and retention for Viva™ C18 and four other popular C18 wide pore columns. Table II and Figure 2 show the Viva™ column ranked highest in retention and selectivity and produced the best peak symmetry measurements.

## ...for peptides, proteins, or other large molecules.

- Exceptional selectivity, for resolving larger biomolecules.
- Excellent base deactivation, for more symmetrical peaks and greater sensitivity without mobile phase modifiers.

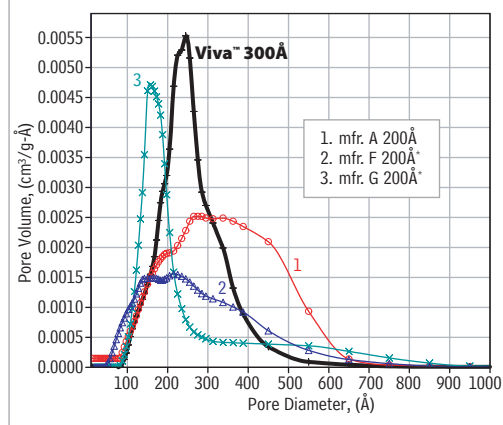
Even with wide pore packings, limitations often are encountered when samples contain closely related compounds, such as complex tryptic digests or genetic variants of a protein. These applications call for columns with maximum resolving power.

Viva™ HPLC columns are ideal for challenging analyses. To determine overall separating power, retention, and peak shape, we evaluated each manufacturer's column with peptide and protein test mixes. The Viva™ C18 column provided excellent resolution and peak shapes, as Figures 3 and 4 show.

Size exclusion studies show Viva™ wide pore columns are well suited for analyses of molecules over a weight range of approximately 800 to 212,000 Dalton. For additional technical information about Viva™ wide pore columns, request Restek Advantage 2005v1 (lit.# 59077) and 2005v2 (lit.# 59923).

Exceptionally large available surface area, a highly desirable pore volume, and a narrow pore diameter distribution help ensure effective retention of peptides, proteins, or other large molecules, and make Viva™ wide pore columns the best choice for your analysis.

**Figure 1** Only Viva™ silica has a majority of pores in the 250-350Å range, in a narrow distribution. (BJH desorption)



\*Materials F and G are 200Å materials being sold as 300Å.

**Table I** Viva™ silica has the largest available surface area in 250-350Å pores, allowing the greatest interaction with large molecules.

Silica	Surface Area (m²/g)		Total Desorp	BET	Total Pore Volume (mL/g)
	0-100Å	250-350Å			
<b>Nominal Pore Diameter (300Å)</b>					
Viva™ lot X	1.6	46.5	144.5	116.9	0.880
Viva™ lot Y	2.3	40.6	138.6	112.4	0.823
mfr. A	2.9	34.4	118.2	101.6	0.885
mfr. A	4.2	33.1	130.3	111.3	0.941
mfr. B	3.7	22.2	83.6	73.9	0.627
<b>Nominal Pore Diameter (200Å)</b>					
mfr. A	41.0	2.7	231.6	189.2	0.852
mfr. A	34.1	0.9	243.4	200.0	0.911
mfr. D*	9.2	23.0	158.4	129.8	0.795
mfr. E	21.7	19.2	90.7	93.0	0.509
mfr. F*	24.7	15.6	105.8	58.5	0.530
mfr. G*	2.6	6.7	115.3	91.6	0.595

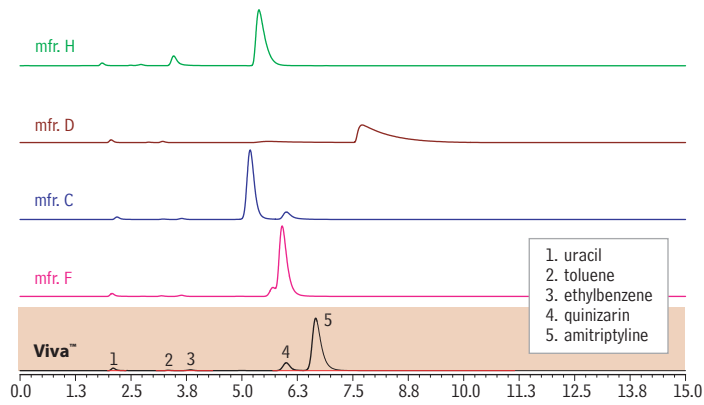
\*Materials D, F, and G are 200Å materials being sold as 300Å.

**Table II** Viva™ wide pore columns provide the best overall performance.

Column	Efficiency (plates/m) (10³)	Asymmetry (biphenyl)	Retention Time (biphenyl)	Pressure (bar)
Viva™ C18	>50	1.16	6.30	60
mfr. F C18	>50	1.30	5.89	66
mfr. C C18	~50	1.46	5.77	72
mfr. D C18	>50	1.46	4.96	102
mfr. H C18	<50	1.49	3.79	80

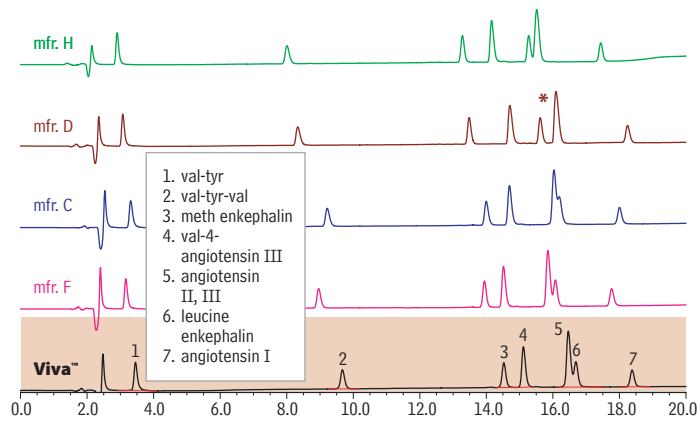
150 x 2.1mm C18 phase columns, 5µm particles; reversed phase test mix

**Figure 2** Viva™ C18: best overall retention and peak symmetry.



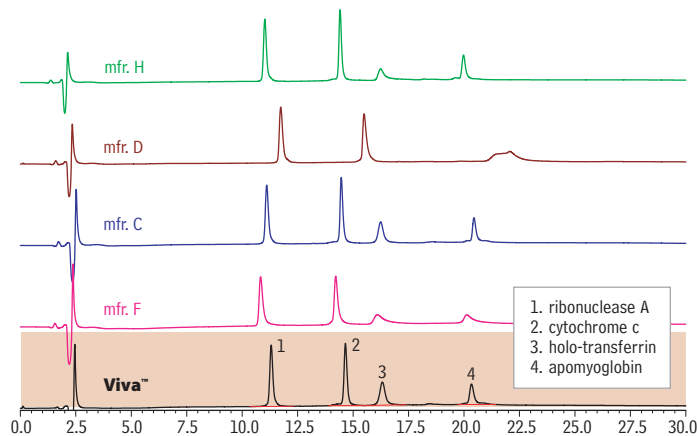
150 x 2.1mm C18 phase columns, 5µm particles; reversed phase test mix  
 Mobile Phase: water:methanol, 25:75 v/v; Flow Rate: 0.2mL/min.; Detection: UV, 254nm; Sample: 10µL HPLC Performance (NIST 870) Test Mix (cat.# 31699)

**Figure 3** Viva™ C18: excellent resolution of peptides.



150 x 2.1mm C18 phase columns, 5µm particles; peptide test mix.  
 Mobile Phase: A - 0.08% trifluoroacetic acid in water (pH 2.0), B - 0.08% TFA in acetonitrile, 10% B to 40% B in 20 min.; Flow Rate: 0.2mL/min.; Detection: UV, 214nm; Injection: 20µL eight peptide test mix  
 \* High levels of trace metals (~100ppm) in the silica enhance this separation.

**Figure 4** Viva™ C18: superior performance with proteins.



150 x 2.1mm C18 phase columns, 5µm particles; four-protein test mix.  
 Mobile Phase: A - 0.1% TFA in water, pH 2.0, B - 0.1% TFA in acetonitrile, 20% B to 70% B in 30 min.; Flow Rate: 0.2mL/min.; Detection: UV, 214nm; Injection: Four Protein Standard Test Mix



## Viva™ wide pore HPLC columns, only from Restek - we think you will be impressed!

Superior physical characteristics and strong evaluation performances show Viva™ columns are an excellent choice for analyzing peptides, proteins, or other larger molecules or biomolecules. For the best results from your large molecule analysis, talk with us about Viva™ columns, today.

C18, C8, C4, and silica columns currently available; other phases and particle sizes on request.

Bulk packing materials also are available.



### guard columns

#### To order:

2.1mm, 3.2mm, or 4.6mm ID column with a Trident™ Integral Inlet Fitting, add "-700" to the catalog number for the column.

Example: 100mm x 4.6mm ID Viva™ C18 column with Trident™ Integral Inlet Fitting: 9514515-700

Nominal additional charge for guard cartridges and fittings for these columns, see our catalog or visit our website.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
<b>Viva™ C18 5µm Columns</b>				
30mm	9514531	9514532	9514533	9514535
50mm	9514551	9514552	9514553	9514555
100mm	9514511	9514512	9514513	9514515
150mm	9514561	9514562	9514563	9514565
200mm	9514521	9514522	9514523	9514525
250mm	9514571	9514572	9514573	9514575
<b>Viva™ C8 5µm Columns</b>				
30mm	9513531	9513532	9513533	9513535
50mm	9513551	9513552	9513553	9513555
100mm	9513511	9513512	9513513	9513515
150mm	9513561	9513562	9513563	9513565
200mm	9513521	9513522	9513523	9513525
250mm	9513571	9513572	9513573	9513575
<b>Viva™ C4 5µm Columns</b>				
30mm	9512531	9512532	9512533	9512535
50mm	9512551	9512552	9512553	9512555
100mm	9512511	9512512	9512513	9512515
150mm	9512561	9512562	9512563	9512565
200mm	9512521	9512522	9512523	9512525
250mm	9512571	9512572	9512573	9512575
<b>Viva™ Silica 5µm Columns</b>				
30mm	9510531	9510532	9510533	9510535
50mm	9510551	9510552	9510553	9510555
100mm	9510511	9510512	9510513	9510515
150mm	9510561	9510562	9510563	9510565
200mm	9510521	9510522	9510523	9510525
250mm	9510571	9510572	9510573	9510575



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