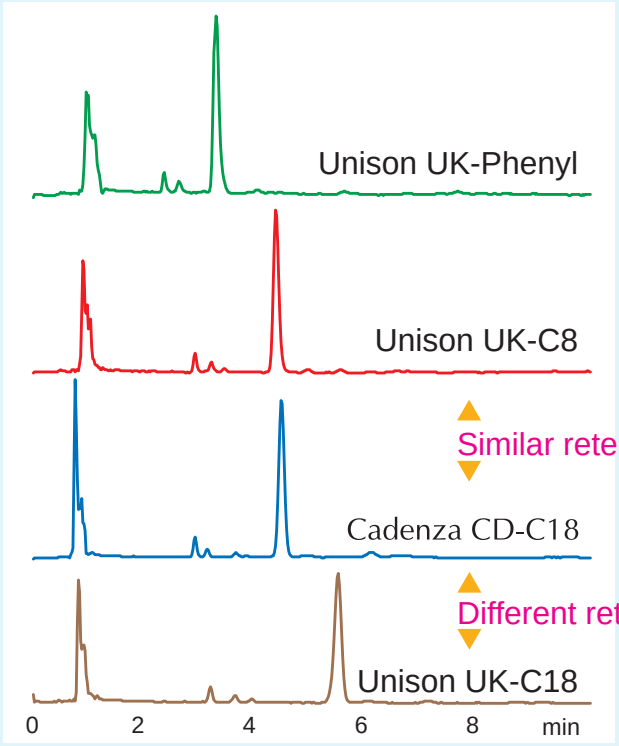
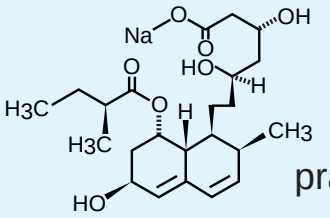
Unison Cadenza 75 x 4.6 mm Technical

Out of elution order by electrostatic interaction





pravastatin

75 x 4.6 mm
0.1% HCOOH / ACN = 70 / 30
1 mL/min, 37 °C, 260nm

Unison series are compatible with 100% of aqueous eluent, and designed to provide better retention and separation for hydrophilic compounds. In contrast, Cadenza CD-C18 phase is designed with high ODS density to achieve better molecular recognition due to large steric selectivity.
There are several differences among stationary phases for retention properties of Pravastatin.

Retention order on Unison phases : C18 > C8 > Phenyl

There is a positive correlation between retention and ligand alkyl chain length of reversed-phase columns. Unison series follows the same rule, so that retention (in ascending order) is UK-Phenyl, UK-C8, and UK-C18. Though the phenyl phase consists of six carbon atoms, the pi-electrons of benzene structure increase the polarity. So it seems that retention is similar to C4.

Unison UK-C18 provides larger retention than Cadenza CD-C18

The C18 coverage and hydrophobicity of Unison UK-C18 is lower than Cadenza CD-C18. This means that retention by hydrophobic interaction on UK-C18 is lower than CD-C18. But in the data above, pravastatin is retained more on UK-C18 than on CD-C18.
The reason for the "out of elution order" is as follows:
There are a lot of oxygen atoms in the Pravastatin solute structure. The pravastatin structure allows for dipole moment (electron lone pairs on the oxygen atom) plus hydrogen bonding capacity (from OH groups). The sum of these forces means pravastatin has the potential for large electrostatic interaction. The siloxane surface structure of UK-C18 also contains a lot of oxygen atoms (dipole moment). As a result, intermolecular forces (dipole-dipole interactions) between solute and stationary phase allow for increase in retention on UK-C18. In contrast, CD-C18 has a higher ligand density than UK-C18 - which means polar analytes cannot access the (oxygenated) siloxane surface. As a result, electrostatic interaction between solute and stationary phase of CD-C18 is weaker than UK-C18. The sum of hydrophobic and electrostatic interaction equals total retention. In this example pravastatin is better retained on UK-C18 than CD-C18.

Close retention between Unison UK-C8 and Cadenza CD-C18

As a result of surface structure of CD-C18 (high ODS density), there is little secondary (electrostatic) interaction. In contrast, the surface structure of UK-C8 (lower ligand density, shorter alkyl chain) allows for more electrostatic interaction between solute and siloxane surface structure. The sum of these interactions resulted in the same retention of pravastatin, and the overall interaction relationship is as follows:

Hydrophobicity: CD-C18 > UK-C8 Electrostatic interaction: UK-C8 > CD-C18

ODS phases may show different retention because of sum of various interactions (which provide the different selectivity in separation). Understanding the interaction between solute and stationary phase is important for optimizing separations.