

Resolution of Ether- and Diacyl-Linked Phospholipids by Differential Ion Mobility Spectrometry (DMS)

SelexION® Technology

Cyrus Papan, Baljit K Ubhi, J. Larry Campbell, Paul RS Baker
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The structural diversity among phospholipids is surprisingly complex, with as many as 7,000 different phospholipid molecular species in a biological sample. Often overlooked when considering structural diversity is the bond type at the *sn*-1 position of the glycerol backbone, which can be an ester bond, an ether bond or a vinyl-ether bond. Certain cell types, especially inflammatory cells and mitochondria-rich cells such as cardiomyocytes, have elevated levels of ether-linked lipids.

The Challenge:

Ether-linked and diacyl-linked phospholipids are near isobars; therefore it is necessary to resolve ether-linked and diacyl-linked phospholipid molecular species to adequately characterize their molecular species compositions. Chromatographic separation is a possibility, but due to the diversity of molecular species within a phospholipid class, this approach is not practical for profiling experiments. Even with high resolution MS, product ion analysis depends on a low-resolution isolation step that would generate a non-specific, convoluted MS/MS spectrum from the nearly isobaric compounds.

The Solution:

SelexION technology (DMS) resolves molecules prior to MS based on their chemical properties and is effective at separating ether-linked lipids from diacyl-linked lipids in complex. Here, the presence of a carbonyl at the *sn*-1 position of the glycerol backbone changes the dipole moment and allows resolution of these phospholipid sub-classes and acquisition of non-interfered MS and MS/MS spectra for qualitative and quantitative analysis.

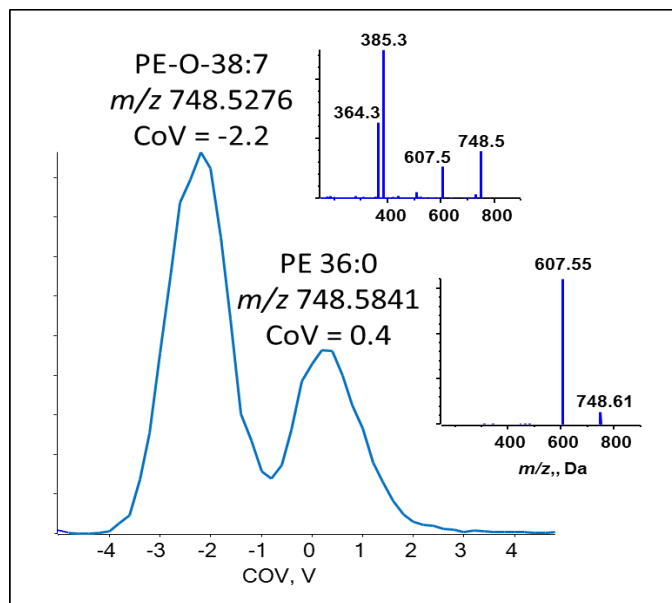


Figure 1. SelexION Technology Resolves Ether- and Diacyl-Linked Molecular Species of Phosphatidylethanolamine. Commercially available PE extract was infused and analyzed by using a QTRAP® 6500 System equipped with SelexION™ Technology, positive ion SIM scan mode was used to monitor *m/z* 748.6 while ramping the compensation voltage (CoV). Appearing in the spectrum are two distinct peaks: PE O-38:7, an ether-linked PE molecular species (i.e., PE plasmalogen with 18:1 ether-linked at the *sn*-1 position and 22:6 esterified at the *sn*-2 position of glycerol backbone), and PE 36:0, a diacyl-linked species. (Inset) Subsequent product ion analysis of *m/z* 748.6 using species-specific CoV values generated spectra consistent with either an ether- or diacyl-linked PE molecular species.

SelexION Technology can resolve ether-linked from diacyl-linked PE molecular species without the need for high resolution MS or complicated chromatography.