Differential Ion Mobility Separation of Glycosylceramides (Cerebrosides)

SelexION® Technology

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Monoglycosylceramides (cerebrosides) tend to be concentrated in the outer leaflet of the plasma membrane together with cholesterol in the specific membrane domains termed rafts. Galactosylceramide (Galβ1-1'Cer) is the principal glycosphingolipid in brain tissue and is an essential structural component of myelin. Glucosylceramide (Glcβ1-1'Cer) is found in animal tissues, and is a major component of skin lipids and neuronal tissue.

The Challenge:

Isolating individual glycoforms of cerebrosides, such as Galβ1-1'Cer and Glcβ1-1'Cer, has been particularly difficult to achieve due to the virtually identical structures of these isobaric lipids, whose only difference being the stereochemistry of the 3'-hydroxylgroup. These two cerebroside isoforms produce identical product ion spectra and possess similar physical properties making them very difficult to distinguish by traditional liquid chromatography/mass spectrometry (LC-MS) analysis.

The Solution:

Used with or without LC flow, SelexION Technology readily distinguishes molecular isobars among different lipid categories, classes and molecular species.

Galactosylceramide and glucosylceramide standards were infused individually (top) or mixed together (bottom) and analyzed using SelexION Technology on a QTRAP® 5500 System. Three MRM transitions were monitored that represent both molecules. Using 1-proponal as a chemical modifier, the DMS COV was ramped from -6 to 4V. Galctosylceramide had a COV maximum at -2.7 V and Glucosylceramide had a maximum at -1.7 V, which can be easily resolved using a higher resolution DMS setting.

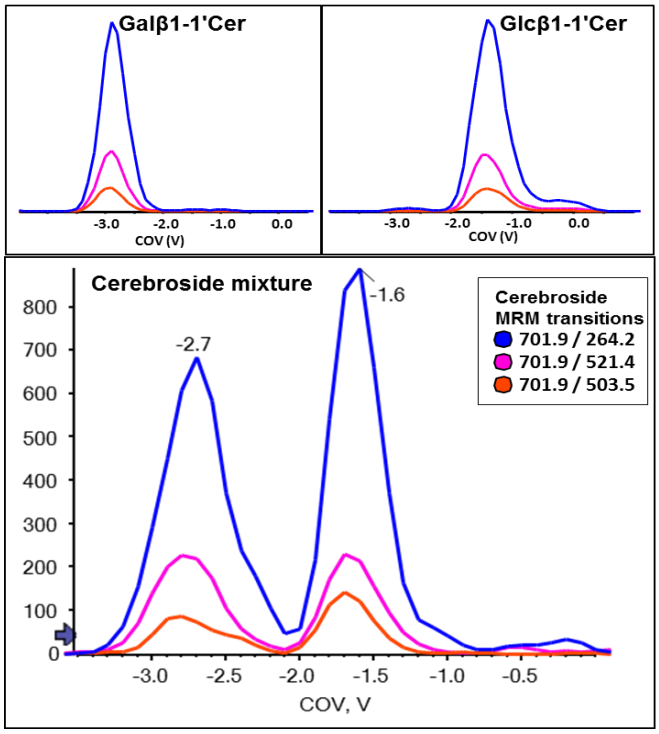

Figure 1. Resolution of Cerebroside Isomers by DMS. Galactosylceramide and glucosylceramide standards were infused individually (top) or together (bottom) and analyzed using SelexION Technology. Differential Mobility Separation (DMS) effectively resolves these two isomers to enable independent confirmation and quantitation.

Here two cerebroside isomers were easily resolved and quantified using SelexION Technology coupled with the QTRAP® system without requiring extensive sample preparation or chromatography.

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