Quantitative Lipidomics Analysis – Comprehensive Coverage with Accurate Quantitation

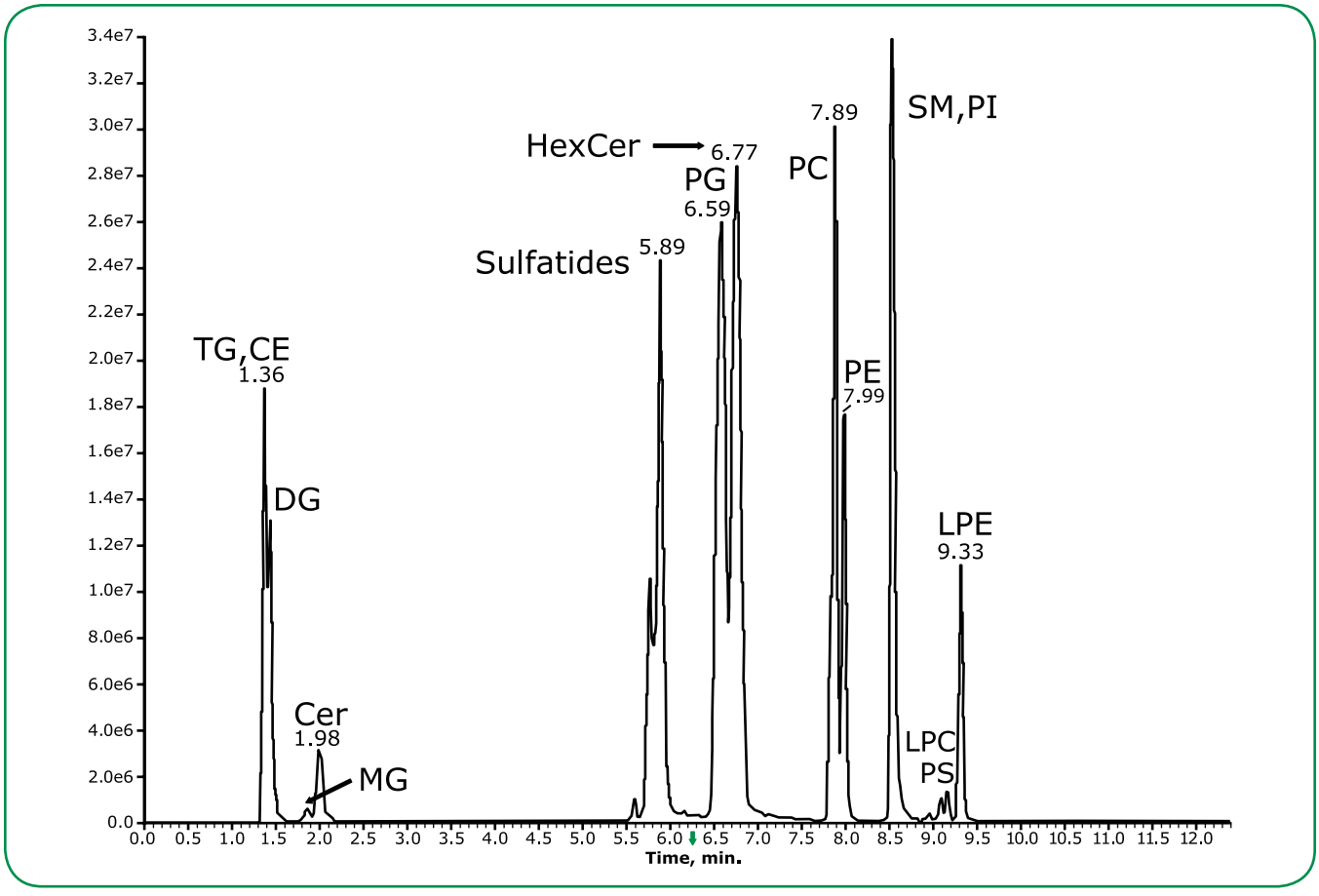
Avanti Analytical Services Division

Lipidomics Analysis

The field of lipidomics aims to quantitatively define lipid classes at the molecular species level in biological systems. Mass spectrometry is the primary means by which lipidomics analysis is performed, but there are significant challenges associated with this technique, including isobaric interference, differential ionization and fragmentation of lipids and the need for complex internal standard strategies for quantitation. Lipidomics studies have evolved tremendously over the last 10 years, progressing from sum composition analysis by “shotgun” analysis to untargeted analysis by HRAM mass spectrometry; but, the limitations of these techniques affects identification quantitation.

How is Avanti's method different from other techniques?

An efficient way to maximize sensitivity, specificity and quantitative accuracy is targeted lipidomics using HPLC ESI-MS/MS using curated MRM transitions that target lipids at the molecular species level. HILIC separation is an attractive chromatographic strategy that separates lipids into classes and subclasses, which span a very narrow RT window. Using a proprietary mix of internal standards, this method provides accurate quantitative measurement of over 1500 different lipid molecular species in virtually any matrix.



Lipidomics analysis using a broadly targeted HPLC ESI-MS/MS approach enables quantitative analysis of over 1500 different lipid molecular species at the fatty acid level. Typically challenging isobaric classes of lipids such as PE, PC and PS are resolved, enabling unambiguous identification and quantitation. The method is highly reproducible in terms of retention times and %RSD.

What are the benefits of targeted lipidomics analysis by HPLC ESI MS/MS?

By using a broad, curated MRM transitions list, HILIC chromatography, and a comprehensive internal standard strategy, many issues that have proven to be challenging in lipidomics analysis via either the shotgun or an untargeted approach are minimized:

- Chromatography minimizes problems with matrix suppression issues.
- MRM transitions are selected for specificity of complex lipids at the fatty acid level. (E.g., PC (16:0_18:1) rather than the sum composition nomenclature of PC 34:1.).
- MRM transitions are included for each lipid class to include any complex lipid containing fatty acids from 14:0 to 22:6, which ensures comprehensive coverage and minimizes false positive results.
- Using a proprietary mixture of internal standards, accurate quantitation is possible at the molecular species level, which is not possible with shotgun techniques nor untargeted approaches.
- The time needed for data analysis is dramatically minimized using a targeted approach, significantly reducing the time needed for large cohort studies.
- Complete customization of the target list is possible.
- Quantitative bias < 20%.

What lipid classes are targeted in the method?

- **Phospholipids**
  - PC, LPC
  - PE, LPE
  - PG, LPG
  - PS, LPS
  - PI, LPI
- **Neutral Lipids**
  - Triglycerides (TG)
  - Diglycerides (DG)
  - Monoglycerides (MG)
  - Cholesteryl esters (CE)
- **Sphingolipids**
  - Sphingomyelin (SM)
  - Ceramides (CER)
  - Dihydro Ceramides (dCER)
  - Hexosyl Ceramides (HexCER)
  - Sulfatides

What kind of samples can be analyzed?

This analytical method was designed to be used for virtually any matrix: blood, plasma, cell culture, tissue, formulations, food, and plants.

How do I request quantitative lipidomics analytical services?

To order quantitative lipidomics services, please visit the Avanti website and fill out a sample submission form. Alternatively, e-mail us at lipidomics@avantilipids.com if you have any additional questions about this service or other Avanti products and services.

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