

Targeted lipidomics of signaling sphingolipids in health and disease

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Our knowledge about distribution, qualitative and quantitative composition of lipid molecules in natural systems is experiencing a tremendous rise during last fifteen years. This would not be possible without recent progress in analytics of non-volatile lipid molecules. This progress was achieved through the invention of ion sources capable of handling solvent flows of ordinary HPLC systems with a resulting expansion in LC/MS-based methods for direct analysis of complex lipid mixtures without their preliminary chemical processing. In case of signaling sphingolipids, the progress in their analytics was supported by relative stability of analytes and by great attention given to these molecules playing critical role in such fundamental processes as cell survival, proliferation, and death. Great examples of such bioactive sphingolipids are sphingosine-1-phosphate and ceramides often playing opposite role in physiological responses. We are still learning about their physiological functions and deciphering the complexity of their interaction with other signaling systems. Our better understanding of signaling pathways regulated by these sphingolipids now offers novel avenues for the treatment of multiple diseases and pathological conditions including cardiac arrest, pulmonary inflammation and fibrosis, and cancer.

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