

Lipidomics

Abstract

This short course provides a basic introduction into lipidomic analysis by the coupling of mass spectrometry (MS) with ultrahigh-performance liquid chromatography (UHPLC) or ultrahigh-performance supercritical fluid chromatography (UHPSFC). The course starts with a basic introduction into the lipid nomenclature and biological consideration of lipid functions. The entire process of lipidomic analysis is briefly described, which includes sample preparation, chromatographic separation, MS analysis, data processing, and reporting consistent with the recommendations of the International Lipidomics Society. The main focus of the short course is paid to the possibility of various chromatographic modes, which includes lipid class separation (UHPSFC or HILIC), lipid species separation (RP-UHPLC), or dedicated modes for the separation of various types of lipid isomers. The data processing consists of lipid identification and quantitation using the appropriate exogenous internal standards. The application of UHPSFC/MS quantitative workflow to the early detection of cancer patients will be presented for blood samples. Finally, the potential of chemical derivatization for improving the lipidomic coverage of low-abundant lipid classes with unfavorable physicochemical properties will be presented.

Biography

Michal Holčapek is a Professor at the University of Pardubice, Department of Analytical Chemistry. He received his Ph.D. in analytical chemistry from the same university in 1999. His research focus is mass spectrometry and its coupling with liquid chromatography or supercritical fluid chromatography, applied mainly in lipidomic analysis and cancer biomarker research. He obtained several scientific awards, for example, the Herbert J. Dutton Award (2022, American Oil Chemists' Society) and the Power List of 100 most influential people in the analytical sciences (2020, 2015 and 2013, The Analytical Scientist). He is a coauthor of 148 articles in peer-reviewed international journals, h-index 45, a contributing editor of Trends in Analytical Chemistry, a member of editorial advisory boards of Analytical and Bioanalytical Chemistry, and Lipids. He was coeditor of the books Handbook of Advanced Chromatography/Mass Spectrometry Techniques and Extreme Chromatography: Faster, Hotter, Smaller, former head of Czech Mass Spectrometry Section and national representative in International Mass Spectrometry Foundation, the chairman of over ten international and national conferences, e.g., HPLC 2017 Prague, 3rd European Lipidomic Meeting in 2013, etc. He is one of the founding members of the Lipidomics Standards Initiative and a vice-president for conferences in the International Lipidomics Society.