

Lipidomic Quantitation by UHPSFC/MS: Potential for Clinical Screening of Pancreatic Cancer

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Lipids are the main constituents of cellular membranes, energy deposits, but they also play an important role in signaling in relation to various diseases, such as cancer. The coupling of liquid phase separation techniques and mass spectrometry (MS) is a prevalent technology in the lipidomic analysis [1]. We have optimized and validated the high-throughput ultrahigh-performance supercritical fluid chromatography – mass spectrometry (UHPSFC/MS) method for lipidomic quantitation of biological samples [2]. Several hundred lipid species are typically quantified in biological samples, such as plasma, serum, cell lines, and tissues. The main issues in lipidomic quantification are the reliability of the data over a long period of time, the comparability of the results among different groups, absolute molar quantitation based on the use of exogenous internal standards, and harmonized data reporting [3,4]. At least one internal standard per each lipid class is used for reliable quantitation together with regular injection of quality control samples. Data are processed by LipidQuant software [5]. The comprehensive MS determination of a wide range of blood lipids reveals statistically significant differences between various types of cancer patients and healthy controls visualized by multivariate data analysis [6]. The most extensive results are obtained for pancreatic cancer [7], which showed the dysregulation of very long-chain sphingomyelins, ceramides, and some (lyso)phosphatidylcholines. The sensitivity and specificity to diagnose pancreatic cancer were more than 90%, which outperforms CA 19-9, especially at an early stage, and is comparable to established diagnostic imaging methods. Similar patterns of dysregulation were observed for kidney, breast, and prostate cancers [6]. The current focus is the performance of clinical validation to confirm the real utility for patient management and then the implementation of UHPSFC/MS method for the early detection of pancreatic cancer in high-risk groups.

[1] M. Holčapek, G. Liebisch, K. Ekroos, *Anal. Chem.* 90 (2018) 4249.

[2] D. Wolrab et al., *Anal. Bioanal. Chem.* 412 (2020) 2375.

[3] G. Liebisch et al., *Nat. Metab.* 1 (2019) 745.

[4] J.G. McDonald et al., *Nat. Metab.* (2022). DOI: 10.1038/s42255-022-00628-3

[5] D. Wolrab et al., *Bioinformatics* 37 (2021) 4591.

[6] D. Wolrab et al., *Sci. Rep.* 11 (2021) 20322.

[7] D. Wolrab et al., *Nat. Com.* 13 (2022) 124.