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Lipidomics as new way to analyse lipid metabolites

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Abstract

The determination of the lipidome profile is often called lipidomics. The lipidome represents all the small molecules metabolomes whit mass lower than 1500 in system. In recent years, the crucial role of lipidomes in the pathogenesis and therapy of deseases has become increasingly apparent. For example, ischemia-reperfusion (IR) injury can initiate oxidative stress that leads to harmful changes in membrane lipids, with an unwanted accumulation of fatty acids that leads to lipotoxicity. Lipid analysis provides additional insight into the pathogenesis of IR disorders and reveals new targets for drug action. A therapeutic approach to reperfusion lipotoxicity involves attenuation of fatty acids overload, i.e., their transport to adipose tissue and/or inhibition of the adverse effects of fatty acids on cell damage and death The framework of this lecture is analysis of the lipid metabolites and other products that can affect the metabolites of lipids. We analyzed lipid profile of heart, lung, brain kidney liver. The carbohydrate profile was also examined. Based on these results we tried to correlate it with various metabolic processes. In order to obtained even better conclusions the chemometrics was employed. The obtained results showed similarities between hearts and lung, whereas liver and brain exhibits specific behavior.

Modern mass spectrometric technologies provide quantitative readouts for a wide variety of lipid specimens. However, many studies do not report absolute lipid concentrations and differ vastly in methodologies, workflows and data presentation. Therefore, we encourage researchers to engage with the Lipidomics Standards Initiative to develop common standards for minimum acceptable data quality and reporting for lipidomics data, to take lipidomics research to the next level

Lipidomics has evolved rapidly over the past decade because it offers new opportunities for studying the roles of lipids in cellular biology as well as in health and disease. The lipidomes of eukaryotic cells comprise hundreds of individual lipid species that structurally and chemically regulate cell membrane dynamics, store energy and/or serve as precursors of bioactive metabolites. Membranes of cells and organelles have unique lipid compositions that are intimately linked to their biological functions. The biophysical properties of membranes are also affected by seemingly minor structural differences among individual lipid species, such as the number, position and geometry of double bonds in acyl chains. These characteristics drive membrane budding and fission events and may regulate protein function. Lipid species in membranes act not as single molecules but as a collective, and must be analysed quantitatively and comprehensively to understand their biological function.

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