GUEST LECTURE SERIES

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Functional lipidomics
a molecular perspective on cellular lipid biochemistry

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The lipidome of eukaryotic cells comprises several hundred to thousands of lipid molecules produced by a metabolic network that interconnects and coordinates the metabolism of fatty acids, glycerophospholipids, glycerolipids, sphingolipids and sterol lipids. One of the grand challenges in cell biology and physiology is to understand how cells and tissues regulate the activities of all lipid metabolic pathways simultaneously to maintain lipid homeostasis and expedite physiological processes. To delineate the regulatory landscape of lipid metabolism, we deploy systems biology approaches to reproducibly, comprehensively and quantitatively monitor both lipid molecules and the proteins that govern lipid metabolic activities. These approaches include high throughput lipidomics workflows capitalizing on nanoelectrospray ionization and high-resolution Orbitrap mass spectrometry combined with quantitative shotgun proteomics for time-resolved quantitative analysis of lipidome and proteome dynamics. The application of our integrated multi-omics technology serves as a new experimental paradigm for understanding, at unprecedented temporal resolution, how lipid metabolism is regulated and coordinated with the remodeling of cellular architecture and processes.

Gallego et al. Quantitative lipidomics reveals age-dependent perturbations of systemic lipid metabolism in ACBP deficient mice. BBA 2017
Casanovas et al. Quantitative analysis of proteome and lipidome dynamics reveals functional regulation of global lipid metabolism in yeast. Chem Biol. 2015
Almeida et al. Comprehensive lipidome analysis by shotgun lipidomics on a hybrid quadrupole-orbitrap-linear ion trap mass spectrometer. JASMS 2015