

# **Around the Clock Lipidomics; Insight into Circadian Oscillations in Intracellular Organelles**

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## **Abstract**

Light-sensitive organisms harbor a circadian clock that regulates their physiology and behavior. The mammalian circadian timing system is structured in a hierarchal manner; a master clock in the brain dictates the time to plentiful clocks in every single cell in the body. We examined whether diurnal oscillations also exist in intracellular organelles. To this aim, we employed lipidomics approach as a time teller for endogenous rhythms and identified diurnal oscillations in both nuclei and mitochondria. These oscillations exhibited opposite phases and readily responded to feeding time. The phase relation between the organelles, however, was maintained under different feeding regimens. Mechanistically, we show that the circadian clock coordinates the phase relation between the different organelles. In view of the vital roles of lipids in a wide variety of cellular functions (e.g. structural components, energy storage and signaling molecules) the substantial daily changes in lipid composition in these organelles are likely to reflect major alterations in their morphology/function. Our extensive temporal and spatial analysis provides new insight regarding circadian rhythmicity in subcellular organelles and advances our knowledge about lipid homeostasis.