Mobile Lipids as Stress Response

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Mobile lipids, or NMR-visible lipids, have been detected in a number of cells and tissue types using $^1$H NMR spectroscopy. While some controversy has persisted regarding their biochemical and physiological origin, it is almost universally agreed that the molecules that give rise to NMR-visible lipids arise from a combination of neutral lipids – triglycerides and cholesterol esters – that have phase separated or partitioned from the phospholipids that comprise the bilayers of the plasma membrane or organelles.

In this session, we will focus on cell studies to review the origins of mobile lipids, first making the distinction between constitutive and inducible mobile lipids. Within the classes of inducible mobile lipids we will compare and contrast mobile lipids of activation vs the mobile lipids induced by stresses such as drug treatment with anticancer drugs. We will discuss the biochemistry leading to the accumulation of triglycerides and cholesterol esters, identifying pharmacological inhibitors of mobile lipid accumulation and place the NMR literature in light of what is known in cellular and tissue pathology. We will identify check points in the development of inducible mobile lipid signals, demonstrating that they are an early indicator of cell stress, independent of cell cycle progression, preceding the committed decision of cell death. We will demonstrate that while mobile lipids often accompany the process of apoptotic / autophagic /necrotic cell death, they are not necessarily causative nor resultant, and therefore care must be taken when interpreting inducible mobile lipids in NMR spectra.