Giuseppe Maulucci et al., Bioenergetics 2017, 6:2(Suppl)
DOI: 10.4172/2167-7662-C1-002

Quantitative analysis of fatty acid metabolism by confocal spectral imaging of intracellular polarity

Giuseppe Maulucci[1], **Flavio di Giacinto**[1], **Claudio De Angelis**[1], **Marco De Spirito**[1] and **Shlomo Sasson**[2]
[1]Università Cattolica del Sacro Cuore, Italy
[2]The Hebrew University of Jerusalem, Israel

Although numerous investigators have studied lipid droplets formation through several imaging techniques, they can't draw conclusions regarding the overall process of lipid metabolism in live cells. Here, a method for studying lipid metabolism with high spatial and temporal resolution is presented, based on the measurement of intracellular polarity through the solvatochromic and lipophilic probe Nile red, which undergoes to a red shift upon a change of polarity of the neighboring lipids. A confocal spectral imaging approach captures in detail polarity variations by acquiring the fluorescence emission spectra at pixel resolution. The analysis of the spectra trough the technique of spectral phasors allowed semi-blind spectral unmixing of the contribution of different classes of lipids in the image, namely hyper polar, polar and non-polar lipids. The method allows a fine-tuned, real-time monitoring of fatty acid metabolism in live cells with submicrometric resolution.

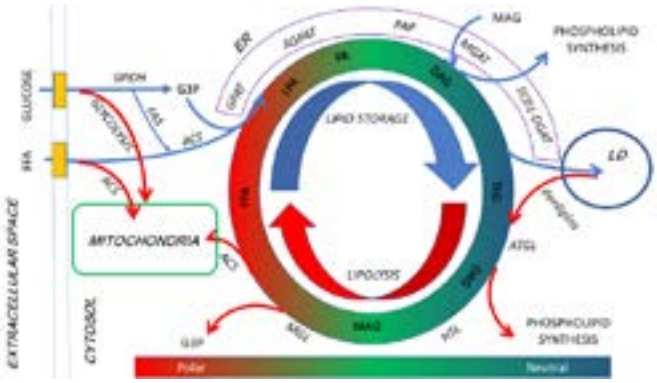

Figure 1: *Overview of fatty acid metabolism, and relative change of polarity of the Nile Red probe.*

Recent Publications:

1. Greenspan P, Mayer E P, and Fowler S D (1985) Nile red: a selective fluorescent stain for intracellular lipid droplets. Journal of Cell Biology 100(3):965–973.
2. Diaz G, Melis M, Batetta B, Angius F, and Falchi A M (2008) Hydrophobic characterization of intracellular lipids in situ by nile red red/yellow emission ratio. Micron 39(7):819–824.
3. Maulucci G, Daniel B, Cohen O, Avrahami, Y, and Sasson S (2016) Hormetic and regulatory effects of lipid peroxidation mediators in pancreatic beta cells. Molecular Aspects of Medicine 49:49–77.
4. Maulucci G, Cohen O, Daniel B, Sansone A, Petropoulou P I, Filou S, Spyridonidis A, Pani G, De Spirito M and Chatgilialoglu C et al. (2016) Fatty acid-related modulations of membranes fluidity in cells: detection and implications. Free Radical Research. DOI: 10.1080/10715762.2016.1231403.

Biography

Giuseppe Maulucci attended La Sapienza University in Rome, where he obtained his Bachelor's degree in Biophysics. He gained his PhD degree at Roma Tre University and worked as Teacher and Researcher at the Institute of Physics and at the center of light and electron microscopy (LABCEMI) of the Catholic University of the Sacred Heart (UCSC). He is an expert in microscopy techniques (University of Florence, University of Genoa, Hebrew University of Jerusalem, University of Patras). His research activity is focused on Metabolic Imaging, a discipline that unites Molecular Biology and *In vivo* Imaging. It enables the visualization of endogenous molecules and supramolecular properties of major importance to maintain energy homeostasis in the cells, and provides a window to several important metabolic processes essential to cell survival.

giuseppe.maulucci@unicatt.it