

NADH as a Natural Biomarker for Mitochondrial and Metabolic Activities in Living Cells

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Abstract

Reduced Nicotinamide Adenine Dinucleotide (NADH) plays an important role in a range of biochemical reactions, metabolic pathways, and mitochondrial activities in living cells. NADH is an electron donor in metabolic pathways with the potential of serving as mitochondrial and metabolic biomarker due to its intrinsic fluorescence. As a result, NADH autofluorescence imaging would allow for quantitative and noninvasive imaging of metabolic activities in living cells under both healthy and pathological conditions. Since live cells are inherently crowded with macromolecules such as proteins and organelles, it is essential to elucidate the effects of crowding on the biochemical reactions involving NADH towards quantitative cell biology. The objective of McNair project is to examine the effects of macromolecular crowding on NADH binding reaction with lactate dehydrogenase (LDH) as a model system. The reactant (NADH) and product (LDH-NADH complex) are quantified, non-invasively, using two-photon time-resolved fluorescence and associated anisotropy. Our projected results are essential towards quantitative assessment of associated NADH biochemical reactions in living cells.