BIOIMAGING AND CHEMOGENETICS IN REDOX METABOLISM STUDIES

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A deep understanding of the roles of redox metabolites and pathways in physiology and pathology requires molecular tools that enable both visualization of these processes and their selective modulation. Over the last two decades, a number of genetically encoded fluorescent biosensors for key redox metabolites have been developed, allowing real-time detection in living systems of varying complexity. Recent developments in this area include the ultrasensitive probe HyPer7 and a new fluorogenic probe, HyPerFAST, which enables even more sensitive H_2O_2 detection across any chosen optical range, from blue to near-infrared. Complementary to imaging with biosensors, chemogenetics offers tunable substrate-dependent modulation of metabolic pathways, allowing the study of normal cell functioning and modeling dysfunctions caused by abnormal pathway activity and/or metabolite levels. We will present recent developments in this area that include insights on oxidative stress brought about by the use of D-amino acid oxidase (DAO) and intriguing details of the Warburg effect brought about by a new mitochondrial "booster," Grubraw, based on bacterial D-amino acid dehydrogenase.