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Multispectral Manifestation of Redox Dynamics and Pathological Progression Based on Integrated NIR Fluorescent Paradigms

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Abstract

As an essential signalling mediator, multiple redox radicals, including reactive oxygen and nitrogen species (ROS/RNS), have been extensively authenticated as significant functional regulators involved in many essential physiological processes such as cellular signal transduction, intermediary metabolism, pathogenesis, as well as immune or inflammatory response. The altered redox balances may cause severe oxidative or nitrosative stress that is closely implicated in the etiology and pathologies of diverse human diseases including cancers, neurodegenerative diseases and bacterial infection. Moreover, mounting investigations have indicated that the generation of ROS or RNS is not static, but rather, their excess or shortage, or even spatiotemporal distributions and correlations are always processing in a highly dynamic and programmed precision. Such biological diversities of free radicals provide great possibilities to act as ideal endogenous biomarkers for spatiotemporally dynamic profiling of the pathophysiological implications in complicated living settings. To this end, by taking advantages of tissue penetrable feature and multiplexing luminescence from NIR laser responsive lanthanide nanoprobe, we recently develop some innovative approaches for simultaneous screening of various redox species, and, significantly, for dynamic profiling of their intricate correlations with pathophysiological implications and therapeutic assessment through multispectral optoacoustic Tomography (MSOT) and NIR fluorescent imaging.

Keywords: Multispectral Imaging, near-infrared light, Fluorescence Imaging, multiple radical dynamics, Theranostics, bacterial pathogenesis

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