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Special Issue Reprint

Oxygen Variations, 2nd Edition

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Oxygen is a fundamental regulator of cellular metabolism and survival, with effects extending far beyond energy production. This Reprint offers a multidisciplinary overview of how oxygen fluctuations—such as hypoxia, normoxia, and hyperoxia—act as molecular signals influencing redox balance, gene expression, mitochondrial function, and inflammation. It explores cellular and systemic responses to changing oxygen levels in contexts like exercise, altitude, and oxygen therapy. Key mechanisms include the activation of transcription factors (HIFs, NRF2, NF- κ B), ROS/RNS signaling, and mitochondrial adaptations. Emerging topics such as extracellular vesicle release and tissue-specific responses in the brain, heart, and kidneys are also covered. By integrating molecular insights with physiological and clinical relevance, this Reprint provides a framework for understanding oxygen as a dynamic signaling molecule. It is intended for researchers and clinicians interested in redox biology and oxygen-based interventions.

