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Special Issue Reprint

# The Rise of Mitochondria in Medicine

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Mitochondria are critical bioenergetic and biosynthetic machines that are essential for normal cell function. Traditionally, mitochondria have been considered the powerhouse of the cell, as they supply most of the cellular energy through oxidative phosphorylation. In addition, they supply the building blocks needed for the synthesis of cellular biomass. More recently, mitochondria have been recognized as signaling hubs that receive and transmit signals throughout the cell, thereby affecting cell functionality and fate. The signals generated by mitochondria include changes in metabolites, the NAD+/NADH ratio, ATP/ADP ratio, Ca2+, and reactive oxygen species (ROS), but our understanding of their nature, dynamics, targets, and roles in different physiopathological contexts is still under development. Mitochondrial dysfunction, which may originate from primary defects within the organelles or from stress conditions in the microenvironment, is a hallmark of many common diseases, including ischaemia–reperfusion injury, cancer, metabolic disease, and neurodegenerative disorders, and has become a major research focus in medicine. Understanding the biology of mitochondrial signaling and the role of mitochondrial dysfunction in the pathogenesis of many metabolic, degenerative, cardiovascular, and neoplastic diseases is crucial for the development of strategies aimed at therapeutically restoring mitochondrial functionality. This Special Issue presents current knowledge in the field of mitochondrial signaling in health and disease, and recent advances in mitochondrial pharmacology.

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