

EDITORIAL

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Mitochondrial signalling pathways in inflammation and health: mechanistic insights of mitochondrial impairment on cellular homeostasis in driving pathogenesis

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Mitochondria, long recognized as the powerhouses of the cell, have emerged as central regulators of oxidative stress, cellular signalling, immune responses, and metabolic homeostasis. Their dynamic roles extend far beyond energy production, encompassing key functions in redox balance, apoptosis, and the orchestration of inflammatory pathways [1]. In recent years, mitochondrial dysfunction has been increasingly implicated in the pathogenesis of a wide spectrum of diseases, from metabolic and neurodegenerative disorders to cardiovascular and autoimmune conditions [2].

This thematic collection, *Mitochondrial signalling pathways in inflammation and health: mechanistic insights of mitochondrial impairment on cellular homeostasis in driving pathogenesis*, brings together cutting-edge research aimed at unravelling the mechanistic links between mitochondrial impairment and systemic inflammation [3]. By exploring how mitochondrial health influences cellular equilibrium and disease progression [4], the collection seeks to illuminate novel aspects of mitochondrial biology with direct relevance to human health.

Contributions in this issue examine the molecular underpinnings of mitochondrial signalling, the consequences of mitochondrial dysfunction on immune and metabolic networks, and the emerging therapeutic strategies designed to restore mitochondrial integrity [5]. The articles could span basic, translational, and clinical research, reflecting the interdisciplinary nature of the field and its growing impact on biomedical science. On balance, the mitochondrial landscape in contemporary biomedical science has shifted from a singular focus on bioenergetics to a broader recognition of its pivotal role in cellular life, death, and disease. Unravelling the complex mitochondrial signalling pathways in inflammation and health is essential for developing the next generation of therapeutic approaches to combat the wide spectrum of diseases driven by cellular imbalance.

As editor, I hope this collection will serve as a valuable resource for researchers and clinicians alike, fostering new insights and collaborations in the pursuit of mitochondrial-targeted therapies. I invite readers to engage with the diverse perspectives presented here and to consider the mitochondrion not only as a metabolic organelle but as a central hub in the maintenance of cellular and systemic health.

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Author Contributions

Salvatore Nesci contributed to the conception, writing, and revision of the manuscript.



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Competing interests

The author serves on the editorial board of JTRM. SN is the section editor of Cellular Metabolism Therapy.

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