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Viswanathan Natarajan • Narasimham L. Parinandi  
Editors

# Mitochondrial Function in Lung Health and Disease

 Humana Press

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# Preface

Mitochondria, often referred to as the “powerhouses” of the cell, generate adenosine triphosphate (ATP) by oxidative phosphorylation or OXPHOS, and maintain cellular homeostasis. In addition, as part of their normal function, mitochondria generate reactive oxygen and nitrogen species which are key regulators of mitochondrial function as well as cell cycle, proliferation, apoptosis, and innate immune responses. The mitochondrion consists of the outer membrane, inner membrane, proteins, lipids and mitochondrial DNA that has substantial similarity to bacterial DNA. Mitochondrial morphology is in a dynamic state being modified continuously enabling the organelle to move, fuse, and fission depending on functional requirements of the cell. Mitochondrial diseases are caused by impairment(s) in the mitochondrial electron transport system, and mitochondrial abnormalities have been documented in pathogenesis of neurodegenerative diseases. Compared to other organs such as heart, brain and liver, the lung has fewer mitochondria as the lung relies on glycolysis more than OXPHOS for energy production. The role of mitochondria in normal lung homeostasis and importance of mitochondrial dysfunction/damage in the pathology of lung diseases remain poorly understood. However, there is evidence for mitochondrial biogenesis in inhalational lung injuries along with oxidative stress and mitochondrial dysfunction in sepsis-induced lung injury, COPD and asthma. Further, mitochondrial abnormalities that perturb the reactive oxygen species-, HIF-1- $\alpha$ -, and oxygen-sensitive K<sup>+</sup> channel pathway may contribute to the pathogenesis of pulmonary hypertension and cancer. Therefore, in addition to their well-recognized role in cellular energy production and apoptosis, mitochondria appear to play a role in many respiratory diseases and lung cancer. By focusing on the mitochondrial metabolism, redox signaling and mechanisms of mitochondrial pathways in lung injury, inflammation, repair and remodeling, this volume will facilitate a better understanding of the emerging concepts of targeting mitochondria to alleviate respiratory lung diseases.

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