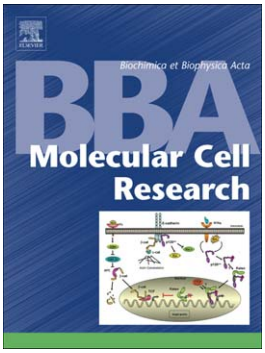

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Mitochondrial degradation and energy metabolism

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Abstract:

Mitochondria are intracellular power plants that feed most eukaryotic cells with the ATP produced by the oxidative phosphorylation (OXPHOS). Mitochondrial energy production is controlled by many regulatory mechanisms. The control of mitochondrial mass through both mitochondrial biogenesis and degradation has been proposed to be one of the most important regulatory mechanisms. Recently, autophagic degradation of mitochondria has emerged as an important mechanism involved in the regulation of mitochondrial quantity and quality. In this review, we highlight the intricate connections between mitochondrial energy metabolism and mitochondrial autophagic degradation by showing the importance of mitochondrial bioenergetics in this process and illustrating the role of mitophagy in mitochondrial patho-physiology. Furthermore, we discuss how energy metabolism could coordinate the biogenesis and degradation of this organelle.

1. Introduction

Mitochondria produce energy through a complex interconnected metabolic network using multiple energy sources, such as amino acids, lipids and carbohydrate derivatives. This energy is produced in the form of ATP and is delivered to all cellular compartments to feed various cellular activities. Mitochondrial energy metabolism is highly regulated to constantly meet the energetic needs of the cell and to utilize the available energy substrates [1]. Among the multiple regulatory processes involved, the control of mitochondrial mass is a crucial determinant of the energy metabolism. In the steady state, the mitochondrial mass is