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Sirtuins in Mitochondrial Stress: Indispensable Helpers behind the Scenes

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Highlights

- Mitochondrial stress responses guarantee mitochondrial viability under stress.
- Sirtuins are indispensable for mitochondrial stress responses, including UPR^{mt}, antioxidant defense, mitochondrial dynamics, mitophagy, etc.
- Sirtuins may be potential therapeutic targets for mitochondria-associated diseases.
- Underlying mechanism behind the role of sirtuins in mitochondrial stress requires further investigation.

Abstract

Mitochondria play an essential part in guaranteeing normal cellular physiological functions through providing ATP and participating in diverse processes and signaling pathways. Recently, more and more studies have revealed the vital roles of mitochondria in coping with stressors in the aging process, metabolic disturbances and neurological disorders. Mitochondrial stress responses, including the mitochondrial unfolded protein response (UPR^{mt}), antioxidant defense, mitochondrial fission, mitochondrial fusion and mitophagy, are induced to maintain cellular integrity in response to stress. The sirtuin family, a group of NAD^+-dependent deacetylases, has been the focus of much attention in recent years for their multiple regulatory functions, especially in aging and metabolism. Recent reports validated the significant link between mitochondrial stress responses and the sirtuin family, which may help to elucidate the pathogenesis and therapies for diseases such as Alzheimer's disease or Parkinson's disease. This review will summarize recent related studies and illuminate the interplay between sirtuins and mitochondrial stress.