



# mitochondria

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Cruising Review

Mitochondria: Publications and Research from SwissMixt



This webpage QR code

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PDF Version of the webpage (first pages)

<https://cruisingreview.com/smx/mitochondria.html>

## Mitochondria Botanical Information

Mitochondria are rod-shaped organelles that can be considered the power generators of the cell, converting oxygen and nutrients into adenosine triphosphate (ATP). ATP is the chemical energy currency of the cell that powers the cell's metabolic activities. Mitochondria are iconic structures in biochemistry and cell biology, traditionally referred to as the powerhouse of the cell due to a central role in energy production. However, modern-day mitochondria are recognized as key players in eukaryotic cell biology and are known to regulate crucial cellular processes, including calcium signalling, cell metabolism and cell death, to name a few. Mitochondria, oxidative phosphorylation, apoptosis, intracellular calcium, mitochondrial fission, mitochondrial biogenesis, metabolism, aging, exercise, aerobic, ROS, inflammation, senescence, lysosome, autophagy, mitophagy, palmitoyl CoA, lipid droplet, perilipin, beta-oxidation, redox environment, energetics, reactive oxygen species

Keywords: mitochondria, oxidative phosphorylation, apoptosis, intracellular calcium, mitochondrial fission, mitochondrial biogenesis, metabolism, aging, exercise, aerobic, ROS, inflammation, senescence, lysosome, autophagy, mitophagy, palmitoyl CoA, lipid droplet, perilipin, beta-oxidation, redox environment, energetics, reactive oxygen species

Description and Research Abstract: Mitochondria are rod-shaped organelles that can be considered the power generators of the cell, converting oxygen and nutrients into adenosine triphosphate (ATP). ATP is the chemical energy currency of the cell that powers the cell's metabolic activities.

Mitochondria are iconic structures in biochemistry and cell biology, traditionally referred to as the powerhouse of the cell due to a central role in energy production. However, modern-day mitochondria are recognized as key players in eukaryotic cell biology and are known to regulate crucial cellular processes, including calcium signalling, cell metabolism and cell death, to name a few. Polyphenol-induced dissipation of Dwm is a physicochemical process that cancer cells cannot develop resistance against by gene mutation. Therefore, polyphenols should receive more attention as agents for cotherapy with cancer drugs to gain synergistic activity. Humans are exposed daily to polyphenols in milligram-to-gram amounts through dietary consumption of fruits and vegetables. Polyphenols are also available as components of dietary supplements for improving general health. Although polyphenols are often advertised as antioxidants to explain health benefits, experimental evidence shows that their beneficial cancer preventing and controlling properties are more likely due to stimulation of pro-oxidant and proapoptotic pathways.

Mitochondria perform diverse yet interconnected functions, producing ATP and many biosynthetic intermediates while also contributing to cellular stress responses such as autophagy and apoptosis. Mitochondria form a dynamic, interconnected network that is intimately integrated with other cellular compartments.

Mitochondria play a key role in energy metabolism in many tissues, including skeletal muscle and liver. Inherent disorders of mitochondria such as DNA deletions cause major disruption of metabolism and can result in severe impairment or death.

Mitochondrial dysfunction is implicated in metabolic and age related disorders, neurodegenerative diseases and ischemic injury in heart and brain.

Mitochondria are one of the major ancient endomembrane systems in eukaryotic cells. Owing to their ability to produce ATP through respiration, they became a driving force in evolution.

For over 40 years, mitochondrial reactive oxygen species (ROS) production and balance has been studied in the context of oxidative distress and tissue damage. However, research over the past decade has demonstrated that the mitochondria have a more complicated relationship with ROS.

Mitochondria are essential for human existence, and thus involved in numerous cell processes that rely on energy sustenance, such as cell growth, cell messaging, aging and replication.

Mitochondria fulfill various important roles in cellular metabolism. Mitochondria fulfil important roles in the biosynthesis of essential molecules, such as lipids, amino acids, haem and iron-sulphur cluster, and are a major cellular site of reactive oxygen species production. Moreover, mitochondrial dysfunction is the cause of devastating human encephalomyopathies and it has been linked with neurodegeneration, cancer and aging.

Aging is a degenerative process that is associated with progressive accumulation of deleterious changes with time, reduction of physiological function and increase in the chance of disease and death. Studies in several species reveal a wide spectrum of alterations in mitochondria and mitochondrial DNA (mtDNA) with aging, including (1) increased disorganization of mitochondrial structure, (2) decline in mitochondrial oxidative phosphorylation (OXPHOS) function, (3) accumulation of mtDNA mutation, (4) increased mitochondrial production of reactive oxygen species (ROS) and (5) increased extent of oxidative damage to DNA, proteins, and lipids.

Biological aging is characterized by buildup of intracellular debris (e.g., oxidative damage, protein aggregates, and lipofuscin), which fuels a vicious cycle of cell/DNA damage response activation (CDR and DDR, respectively), chronic inflammation (inflammaging), and progressive cell deterioration. Rejuvenation by exercise is a non-pharmacological approach that targets all the major hallmarks of aging and extends both health- and lifespan in modern humans.

Direct delivery and channeled processing of lipids in mitochondria could represent a reliable and efficient way to maintain reactive oxygen species (ROS) within levels compatible with signaling while ensuring robust and reliable energy supply.



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