Mitochondria

The mitochondrion (plural mitochondria) is a membrane-bound organelle found in most eukaryotic cells (the cells that make up plants, animals, fungi, and many other forms of life).

The word mitochondrion comes from the Greek μίτος, mitos, i.e. “thread”, and χονδρίον, chondrion, i.e. “granule”.

Mitochondria range from 0.5 to 1.0 micrometer (μm) in diameter. These structures are sometimes described as “the powerhouse of the cell” because they generate most of the cell's supply of adenosine triphosphate (ATP), used as a source of chemical energy.

In addition to supplying cellular energy, mitochondria are involved in other tasks such as signaling, cellular differentiation, and cell death, as well as maintaining the control of the cell cycle and cell growth.

Mitochondria are often referred to as the “powerhouses” of the cell because they play a critical role in generating energy in the form of adenosine triphosphate (ATP) through a process called oxidative phosphorylation.

Mitochondria have been implicated in several human diseases, including mitochondrial disorders and cardiac dysfunction, and may play a role in the aging process. More recent research indicates that autism, especially severe autism, is correlated with mitochondrial defects.

Subtypes

Classical Mitochondria: These are the typical mitochondria found in most eukaryotic cells. They have a double-membraned structure with an outer mitochondrial membrane and an inner mitochondrial membrane. The inner membrane contains folds called cristae, which house the machinery responsible for ATP production through oxidative phosphorylation.

Chondriome: The term “chondriome” refers to the entire population of mitochondria within a cell. It encompasses all mitochondrial subtypes and their variations in terms of size, shape, and function.

Megasomes: Megasomes are larger-than-average mitochondria that have been observed in certain cell types and under specific conditions. These mitochondria may have distinct roles in energy production or other cellular processes.

Balloon Mitochondria: These mitochondria appear swollen or balloon-like in structure due to changes in their inner membrane morphology. The exact significance of balloon mitochondria is still under investigation, but they may be related to various cellular stress responses.

Mitochondria-Associated Membranes (MAMs): MAMs are regions where the mitochondrial outer membrane comes into close proximity with the endoplasmic reticulum (ER). These contact sites

facilitate the exchange of lipids, calcium ions, and signaling molecules between the two organelles. MAMs play a role in various cellular processes, including lipid metabolism and calcium signaling.

Mitochondrial Networks: Mitochondria within a cell can form networks or interconnected structures. These networks enable the efficient distribution of energy production and other mitochondrial functions throughout the cell. The balance between mitochondrial fusion (joining of mitochondria) and fission (division of mitochondria) helps regulate the structure of these networks.

Mitochondrial DNA (mtDNA): While not a subtype of mitochondria per se, it's worth noting that mitochondria have their own DNA (mtDNA) distinct from the nuclear DNA. MtDNA can exhibit variations or mutations, and these can give rise to different mitochondrial characteristics and functions.

Mitochondrial subtypes may have specific roles in different cell types or under specific physiological conditions. These variations in mitochondrial structure and function are areas of active research, as they can provide insights into cellular energy metabolism, responses to stress, and various diseases associated with mitochondrial dysfunction.

Function

see Mitochondrial function

Mitochondrial dysfunction

see Mitochondrial dysfunction.