NERVES and MITOCHONDRIA

Axons do have mitochondria. These mitochondria are essential for providing energy to the axon, especially in areas of high energy demand like branch points, presynaptic terminals, and nodes of Ranvier. Axonal mitochondria are also involved in various other functions, including axonal regeneration and autophagy. [1, 2, 3, 4]

A bundle of axons is termed as a nerve. Nerve signals travel rapidly along the axons of myelinated nerves as the electrical signals tend to hop along the axon from gap to gap, rather than having to flow along the whole axon

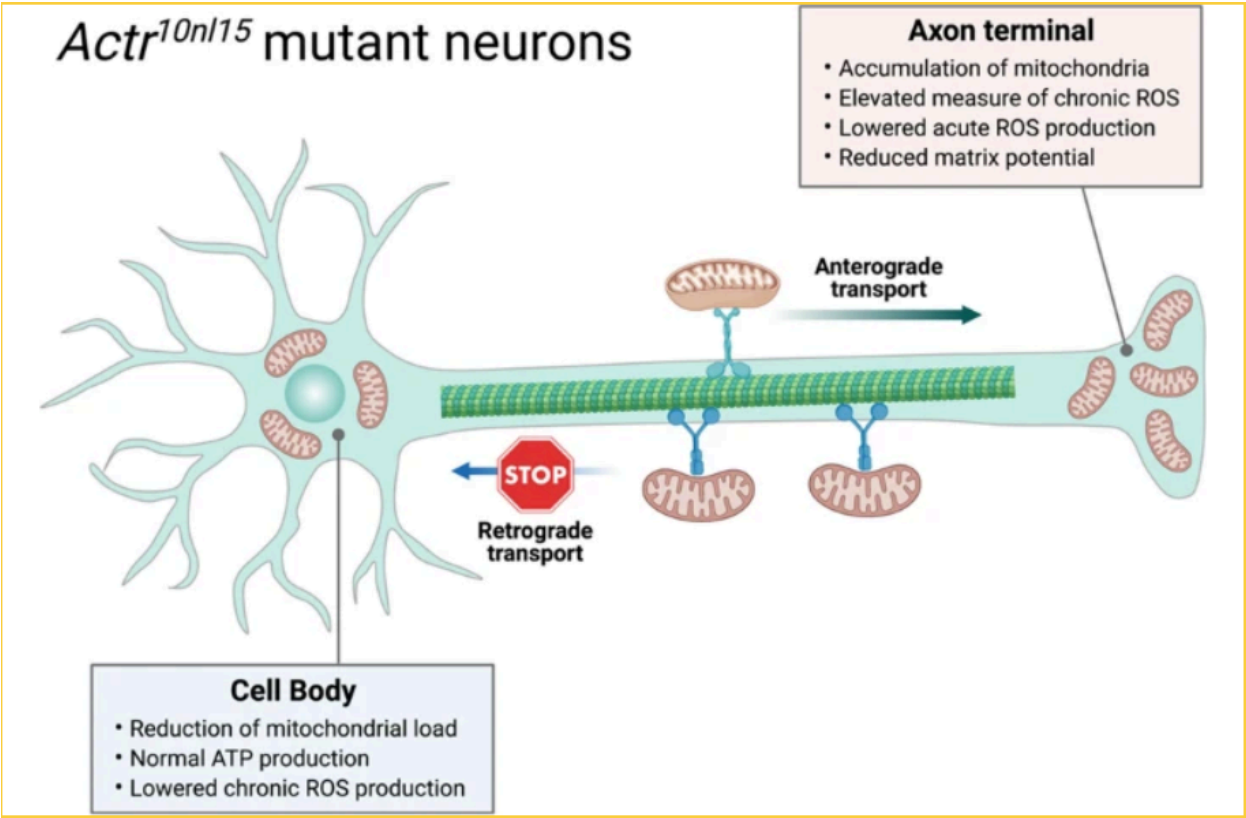
Here's a more detailed look: [2, 5]

- **Energy Production:** Mitochondria are the powerhouses of the cell, and they play a crucial role in generating ATP, the primary energy currency of the cell. This energy is essential for various axonal functions, including the transport of molecules and the maintenance of the axon's structure. [2, 5, 6]

- **Axonal Regeneration:** Studies have shown that axon injury results in increased mitochondrial density in the injured axons. This increase is thought to be necessary for axon regeneration, as mitochondria provide the energy required for the process. [3]

- Autophagy: Axonal mitochondria are also involved in autophagy, a process by which cells break down and recycle damaged organelles and proteins. Loss of axonal mitochondria can impair autophagy and lead to the accumulation of proteins in the axon, according to a study on eLife. [4]

- **Morphology and Distribution:** Axonal mitochondria tend to be more punctate (small and scattered) compared to dendritic mitochondria, which are more tubular. There's also a dynamic balance between mobile and stationary axonal mitochondria, with a significant portion remaining in place at specific locations within the axon, according to the National Institutes of Health (NIH). [1, 7, 8, 9]



[1] https://www.sciencedirect.com/science/article/pii/S2211124721009396
[2] https://www.sciencedirect.com/science/article/pii/S0896627322002513
[3] https://pmc.ncbi.nlm.nih.gov/articles/PMC5364819/
[4] https://elifesciences.org/reviewed-preprints/95576
[5] https://www.britannica.com/science/mitochondrion
[6] https://pmc.ncbi.nlm.nih.gov/articles/PMC3656622/
[7] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7271820/
[8] https://pmc.ncbi.nlm.nih.gov/articles/PMC5687842/
[9] https://pmc.ncbi.nlm.nih.gov/articles/PMC2259239/