Mitophagy is a cellular process that involves the selective removal of damaged or dysfunctional mitochondria through autophagy, a cellular mechanism for breaking down and recycling cellular components. The term “mitophagy” is a combination of “mito,” which refers to mitochondria, and “phagy,” which means “to eat” or “to devour.”

Here's how mitophagy works:

Mitochondrial Damage: Mitochondria can become damaged due to various factors, such as oxidative stress, DNA mutations, or other cellular stressors. Damaged mitochondria can produce harmful reactive oxygen species (ROS) and disrupt cellular functions.

Recognition of Damaged Mitochondria: Cells have specific mechanisms to recognize damaged mitochondria. These mechanisms involve proteins and signaling pathways that can detect abnormal mitochondrial components or membrane potential.

Engulfment by Autophagosomes: Once damaged mitochondria are recognized, the cell forms double-membraned structures called autophagosomes around the damaged mitochondria. Autophagosomes are like cellular “bubbles” that encase the targeted mitochondria.

Fusion with Lysosomes: Autophagosomes then fuse with lysosomes, which are cellular organelles containing enzymes capable of breaking down cellular materials. This fusion forms autolysosomes.

Degradation: Inside the autolysosomes, the damaged mitochondria are broken down, and their components are digested and recycled by the lysosomal enzymes.

Mitophagy is crucial for maintaining mitochondrial health and overall cellular function. It helps eliminate dysfunctional mitochondria that could otherwise produce harmful reactive molecules and impair cellular energy production. Dysregulation of mitophagy has been implicated in various diseases, including neurodegenerative disorders and cancer. Researchers are actively studying this process to better understand its role in health and disease and to explore potential therapeutic interventions.

There is an urgent need for novel diagnostic and therapeutic strategies for patients with Glioblastoma. Previous studies have shown that BCL2-like 13 (BCL2L13) is a member of the BCL2 family regulating cell growth and apoptosis in different types of tumors. However, the clinical significance, biological role, and potential mechanism of GBM remain unexplored. In a study, Wang et al. showed that BCL2L13 expression is significantly upregulated in GBM cell lines and clinical GBM tissue samples. Mechanistically, BCL2L13 targeted DNM1L at the Ser616 site, leading to mitochondrial fission and high mitophagy flux. Functionally, these alterations significantly promoted the proliferation and invasion of GBM cells both in vitro and in vivo. Overall, these findings demonstrated that BCL2L13 plays a significant role in promoting mitophagy via DNM1L-mediated mitochondrial fission in GBM. Therefore, the regulation and biological function of BCL2L13 render it a candidate molecular target for glioblastoma treatment [1].

1)

Wang J, Chen A, Xue Z, Liu J, He Y, Liu G, Zhao Z, Li W, Zhang Q, Chen A, Wang J, Li X, Wang X, Huang B. BCL2L13 promotes mitophagy through DNM1L-mediated mitochondrial fission in glioblastoma. Cell Death Dis. 2023 Sep 2;14(9):585. doi: 10.1038/s41419-023-06112-4. PMID: 37660127.