Tumor Suppression and Promotion by Autophagy

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 Autophagy is a highly regulated catabolic process that involves lysosomal degradation of proteins and organelles, mostly mitochondria, for the maintenance of cellular homeostasis and reduction of metabolic stress. Problems in the execution of this process are linked to different pathological conditions, such as neurodegeneration, aging, and cancer. Many of the proteins that regulate autophagy are either oncogenes or tumor suppressor proteins. Specifically, tumor suppressor genes that negatively regulate mTOR, such as PTEN, AMPK, LKB1, and TSC1/2 stimulate autophagy while, conversely, oncogenes that activate mTOR, such as class I PI3K, Ras, Rheb, and AKT, inhibit autophagy, suggesting that autophagy is a tumor suppressor mechanism. Consistent with this hypothesis, the inhibition of autophagy promotes oxidative stress, genomic instability, and tumorigenesis. Nevertheless, autophagy also functions as a cytoprotective mechanism under stress conditions, includ