Frontiers in Bioscience-Landmark

Special Issue

Autophagy in neurodegenerative diseases and other diseases associated with the central nervous system

Guest Editor

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Message from the Guest Editor

Dear Colleagues,

Neurodegenerative diseases represent a major challenge for society as these are not diseases where patients have short-term vital prognoses. A primary challenge is that this class of diseases are very debilitating, caregivers are under great pressure, and appropriate centers are required for the care of patients. Among neurodegenerative diseases there are demyelinating neurodegenerative diseases such as multiple sclerosis and peroxysomal leukodystrophies, as well as non-demyelinating diseases such as Alzheimer’s disease, Parkinson’s disease, Niemann–Pick disease, Huntington’s disease, and amyotrophic lateral sclerosis or Charcot disease. It is clearly of importance to understand the mechanisms involved in the pathophysiology of these diseases to better treat those afflicted with neurodegenerative disease. In Alzheimer's or Parkinson's disease, abnormal accumulations of tau protein or α-synuclein aggregates occur, and in Huntington's disease accumulation of the huntingtin protein is observed, suggesting that in these diseases disruption of a critical degradation mechanism, termed autophagy, occurs. Autophagy is a major cellular pathway by which cells deliver cytoplasmic contents to lysosomes for degradation, and the targets for degradation by autophagy are varied such as organelles, RNA, protein aggregates, lipid droplets, sugar clusters, bacteria, viruses. Autophagy serves to breakdown each of these targets into basic building blocks, such as amino acids, carbohydrates, and lipids, which are subsequently used to reconstitute new cellular components and produce energy. Twenty types of selective autophagic mechanisms have been described and are named according to the type of substrates targeted such as mitochondria (mitophagy), peroxisomes (pexophagy), portions of nuclei (nucleophagy), glycogen (glycophagy), lipid droplets (lipophagy), portions of the endoplasmic reticulum (reticulophagy), ribosomes (ribophagy), protein aggregates (aggrephagy), bacteria (bacterial xenophagy), viruses (viral xenophagy), and lysosomes (lysophagy). Furthermore, some particular types of autophagy, such as mitophagy, may be of particular interest in the context of neurodegenerative diseases.

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Understanding how to control autophagy using different natural or Autophagy in neurodegenerative diseases and other diseases associated with the central nervous system molecules promises to improve both our understanding of neurodegenerative diseases as well as their clinical management. The study of diseases associated with the central nervous system, for example the visual system, could also boost research into autophagic mechanisms and how to modulate their activity.

Dr. Anne Vejux

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