CHEMISTRY & BIODIVERSITY

REVIEW

Unraveling Berberine's Molecular Mechanisms in Neuroprotection Against Neurodegeneration

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ABSTRACT

Neurodegenerative diseases (NDs) exhibit significant global public health challenges due to the lack of effective treatments. Berberine (BBR), a natural alkaloid compound in various plants, has been recognized for its potential neuroprotective properties. This review explores the current understanding of BBR's mechanisms of action and its therapeutic potential in preventing and treating NDs such as Alzheimer's disease, Parkinson's disease, and Huntington's disease. BBR's neuroprotective properties are attributed to its multifaceted actions, including anti-inflammatory, antioxidant, antiapoptotic, and neurotrophic effects. In addition, BBR can influence many signaling pathways involved in neurodegeneration, including AMP-activated protein kinase (AMPK), nuclear factor erythroid 2-related factor 2, and brain-derived neurotrophic factor pathways. Furthermore, BBR targets vital signaling pathways, including AMPK, PI3K/Akt, and MAPK, which are essential for developing NDs. In addition, BBR's efficacy in reducing neurodegenerative pathology and improving cognitive function has been demonstrated through preclinical studies using cellular and animal models. Clinical trials demonstrating BBR's therapeutic potential in NDs have yielded promising results, but further research is needed to confirm its safety and efficacy in humans.

The authors declare no conflicts of interest.

Data Availability Statement

The authors have nothing to report.

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