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Nanocarrier-mediated nose-to-brain drug delivery for Parkinson's disease

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The intranasal route attracts attention due to the specific anatomical and physiological features of the nasal cavity. Intranasally administered drugs can be transported to the central nervous system within minutes due to the connection between the nasal cavity and the brain via olfactory neurons. Nowadays, there are approaches to increase the efficacy of drugs by including them in bioadhesive formulations for nasal administration. The development of nanocarriers (NCs) is promising for improving the brain therapeutic delivery. NCs have some advantages over conventional formulations including encapsulation of one or more drugs, loading of higher doses in a small volume of formulation, controlling drug release, and targeting drugs to diseased locations. The rapid and preferential distribution of drugs to the brain via the intranasal route may lead to the reduction of systemic exposure and peripheral adverse effects.

The purpose of this review is to present various NCs that encapsulate drugs for targeted nose-to-brain delivery for the treatment of neurodegenerative diseases such as Parkinson's disease (PD). Along with the traditionally recognised pathological hallmarks of dopaminergic neuronal death and intracellular α-synuclein depositions, iron accumulation, elevated oxidative stress and lipid peroxidation damage are further features of PD pathophysiology. Therefore, active substances that can affect the disease by various mechanisms e.g., drugs increasing dopaminergic mediation or neuroprotectants which discontinue the progress of the disease (iron chelators, antioxidants) can promote direct access to the central nervous system by inclusion in nanocarriers. This review highlights the recent advances of nanocarriers in enhancing drug activity for PD therapy.

References

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