

Abstract

Potential of Antioxidant-Loaded Solid Lipid Nanoparticles (SLN) and Nanostructured Lipid Carriers (NLC) for the Management of Neurodegenerative Diseases [†]

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Abstract: The intranasal route has been suggested as a promising alternative to improve drug delivery to the central nervous system, as it can transport drugs from the nose directly to the brain, avoiding the need to cross the blood-brain barrier and, therefore, can represent an effective strategy in the treatment of neurodegenerative diseases. Natural compounds, existent in marine microorganisms, can be used in the management of neurodegenerative diseases due to their remarkable antioxidant activity that reduces the oxidative stress associated with the development of these diseases. The objective of this work was to prepare solid lipid nanoparticles (SLN) and nanostructured lipid carriers (NLC) for nose-to-brain delivery loaded with 1000 µg/mL of two natural antioxidants, in particular antioxidant extract and pure antioxidant. On the day of the production, all formulations had a particle size, polydispersity index and zeta potential suitable for nose-to-brain administration. In addition, all formulations showed high encapsulation efficiency of the tested natural antioxidants. Six months after storage at 20.0 ± 0.5 °C, in the case of SLN and NLC with antioxidant extract, and one month after storage, in the case of SLN and NLC with pure antioxidant, the characterization parameters underwent only slight changes. Biocompatibility studies in human neuronal cells SH-SY5Y, showed that the developed formulations are safe at least at concentrations up to 100 µg/mL. The results of this study highlighted the potential of using lipid nanoparticles loaded with natural antioxidants in the management of neurodegenerative diseases, although more experiments are needed to confirm this evidence.

Keywords: antioxidant; neurodegenerative diseases; oxidative stress; antioxidant activity; nanostructured lipid carriers (NLC); solid lipid nanoparticles (SLN); nose-to-brain

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