

Lipid carriers mediated targeted delivery of nutraceuticals: Challenges, role of blood brain barrier and promises of nanotechnology based approaches in neuronal disorders

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Abstract:

Despite all significant research in discovering new therapeutics, there has been an alarming rate of reported neurological disorders. However, the delivery of these neurotherapeutics within the brain region is still a significant challenge in the clinical management of neuronal disorders. Here, characteristic of the blood-brain barrier and blood-cerebrospinal fluid barrier serves the purpose of a physiological barrier to restrict the passage of systemic bioavailable neurotherapeutics inside the brain, owing to low permeability and drug localization issues. The major advantage of such lipid-based delivery systems is that these are effective non-invasive techniques-based approaches that enable targeting of neuro-therapeutics into the central nervous system. In the case of poorly water-soluble drugs, these lipid-based carriers not only favor to increase bioavailability by enabling better solubility characteristics in the gastrointestinal tract but such encapsulated neurotherapeutics loads within the systems; may also favor stability. While owing to their small size and lipid-based composition, they offer enhanced permeability across the blood-brain barrier. These lipid-based nanocarriers effectively transport the encapsulated loads such as synthetic drugs, nutraceuticals, phytoconstituents, herbal extracts, or therapeutic peptides; across of these impermeable barriers to reduce the incidence of off-target mediated adverse impacts and toxicity.

In this review, we discussed, in brief, the potential of nanotechnology processed and lipid-based carriers, which are not only to enable higher penetration through the blood-brain barrier but also to maintain drug plasma levels in the desired range, owing to control release profile. Apart from an increase in the extent of bioavailable fraction of drugs within the brain region, other attributes such as modulation in drug release, better penetration, the incidence of bypassing the first-pass metabolism to elevate half-lives; are further favoring the potential application of these carriers. Hence in this introductory review paper, a brief account of general introduction on limitation of neurotherapeutics loaded conventional dosage forms, the blood-brain barriers as pharmacological barriers, challenges in brain targeted drug delivery, as well as potentials of different lipid-based nanoparticles and their patents, as emerging delivery solutions for neurotherapeutics delivery; in the clinical management of neuronal disorders; were thoroughly discussed.

Keywords: Nanotechnology, nutraceuticals, Nanoparticles, CNS, BBB, Nanoemulsion, Toxicity, Regulatory, SLN, NLC, liposomes