LIPID NANOPARTICLES FOR BRAIN DRUG DELIVERY

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The access to the brain parenchyma is hindered by different physiological barriers that tightly regulate molecular trafficking. The blood-brain barrier (BBB), by regulating brain influx and efflux from the bloodstream, has a fundamental role in brain drug discovery and development. Indeed, numerous potential therapeutics fail to reach their molecular targets in the brain due to their inability to cross the BBB and/or to reach brain parenchyma in therapeutic concentrations. Nanotechnology-based approaches might improve the unfavorable pharmacokinetics of therapeutic molecules by enhancing binding to the cerebrovascular endothelium and translocation into the brain, thereby increasing delivery to target cells.

After an overview of the most relevant nanotechnology-based approaches engaged to improve drug delivery to the brain, I will discuss a simple and effective strategy for enhancing uptake of lipid nanoparticles in the brain. Adsorption of apolipoprotein E4 onto nanoparticles to produce an extemporaneous protein corona allows the specific targeting of cerebrovascular endothelium. This strategy increased nanoparticle translocation into brain parenchyma and improved brain nanoparticle accumulation with respect to undecorated particles. Apolipoprotein decorated nanoparticles have high clinical translational potential and may improve the development of nanotechnology-based medicine for a variety of neurological diseases.