J Stem Cell Res Ther 2018, Volume 8
DOI: 10.4172/2157-7633-C6-048

Niosome-mediated gene delivery: New insights into safe and effective CNS therapeutics

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Gene therapy is considered an intriguing therapeutic alternative in wide-ranging neurological disorders. Though non-viral gene carriers represent a safer alternative to their viral counterparts, a thorough design of such vehicles is crucial to enhance their transfection properties. This study evaluated the effects of combined use of two non-ionic surfactants, poloxamer 188 (P) and polysorbate 80 (P80) into nanovesicles based on 2,3-di(tetradecyloxy)propan-1 amine cationic lipid (D)- destined for gene delivery to CNS cells. Niosome formulations without and with poloxamer 188 (DP80 and DPP80, respectively) were prepared by the reverse phase evaporation technique and characterized in terms of size, surface charge, and morphology. Upon the addition of pCMS-EGFP reporter plasmid, the resulting complexes at different cationic lipid/DNA mass ratios- were further evaluated if they can condense, release and protect the DNA against digestive enzymes. In-vitro experiments on NT2 cells revealed that the complexes based on a surfactant combination (DPP80) enhanced cellular uptake and viability when compared to the DP80 counterparts. Interestingly, DPP80 complexes showed protein expression in glial cells after in vivo administration into the cerebral cortices of rats. These data provide new insights for a glia-centered approach for gene therapy of nervous system disorders using cationic nanovesicles, where non-ionic surfactants play a pivotal role.

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