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Preparation and characterization of negatively-charged niosomes as gene-delivery vectors

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Background and Aims: DNA delivery systems are required not only to carry the gene to the target tissue or organ, but also to improve its stability. The aim of this study was the efficiency evaluation of niosomes with negative charge in gene-delivery.
Methods: In this study neutral and negatively charged niosomes were used for DNA (PUC18 supercoiled plasmid) complexation. Different proportions of Span/ Tween/ Cholesterol with or without dicetylphosphate were utilized for niosomes preparation by the film hydration method.
Size distribution analysis, microscopical observation of vesicles and aggregation or fusion of niosomal Bilayers in the presence of Ca2+ and DNA was investigated by laser light diffraction. The effect of Ca2+ ion on niosomal suspension light absorption was studied at 410nm. The effect of 50mM Ca2+ on the formation of DNA-niosome complex was investigated by centrifugation at 22000 rpm and determination of un-entrapped DNA at 260nm spectrophotometrically. The stability of plasmid DNA-niosome complex was studied by gel electrophoresis.
Results: Ca2+ ion showed different effects depending on the surfactant type and the presence of negative charge. The complexation percent of DNA-niosomes was as high as 80% in some formulations and the DNA was stable during complexation and extraction processes.
Conclusions: It seems that the negatively-charged niosomal systems can be used as a gene-delivery vector in the presence of Ca2+.

Keywords: Niosome; Gene delivery; DNA; Calcium ion