Turkish Journal of Chemistry

Turkish Journal

of

Chemistry

Development and Characterization of a Cationic Emulsion Formulation as a Potential pDNA Carrier System

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Keywords
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Abstract: The development of efficient and stable carriers for the delivery of DNA to the body is becoming an increasingly important issue in the fields of gene therapy and vaccination. The present study was designed to prepare an emulsion-based gene delivery system. Oil-in-water emulsions containing cetyltrimethylammonium bromide (CTAB) as a cationic surfactant and Pluronic F-68 as a nonionic co-surfactant were formulated and their physical characteristics were investigated. The cationic emulsion, referred to as B13d, containing a liquid crystal phase, was found to be stable and suitable for parenteral application. Complex formation between pGL3 plasmid DNA and B13d emulsion achieved at the pDNA:CTAB ratio of 1:2.74 (μ g/nmol) was demonstrated using the gel retardation and SYBR Green I displacement assays. Particle sizes of the freshly prepared empty and pDNA-associated B13d emulsions were about 350 nm. Zeta potentials of empty and pDNA loaded emulsions were +45.3 mV and +43.7 mV, respectively. The sensitivity of pDNA/emulsion complexes to endonuclease digestion was determined and complexes were found to be highly effective for protecting pDNA from DNase I attack. The final in vitro stability analysis carried out in the presence of human serum revealed that the super-coiled pDNA was observable even after 24 h of incubation. The physical characteristics and serum resistant properties of the complexes suggest that B13d emulsion could be an efficient pDNA carrier system for gene and/or immunogene delivery.

Key Words: Gene delivery, Cationic emulsions, Cetyltrimethylammonium bromide (CTAB), Plasmid DNA

Turk. J. Chem., **29**, (2005), 27-40.
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Other articles published in the same issue: Turk. J. Chem.,vol.29,iss.1.