Research in Pharmaceutical Sciences, 2012;7(5)
School of Pharmacy and Pharmaceutical Sciences
Isfahan University of Medical Sciences

Study on the main factors affecting the non-ionic surfactant vesicular size

A. Pardakhty

Pharmaceutics Research Center, Kerman Medical University, Kerman, Iran

Background and Aims: Many physical and biological factors affected by the size of lipid vesicles such as the effectiveness of targeting and accumulation of therapeutics in tumors or the other organs. Study on the factors affecting this important factor is essential in niosomal developing stages. In this study some related factors has been studied and reported

Methods: Four drugs with different lipophilicity including insulin (log P 0.218), ciprofloxacin HCl (log P 1.335), clindamycin phosphate (log P 2.16) and α-tocopherol (log P 10) were used for preparation of niosomes composed of sorbitan esters, their ethoxylated derivatives and cholesterol. Encapsulation efficiencies of these compounds were calculated by radioimmunoassay, microbiological assay or spectrophotometry. The vesicular stability and drug release were also evaluated

Results: Generally drugs were better encapsulated in C_{16} and C_{18} n-alkyl surfactant bilayers which in their DSC a distinct phase transition temperature were distinguished. For enhancing the encapsulation efficiency of ciprofloxacin a modified remote loading was utilized. In some cases, such as empty Span/Tween (ST) 40 or 60 niosomes hydrated with NaCl 0.9%, a size reduction was observed following storage at refrigerator for 6 months. Drug release profiles showed a specific interaction between clindamycin, ciprofloxacin and insulin with ST 20 niosomes which apparently was pH dependent. The hydration media composition and entrapped drug molecular weight or lipophilicity also had influencing effects on vesicular size.

Conclusions: In niosomes, the HLB of applied amphiphiles, the type of hydration media and integrated substance properties such as hydrophobicity, amphipatic nature and ionizing capability have key roles in determining the niosomal dimensions. The mentioned factors also had influential effects on encapsulation efficiency and release of entrapped drugs, and on vesicular stability as well. These factors should be kept in mind for developing new vesicular-based drug, gene and vaccine delivery systems.

Keywords: Niosome; Volume diameter; Stability; Release