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Research Article

The use of hot and cold high pressure homogenization to enhance the loading capacity and encapsulation efficiency of nanostructured lipid carriers for the hydrophilic antiretroviral drug, didanosine for potential administration to paediatric patients

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Abstract

A major obstacle to the application of nanostructured lipid carriers (NLCs) as carriers for hydrophilic drugs is the limited loading capacity (LC) and encapsulation efficiency (EE) of NLCs for these molecules. The purpose of this research was to design and implement a strategy to enhance the LC and EE of NLCs for the hydrophilic drug, didanosine (DDI). DDI was dispersed in Transcutol® HP and the particle size of DDI in the liquid lipid was reduced gradually using hot high pressure homogenization (HPH). The product obtained thereafter was added to Precirol® ATO 5 and the hot mixture was immediately dried using liquid nitrogen. The dried materials were then ground and passed through a 200 µm sieve and the solid lipid particles were dispersed in a surfactant solution and subsequently used to manufacture DDI-loaded NLCs using cold HPH. The LC and EE of NLCs for DDI manufactured using the new strategy were 3.39 ± 0.63% and 51.58 ± 1.31%, respectively, compared to 0.079 ± 0.001% and 32.45 ± 0.08%, respectively, obtained when DDI-loaded NLCs were produced using conventional hot HPH. The enhanced LC and EE for DDI make NLCs a potential technology for the oral administration of DDI to paediatric patients.

Keywords:: Didanosine paediatric formulations NLC Transcutol® HP Precirol® ATO 5