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Development, characterization and antimalarial efficacy of dihydroartemisinin loaded solid lipid nanoparticles

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Abstract

Effective use of dihydroartemisinin (DHA) is limited by poor water-solubility, poor pharmacokinetic profile and unsatisfactory clinical outcome especially in monotherapy. To reduce such limitations, we reformulated DHA into solid lipid nanoparticles (SLNs) as a nanomedicine drug delivery system. DHA-SLNs were characterized for physical parameters and evaluated for in vitro and in vivo antimalarial efficacy. DHA-SLNs showed desirable particle characteristics including particle size (240.7 nm), particle surface charge (+ 17.0 mV), drug loadings (13.9 wt %), encapsulation efficacy (62.3%), polydispersity index (0.16) and a spherical appearance. Storage stability up to 90 days and sustained release of drug over 20 h was achieved. Enhanced in vitro (IC₅₀ 0.25 ng/ml) and in vivo (97.24% chemosuppression at 2 mg/kg/day) antimalarial activity was observed. Enhancement in efficacy was 24% when compared to free DHA. These encouraging results show potential of using the described formulation for DHA drug delivery for clinical application.

Keyword

Dihydroartemisinin; Solid lipid nanoparticles; Nanomedicine drug delivery