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Abstract

β-Cyclodextrin Nanosponges for Oral Drug Delivery of Anti-Hypertensive Drug †

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Abstract: Nicardipine (NC) is an antihypertensive drug indicated for treatment of high blood pressure and angina. It belongs to BCS class-II, having poor solubility and low oral bioavailability. The present work was aimed at developing pyromellitic dianhydride (PMDA) cross-linked β-cyclodextrin (βCD) nanosponges (NS) for improved solubility and drug release. The βCDNS were prepared by the solvent evaporation method in 1:2, 1:4, 1:6 *w*/*w* ratio of β-CD: PMDA. The prepared drug loaded β-CDNS were subjected to characterization studies such as DSC, FESEM, FTIR, PXRD and particle size. Characterisation studies confirmed the formation of nanosponges and the entrapment of drug molecules into them. The βCDNS prepared in 1:4 *w*/*w* ratio of βCD: PMDA showed the highest increase in solubility and entrapment efficiency, with particle size of 411 nm and −20.9 mV zeta potential. The molecular docking study revealed the formation of stable complexes through interaction of NC and βCD. The nanosponges were formulated into a capsule dosage form by blending the drug-loaded nanosponges with granulated excipients such as talc, aerosol, lactose and starch. The powder blend showed acceptable flow properties. The in vitro dissolution studies of the optimized capsule formulation, performed using USP Type-I apparatus, showed considerably higher drug release compared to pure NC. Thus, PMDA cross-linked βCDNS represents a novel approach to solubility enhancement and an improved dissolution of the selected model drug.

Keywords: β-cyclodextrin; nanosponges; antihypertensive; solubility

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