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Formulation and Evaluation of Solid Dispersion of an Anti-Epileptic Drug Carbamazepine

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Abstract : Relatively insoluble candidate drug like carbamazepine (CBZ) often exhibit incomplete or erratic absorption; and hence wide consideration is given to improve aqueous solubility of such compound. Solid dispersions were formulated with an aim of improving aqueous solubility, oral bioavailability and the rate of dissolution of Carbamazepine using different hydrophyllic polymer like Polyethylene Glycol (PEG) 6000, Polyethylene Glycol (PEG) 4000, kollidon 30, HPMC 6 cps, poloxamer 407 and povidone k 30. Solid dispersions were prepared with different drug to polymer weight ratio by the solvent evaporation method where methanol was used as solvent. Drug-polymer physical mixtures were also prepared to compare the rate of dissolution. Effects of different polymer were studied for solid dispersion formulation as well as physical mixtures. These formulations were characterized in the solid state by Fourier Transform Infrared (FTIR) spectroscopy and Scanning Electron Microscopy (SEM). Solid state characterization indicated CBZ was present as fine particles and entrapped in carrier matrix of PEG 6000 and PVP K30 solid dispersions. Fourier Transform Infrared (FTIR) spectroscopic studies showed the stability of CBZ and absence of well-defined drug-polymer interactions. In contrast to the very slow dissolution rate of pure CBZ, dispersions of drug in polymers considerably improved the dissolution rate. This can be attributed to increased wettability and dispersibility, as well as decreased crystallinity and increase in amorphous fraction of drug. Solid dispersion formulations containing PEG 6000 and Povidone K 30 showed maximum drug release within one hour at the ratio of 1:1:1. Even physical mixtures of CBZ prepared with both carriers also showed better dissolution profiles than those of pure CBZ. In conclusions, solid dispersions could be a promising delivery of CBZ with improved oral bioavailability and immediate release profiles.

Keywords : carbamazepine, FTIR, kollidon 30, HPMC 6 CPS, PEG 6000, PEG 4000, poloxamer 407, water solubility, povidone k 30, SEM, solid dispersion
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