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Enhancing Dissolution Efficiency of Ketoprofen, A Rheumatoid Arthritis Pain Management Drug, through Solid Dispersion Formulation

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Background

Ketoprofen (KPN) is commonly prescribed drug to alleviate pain related with rheumatoid arthritis (RA). However, KETO belongs to the BCS class-II category, characterized by poor water solubility, resulting in less dissolution capability leading to limited systemic absorption. Purpose of this study was to increase aqueous solubility as well as rate of dissolution of KPN using solid-dispersion technique.

Methods

Two different hydrophilic carriers, D-mannitol and polyvinylpyrrolidone K30 (PVP K30) and, were utilized, in varying ratios with the drug, to formulate solid dispersions. Kneading and solvent evaporation techniques were employed for preparing KPN solid dispersions with PVP K30, while kneading and melting methods were utilized for solid dispersions containing D-mannitol. The liquid state of the formulations was characterized through phase-solubility studies, while Scanning Electron Microscopy (SEM), Fourier Transform Infrared (FTIR) spectroscopy, Differential Scanning Calorimetry (DSC) and X-ray diffraction (XRD) analysis were performed to examine the solid state.

Results

Both carriers demonstrated a favorable impact on the aqueous solubility of KPN. Solid state examination of D-mannitol solid dispersions revealed that KPN existed as fine particles, while it was entrapped within the polymer matrix in solid dispersions with PVP K30. Compared to poor rate of dissolution of pure drug KPN, the drug dispersions in both carriers showed a significantly improved dissolution rate. Improvement of dissolution rate can be ascribed to enhanced wetting behavior and dispersion of fine particles along with reduced crystalline fraction and an increase in the amorphous nature of KPN.

Conclusion

PVP K30 solid dispersions of KPN exhibited a noteworthy enhancement in the dissolution efficacy of KPN. Moreover, physical mixtures of KPN exhibited better dissolution profiles with D-mannitol and PVP K30 in comparison to pure KPN.