Nifedipine Solid Dispersions with PEG 4000 and Gelucire 53/10 – a DSC Study

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Nifedipine, 1,4-dihydropyridine with calcium channel blocking activity, has pore aqueous solubility resulting in low and often irregular bioavailability. Incorporation of such substance into the of water soluble matrix leads to the solid dispersion system (SD) where the dissolution rate of the active is significantly improved. Due to abbility to improve wettability and solubilize some compounds, polyethylene glycols (PEG) have been widely used as carriers in SD. Additional presence of self-emulsifying component improves the water solubility of the active ingredient. Moreover, it can also increase the dispersability of hydrophobic drug in the hydrophilic carrier during the process of solid dispersion formation. Therefore, higher amounts of molecularely dispersed substance are expected.

We have studied the presence of 50% of Gelucire 53/10 as surface ative agent in the PEG 4000 matrix and its influence on amount of nifedipine incorporated. SD containing 0, 5, 10, 30 and 50% of drug were prepared by melting the corresponding physical mixtures at two different temperatures: just above the mp of carriers (~70°C) and reaching the mp of nifedipine (~175°C). DSC results indicate up to 30% (including) molecularely dispersed nifedipine in the matrix, since we observed no melting peak of substance. This was found for the systems with or without Gelucire 53/10 in the case of preparation at 175°C. Using lower temperature of preparation, only 10% of nifedipine was successfully integrated. Comparing DSC results from different temperatures of preparation, nifedipine melting peak for the 50% SD melted at 175°C was smaller than in the case of melting at 70°C, meaning that melting of nifedipine improves its molecular dispersability in the system. Therefore, melting of all components is required for optimal distribution of active substance in the matrix. From the DSC results of SD we conclude that the presence of Gelucire 53/10 did not increase the amount of nifedipine dissolved in the matrix. However, other methods are to be employed to ensure additional information on this system.

References

1. Leuner C, Dressman J. Eur J Pharm Biopharm 50 (2000); 47-60.
2. Vippagunta SR et al. Int J Pharm 236 (2002); 111-123.