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Effects of Direct Tabletting Agents on Drug Release Kinetics and Swelling Behavior of Hydrophilic Matrix Tablets

Evren ALĞIN
Müge KILIÇARSLAN
Ayşegül KARATAŞ
Nilüfer YÜKSEL
Tamer BAYKARA
Ankara University, Faculty of Pharmacy, Department of Pharmaceutical Technology,
06100 Tandoğan, Ankara - TURKEY

Abstract: Aims: This work focused on the effects of direct tabletting agents (DC-agents) (Microcel PH101®, Cellactose 80®, Ludipress LCE®, Pharmatose DCL11®) and hydroxypropyl-methylcellulose (HPMC) types (Methocel® K100LV, K15M, K100M) on release of Verapamil HCl from hydrophilic matrix tablets and swelling behaviors of these tablets. Material and Methods: Tablets were prepared by direct compression method. In vitro dissolution and swelling degree tests were performed on the tablets. The release mechanisms of drug were evaluated by using Korsmeyer-Peppas model. Results: While the increase in cellulose content of DC-agents contributed to the swelling of matrices and decreased the release rate of drug from the matrices, in contrast the increase in lactose content of DC-agents caused a faster hydration and erosion of the matrices and accelerated the release of drug. The increase in viscosity grade of HPMC resulted as a decrease in release rate of drug and Methocel K15M and K100M delayed the release of drug to the same extent. Drug release was mainly fitted to the non-Fickian transport mechanism and became diffusive by decreasing the R/F values of the matrices. Tablets containing Cellactose® 80 showed an equal contribution of diffusion and swelling with 3 types of HPMCs, according to their n values and R/F profiles. The FM1 formulation containing Microcel PH101® with Methocel K100LV and the reference product Isoptin®-KKH both showed a non-Fickian transport mechanism and they were found to be similar depending on the values of difference factor (f_1 = 9.4) and similarity factor (f_2 = 56.8). Conclusions: An extended release tablet formulation can be prepared as a matrix tablet by using a cellulose based DC-agent and a low viscosity grade HPMC polymer as an alternative to film coated tablets.

Key Words: Hydroxypropyl-methylcellulose, Direct tabletting agents, Matrix tablet, Swelling degree, Verapamil hydrochloride

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