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A novel approach to determine the rheological properties of the gel layer of swollen hydrophilic matrix tablets

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Drug release from hydrophilic Matrix Tablets (MT) is controlled by the diffusion of the drug through a polymeric gel layer. When MT hydrates, a gel layer is formed. The objective of this study was to examine the utility of controlled-stress rheometer as a novel approach to measure the rheological properties of the gel layer of swollen matrices formed upon tablet hydration. MT were prepared using the low (K100LV) and high (K4M) viscosity grade Hydroxypropyl Methylcellulose (HPMC). Two sets of MT were prepared containing 21.3% K100LV (K100LV MT) and 21.3% K4M (K4M MT). Oscillatory rheological analysis of the hydrated swollen MT was performed using a controlled-stress rheometer. The gel layer exhibited more elastic behavior, where the elastic modulus (G') dominated the viscous modulus (G''), which is typical for gel materials. Swollen K100LV MT exhibited higher G' and G'' values compared to those of K4M MT. K100LV MT exhibited a lower water penetration and hydration capacity into the matrix compared to K4M MT, resulting in the formation of a thin gel layer. Therefore, the rheological properties of the dry (un-wetted) core of the K100LV MT rather than the thin gel layer were detected. These results suggested that water penetration through MT and extent of hydration depend on the polymer viscosity grade, thereby controlling the formation of the gel layer. Rheological analysis of the gel layer provides a good prediction of matrix hydration from controlled-release MT, which can guide the selection of an appropriate polymer for successful preparation of swellable hydrophilic MT.

Biography

Rania Hamed has received her PhD in Pharmaceutical Sciences from The University of Iowa in 2011. She is currently an Assistant Professor in the Faculty of Pharmacy at Al-Zaytoonah University of Jordan. Her current research focuses on developing controlled release matrix tablets using hydrophilic/hydrophobic polymers, correlating the rheological properties of the nanoemulsion-based gel formulations to the *in-vitro* permeation of drug molecules, and determining the key parameters of the biorelevant dissolution media that control the rate of dissolution of BCS class II drugs to better predict the *in-vivo* performance.

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