

## ORIGINAL RESEARCH ARTICLES

# INTERACTION ANALYSIS OF A pH RESPONSIVE ENTERIC HYPROMELLOSE PHTHALATE POLYMER IN COMPLEX WITH DIROXIMEL FUMARATE USING MOLECULAR DYNAMICS SIMULATION

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### ABSTRACT

The present study uses molecular dynamic simulations to investigate the molecular interactions, stability and pH responsive behavior of commercially available hypromellose phthalate enteric polymer in complex with drug diroximel fumarate under gastric pH 1.5 and intestinal pH 5.5, and physiological temperature 310 K. Simulations were run for 100 ns at each condition and coulombic energy, hydrogen bonding, van der Waals forces, conformational stability and binding free energy were analyzed. At pH 1.5, strong electrostatic interactions and hydrogen bonding stabilized the complex with energies fluctuating between 275-250 kcal mol<sup>-1</sup>, preventing premature gastric release. At pH 5.5, hydrogen bonding decreased, and van der Waals forces predominated facilitating drug release, suggesting pH responsiveness of the polymer. This study provides molecular level insights into pH responsive release mechanism of the polymer, offering a cost-effective approach in optimizing enteric coated formulations by reducing experimental trial-and-errors and guiding rational selection of polymeric excipients for enhanced drug stability and bioavailability.