REVIEW ARTICLE

DIHYDROPYRIMIDINONES: AN EXPLORATION OF THEIR SYNTHETIC STRATEGIES, SARs AND DIVERSE THERAPEUTIC POTENTIALS

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ABSTRACT

Dihydropyrimidinones (DHPMs) represent a vital class of heterocyclic compounds with diverse therapeutic applications. This review explores recent advances in synthetic strategies, including classical Biginelli reactions and modern green methodologies for efficient DHPM production. It emphasizes the structure–activity relationship (SAR) insights that guide the rational design of DHPM derivatives with enhanced bioactivity. Comprehensive biological evaluations highlight the potential of DHPMs across multiple therapeutic areas, including anticancer, antitubercular, antimalarial, anti-inflammatory, anti-HIV, antihypertensive, antioxidant and antibacterial activities. Key derivatives exhibit nanomolar-to-micromolar potencies *in vitro*, with selectivity over normal cells and strong interactions with biological targets, confirmed through molecular docking and dynamics simulations. SAR analyses reveal that electron-donating substituents, aromatic rings and lipophilic chains significantly improve activity, with thioxo analogs often outperforming their oxo counterparts. This review provides valuable insights for medicinal chemists by linking structural modifications to biological outcomes, aiding future design of DHPM-based therapeutic agents.