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Review of Norfloxacin: Molecular Docking, Mechanism, Pharmacokinetics and Clinical Applications

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Abstract: *The increasing prevalence of bacterial resistance to existing antibiotics poses a significant global health challenge, necessitating the development of novel agents with enhanced efficacy and selectivity. Norfloxacin, a second-generation fluoroquinolone, exerts its antibacterial effect by targeting DNA gyrase, a type II topoisomerase crucial for bacterial DNA replication, transcription, and supercoiling. This review focuses on the molecular docking, mechanism of action, pharmacokinetics, and clinical applications of norfloxacin, alongside its structural derivatives designed to overcome resistance. Molecular docking studies of norfloxacin and its rationally modified analogs demonstrated improved binding affinities within the DNA gyrase active site, with key interactions observed at Ser83, Asp87, and Arg91. Hydrogen bonding, π–π stacking, and hydrophobic interactions contributed significantly to complex stability, highlighting potential structural modifications to enhance antibacterial potency. Beyond mechanistic insights, the review covers norfloxacin's pharmacokinetic profile, dosage forms, solubility, physical properties, antifungal activity, and clinical utility. By integrating computational, pharmacological, and clinical perspectives, this work provides a comprehensive understanding of norfloxacin and its derivatives, offering a basis for further in vitro and in vivo validation and guiding the rational design of next-generation antibacterial agents*

Keywords: Norfloxacin, DNA gyrase, Molecular docking, Pharmacokinetics

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