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(57) Abstract :
[030] The present invention relates to novel substituted fluoroquinolone derivatives, their pharmaceutically acceptable salts, solvates, polymorphs, and pharmaceutical compositions, and therapeutic methods for inhibiting bacterial DNA gyrase and topoisomerase IV in multidrug-resistant Gram-positive and Gram-negative infections. The disclosed compounds are rationally designed through strategic structural modifications at the N-1, C-7, and C-8 positions of the fluoroquinolone core to enhance antibacterial potency, improve pharmacokinetic and pharmacodynamic properties, increase cellular uptake, and overcome established resistance mechanisms. The pharmaceutical compositions are formulated in various dosage forms suitable for oral, parenteral, topical, inhalational, ocular, nasal, and transdermal administration. The invention further provides methods for treating and preventing a wide range of bacterial infections, including respiratory, urinary, gastrointestinal, skin and soft tissue, bloodstream, and biofilm-associated infections. The substituted fluoroquinolone derivatives exhibit broad-spectrum bactericidal activity against clinically significant multidrug-resistant pathogens and demonstrate superior in vitro and in vivo efficacy compared to conventional fluoroquinolones, thereby offering a robust next-generation antimicrobial platform to combat the escalating global challenge of antibiotic resistance. Accompanied Drawing [FIGS. 1-2]

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