

AI-DRIVEN TARGETING OF BIOFILM MATRIX ARCHITECTURE USING MICROBIAL MOLECULES FROM EXTREME ENVIRONMENTS

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Biofilm matrices intensify antimicrobial resistance by shielding microbial communities with exopolysaccharides, eDNA, and functional amyloids, limiting antibiotic penetration and promoting chronic infections. This review highlights a paradigm shift toward dismantling biofilm matrices using stable, bio-optimised molecules derived from extremophilic microbes. Advances in AI-driven workflows, such as genomic mining (SEGMA) and multi-objective optimisation (MultiMol), enable the discovery of resilient metabolites and enzymes that disrupt matrix synergy. Integrating artificial intelligence with extremophile bioprospecting offers a scalable strategy to counter biofilm-mediated AMR and restore clinical efficacy.
