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EMERGING THERAPIES FOR MRSA: ANTIMICROBIAL PEPTIDES, PHAGES, AND NANOMEDICINE

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Abstract

Objective: Methicillin-resistant Staphylococcus aureus (MRSA) poses a significant healthcare challenge due to increasing antibiotic resistance. This review explores innovative therapeutic strategies beyond conventional antibiotics, emphasizing antimicrobial peptides (AMPs), bacteriophage therapy, and nanoparticle-based drug delivery.

Method: A literature search was performed across PubMed, Scopus, and Google Scholar, focusing on studies published in the past 10 years. Antimicrobial peptides, bacteriophages, and nanoparticles. Experimental, clinical, and review studies reporting efficacy, mechanisms, safety, and clinical relevance were included, while irrelevant or non-English studies were excluded. Data were analyzed to identify promising strategies and potential synergistic effects.

Results: AMPs exhibit broad-spectrum antibacterial effects by disrupting bacterial membranes and inhibiting biofilm formation, which often contributes to antibiotic resistance. Bacteriophage therapy provides highly specific targeting of MRSA and penetrates biofilms that resist conventional antibiotics. Nanoparticle-based drug delivery enhances stability, bioavailability, and targeted release of antimicrobials while minimizing systemic toxicity. Emerging evidence suggests that combining these approaches may produce synergistic effects, offering a promising shift in MRSA management strategies.

Conclusion: AMPs, bacteriophages, and nanoparticle-mediated delivery represent promising alternatives to traditional antibiotics for MRSA treatment. These novel therapies underscore the critical role of clinical pharmacists in evaluating, implementing, and monitoring innovative interventions to optimize patient outcomes and address the growing threat of antibiotic resistance.

Keywords: MRSA, antimicrobial peptides, bacteriophage therapy, nanoparticles, novel therapies, clinical pharmacy.