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Abstract

Silver Nanoparticles and Their Antimicrobial Activity on Multidrug-Resistant Bacteria (AgNPs): A Literature Review †

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Conventional antibiotics have become increasingly compromised due to the constant growth of bacterial resistance, requiring new therapeutic strategies. Silver nanoparticles have emerged as promising candidates due to their multifaceted action, because they bind to components of the bacterial cell wall and membrane, rendering them susceptible to lysis and releasing silver ions. This process induces oxidative stress and inhibits DNA replication. This study aims to review the antimicrobial potential of AgNPs against resistant strains, as well as their potential effectiveness when combined with conventional antibiotics. A literature review was conducted in the PubMed and Scielo databases using the keywords 'silver nanoparticles' and 'multidrug-resistant bacteria'. Articles published between 2020 and 2025 addressing the antimicrobial activity and clinical and experimental applications of AgNPs were included. Silver nanoparticles demonstrated significant antimicrobial activity against multidrug-resistant bacteria, exhibiting multiple mechanisms of action such as membrane damage and the generation of reactive oxygen species [1]. Furthermore, combining them with antibiotics reduced the minimum inhibitory concentration (MIC), indicating a synergistic effect and increased clinical efficacy [2]. These results highlight the potential of AgNPs in the treatment of resistant infections, both in isolation and as adjuvants, as well as in combination with antibiotics. The findings reinforce the potential of silver nanoparticles as an alternative or adjuvant strategy in combating multidrug-resistant bacteria. However, further studies are needed, particularly clinical studies on safety, standardisation and sustainable production, to enable the application of AgNPs in clinical treatments.

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