

## ORIGINAL RESEARCH

69. **Green Synthesis of Streptomycin-Conjugated Silver Nanoparticles and their Efficacy Against Multi Drug-Resistant *Staphylococcus aureus***

oura Rajeshwara,<sup>1</sup> Raghu S. Holalkere,<sup>2</sup> Raghavendra S. Nagaraju,<sup>2</sup> Rajeshwara Achur,<sup>2</sup> Halesh L.H.<sup>1</sup>

<sup>1</sup> Shimoga Institute of Medical Sciences, India

<sup>2</sup> Kuvempu University, India

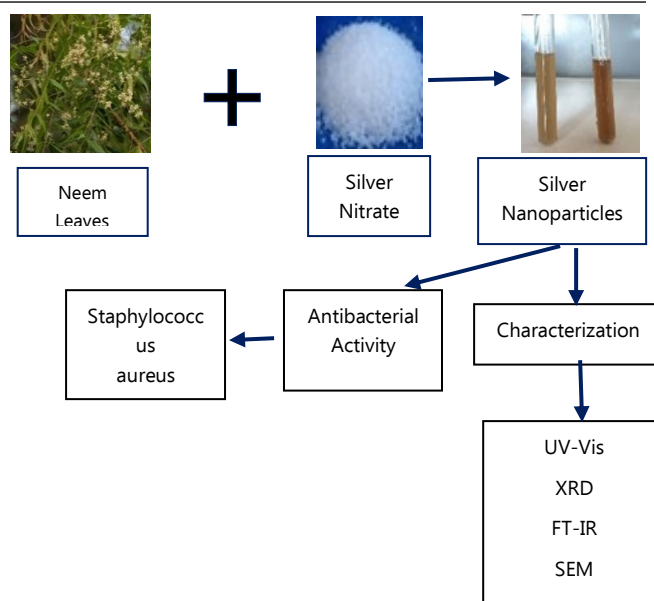
**Background:** The emergence of multidrug resistant (MDR) pathogenic microbes against typical antibiotics is a global problem. Novel and effective strategies are being explored to treat various disease causing MDR pathogens. In this study, we prepared and tested the efficacy of antibiotic-conjugated silver nanoparticles against MDR-pathogens.

**Methods:** We used the plant extract for the green-synthesis of Silver nanoparticles (AgNPs) as well as Streptomycin-conjugated AgNPs. The aqueous *Azadirachta indica* (Neem) leaf extract was used for the synthesis of AgNPs. The synthesized nanoparticles were characterized by various techniques and the antimicrobial activity was determined by agar-well plate method.

**Results:** The green synthesized Streptomycin-conjugated AgNPs were characterized by different analytical techniques to establish the nanoparticle formation, size, shape and the presence of functional groups. The UV-visible spectra indicating absorbance at 450 and 440nm confirmed the formation of AgNPs and St-AgNPs, respectively. The scanning electron microscopic images showed that AgNPs and St-AgNPs are spherical in shape and the size in the range of 21-30 nm and 29-43 nm, respectively. The X-ray diffraction pattern of AgNPs and St-AgNPs showed peaks establishing the crystalline nature of the particles with characteristic peaks of  $2\theta$  for (111), (200), (220) and (311) planes. The Fourier Transform Infrared spectrum of St-AgNPs shows distinct peaks at 2980.47 (C-H bond), 1723.37 (C=O bond), 1606.89 (C=C bond), 1507.63 (N-O group), 1445.33 (C-H), 1269.02 (C-O bond), 1019.19 (C-O bond), and 812.43 cm (C-C bond) which corresponds to the functional groups present in both AgNPs and the conjugated antibiotic streptomycin. Further, the antimicrobial activity of AgNPs and St-AgNPs was examined by using the agar-well plate method against MDR *Staphylococcus aureus*. The antimicrobial activity analysis showed that St-AgNPs exhibited ~50% higher activity as compared to streptomycin alone.

**Conclusion:** The results of our study indicate that the green synthesized antibiotic conjugated AgNPs could be used to treat MDR *Staphylococcus aureus* and potentially other MDR pathogens as well. Further detailed studies are in progress to confirm the utility of these antibiotic conjugated AgNPs.

**Figure 1.** Green Synthesis Workflow of Silver Nanoparticles using Neem Leaves



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

ISSN 2076-6327

This journal is published by [Pitt Open Library Publishing](https://pittopenlibrarypublishing.com/)

**Pitt** Open Library Publishing