

Effect of silver nanoparticles on the antibacterial activity of different antibiotics against *Staphylococcus aureus* and *Pseudomonas aeruginosa*

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Background and Aims: In this study colloidal silver nanoparticles are evaluated for their synergistic effects in enhancing the antimicrobial activities of different antibiotics against *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Methods: Water soluble colloidal nanosilver particles (Ag-NPs) with average size of 5 nm containing Tween prepared in distilled water and brown in color were used (Product of NanoNasb Pars Company). A stock solution of the 10 µg/ml nano Ag was prepared in ultra pure distilled water. The microorganisms utilized for the test were *Staphylococcus aureus* ATCC 29213 and *Pseudomonas aeruginosa* PTCC 1310. Microbial inoculums were prepared by subculturing microorganisms into Muller Hinton Broth (MHB) at 37 °C for 24h and were diluted with 0.9% NaCl to 0.5 McFarland standard. The standard antibiotics disks of Amoxicillin, Erythromycin, Vancomycin, Gentamicin, Tetracycline and Carbenicillin were impregnated with 10 µL of the freshly prepared Ag-NPs at a final content of 10 µg/disk and applied to on Muller-Hinton agar plates (disk diffusion method). Also, experiments were carried out with Ag-NPs alone. Plates were incubated at 37°C for 18 hours and then the zones of inhibition were measured. The assays were carried out in triplicate.

Results:

The antibacterial activities of amoxicillin, erythromycin and vancomycin were increased in the presence of Ag-NPs against *S. aureus*, also Gentamicin, Tetracycline and Carbenicillin against *P. aeruginosa*. The highest enhancing effects were observed for vancomycin and amoxicillin against *S. aureus* and Carbenicillin and Gentamicin against *P. aeruginosa*.

Conclusions: The development of new resistant strains of bacteria to current antibiotics has become a serious problem in public health; therefore, there is a strong incentive to develop new bactericides. Our study showed that Ag-NPs have a significant synergistic effect on the antibacterial activity of different antibiotics.

Keywords: Silver nanoparticles; Antibacterial activity; Antibiotic resistance