Antibacterial activity of modified zinc oxide nanoparticles against Pseudomonas aeruginosa isolates of burn infections

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ABSTRACT

In this research antimicrobial activity of nanoparticles ZnO on perilous bacteria such as Pseudomonas aeruginosa was evaluated. P. aeruginosa is important pathogen that caused burn wound infections as it is multi-drug resistant and has several virulence factors. Fifteen samples of P. aeruginosa were collected from patients who suffering from Burn infections in Al-Hilla teaching hospital burn unit with the age range between (7-80) years old for both genders. After collecting burn samples, the diagnosis and characterization were performed by culturing and biochemical tests. ZnO NPs were synthesized by chemical method, Zinc oxide nanoparticles are well-known to be one of the multifunctional inorganic compounds which are widely used in medical applications. This study aims to prepare ZnO nanoparticles with particle size ranging from 23-29 nm. In the present study, surface modification of ZnO nanoparticles was performed, and influence of modification of the structure and morphological properties was investigated. The resulting nanoparticles were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM) and atomic force (AFM). Zinc oxide nanoparticles with the average diameter of about 29 nm were modified with an oleic acid to exert more compatibility. From the results obtained it is suggested that modified ZnO-nanoparticles could be used effectively in safety environmental and medical applications. Antibacterial activity for nanoparticle ZnO against P. aeruginosa isolates was measured by: Agar Diffusion Technique and Minimum Inhibitory Concentration (MIC)/Minimum bactericidal Concentration (MBC) with microdilution. The best zone of inhibition was (35.5mm) at a concentration of 40 µg/ml of nano-ZnO in one strain of P. aeruginosa while the lowest inhibition zone was (16 mm) at a concentration of 20

µg/ml of nano ZnO in one strain also. In addition, all P. aeruginosa isolates were completely inhibited at the concentration of 3.7 µg/ml of nano-ZnO (MIC) but no significant antibacterial activity was observed at concentrations less than 1.8 µg/ml of nano-ZnO and .the (MBC) was same as MIC (3.7 µg/ml) for all P.aeruginosa isolates

Keywords: ZnO; nanoparticles; surface modification; burn infection; Pseudomonas aeruginosa; Antimicrobial activity