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Investigation of LSPR effect on antibacterial properties of silver nanoparticles

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Abstract

Localized surface-plasmon resonance (LSPR) refers to the collective oscillation of electrons at the interface of metallic nanoparticles, which could be produced through the electron-magnetic interaction of the metal with incident light of a specific wavelength. This phenomenon enables the transfer of hot electrons to substrates that release Reactive Oxygen Species (ROS) and subsequently effects on metallic nanoparticles antibacterial properties. This review was aimed to evaluate the efficiency of Ag-NPs – laser combined therapy as antibacterial approaches against *Pseudomonas aeruginosa* bacteria *in vitro*. The antibacterial activity of green synthesis silver nanoparticles (Ag-NPs) against Gram-negative microorganism (*Pseudomonas aeruginosa*) has been determined with and without pre-irradiation with 450 nm diode laser irradiation. Based on the plasmon resonance frequency of these nanoparticles, the frequency of laser irradiation was chosen. Results showed that the laser-activated Ag-NP treatment reduced the surviving bacteria population to 100% compared to control group by 15min irradiation time. Overall, the results presented here show that LSPR stimulation of Ag-NPs by blue diode laser light significantly reduced bacterial growth, which indicating that this form of treatment could be beneficial in the ongoing efforts to reduce the deleterious effects of antibiotic resistant Gram-negative bacteria.

Keywords: local surface plasmon resonance, silver nanoparticles, Pseudomonas aeruginosa, blue diode laser**.**