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The molecular mechanism of antimicrobial properties of laser processed nano-particles

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Multi-drug resistant pathogens have become a global health problem in recent years. Nanoparticle (NP) is a promising alternative to be used against bacteria. One way of producing NPs is the laser technology which is considered a clean method without relying on chemical reactants. In this study, Ag and Ag-TiO₂ NPs were produced using laser ablation in deionised water. The aim of the study is to characterize the antibacterial activity of the laser NPs, the molecular mechanisms behind and the potential risk to human. The antibacterial activities of laser Ag and laser Ag-TiO₂ NPs have been determined on the gram negative bacteria, *E. coli* and *Pseudomonas aeruginosa* and the gram positive bacteria, *Staphylococcus aureus*. Results showed that both types of NPs exhibited strong antibacterial activity against all of the bacterial strains in this study. Laser Ag NPs induced significant amount of dose-dependent ROS generation which is associated with bacterial cell death. Increased cell permeability was observed when *E. coli* were co-cultured with the laser Ag NPs. The cytotoxicity of laser Ag and Ag-TiO₂ NPs was determined using MTT assay on five different human cells including lung adenocarcinoma cell line (A5 49), endothelial cells (HEMC-1), kidney epithelial cells (HEK), dermal fibroblast (HDFc) and hepatic cells (HepG2). We found that laser Ag and Ag-TiO₂ NPs had no significant cytotoxicity to the human cell types used in this study except for endothelial cells, which were more susceptible to the toxic effect of both laser Ag and Ag-TiO₂ NPs. In conclusion, laser generated Ag and Ag-TiO₂ NPs have strong bactericidal effect and low toxicity to human cells which could be a type of promising antibacterial agents for future hygiene and medical applications.

Biography

Peri Ahmad Korshed has completed her BSc in Biology and MSc in Biology/Microbiology from the University of Tikrit/Tikrit-Iraq. She served for about three years as a Lecturer at the University of Kirkuk-Iraq, and then moved to the University of Koya. She has two published papers in Koya University; one of them under the name, "Bacteriological study of some pathogens causing urinary tract infection" and the other, "The effect of some plant extracts on the activity of some pathogenic bacteria". She is now working towards her PhD in School of Medicine, University of Manchester, UK. She has two papers ready for publication.

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