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Plasmonic photothermal inactivation of *Escherichia coli* and *Bacillus cereus* using polymer coated gold nanoparticle

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The fast-growing nanotechnology provides every day new type of materials to fulfill the biomedical needs. Whereas infections caused by pathogenic multidrug-resistant bacteria has become one of the most worrying problems that the human health and economy suffer from and what makes the development of new effective alternatives to classical antibiotics an urgent need. Nanotechnology has generated a novel class of photothermally sensitized agents –gold nanoparticles (AuNPs). Depending on the phenomenon of surface plasmon resonance of noble metal nanoscale particles new therapy has been established called plasmonic photothermal therapy (PPTT). PPTT has attracted new interest in cancer therapy and also against microbes. The current research aims to assess the PPTT of AuNPs against Gram-negative *Escherichia coli* (E. coli) and Gram-positive *Bacillus cereus* (B. cereus) bacteria. Different concentrations of AuNPs capped with different polymers (polyvinyl alcohol (AuNPs -PVA) or Polyvinylpyrrolidone (AuNPs -PVP) were applied on *E. coli* and *B. cereus* in dark and under the irradiation of several doses of the light emitting diode (LED 530 nm). Results showed that the maximum antibacterial effect occurred at 10 µM of AuNPs -PVP in the presence of 0.9 J/cm^2 of LED. Finally, it was concluded that PPTT with gold nanoparticles considered as an effective method for bacterial eradication as AuNPs induce hyperthermia in the surrounding environment of bacteria upon irradiation which causes cell damage. Also, the capping material of AuNPs plays an important role in its biological effect.

Biography

Heba ElSayed ElZorkany received her BSc in Biotechnology from Benha University in 2006. She joined the National Institution of Laser Enhanced Science, Cairo University as a Post-graduate student and she was awarded with a Diploma degree in Laser Applications in Biotechnology and Photobiology in 2008. She completed her MSc degree in 2013 "The photothermal effect of metallic nanoparticles on bacteria". She has enrolled in the PhD program at NILES, since 2014 to conduct her thesis titeled "Efficiency of biocompatible quantum dot for cellular imaging using confocal laser scanning microscope". She has been appointed as a Researcher at Nanotechnology and Advanced Materials Central Lab. (NAMCL), Agriculture Research Center (ARC) since 2010. Her research experiences include biotechnology, microbiology, photobiology, laser applications in biology, nanotechnology, spectroscopy, and microscopy. She is a Confocal Laser Scanning Microscope (CLSM) & Cell Culture Specialist. She has participated in several international conferences.

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