

Antibiofilm Activities of Biogenic Silver Nanoparticles against Human Pathogenic Bacteria

Authors : Muhammad Shahzad Tufail, Iram Liaqat, Umer Sohail Meer, Muhammad Ishtaiq, Muhammad Sattar

Abstract : Nanotechnology is a vibrant field with numerous applications in many different branches of science and technology. Several methods are used to synthesize nanoparticles (NPs), which have multiple range of applications. Comparatively, the biogenic synthesis of NPs is a more economical and environmentally favourable method than the traditional chemical method. The current study aims to synthesize biogenically silver nanoparticles (AgNPs) using bacterial isolates. Four bacterial strains *Escherichia coli* (MT448673), *Pseudomonas aeruginosa* (MN900691), *Bacillus subtilis* (MN900684) and *Bacillus licheniformis* (MN900686) were used for the synthesis of AgNPs from silver nitrate (AgNO_3) solution. The biofilm time kinetics of four bacterial isolates (*P. aeruginosa*, *E. coli*, *B. licheniformis* and *B. subtilis*) was analysed by incubating bacterial cultures at 37°C in test tubes over a period of different time intervals i.e., 2, 3, 5 and 7 days following crystal violet staining method. All the four strains had ability to form strong biofilms between 48 to 72 hours of incubation. Two strains (*B. subtilis* and *B. licheniformis*) formed significant ($p < 0.05$) biofilm after 3 days of incubation period. The other two strains (*E. coli* and *P. aeruginosa*) showed strong biofilm formation after 2 days of incubation. Next, the antibiofilm activity of biogenically synthesized AgNPs ($10 - 100 \mu\text{g mL}^{-1}$) was analysed against biofilm forming human pathogenic bacteria. Findings of the work revealed that 60-90% inhibition was observed at $60 \mu\text{g mL}^{-1}$ of AgNPs, while maximum inhibition (i.e., 100%) was found at highest concentration ($90 \mu\text{g mL}^{-1}$). It was evident that highly significant ($p < 0.05$) decrease in biofilm formation was observed with increasing concentration of AgNPs.

Keywords : antibiofilm, biofilm formation, nanotechnology, pathogenic bacteria, silver nanoparticles

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