World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:11, No:02, 2017

# Facile Surfactant-Assisted Green Synthesis of Stable Biogenic Gold Nanoparticles with Potential Antibacterial Activity

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**Abstract :** The major issue which decides the impending use of gold nanoparticles (AuNPs) in nanobiotechnological applications is their particle size and stability. Often the AuNPs obtained biomimetically are considered useless owing to their instability in the aqueous medium and thereby limiting the widespread acceptance of this facile green synthesis procedure. So, the use of nontoxic surfactants is warranted to stabilize the biogenic nanoparticles (NPs). But does the surfactant only play a role in stabilizing by being adsorbed to the NPs surface or can it have any other significant contribution in synthesis process and controlling their size as well as shape? Keeping this idea in mind, AuNPs were synthesized by using surfactant treated (lechate) and untreated (cell lysate supernatant) Bacillus licheniformis cell extract. The cell extracts mediated reduction of chloroauric acid (HAuCl 4) in the presence of non-ionic surfactant, Tween 20 (TW20), and its effect on the AuNPs stability was studied. Interestingly, the surfactant used in the study served as potential alternative to harvest cellular enzymes involved in bioreduction process in a hassle free condition. The surfactants ability to solubilize/leach membrane proteins and simultaneously stabilizing the AuNPs could have advantage from process point of view as it will reduce the time and economics involve in the nanofabrication of biogenic NPs. The synthesis was substantiated with UV-Vis spectroscopy, Dynamic light scattering study, FTIR spectroscopy, and Transmission electron microscopy. The Zeta potential of AuNPs solutions was measured routinely to corroborate the stability observations recorded visually. Highly stable, ultra-small AuNPs of 2.6 nm size were obtained from the study. Further, the biological efficacy of the obtained AuNPs as potential antibacterial agent was evaluated against Bacilllus subtilis, Pseudomonas aeruginosa, and Escherichia coli by observing the zone of inhibition. This potential of AuNPs of size < 3 nm as antibacterial agent could pave way for development of new antimicrobials and overcoming the problems of antibiotics resistance

**Keywords :** antibacterial, bioreduction, nanoparticles, surfactant
**Conference Title :** ICBN 2017 : International Conference on Biotechnology and Nanotechnology
**Conference Location :** Paris, France
**Conference Dates :** February 23-24, 2017