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$Au_{core}Ag_{shell}$ nanoparticles with potent antibiofilm activity as novel nanomedicine

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Medicinal plants serve as a rich source of diverse bioactive phytochemicals that might even take part in bioreduction and stabilization of phytogenic nanoparticles with immense therapeutic properties. *Dioscorea bulbifera* is a potent medicinal plant used in both Indian and Chinese traditional medicine owing to its rich phytochemical diversity. Herein, we report the rapid synthesis of novel $Au_{core}Ag_{shell}$ DBTE). $Au_{core}Ag_{shell}$NPs synthesis was completed within 5 h showing a prominent peak at 540 nm.

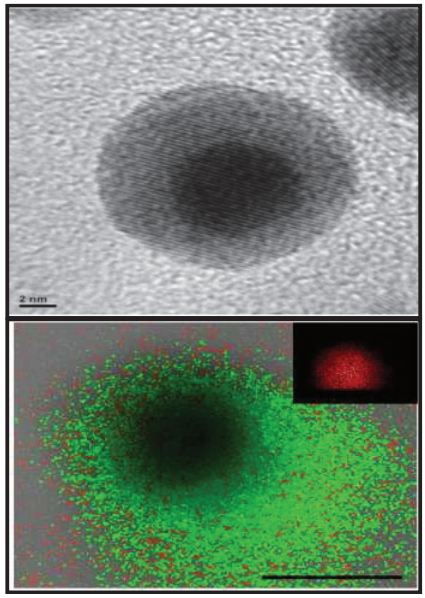

Figure 1. HRTEM micrographs and elemental mapping analysis of $Au_{core}Ag_{shell}$NPs synthesized by DBTE

The bioreduced nanoparticles were characterized using high-resolution transmission electron microscopy (HRTEM), energy dispersive spectroscopy (EDS), dynamic light scattering (DLS), X-ray diffraction spectroscopy (XRD) and fourier transform infrared spectroscopy (FTIR). The particles were further checked for antibiofilm activity against bacterial pathogens. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) was employed to study the mechanism behind antibiofilm activity. HRTEM analysis revealed 9 nm inner core of elemental gold covered by a silver shell giving a total particle diameter upto 15 nm.

$Au_{core}Ag_{shell}$NPs were comprised of 57.34±1.01% gold and 42.66 ± 0.97% silver of of the total mass. $Au_{core}Ag_{shell}$NPs showed highest biofilm inhibition upto 83.68 ± 0.09% against *Acinetobacter baumannii*. Biofilms of *Pseudomonas aeruginosa*, *Escherichia coli* and *Staphylococcus aureus* were inhibited up to 18.93 ± 1.94%, 22.33 ± 0.56%, and 30.70 ± 1.33%, respectively.

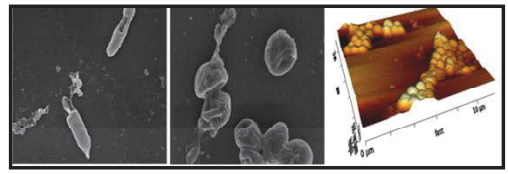

Figure 2. Scanning electron micrographs of biofilm treated with $Au_{core}Ag_{shell}$NPs synthesized by DBTE

Scanning electron microscopy (SEM) and atomic force microscopy (AFM) confirmed unregulated cellular efflux through pore formation leading to cell death. This is the first report of synthesis, characterization, antibiofilm, and antileishmanial activity of $Au_{core}Ag_{shell}$NPs synthesized by *D. bulbifera*.

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