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Silver nanoparticles immobilized on TRIS functionalized glass serve as an efficient antimicrobial surface against opportunistic pathogenic bacteria

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Increasing water pollution and limited access to safe water creates an immediate need to develop alternative antimicrobial agents. Silver nanoparticles (AgNPs) in their immobilized form can serve as a promising antimicrobial surface for point-of-use water disinfection. The present study focused on development of a unique nanoantimicrobial consisting of AgNPs immobilized on glass substrate with minimal silver leaching. AgNPs were synthesized via chemical reduction method using $AgNO_3$ as metal precursor, $NaBH_4$ as reducing agent and trisodium citrate as stabilizing agent. The nanocomposite was prepared by immobilizing AgNPs on N1-(3-trimethoxysilylpropyl) diethylenetriamine i.e., TRIS-functionalized glass substrate and characterized prior to use. A surface resonance peak at 398 nm in UV-Vis spectra indicated small sized AgNPs. FEG-TEM confirmed the spherical shape and small size of AgNPs with average size of 7.8± 2.9 nm. XRD spectra exhibited lattice plane of (111), (200), (220) and (311), i.e., fcc crystal structure favorable for enhanced reactivity. SEM imaging demonstrated a highly dense and homogenous coating of AgNPs on the surface. The characteristic peak in EDS spectra at 3 KeV confirmed the immobilization of silver with >30% silver loading. Atomic force microscopy further corroborated AgNP deposition by unveiling an increase in roughness of surface by 5.35 nm. Batch disinfection studies were conducted by immersing the AgNP immobilized substrate ($1 cm^2$) in 100 ml artificially contaminated water containing 10^3 CFU/ml of bacteria against four waterborne opportunistic pathogens, i.e., *Escherichia coli* (MTCC 443), *Burkholderia cepacia* (MTCC 5332), *Pseudomonas aeruginosa* and *Acinetobacter baumanii*. For both log and stationary phase cultures of these pathogenic strains >99% bactericidal effect was observed in <40 min and complete disinfection was achieved within 60 min. Complete killing was further confirmed using CLSM imaging. Only red fluorescence in treated water stained with Baclight kit, confirmed the absence of viable but non-culturable bacterial cells.

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Nanosized soy phytosome-based thermogel formulation for treatment of obesity, characterization and *in vivo* evaluation

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Obesity has become an increasing problem over recent years. Nano lipo-vesicles hydrogels of soy saponin were formulated and evaluated in an attempt to reduce the size of adipose tissue cells through percutaneous absorption. Phytosome formulations were prepared with four different techniques: Solvent evaporation, anti-solvent precipitation, co-solvency and mechanical dispersion. Best formulae was selected by the means of the highest entrapment efficiency, minimum particle size and maximum drug release and then evaluated for successful complex formation by means of FTIR. Particles zeta potential was detected and particles shape was evaluated using TEM to insure particles spherical shape. Selected phytosome formulae were involved into selected hydrogel formulae after evaluation of different plain hydrogel formulations for its clarity homogeneity, pH, gel transforming temperature and viscosity study. Obtained phytosomal hydrogel formulae were then re-evaluated for its clarity, homogeneity, pH and gel transforming temperature and for its rheology behavior and permeation study. *In vivo* study was done to ensure anti -obesity effect of soy phytosomal hydrogel. Concisely, soy phytosomal hydrogel was found to have the ability to reduce the size of adipose tissue cells in male Albino rats.

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