

Accepted Manuscript

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PII: S0928-4931(17)31922-7

DOI: doi: [10.1016/j.msec.2017.07.054](https://doi.org/10.1016/j.msec.2017.07.054)

Reference: MSC 8203

To appear in: *Materials Science & Engineering C*

Received date: 28 May 2017

Revised date: 3 July 2017

Accepted date: 31 July 2017

Please cite this article as: M.B. Marulasiddeshwara, S.S. Dakshayani, M.N. Sharath Kumar, R. Chethana, P. Raghavendra Kumar, S. Devaraja , Facile-one pot-green synthesis, antibacterial, antifungal, antioxidant and antiplatelet activities of lignin capped silver nanoparticles: A promising therapeutic agent, *Materials Science & Engineering C* (2017), doi: [10.1016/j.msec.2017.07.054](https://doi.org/10.1016/j.msec.2017.07.054)

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Facile-one pot-green synthesis, antibacterial, antifungal, antioxidant and antiplatelet activities of lignin capped silver nanoparticles: A promising therapeutic agent

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Abstract

The current work portrays the green synthesis of Lignin Capped Silver Nanoparticles (LCSN) and their antibacterial, antifungal, antioxidant and antiplatelet potential. The LCSN was synthesized in water using a carbohydrate based polymer 'lignin' as the reducing and capping agents. The peak at 406 nm (λ_{max}) in the UV-Vis., spectrum and EDX analysis confirmed 1.68% (w/w) of silver was found to be loaded on lignin. The characteristic sharp peaks appeared in the PXRD spectrum showed fcc crystalline structure LCSN. SEM and TEM images indicated that the spherical Ag-NPs were well dispersed on lignin with an average particle size of ~10-15 nm. LCSN showed antibacterial and antifungal activity against human pathogens *S. aureus*, *E. coli* and *A. niger* and the percentage of zone of inhibition was found to be 10%, 12% and 80% respectively. Further, LCSN was evaluated for antioxidant potential using DPPH scavenging assay, interestingly it showed antioxidant activity and the percentage against positive control vitamin C was found to be 70%. Furthermore, LCSN did not interfere in plasma coagulation; however, it found to inhibit agonist ADP induced platelet aggregation of human platelet rich plasma. The observed inhibition was found to be 37% and the calculated IC₅₀ value was found to be 9 mg/mL. LCSN did not lyses RBC membrane when assayed hemolytic activity suggesting its non-toxic nature.

Key words: Lignin, Silver nanoparticles, Antimicrobial activity, Antioxidant activity, Antiplatelet, Plasma Recalcification, Biodegradable, Environmentally benign.

1. Introduction

The existing antimicrobials have become a serious hazard in human health as they may be resistant to the existing microbes or the new ones that could be generated due to environmental facts or human activities. There has been influence for researchers to design new drugs to fight against them.

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