NANO WORLD SUMMIT: CURRENT AND FUTURE PERSPECTIVES

June 06-07, 2018 | Philadelphia, USA

Formulation of garlic oil nanoparticles with enhanced anti-microbial activities

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In the present study, garlic oil (GO) colloidal nano-particles (NPs) were prepared by combining GO with poly lactic-co-glycolic acid (PLGA) polymer by single emulsion/solvent evaporation (SE/SE) method. Different PLGA/GO NP formulations were prepared by high speed homogenizer at different homogenization time intervals. A number of preparation factors were carefully controlled in order to have stable and uniform size distribution of the different PLGA/GO-Colloidal NPs formulations. Complete characterization of the particle sizes, zeta potential, poly dispersity index (PDI), the GO% in each PLGA/GO-Colloidal NPs formulation, the morphology (by using Scanning Electron Microscope (SEM)), and the chemical structural characteristics (by using Fourier Transform-Infra-red spectroscopy (FT-IR) and Ultraviolet-Visible spectrophotometry (UV-vis), were carried out. In addition, antibacterial assessment has been carried out against *Escherichia coli (E. coli)* and *Staphylococcus aureus (S. aureus)* bacteria using Colony Counting Method (CCM). Interestingly, the size of the PLGA/GO-Colloidal NPs was found to be in the range of 201 – 319 nm (which was reduced by more than 10 folds compared to the GO particles). In addition, the antibacterial activities of the different PLGA/GO formulations against both E. coli and *S. aureus* were enhanced by 70-78% of bacterial inhibition compared with GO in the bulk form. These results shed more insights into the important factors that need to be considered when preparing NPs conjugates from natural materials, and open new avenues in exploring other extracts with promising antibacterial activities.

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