

Formulation and evaluation of ciprofloxacin-cockle shells derived calcium carbonate aragonite nanoparticles physicochemical properties mediated in vitro bactericidal activity in Salmonella Typhimurium

ABSTRACT

Since the use of classical antibiotics in the management of resistant bacterial infections requires high dosage and regular administration for a lengthy duration, the enhanced delivery system that will ensure sustained release of antibiotic to the Site of action is important. We synthesized and formulated ciprofloxacin-cockle shell derived calcium carbonate aragonite nanoparticles (C-CSCCAN), appropriately analysed its physicochemical properties mediated antibacterial activity in Salmonella Typhimurium. The size of the formulated nanoparticles were in the range of 13.94 and 23.95 nm and Zeta potential was optimally negative. Diffraction pattern by X-ray powder diffraction (XRD) revealed strong crystallizations in all the formulations. Fourier-transform (FT-IR) spectra displayed evidence of interactions between the drug and nanoparticles at the molecular level and no change in peaks position was observed prior to and after the synthesis of the nanoparticles. Higher encapsulation (99.5) and loading capacity (5.9%) were attained at ciprofloxacin to nanoparticles ratio 1:17. No burst effect but a sustained drug release was observed from the formulation. C-CSCCAN suspension exhibited higher antibacterial activity than free ciprofloxacin. It was concluded that physicochemical properties of CSCCAN enhanced susceptibility of Salmonella Typhimurium, which could potentially improve the clinical efficacy of ciprofloxacin.

Keyword: Antibacterial resistance; Ciprofloxacin; Calcium carbonate nanoparticles; Physicochemical properties