Development of cockleshell (Anadara granosa) derived CaCO3 nanoparticle for doxorubicin delivery

ABSTRACT

Despite the progress made in cancer treatment, difficulties are encountered with tumour targeting due to cancer structural complexity. The synthesis of homogenous calcium carbonate (CaCO3) nanoparticles could be a carrier for doxorubicin in the management of bone cancer due to its osteoconductive and physicochemical properties with simple synthesis method to produce large scale. Among the nanocarriers, CaCO3 nanoparticles have exhibited promising potential as targeting drug nanocarrier. The aim of this study is to synthesised and characterised doxorubicin-conjugated CaCO3 nanoparticle (CS-CaCO3NP-DOX), using a simple precipitation and mechanical approach to synthesise homogeneous CaCO3NP from cockleshell. The oven-dried nanoparticles were further characterised for its physicochemical properties before and after conjugating with doxorubicin. A homogenous aragonite, spherical, porous nanocarrier was obtained with a mean diameter of 24.9 nm and zeta potential of –21 mV. The energy dispersion X-ray analysis revealed high proportion of calcium as a major element in the nanoparticle. The spectrum peak suggests little alteration upon incorporation of doxorubicin. Higher loading content and encapsulation efficiency were recorded with CS-CaCO3NP. These properties underscore the potential of CS-CaCO3NP in the delivery of doxorubicin, thus giving it a high potential for application in the delivery of the anticancer in the management of cancers.

Keyword: Cockleshell; Doxorubicin; Drug Delivery; Nanocarrier