PTH-ANC for Osteoporosis Management

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Abstract

Physicochemical and *in vitro/invivo* characterization of cockle shells-derived calcium carbonate nanocrystals aragonite polymorph (ANC) as an antiosteoporotic agent and a nanocarrier in the management of osteoporosis were investigated. ANC was synthesized, using top down method, and was loaded with Human Recombinant Parathyroid Hormone (PTH 1-34) to obtain PTH-ANC conjugate. Transmission Electron Microscopy, Field Emission Scanning Electron Microscope, Zeta potential, Fourier Transmission Infrared Spectroscopy (FT-IR) X-ray diffraction spectroscopy (XRD), loading capacity, encapsulation efficiency, drug release profile, MTT and *in vivo* analyses were used to characterize ANC and PTH-ANC. The results demonstrated highly homogenized spherical-shaped clean aragonite nanocrystals of 30±5 nm in diameter and -27.6 ± 8.9 mV Zeta potential. The encapsulation efficiency of ANC was directly proportional to the concentrations of the drug fed. XRD revealed strong crystallizations, no positional change of peaks was observed in PTH-ANC synthesis. FT-IR demonstrated no detectable interactions between micron aragonite and surfactant at molecular level. PTH-ANC stabilized at pH 7.5, enabling sustained slow release, and 69.83% of PTH 1-34 was released at 168 hours. 72 hour MTT relative biocompatibility study on Human Foetal Osteoblast Cell Line hFOB 1.19 revealed that ANC best supported osteoblast proliferation up to 48 hours while PTH-ANC best supported the proliferation beyond 72 hours. Weekly PTH-ANC improved bone remodeling and strength *in vivo*. It was concluded that PTH-ANC is a potent antiosteoporotic product for the enhancement of safety, and reduction of cost, dosage and dose frequency of PTH 1-34 due to its biogenic nature and simplicity of its synthesis.

Biography

Zubair Jaji is a Lecturer with the University of Ilorin, Ilorin, Nigeria. He was admitted to th University Putra Malaysia in the year 2012 to study PhD (Anatomy) under the supervision of Prof MD Zuki AbuBakar @ Zakaria. The aim of his research was to develop cockle shells derived calcium carbonate nanocrystals and nanocarrier for the management of osteoporosis.