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Effect of calcium phosphate synthesis conditions on its physico-chemical properties and evaluation of its antibacterial activity

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Abstract: The antibacterial activity of non-stoichiometric calcium phosphate particles prepared by precipitationunder controlled experimental conditions at pH ?? ?9 and sintered at high temperature was studiedagainst Staphylococcus aureus bacteria. The effects of operating parameters developed according to anexperimental design of Plackett-Burman type on the physicochemical characteristics and the capacityto inhibit bacterial growth were identi fi ed using a thermal analysis (TGA-DTA-DSC) , x-rayDiffraction(XR) , Raman Spectroscopy, Scanning Electron Microscope(SEM) and the Kirby BauerMethod. The XRD spectrum shows that the synthetic crystalline nanoparticles powders consist ofmultiphasic calcium phosphate? -TCP/? -CPP/OCP / HA and that the average particle size is between56 and 123 nm calculated by the Debay-Shearer equation. The Raman spectrum of sintered powdershows the main absorption bands that are assigned to the asymmetric / symmetric P-O stretchingvibrations in PO4? 3and the symmetric O-H stretching mode of the hydroxyl group in addition ofCa-PO4and Ca-OH modes. The samples were found to possess different morphologies consisting ofnano-rods of different lengths, semi / spherical structures and fine granules, in addition to irregularclusters. The antibacterial tests results showed that the high concentration calcium phosphate powderexhibited better antibacterial activity against Staphylococcus aureus bacteria with inhibition zonesranging from 0.2 –0.7 cm.

Keywords : Biomaterials, calcium phosphate, Antibacterial Activity, nanoparticles