Evaluation of the acute toxicity by Artemia salina of hydroxyapatite nanoparticles obtained via sol-gel in an aqueous medium without using additives

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Abstract

Hydroxyapatite (Hap) is one of the most important calcium phosphate bioceramics applied to bone tissue regeneration. Synthesizing Hap nanoparticles from easily accessible and low-cost alternative sources of calcium precursors remains a challenge, as well as defining an ideal and reproducible synthesis route without using additives to control the pH of the reaction and entirely performed at room temperature. This study proposes a route for the synthesis of hydroxyapatite by the sol-gel method without the addition of additives for pH control, carried out at room temperature. The Hap samples were characterized by FTIR, XRD, SEM, and BET. The synthesized Hap presented a spherical morphology without the formation of unwanted phases or residues. Samples calcined at 600 and 750 °C resulted in stoichiometric hydroxyapatite with 100% purity and average particle sizes of 24 and 53 nm, respectively. On the other hand, the samples calcined at 900 and 1050 °C presented a specific content of β-calcium phosphate and average particle sizes of 118 and 732 nm, respectively. Acute toxicity was evaluated by Artemia salina nauplii instar I and II for 24 and 48 h of exposure. The tests were conducted on 10, 100, and 1000 ppm of Hap dissolutions. The highest death rate and more significant morphological alterations were observed in A. salina nauplii instar II, exposed to Hap at a concentration of 1000 ppm for 48 h.