Marine Sponges – a new source of bioactive ceramics for tissue engineering and regenerative medicine applications

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ABSTRACT

Marine organisms are exceptionally rich in natural products and present huge prospective for biomedical applications. In this work we have studied the potential of bioceramics from different sponge species, namely *Petrosia ficidormis, Agelas oroides* and *Chondrosia reniformis,* for novel biomedical applications. Studies reported in the literature have already demonstrated the potential of carbonate corals as a source of bioceramics. However, similar studies directed towards the valorization of marine sponge skeletons are still missing. The bioceramics, exempt of organic components, were obtained after calcination of the sponges at 750ºC for 6 hours in a furnace. The powder was recovered and Scanning electron microscopy (SEM) was used to observe the morphology and gain insight of the elements spatial arrangement. Spectroscopic elemental analysis (EDS) was used to determine the chemical composition and has shown that *Petrosia ficidormis* skeleton is constituted mainly by silicate, while *Chondrosia reniformis* spicules are mostly calcium carbonates. On the other hand, the ceramics obtained from *Agelas oroides* present a combination of silicate and calcium salts. *In vitro* bioactivity of the bioceramics was evaluated in simulated body fluid (SBF), after 3, 7 and 14 days of incubation. Observation of the bioceramics by SEM, coupled with EDS, has shown that it is possible to induce the precipitation of calcium-phosphate crystals, consistent with similar to hydroxyapatite (HA) coating. The determination of Ca/P ratio, together with the infrared spectrum by Fourier transform infrared spectroscopy (FTIR) and x-Ray diffraction (XRD) pattern, has confirmed the deposition of HA. Cytotoxicity of developed bioceramics materials was also assessed, comparing their behaviour with synthetized bioactive glass as reference. Results obtained thus far have shown the potential of bioceramics from marine sponges for its use in biomedical applications, namely in tissue regeneration approaches.

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