Production, Characterization and Biocompatibility of Marine Collagen Matrices from an Alternative and Sustainable Source: The Sea Urchin Paracentrotus lividus

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ABSTRACT

Collagen has become a key-molecule in cell culture studies and in the tissue engineering field. Industrially, the principal sources of collagen are calf skin and bones which, however, could be associated to risks of serious disease transmission. In fact, collagen derived from alternative and riskless sources is required, and marine organisms are among the safest and recently exploited ones. Sea urchins possess a circular area of soft tissue surrounding the mouth, the peristomial membrane (PM), mainly composed by mammalian-like collagen. The PM of the edible sea urchin Paracentrotus lividus therefore represents a potential unexploited collagen source, easily obtainable as a food industry waste product. Our results demonstrate that it is possible to extract native collagen fibrils from the PM and produce suitable substrates for in vitro system. The obtained matrices appear as a homogeneous fibrillar network (mean fibril diameter 30"400 nm and mesh < 2 Î¼m) and display remarkable mechanical properties in term of stiffness (146 ± 48 MPa) and viscosity (60.98 ± 52.07 GPa·s). In vitro tests with horse pbMSC show a good biocompatibility in terms of overall cell growth. The obtained results indicate that the sea urchin P. lividus can be a valuable low-cost collagen source for mechanically resistant biomedical devices.