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The potential of innovative marine-derived biomaterials

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Nowadays, the use of marine-derived biomaterials is one of the most promising in the tissue engineering and biotechnology field. Among these, marine collagens are particularly useful in regenerative medicine. Sea urchins have been recently proposed as innovative and sustainable source of collagen for this purpose. Indeed, by using by-products of the edible sea urchin *Paracentrotus lividus* we could obtain valuable Glycosaminoglycan (GAG)- decorated fibrillar collagen which was used to produce very thin but resistant Two-Dimensional (2D) membranes. In this work, we optimized a new protocol to produce Three-Dimensional (3D) scaffolds for novel tissue engineering applications, such as skin regeneration. The obtained 3D scaffolds were characterized in terms of ultrastructure, stability and behaviour in wet conditions. At scanning Electron Microscope (SEM) analyses, the scaffolds presented a highly porous structure whose features could be tuned at need. Scaffolds of 1-2 mm in thickness were prepared to perform experiments of cell seeding with mammalian fibroblasts. Results indicated that the scaffold was easily infiltrated and progressively colonised by the cells which remained vital and proliferated over prolonged period. In parallel, to evaluate the biocompatibility of the biomaterial, preliminary *in vivo* tests were performed by sub-cutaneous implantation of thin membranes in rat models. First results indicated that the animals did not show clinical signs of sufferance nor marked inflammatory reactions (i.e. rejection, abscess formation) compared to commercial bovine collagen devices used as controls, suggesting a general promising biocompatibility. Overall, our data showed that sea urchin connective tissues might be considered a valuable eco-friendly alternative source of marine collagen to produce different types of devices for regenerative medicine applications, including complex 3D scaffolds. Further tests are necessary to validate the biocompatibility *in vivo* and to test the actual efficacy in promoting tissue (i.e. skin) regeneration.

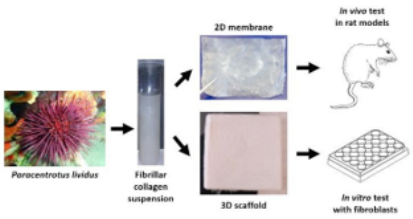

Figure 1: From the peristomial membranes of the edible sea urchin *Paracentrotus lividus* fibrillar collagen is extracted and, after protocol optimization, used to produce thin 2D membranes and thick 3D scaffolds that are tested *in vivo* in rat models and *in vitro* with mammalian fibroblasts.

Biography

Cinzia Ferrario has completed her PhD in Environmental Sciences. She has her expertise in echinoderm regeneration and in the production of biomaterials derived from marine animals. Her research interests are focused on the regenerative abilities of invertebrates to highlight similarities and differences with vertebrate regeneration and understand how to possibly improve the scarce mammal regenerative abilities. Her interest is in exploring the potential of the peculiar mutable connective tissues (and collagen) of echinoderms to produce innovative biomaterials for regenerative medicine applications.

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