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Biomimetic innovative applications for tendon and skin regenerative medicine

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In the tissue regeneration field the use of scaffolds as support represents an important complementary tool to surgery in tendon and skin tissue engineering. Up to now natural and synthetic materials have been used as extracellular matrix (ECM) equivalent but none of them simultaneously offered biocompatibility, biofunctionality and mechanical performances. Collagen-made materials are the most promising for this purpose. Commercially available collagen is mainly of bovine origin, but in recent times alternative sources of collagen were found, including aquatic organisms. In the present work we used common marine invertebrates (echinoderms) as an innovative and low-cost source of native intact collagen fibrils to develop ECM equivalents. These animals possess peculiar connective tissues, called Mutable Collagenous Tissues (MCTs), which display striking passive mechanical properties. The idea we pursue is that MCT-derived collagenous matrices have the potential to be used for tissue engineering/regenerative medicine, especially for those applications where high mechanical performances are required (e.g. tendons). Native intact collagen fibrils were isolated from echinoderm connective tissues and used to prepare films and 3D scaffolds. *In vitro* biocompatibility and cytotoxicity tests were performed using mesenchymal stem cells isolated from horse peripheral blood (PB-MSCs) and cultured for different time-points using the MCT-derived matrix as substrate; *in vivo* tests were assessed by subcutaneous implantation of the MCT-derived matrix in rabbits. The evaluation of cell viability, inflammatory response and angiogenesis were performed with histo-immunohistochemical and molecular methods.

The obtained fibrillar matrices, which strictly mimicked the native ECM, were used as a support for the growth and proliferation of PB-MSCs; *in vitro* tests indicated that: MCT-derived matrices are not toxic for mammalian cells, showed standard (fibroblast-like) morphology and behaviour and, after an initial "adaptation" stage, were also able to proliferate actively. *In vivo* tests and post mortem histological analysis suggest encouraging results related to biocompatibility, although further investigations will be necessary.

Biography

Tiziana Martinello completed his PhD in Cellular and Molecular Biology and Pathology at University of Padova, Italy in 2004. Since then, she has held a Post-Doctoral Research position by Department of Histology Microbiology and Medical Biotechnologies. Currently, she is a Senior Post-Doctoral Research by Dept. Comparative Biomedicine & Food Scienceat University of Padova. Her research specialties include stem cells study for muscle, tendon and epithelial pathologies. She published papers in reputed scientific journaland presented abstracts/posters/talks at conferences worldwide.

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