NEW INSIGHTS INTO MUTABLE COLLAGENOUS TISSUE: WORK IN PROGRESS AND APPLIED PERSPECTIVES

SERENA **TRICARICO** [1], ALICE **BARBAGLIO** [1], NEDDA **BURLINI** [2], LUCA **DEL GIACCO** [1], ANNA **GHILARDI** [1], MICHELA **SUGNI** [1], CRISTIANO **DI BENEDETTO** [1], FRANCESCO **BONASORO** [1], IAIN **WILKIE** [3], MARIA DANIELA **CANDIA CARNEVALI** [1]

[1] *Department of Biology, University of Milan, via Celoria 26, 20133 Milano, Italy; E-mail: serena.tricarico@unimi.it*
[2] *Department of Biotechnology and Biomolecular Sciences, University of Milan, via Celoria 26, 20133 Milano, Italy*
[3] *Department of Biological and Biomedical Sciences, Glasgow Caledonian University, 70 Cowcaddens Road, Glasgow G4 0BA, Scotland*

Keywords: Echinoderms, MCT, collagen, tensilin.

The mechanically adaptable connective tissue of echinoderms (Mutable Collagenous Tissue - MCT), which can undergo drastic nervously-mediated changes in its stiffness, tensile strength and viscosity, represents a promising model for biomaterial design and biomedical applications. MCT could be a source of, or an inspiration for, new composite materials whose molecular interactions and structural conformation can be changed in response to external stimuli.

MCT is composed mostly of collagen fibrils comparable to those of mammals plus a variety of other components, including other fibrillar structures (fibrillin microfibrils), proteoglycans and glycoproteins. According to Trotter and coworkers (1996, 2003), the extracellular matrix of holothurians includes at least two important glycoproteins, *stiparin* and *tensilin*, that can modulate the aggregation of collagen fibrils and their capacity for reciprocal sliding and establishing interfibrillar links.

This contribution presents the latest results of a detailed analysis of MCT components in the sea urchin *Paracentrotus lividus*: focusing on 1) biochemical characterization of the fibrillar components (extraction, purification and quantification of collagen from MCT samples); 2) biomolecular analysis of the presumptive glycoprotein components. Preliminary data have been obtained on the biomolecular characterization of tensilin. The next steps will be the synthetic production of tensilin-like protein and combining it with collagen at different degree of purification. The final aims will be to confirm the presence and the role of these glycoproteins in echinoids and to manipulate simpler components in order to produce a composite with mutable mechanical properties.

In the long term, MCT could provide inspiration for biomimetic materials and offer great potential for economically relevant biotechnological and clinical applications that require, for example, the controlled and reversible plasticization and/or stiffening of connective tissue.