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New insights into the mutable collagenous tissue of *Paracentrotus lividus*: preliminary results*

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Abstract

The mechanically adaptable connective tissue of echinoderms (Mutable Collagenous Tissue—MCT), which can undergo drastic nervously-mediated changes in mechanical properties, 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, proteoglycans and glycoproteins. This contribution presents the preliminary results of a detailed analysis of MCT components in the sea-urchin *Paracentrotus lividus*, focusing on biochemical characterization of the fibrils and biomolecular analysis of the presumptive glycoproteins involved. 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.

Key words: Mutable Collagenous Tissue, Echinodermata, Echinoidea, glycoproteins, mechanical properties

Introduction

Many echinoderm connective tissues undergo rapid and reversible changes in their mechanical properties (Motokawa 1984; Wilkie *et al.* 2004). The mutability of these tissues is facilitated by distinctive features of their collagen fibrils, which are much shorter than the length of the tissue in which they are found and lack permanent interfibrillar associations (Matsumura 1974; Trotter & Koob 1989; Trotter *et al.* 1996). The load-bearing potential of these tissues depends on the ability of adjacent fibrils to transfer stress via transiently established interactions. The transient nature of these associations accounts for the capacity of such tissues to become reversibly stiff or compliant (Wilkie *et al.* 1993).

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 *et al.* (1996, 2003), the extracellular matrix of holothurians includes at least two important glycoproteins, *stiparin* and *tensilin*, that can modulate the aggregation of collagen

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