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In vitro models for the study of skeletal muscle function

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C2C12 cell line was chosen to study a number of conditions involved in skeletal muscle biology. First, cells were characterized along differentiation. Their organization, continuously monitored at reverted microscope, was investigated by scanning and transmission electron microscopy, as well as at fluorescence microscopy. Skeletal muscle development in vitro was compared to that in vivo, and, for that purpose, newborn, young and adult rats were considered. Actin and myosin, M-cadherin, involved in myotube assemblage, and mitochondrial behaviour were studied during cell differentiation. (Burattini et al.,2004) Confocal microscopy highlighted progressive mitochondrial biogenesis, by the analysis of their functionality, revealed by means of MitoTracker and JC1, both at microscopy and flow cytometry levels. Membrane change study was supported by electrophysiological approaches, which suggested a certain activity, accounting for spontaneous myotube contractions in the absence of innervation (Curci et al., 2008).

Proteomic analysis, carried out at variable differentiation times, allowed to correlate the appearance of cell components with a number of molecules involved in the various stages of skeletal muscle cell development (Casadei et al., 2009). Myoblast and myotube differentiation was also studied in terms of myogenic commitment, and MRFs, i.e. MyoD, Myf-5, MRF-4 and myogenin presence and amount were monitored by RT-PCR and immunofluorescence. Their ultrastructural localization was also performed by immunogold electron microscopy (Ferri et al., 2009).

Successively, we studied C2C12 response to the treatment with ergogenic molecules, such as some commonly utilized in athlete performance improving. The effect of creatine on control and oxidatively injured C2C12 cells was so studied and characterized by molecular and morphological techniques (Sestili et al., 2006 and 2009).

Recently, we studied skeletal muscle cell death, which was induced by means of UV-B radiations, H2O2, staurosporine, cisplatin and etoposide, and investigated by DNA gel electrophoresis, caspase activity analysis, TUNEL and a variety of morphological approaches (D'Emilio et al., 2010).

C2C12 seem to reproduce a number of skeletal muscle features, so representing a reliable model for the study of muscle tissue in a variety of normal and pathological conditions.

Key words
C2C12 skeletal muscle cells, differentiation, cell death