

Growth hormone and resistance exercise effects on myotendinous junction in hind-limb unloaded rats: an ultrastructural study

Davide Curzi¹, Davide Lattanzi¹, Sabrina Burattini¹, Richard E. Grindeland², Reggie V. Edgerton^{3,4}, Roland R. Roy³, James G. Tidball⁵ and Elisabetta Falcieri^{1,6}

¹ Dept. of Earth, Life and Environmental Sciences, University of Urbino Carlo Bo, Urbino, Italy

² Life Sci Divis, NASA - Ames Research Center, Moffett Field, USA

³ Det. of Neurology and Neurosurgery, University of California, Los Angeles, USA

⁵ Mol, Cell & Integrative Physiol Program, University of California, Los Angeles, USA

⁶ CNR, Molecular Genetics Inst and Rizzoli Orthopaedic Inst, Bologna, Italy

Myotendinous junction (MTJ), is the site at which the contractile forces are transmitted from myofibrils to extracellular matrix, and, when observed at ultrastructural level, it displays an interdigitated profile (Kojima et al., 2008). The aim of this study is to investigate the junctional behaviour in the atrophic condition and during particular prevention protocols. The MTJs of plantaris muscles from twenty hypophysectomized rats were processed for electron microscopy (Curzi et al., 2012). The animals were assigned to one of five groups: control (CTRL), hind-limb suspended (HS), hind-limb suspended and exercised (EX), hind-limb suspended and growth hormone injected (GH) and hind-limb suspended, GH injected and exercised (GH+EX). After unloading, the tendon finger-like processes appeared small and irregular and the contact between tissues is reduced to 61.3%. The prevention treatments increased the interface area up to 6.2% in GH, 25.3% in EX and 46.4 % in GH+EX respectively. The resistance exercise protocol, as well as GH treatment, was not capable of maintaining the contact surface between tissues, but in both exercised groups the number of bifurcated interdigitations was higher than in the CTRL. In conclusion, ultrastructural changes occur at MTJ in HS, as an adaptation to muscle unloading. Differently, MTJ structure is partially maintained by resistance training or GH treatment, while the exercise with simultaneous somatropin administration showed a greater effect.

References

- [1] Kojima et al. (2008) Ultrastructural changes at the myotendinous junction induced by exercise. *J Orthop Sci* 13: 233-239.
- [2] Curzi et al. (2012) How physical exercise changes rat myotendinous junctions: an ultrastructural study. *Eur J Histochem* 56: 117-122.

Key words

Myotendinous junction, exercise, growth hormone, atrophy.