

# The Role of Fascia in Resting Muscle Tone and Heat Induced Relaxation

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**BACKGROUND:** The use of heat is a common tool in the treatment of muscular disorders such as stiffness or myalgia. Clinical data as well as in vitro experiments demonstrate that increased temperature leads to a heat-related myofascial relaxation [1]. The mechanisms underlying the so-called resting muscle tone are not well understood. In this study we investigated the differential effects of the skeletal muscle fibers and the fascial structures.

**METHODS:** We performed mechanographic force registrations on freshly dissected samples from rats as well as humans. The muscle strips and fascia samples were placed in a physiological organ bath. The temperature was varied between 20°C and 40°C and force was measured with and without electrical stimulation of the tissue (0,1 Hz; 1ms; 25 V).

**RESULTS:** Electrical stimulation leads to visible twitching of the muscle strips. The functional parameters of active twitching were strongly temperature dependent. Also, the pharmacosensitivity to  $\text{Ca}^{2+}$ -releasing drugs was increased at higher temperature. At low temperatures, the muscle twitching shows a relaxation deficit which leads to cold-induced stiffness and mimics a myotonic syndrome. The resting basal tension of muscle strips was studied without electrical stimulation. Muscle strips lacking epi- and perimysium had a basal tension which was unchanged or even higher with an increase in temperature. This effect contrasts with the reported heat relaxation in collagenous connective tissues [2].

**CONCLUSION:** We show that increased temperature leads to an enhancement in the functional properties of skeletal muscle in terms of accelerated contraction and relaxation parameters. There is a tendency towards a heat induced increase of basal muscle tension. Since resting muscle tone is reportedly EMG-silent [3], this excludes a link to the increased electrical activity of muscle fibres. The contractile apparatus is regulated by temperature dependent on  $\text{Ca}^{2+}$  release from and re-uptake into intracellular stores (sarcoplasmic reticulum). We conclude that variations of the resting tension of isolated muscle fibers may be explained by altered intrinsic  $\text{Ca}^{2+}$ -turnover. Our findings on isolated muscle fibers are in contrast to the heat-induced relaxation of resting muscle stiffness [1]. We speculate that apart from temperature effects on peripheral nociceptors and the nervous system in vivo, there is a direct fascial relaxation that contributes to heat-induced relaxation. This supports the notion that the regulation of fascial stiffness plays a major part in resting muscle tone.

**REFERENCES:**

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