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Reference (Published version):
Keytsman, Charly; Blancquaert, Laura; Derave, Wim; Missinne, Maarten; Vandenabeele, Frank; Wens, Inez & Op' t Eijnde, Bert (2017) Muscle carnosine in Experimental Autoimmune Encephalomyelitis and Multiple Sclerosis: effects of exercise. In: MULTIPLE SCLEROSIS JOURNAL, 23(6), p. 880-881
Handle: http://hdl.handle.net/1942/24221
Muscle carnosine in Experimental Autoimmune Encephalomyelitis and Multiple Sclerosis: effects of exercise

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Introduction. Part of the neuromuscular dysfunction in Multiple Sclerosis (MS) may reside within the muscle (impaired cross-bridging, impaired Ca²⁺ handling, altered exercise-induced lactate response). Muscle carnosine may affect this. The impact of MS on muscle carnosine however was never investigated before.

Methods. First, muscle carnosine levels of m. tibialis anterior were measured in control rats (CON, n=40) and in an animal MS model (EAE, Experimental Autoimmune Encephalomyelitis, n=40) before and after exercise therapy (EAE_EX, CON_EX, 10d, 1h/d, 24m/min treadmill running) and sedentary conditions (EAE_SED, CON_SED, n=20). Furthermore, m. vastus lateralis carnosine levels of healthy controls (HC) and MS patients were measured (HC, n=22; MS: n=24). Hereafter and in a subgroup of MS patients only, the effect of high intense exercise therapy (MS_EX, n=11, 12w, 5sessions/2w, 80-100% HR_max) versus sedentary conditions (MS_SED, n=6) on muscle carnosine levels were evaluated.

Results. EAE decreased (p<0.05) muscle carnosine levels by ~40% to ~64% in EAE_SED 10d to 17d following EAE induction. This was not restored/prevented by exercise therapy (~37% to ~64%). MS decreases (p<0.05) muscle carnosine levels by ~25% compared to HC. Exercise did not appear to remediate this.

Conclusion. EAE and MS decrease muscle carnosine levels substantially. Exercise therapy does not appear to restore this.