

Skeletal muscle heat shock protein 60 increases after endurance training in mice and induces peroxisome proliferation-activated receptor- γ coactivator-1 α 1 expression

Claudia Sangiorgi¹, Rosario Barone¹, Filippo Macaluso¹, Antonella Marino Gammazza¹, Claudia Campanella¹, Daniela D'Amico¹, Viviana Moresi², Dario Coletti², Sergio Adamo², Francesco Cappello¹, Giovanni Zummo¹, Felicia Farina¹, **Valentina Di Felice¹**

¹ Dipartimento di Biomedicina Sperimentale e Neuroscienze Cliniche, Università degli studi di Palermo, Palermo, Italy - ² Department of Anatomical, Histological, Forensic & Orthopaedic Sciences, Section of Histology & Medical Embryology, Università "La Sapienza" di Roma, Roma, Italy

Heat shock protein (Hsp60) is a mitochondrial chaperonin whose unconventional cellular localizations and functions are discovered day by day.

In the present study, the levels of Hsp60 in fibres of the *soleus* muscle and its correlation to the expression of four isoforms of peroxisome proliferation-activated receptor- γ (PPAR- γ) coactivator-1 α (PGC1 α) were investigated in 72 young (7-weeks old) healthy male mice (BALB/c AnNHsd) at baseline and after completing a 6-week endurance training program. The mice were assigned to one of the two experimental groups: SED (sedentary) or TR (trained). Short-term overexpression of *hsp60*, achieved by *in vitro* plasmid transfection, was then performed to determine whether this chaperonin could have a role in the activation of the expression levels of PGC-1 α isoforms.

The levels of Hsp60 protein were fibre-type specific in the posterior muscles at baseline, and endurance training increased its content in type I muscle fibers. Concomitantly with the increased levels of Hsp60 released in the blood stream of trained mice, mitochondrial copy number and the expression of three isoforms of PGC-1 α increased. Overexpressing *hsp60* in cultured myoblasts induced only the expression of PGC-1 α 1, letting us suppose a direct correlation between Hsp60 overexpression and PGC-1 α 1 activation.

Overall, these results suggest that during endurance training Hsp60 is upregulated and activates the mitochondrial biogenesis pathway, probably as a response to the oxidative stress induced by exercise. This study reveals a molecular response of skeletal muscle to a mechanical stress induced by training which involves the molecular chaperonin Hsp60 and the transcriptional co-activator PGC-1 α 1. The role of these proteins in aerobic adaptation and pathological conditions as cancer cachexia warrants further investigations.

References

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