IJAE
Vol. 120, n. 1 (Supplement): 139, 2015
ITALIAN JOURNAL OF ANATOMY AND EMBRYOLOGY

Skeletal muscle heat shock protein 60 increases after endurance training in mice and induces peroxisome proliferation-activated receptor-γ coactivator-1 α1 expression

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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-1α (PGC1α) 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-1α 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-1α increased. Overexpressing *hsp60* in cultured myoblasts induced only the expression of *PGC-1 α1*, letting us suppose a direct correlation between Hsp60 overexpression and PGC-1 α1 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 α1. The role of these proteins in aerobic adaptation and pathological conditions as cancer cachexia warrants further investigations.

References

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