Exercise Biochemistry Review

Proceedings of IBEC 2018, Beijing, China, October 23-25
PL-020

Establishment of skeletal muscle-specific PGC-1α overexpression model via in vivo local transfection

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Objective To establish a skeletal muscle-specific PGC-1α overexpression mouse model via in vivo local transfection.
Methods For the PGC-1α in vivo transfection study, the Male FVB/N mice were randomly divided into 2 groups: subject to green fluorescent protein (GFP) transfection (Con-GFP), and subject to PGC-1α in vivo transfection (Con-PGC-1α). Plasmid DNA solution (2.5 mg/ml GFP or 2.7 mg/ml Flag-PGC-1α) were injected into the proximal (6 ml) and distal (6 ml) ends of the muscle belly. Following the injections, electric pulses were applied through 2 stainless steel pin electrodes laid on top of the proximal and distal myotendinous junctions. Then skeletal muscle and myocardium were isolated, and PGC-1α, mtTFA, NF-κB, MnSOD, FNDC5 protein expression were measured with Western blot.
Results n skeletal muscle, compared with con-GFP group, the expression of PGC-1α (+125%, p<0.01), mtTFA (+210%, p<0.01), and FNDC5 (+47%, p<0.05) were significantly increased in con-PGC-1α group. However, NF-κB and MnSOD protein level had no change in con-PGC-1α group. In myocardium, compared with con-GFP group, the expression of mtTFA (+130%, p<0.01) and FNDC5 (+55%, p<0.05) were significantly increased in con-PGC-1α group.
Conclusions Skeletal muscle-specific PGC-1α overexpression model via in vivo local transfection was established, which was supported by elevated expression of PGC-1α and its downstream FNDC5 and mtTFA. Furthermore, skeletal muscle-specific PGC-1α overexpression induced increase in myocardial mitochondrial biogenesis, while relative mechanism remains to be determined.