A comparative study on the effects of high-fat diet and endurance training on the PGC-1α-FNDC5/irisin pathway in obese and non-obese male C57BL/6 mice

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The present study was performed to clarify how a combined exercise/diet treatment could affect the expression level of the muscle Fndc5 with respect to the body fat mass. Male C57BL/6 mice were divided into 2 groups including low-fat (LF) and high-fat (HF) diets for 12 weeks. Then, LF fed (non-obese) and HF fed mice (obese), were divided into 4 groups: HF-Exercise, HF-Sedentary, LF-Exercise and LF-Sedentary. The exercise group received exercise, on a motor-driven treadmill for 45 min/day, 5 days/week for 8 weeks. Mice were sacrificed 24 hours after the final exercise session. Gastrocnemius muscle and the visceral adipose tissue were excised and frozen for the assessment of Pgc-1α and Fndc5 mRNA and protein levels. Data indicated that protein level of muscle PGC-1α was decreased in HF vs. LF groups and in obese vs. non-obese mice. Moreover, Fndc5 mRNA levels were increased in the muscle tissue of HF vs. LF groups and in obese vs. non-obese mice. Interestingly, Fndc5 mRNA expression levels were significantly correlated with fat mass. Also, in the gastrocnemius skeletal muscle, protein levels of FNDC5 were significantly higher in the high-fat fed mice, as compared to their low-fat fed counterparts, like what was observed for exercised vs. sedentary mice. Overall, we found that the high-fat diet increased Fndc5 transcript levels in the skeletal muscle, but exercise had a minimal effect on the transcript level of Fndc5, whereas endurance training increased the protein content of FNDC5 in the skeletal muscle.