Original Article

Effects of a moderate-fat diet on high-intensity intermittent and endurance training-induced metabolic adaptations in mouse skeletal muscle

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ABSTRACT

【Aim】

The long-term intake of a very high-fat diet enhances the fat oxidation capacity in skeletal muscle, while exerting an inhibitory effect on carbohydrate metabolism. The purpose of this study was to evaluate the effect of a moderate-fat diet on exercise training-induced metabolic adaptations in mouse skeletal muscle.

【Method】

Male 8-week-old ICR mice were subjected to an 8-week exercise training program (high-intensity intermittent or endurance running, 90 min/day, 5 days/week) and were fed either a control diet (PFC ratio = 19:17:64, Con-Tr group), a moderate-fat diet (PFC ratio = 27:54:19, Mod-Tr group), or a high-fat diet (PFC ratio = 11:88:1, High-Tr group). Sedentary mice fed the control diet were used as a control group (Con-Sed group). After the 8-week intervention, the tibialis anterior muscles were dissected and the enzyme protein contents were measured.

【Result】

Both the Mod-Tr and High-Tr groups had a significantly higher muscle βHAD protein content, which is a key enzyme in fatty acid β-oxidation, compared with the Con-Sed group, with the High-Tr group having the highest value. In addition, the PDK4 protein content, which is a negative regulator of glycolytic flux, was substantially higher in the High-Tr group than in the other three groups. However, an increase in PDK4 was not observed in the Mod-Tr group.

【Conclusion】

The present results suggest that the long-term intake of a moderate-fat diet in combination with training may enhance fat oxidation capacity without inhibiting carbohydrate metabolism.

Keywords: high-fat diet, β-hydroxyacyl CoA dehydrogenase, pyruvate dehydrogenase kinase 4, skeletal muscle, mice