



Effects of aerobic exercise on fatty acid metabolism in liver of NAFLD Rats

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Objective Aerobic exercise can improve liver metabolic diseases such as non-alcoholic fatty liver disease (NAFLD), but the molecular mechanism is not completely clear, which limits the application of aerobic exercise in the treatment and improvement of NAFLD. In this paper, the effects of aerobic exercise on the expression levels of important genes regulating fatty acid metabolism in the liver of NAFLD rats were studied in order to explore the possible molecular mechanism of aerobic exercise regulating hepatic fatty acid metabolism.

Methods 1. Animal grouping. 36 male Sprague Dawley (SD) rats aged 21 days old were randomly divided into three groups after 1 week of adaptive feeding: 10 in the normal diet quiet group (NC group), 10 in the high-fat diet quiet group (HC group) and 16 in the high-fat diet exercise group (HT group). 2. Training arrangements. After 12 weeks, the rats in the HT group underwent 8 weeks of aerobic exercise with a training intensity of 25m/min, and continued exercise for 1h/d, 6d/w for a total of 8 weeks. 3. Sample collection. After an overnight fast, rats in the three groups were weighed and anesthetized with an intraperitoneal injection of 10% chloral hydrate (0.3 ml/100 g body weight). Blood samples were collected from the aortaventralis, centrifuged, and kept frozen at -80 °C for chemical assays. The rat liver was removed, frozen in liquid nitrogen, and stored in a -80 °C freezer. 4. Serum lipid concentration and liver function detection. Serum levels of total cholesterol (TC), triglyceride (TG), high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C), free fatty acid (FFA), aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were detected in three groups of rats. 5. Detection of expression levels of fatty acid metabolism related genes in liver. The expression levels of AMP-activated protein kinase (AMPK), silence information regulator 1 (SIRT1), peroxisome proliferator-activated receptor γ coactivator 1 α (PGC-1 α) in rat liver were detected by SYBR Green real-time PCR. 6. Data statistics. Results were expressed in the form of mean \pm standard deviation. Spss17.0 statistical software was used to conduct one-way ANOVA to compare the differences between the groups, $p < 0.05$ indicates significant difference between groups.

Results 1. Effects of aerobic exercise on Blood lipids and liver function. The serum levels of TC, TG, LDL-C, FFA, AST and ALT in HC group were significantly higher than those in NC group ($p < 0.05$), while HDL-C level was significantly lower ($p < 0.05$). The serum concentrations of TC, TG, LDL-C, FFA, AST and ALT in HT group were significantly lower than those in HC group ($p < 0.05$), while HDL-C level was significantly higher ($p < 0.05$). 2. Effects of aerobic exercise on the expression of fatty acid metabolism regulatory genes in liver of rats. The mRNA expression levels of AMPK, SIRT1 and PGC-1 α in liver of HC group were significantly lower than those of NC group ($p < 0.05$). While the mRNA expression levels of AMPK, SIRT1 and PGC-1 α in liver of HT group were significantly higher than those of HC group ($p < 0.05$).

Conclusions Aerobic exercise can improve serum lipid concentration and liver function in NAFLD rats. It increased the consumption of ATP, led to an increase in AMP/ATP ratio, enhanced the mRNA expression of AMPK, SIRT1 and PGC-1 α , activated AMPK - SIRT1 - PGC-1 α signaling pathway, reduced hepatic fat synthesis and accelerated fatty acid oxidation in NAFLD rats liver.