

Effects of High fat Diet-induced Metabolic Disorders and Obesity in Postpartum Mice with
Intrinsic High- or Low-aerobic Exercise Capacity

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Abstract

Introduction: Pregnant women are one of the high risk groups of obesity. If there is no dietary monitoring plan after pregnancy, The over-consumption of high-fat diet would lead to increase the risk of hyperglycemia, hyperlipidemia, diabetes mellitus and lipid deposition in women, especially those without dietary monitoring plan in the postnatal period. In this study, we selectively breed the high- and low- intrinsic exercise capacity postpartum mice to explore if there are protective factors for obesity and metabolic diseases.

Methods: Female ICR mice were divided into 4 groups (n = 8 per group) high-exercise capacity postpartum mice with normal chow diet (HCP-ND); high-exercise capacity postpartum mice with high-fat diet (HCP-HFD); low-exercise capacity postpartum mice with normal chow diet (LCP-ND); low-exercise capacity postpartum mice with high-fat diet (LCP-HFD).

Results: After a 11-week chow or high-fat diet, there were two groups that were significantly different in physical performance (from best to worst): 1). HCP-ND; 2) LCP-ND; 3) HCP-HFD; and 4) LCP-HFD. The average running time-to-exhaustion for HCP-ND, HCP-HFD, LCP-ND and LCP-HFD were 42.40, 30.31, 31.11 and 26.28 min, respectively, in the treadmill endurance test. The final body weight, and several adipose depots weights, including mesenteric, ovarian and perirenal fat pads were all significantly increased in both HCP-HFD and LCP-HFD groups, as well as macrovesicular steatosis in the livers. Serum levels of total cholesterol, triacylglycerol and low-density lipoprotein in HCP-HFD and LCP-HFD groups were all significantly higher than those of HCP-ND and LCP-ND groups. We also found the levels of these three serum markers in LCP-HFD group were worsen than in HCP-HFD group. When we checked the glucose intolerance via an oral glucose tolerance test (OGTT), the glucose area under the curve (AUC), an index of glucose excursion, in the LCP-HFD group was significantly higher than other three groups.

Conclusions: Our results suggested that postpartum mice with intrinsic high-aerobic exercise capacity were more resistant to HFD, whereas the low-aerobic exercise capacity exacerbated HFD-induced complications.

Keywords: Postpartum, Exercise capacity, High fat diet, Obesity