Exercise Biochemistry Review

Effects of accumulated exercise with different intensities on insulin resistance in mice

Yuli Zhang,Songtao Wang,Fei Liang,Xiangyu Shuai,Weibao Liang,Yuanpu Qi
South China Normal University

Objective The aim of this study was to investigate the effect of 8-week moderate-intensity and high-intensity accumulated exercise on insulin resistance in mice, compared with the moderate intensity continuous exercise with equal workload, which will provide an experimental reference for seeking a more reasonable and effective exercise program to break sedentary behavior and improve metabolic diseases such as IR.

Methods Eighty 4-week-old C57BL/6J mice were randomly divided into normal diet group (group C) and high-fat diet group (group H), fed with different diet. At the 10th weekend, insulin resistance model was judged by OGTT curve (AUC) and fasting blood glucose. All mice with insulin resistance were randomly divided into four groups: IR control group (IC), IR moderate-intensity continuous exercise group (IE), IR moderate-intensity accumulated exercise group (IM), IR high-intensity accumulated exercise group (IH), retained normal diet control group (C), with 12 mice for each group. All groups were fed with normal feed. The three exercise-related group performed an 8-week's treadmill exercise program with equal workload (involve preparation and relaxation activities,0°platform slope, 5 days/week). For IE group, mice run 50min continuously with the velocity of 11m/min. For IM group，mice exercised 12.5 min per session, total 4 sessions per day, with 3-hour's interval and the velocity of 11m/min. The IH group performed an alike exercise program with IM group, except the running speed (19m/min) and exercise time (7.5min). On the 8th weekend of exercise, FBG, OCTT, FINS, HOME- IR, and ISI were tested for each groups.

Results 1. Compared with group C, body weight, FBG and OGTT-AUC were significantly increased in group H (P<0.05 or P<0.01). 76% mice were induced to insulin resistance successfully. 2. Before and after exercise intervention of 8 weeks, there were no significant changes in body weight and OGTT-AUC, while the FBG was significantly increased in IC group (P<0.05). Body weight, FBG, and OGTT-AUC significantly decreased in IE group, IM group and IH group (P<0.05 or P<0.01). 3. After 8 weeks of exercise intervention, the FBG in the IE group, IM group, and IH group were significantly lower than that in C group (P<0.05 or P<0.01). Compared with the IC group, the FBG, FINS, OGTT-AUC, and HOME-IR in IM group, IH group and IE group were lower than those in the IC group (P<0.05 or P<0.01). Compared with the IE group, the body weight and HOME-IR index of IH group were significantly lower than those in IE group (P<0.01). Compared with IH group, the HOME-IR in IH group was lower than that in IM group (P<0.05); There was no significant difference between IM group and IE group.

Conclusions 1. Chronic moderate-intensity continuous exercise, moderate-intensity accumulated exercise, and high-intensity accumulated exercise all can effectively improve the glucose metabolism and insulin resistance in IR mice. 2.Compared with moderate-intensity accumulated exercise and moderate-intensity continuous exercise, the high-intensity accumulated exercise with equal workload is more effective in reducing the body weight and improving insulin resistance in IR mice.