Effects of food restriction and/or aerobic exercise on the GLUT4 in type 2 diabetic male rats

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Abstract

Background:

The aim of present study was to compare the effects of negative energy balance with food restriction and/or aerobic exercise on the glucose, insulin, and GLUT4 levels in diabetic male rats.

Methods:

Fifty-six 10-week old male Wistar rats were randomly assigned to seven groups: a non-diabetic (ND) group and six diabetic groups. After an infusion of type 2 diabetes, the diabetic groups were given labels as well, namely diabetic control (DC) group, exercise (Ex) group, food restriction with standard diet (FRSD) group, food restriction with low-carbohydrate diet (FRLCD) group, food restriction with standard diet combination in exercise (FRSDE) group, and food restriction with low-carbohydrate diet combination in exercise (FRLCDE) group. Further, to induce caloric restriction (CR), food intake was reduced by 20% and given to food restriction consists of both of (FRSD and FRLCD). Hundred percent food consumption for the Ex group was fixed, but instead, 20% of their energy intake in exercise was calculated, and time of daily exercise was determined. Finally, a combination of reduced food intake (10%) and exercise (10%) was applied in each group FRSDE and FRLCDE for 8 weeks.

Results:

The results showed that type 2 diabetes inductions had reduced glucose, insulin, and GLUT4 gene expression compared to the ND group ($P = 0.001$). However, there were significant differences in GLUT4 gene expression between groups after 8 weeks of intervention ($P = 0.001$). A post hoc least significant difference test show that compared to DC group, GLUT4 gene expression level of Ex, FRSDE, and FRLCDE groups was significantly increased 47% ($P = 0.004$), 60% ($P = 0.001$), and 65% ($P = 0.001$), respectively after 8 week of intervention, but it was not significant or with any other diabetic groups ($P > 0.05$). Moreover, glucose levels were significantly higher in the FRLCDE, FRLCD, FRSD, FRSDE, Ex groups compared with the DC group in the same period ($P = 0.0.01$).

Conclusions:

It was concluded that FRSD and FRLCD combination in regular exercise was elevated of GLUT4 gene expression in type 2 diabetes. These results may help to develop new methods for the treatment of obesity and type 2 diabetes mellitus.

Keywords: *GLUT4 gene expression, low-carbohydrate diet, standard diet, type 2 diabetes*