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Effects Of Body Weight Resistance Training On Glut4 Expression In Obese And Lean Zucker Rats: 973 *Board #195* 10:30 AM – 12:00 PM

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PURPOSE

GLUT4 is the most regulated glucose transport protein in mammalian muscles. Expressed mainly in skeletal muscle it dramatically increases the muscle's uptake of glucose from the blood in response to insulin or metabolic demand. In insulin resistance there is a decrease level of GLUT4 expression in skeletal muscle. It has been shown that aerobic exercise training can increase the total GLUT4 expression. However, limited data exist concerning the effects of resistance training on skeletal muscle GLUT 4 expression. The purpose of this study was to determine if low intensity voluntary resistance training could enhance the expression of GLUT4 in lean as well as obese Zucker rats.

METHODS

Using a hind limb loading apparatus, eight 6-week old male genetically obese Zucker rats (fa/fa) and eight Zucker lean rats (+/fa) were trained with positive reinforcement to perform weight bearing plantar flexion. Eight obese and eight lean Zucker rats served as non-exercising controls. Training sessions were conducted 5 days per week and each lasted until at least 50 lifting and lowering movements were performed or 1.5 hrs. Food and water were available in the home cage at all times. All rats were sacrificed 48 hours after the final training session and the soleus and plantaris muscles were removed. GLUT4 protein levels were estimated by western blots and the optical density and area of the resultant bands were determined.

RESULTS

All rats successfully acquired the weight-lifting movement. However, only 2 of the obese and 5 of the lean zucker rat were able to approach the goal of 50 lifts per session. GLUT4 protein expression was signifficantly ($p < .05$) higher in the lean versus obese control rats in both the soleus and plantaris muscles. GLUT4 protein levels did not differ in the soleus or plantaris of either the lean or obese resistance trained rats when compared to matched controls ($P > .05$). However, when examining the soleus muscle of the three obese rats that performed the most lifts, there was a significant improvement compared to sedentary matched controls ($P < .05$).

CONCLUSIONS

Genetically obese Zucker rats have signifficantly lower GLUT-4 protein expression when compared with leans. Limited weight-bearing exercise alone was not sufficient to result in increased GLUT4 expression in either obese or lean animals. However, the data suggest that resistance training may augment the GLUT 4 protein expression in hindlimb muscles of obese Zucker rats that perform consistent weight-bearing plantar flexion exercise. This study provides the basis for further investigation on the effects of progressive resistance training on GLUT4 expression in muscles of the obese Zucker rat.