

Abstract

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Interactions of conjugated linoleic acid and lipoic acid on insulin action in the obese Zucker rat.

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BACKGROUND: The fatty acid conjugated linoleic acid (CLA) and the antioxidant R-(+)-alpha-lipoic acid (R-ALA) individually enhance glucose tolerance and insulin action on skeletal muscle glucose transport in the insulin-resistant obese Zucker rat. To date, no study has assessed the potential interactions between these 2 interventions in treating insulin resistance.

OBJECTIVE: The present study was designed to determine whether chronic treatment with CLA and R-ALA in combination would enhance skeletal muscle glucose transport to a greater extent than either intervention individually.

METHODS: CLA, R-ALA, or a combination treatment of R-ALA and CLA were administered to female obese Zucker rats for 20 days at low or high doses.

RESULTS: Whereas low-dose R-ALA (10 mg/kg body weight) alone did not alter muscle glucose transport, low-dose CLA (0.3 g/kg) induced a significant increase (38%, $P < .05$) in insulin-mediated glucose transport in epitrochlearis, but not in soleus. Low-dose combination therapy brought about the greatest enhancement of insulin-mediated glucose transport in epitrochlearis (77%) and soleus (54%), with the latter effect being associated with a 50% reduction in protein carbonyls (an index of tissue oxidative stress) and a 33% diminution in muscle triglycerides. High-dose treatments with CLA (1.5 g/kg), R-ALA (50 mg/kg), and the combination of CLA and R-ALA elicited increases in insulin-mediated glucose transport in epitrochlearis (57%, 58%, and 77%) and soleus (32%, 35%, and 54%). However, whereas the individual high-dose treatments with CLA and R-ALA reduced protein carbonyls (63% and 49%) and triglycerides (29% and 28%) in soleus, no further reductions were observed with the high-dose combination treatment groups.

CONCLUSION: These findings support a significant interaction between low doses of CLA and R-ALA for enhancement of insulin action on skeletal muscle glucose transport, possibly via reductions in muscle oxidative stress and in lipid storage.

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