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Effects Of Training In The Fasted State In Conjunction With Fat-rich diet On Muscle Metabolism: 721: June 3 8:15 AM - 8:30 AM

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(No disclosure reported)

A high turnover rate of intramyocellular lipids (IMCL) is proposed to reduce high-fat diet-induced accumulation of toxic lipid intermediates interfering with insulin action. It has been shown that an acute exercise bout in the fasted state stimulates IMCL breakdown compared with postprandial exercise.

PURPOSE: To compare the effect of an exercise training program in the fasted state versus the postprandial state on insulin sensitivity and IMCL content during a period of hypercaloric fat-rich diet, and to explore the underlying cellular mechanisms.

METHODS: Moderately active males (18-25y) consumed a hyper-caloric (normal diet +30% kcal/day) high-fat (50%) diet (HFD) during 6 weeks, alone (CON; n=7) or in conjunction with endurance training (1-1.5h @70% VO_2max, 4d/week) in either the fasted state (F; n=10) or with carbohydrate intake before and during exercise (CHO; n=10). Needle biopsies were taken from m. vastus lateralis. Glucose tolerance was measured by a 2h oral glucose tolerance test.

RESULTS: In CON, body weight on average increased by ~3kg. This weight gain was largely, if not entirely accounted for by fat accretion as evidenced by the 15% increase in sum of skinfolds, reflecting elevated subcutaneous fat deposit. The HFD-induced increase in body weight and skinfolds was largely negated by training in F ($P<0.05$).Compared with CON, both glucose tolerance and whole-body insulin sensitivity were improved after training in F ($P<0.05$), but not in CHO. HFD increased IMCL content to the same degree in all groups in both type I and type

IIa fibers. Muscle diacylglycerol, ceramide, and phospholipid content were not significantly different between the groups at any time. The training-induced upregulation (+28%) of muscle GLUT4 content was greater in F than in CHO (P=0.05). Furthermore, compared with CON, the phosphorylated fraction of AMPKa increased by ~25% in F (P<0.05) but not in CHO. Endoplasmatic reticulum stress occurred only in F, as indicated by elevated protein content of the unfolded protein response markers IRE1a and BiP (P<0.05).

CONCLUSION: Exercise training in the fasted state during a period of HFD is more effective than similar training in the carbohydrate-fed state to promote metabolic adaptations in muscles that enhance glucose tolerance and insulin action.