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Exercise at the lactate threshold (LT) and above the LT increases phosphorylation of AMPK and Akt in rat skeletal muscle

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Objective A single bout of exercise can enhance glucose uptake in skeletal muscle. It is well established that AMP-activated protein kinase (AMPK) activation is required for stimulation of glucose uptake by exercise. After the initial phosphorylation of glucose by hexokinase, glucose is further utilized to mitochondrial oxidation during exercise. The direct or functional interaction between hexokinase and Akt may act to integrate glucose metabolism in working muscle. Hence, AMPK and Akt activation would be cooperatively regulated exercise-induced activation of glucose metabolism. Although exercise at the lactate threshold (LT) and above the LT sharply increase glucose uptake via increasing AMPK activity, whether LT exercise can also increase Akt activity is still unknown. Therefore, we examined the AMPK and Akt activity immediately after several intensities of exercise.
Methods Male wistar rats (250-270 g) were randomly assigned to 3 groups: Resting control (sedentary, n=16), Low-intensity exercise (LIE: 10 m/min for 30 min, n=8), LT intensity exercise 1 (LTE1: 17.5 m/min for 30 min, n=8), LT intensity exercise 2 (LTE2: 22.5 m/min for 30 min, n=8), and High-intensity exercise (HE: 27.5 m/min for 30 min, n=8). Immediately after each treadmill exercise, plantaris and soleus muscles were dissected.
Results LIE exercise did not changed AMPK phosphorylation site (Thr172), indicator of AMPK activity, and Akt phosphorylation site (Ser473, Thr308), indicator of Akt activity, in these muscles compared with resting control. At and above LTE1 exercise increased the phosphorylation of AMPK in these tissues. At and above LTE2 exercise increased the phosphorylation of Akt in these tissues. Therefore, increasing AMPK and Akt activity immediately after LT exercise possibly involved with regulating glucose metabolism.
Conclusions Phosphorylation of AMPK and Akt is increased immediately after at and above LT exercise in rat soleus and plantaris muscle.