

Original Article

Reevaluation of the effects of time of glucose ingestion on post-exercise glycogen recovery in mouse skeletal muscle

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ABSTRACT

To maximize the rate of muscle glycogen recovery, athletes are recommended to consume a sufficient amount of carbohydrate within 30 min after the exercise. The purpose of this study was to reevaluate the effects of the time of carbohydrate intake on the post-exercise glycogen resynthesis rate in mouse skeletal muscle. Male ICR mice were subjected to 60-min running exercise and then were orally administered a glucose solution (2 mg of glucose/g body weight) either immediately (0 min) or 30, 60 or 120 min after the exercise. At 2 h after the glucose administration, the tibialis anterior muscles were dissected out and the muscle glycogen concentrations were determined. The muscle glycogen resynthesis rate during the 2-h recovery period was significantly higher for the mice administered with glucose solution immediately after the exercise, compared with those fed at 30, 60, or 120 min after exercise. While no significant differences in phosphorylation statuses of AMP-activated protein kinase and glycogen synthase were seen, the increase in the plasma glucose level (area under the curve [AUC] of plasma glucose) was significantly higher for the mice administered immediately after exercise, compared with the other groups. In addition, a significant correlation was observed between the plasma glucose AUC and the muscle glycogen recovery rate. These results suggest that even a 30-min delay in the intake of carbohydrates resulted in a slower rate of muscle glycogen recovery after exercise. Furthermore, the higher rate of post-exercise glycogen resynthesis induced by the earlier ingestion of glucose appears to be caused by increases in intestinal glucose absorption and glucose availability in the systemic circulation.

Keywords: timing, muscle glycogen, glucose, insulin, mouse