

Original Article

Co-ingestion of milk and glucose promotes post-exercise glycogen resynthesis in mouse skeletal muscle and liver

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ABSTRACT

To develop a novel method of promoting glycogen recovery, we examined the effects of the co-administration of glucose and milk on insulin secretion and glycogen resynthesis in muscle and liver after exercise in C57BL/6J mice. In Experiment 1, non-exercised mice were orally administered a glucose solution (2 mg/g body weight [BW], CHO group), milk (40 μ L/g BW, Milk group), or milk containing glucose (CHO-Milk group). Blood samples were collected from the tail vein, and the levels of plasma glucose, insulin and glucose-dependent insulinotropic polypeptide (GIP) were determined. Compared with the CHO and Milk groups, the CHO-Milk group had a significantly higher plasma insulin level and a lower glucose level after administration. Furthermore, the plasma GIP concentration was significantly higher in the CHO-Milk group and was positively correlated with the plasma insulin concentration. In Experiment 2, mice performed an acute bout of 30-min running exercise and were then orally given a milk and/or glucose as in Experiment 1. At 60 min after administration, the glycogen concentrations in the muscle and liver were significantly higher in the CHO-Milk group than in the CHO group. These results suggest that the co-ingestion of glucose and milk stimulates insulin secretion via gut-derived GIP and promotes muscle and liver glycogen resynthesis after exercise in mice.

Keywords: milk, glycogen, GIP, insulin, mouse