Effect of carbohydrate ingestion on glucose kinetics and muscle metabolism during intense endurance exercise


Published: J Appl Physiol 89: 1690-1698, 2000

There as been recent interest in the potential performance and metabolic effects of carbohydrate ingestion during exercise lasting ~1 h. in this study, 13 well-trained men ingested in randomized order either a 6% glucose solution (CHO trial) or a placebo (Con trial) during exercise to exhaustion at 83 ± 1% peak oxygen uptake. In six subjects, vastus lateralis muscle was sampled at rest, at 32 min, and at exhaustion, and in six subjects, glucose kinetics was determined by infusion of [6, 6-²H] glucose in both trials and ingestion of [6-³H] glucose in the CHO trial. Of the 84 g of glucose ingested during exercise in the CHO trial, only 22 g appeared in the peripheral circulation. This resulted in a small (12 g) but significant (P < 0.05) increase in glucose uptake without influencing carbohydrate oxidation, muscle glycogen use, or time to exhaustion (CHO: 68.1 ± 4.0 min; Con: 69.6 ± 5.5 min). Decreases in muscle phosphocreatine content and increases in muscle inosine monophosphate and lactate content during exercise were similar in the two trials. Although endogenous glucose production during exercise was partially suppressed in the CHO trial, it remained significantly above preexercise levels throughout exercise. In conclusion, only 26% of the ingested glucose appeared in the peripheral circulation. Glucose ingestion increased glucose uptake and partially reduced endogenous glucose production but had no effect on carbohydrate oxidation, muscle metabolism, or time to exhaustion during exercise at 83% peak oxygen uptake.