

Carbohydrate versus fat ingestion during exercise

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Although it is known that carbohydrate (CHO) feedings during exercise improve endurance performance, relatively little is known about the underlying mechanisms. One of the proposed mechanisms is based on the observation that CHO ingestion during exercise maintains blood glucose levels and high rates of CHO oxidation. Studies using (stable) isotope methodology have shown that not all CHO are oxidized at similar rates and hence they may not be equally effective. Glucose, sucrose, maltose, maltodextrins and amylopectin are oxidized at high rates. Fructose, galactose and amylose have been shown to be oxidized at 25-50% lower rates. Combinations of multiple transportable CHO may increase the total CHO absorption and total exogenous carbohydrate oxidation. Increasing the CHO intake will increase the oxidation up to about 1.0-1.1 g/min. A further increase in CHO intake, however, will not further increase the oxidation rates (Jeukendrup et al 1999a). There is convincing evidence that this limitation is not at the muscular level but most likely located in the intestine or the liver (Jeukendrup et al 1999ab). Intestinal perfusion studies seem to suggest that the capacity to absorb glucose is slightly in excess of the observed entrance of glucose into the blood and is thus a factor contributing to the limitation. The liver, however, seems to play an additional important role, in that it provides glucose to the bloodstream at a rate of only ~1 g/min by balancing the glucose delivery from the gut and from endogenous glycogenolysis/gluconeogenesis into the systemic circulation (Jeukendrup et al 1999ab).

In the last few years several studies have attempted to increase fat oxidation during exercise by dietary means in order to "spare" CHO. This could theoretically enhance physical performance. Ingestion of long-chain triglycerides (LCT) pre-exercise may result in small alterations in fat substrate availability, but no effects on substrate oxidation or performance were observed. Medium chain triglyceride (MCT) ingestion during exercise has been suggested as an alternative way to increase plasma fatty acid levels. However, the contribution of MCT to energy expenditure is only small because generally the gastrointestinal tract can tolerate only small amounts (Jeukendrup et al 1995). Although one study showed decreased glycogen utilization and improved performance with CHO+MCT feedings (Van Zeijl et al 1996) when larger amounts of MCT were ingested, this could not be confirmed by follow-up studies (Jeukendrup et al 1998, Goedecke et al 1999).

References

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