

Applied Sports Nutrition Update

Dr Greg Cox

AIS Sports Dietician

Recently I attended the European College of Sports Science Conference in Salzburg, Austria. The conference had several nutrition symposium sessions along with nutrition research being presented in oral and poster formats. This year there was a great line-up of speakers including Ron Maughan, Bente Pedersen, Asker Jeukendrup, David Nieman, Lawrence Spriet, Bengt Saltin, Roy Jentjens and Kevin Tipton to name a few. Topics covered included nutritional intervention during recovery from exercise and its likely impact on immune function and the muscles' adaptation to exercise, risks associated with taking nutritional supplements, issues relating to carbohydrate ingestion pre- and during exercise, and new insights into fat regulation.

Highlight One:

In a symposium session titled "New developments in sports nutrition" Roy Jentjens presented a series of recent studies that have attempted to systematically examine the effects of pre-exercise feeding by examining the influence of the amount of carbohydrate (CHO) ingested (1), the timing of CHO feeding (3), and the type of CHO intake (2) on subsequent metabolism and exercise performance.

Currently, the literature is unclear regarding the impact of CHO feedings in the hour before exercise. On one side - pre-exercise CHO may enhance CHO availability during prolonged exercise by increasing muscle and liver glycogen stores prior to exercise, or by providing a source of glucose in the gut for later release into the circulation. On the flip-side however, glucose ingestion in the hour before exercise may result in hyperglycemia and hyperinsulinemia, which is often followed by a rapid decline in blood glucose at the onset of exercise, commonly referred to as "rebound hypoglycemia".

Jentjens showed that different amounts of glucose ingested before exercise (25 to 200 g), had no effect on 40min time trial performance following 20min at steady state (1). More importantly, the ingestion of glucose 45 min before exercise did not impair exercise performance compared with the ingestion of a non-energetic placebo. It should be noted that during the first 20 min of exercise, plasma glucose concentrations in the CHO trials fell rapidly to 3.6-3.7 mmol/L, while plasma glucose remained stable in the placebo trial. Because no differences in performance were observed, these results suggest that mild rebound hypoglycemia in the early stage of exercise does not negatively affect time trial performance.

In another study (2), they examined the effect of different types of CHO (varying in glycemic index (GI)) on metabolic responses in rest and exercise and on time trial performance. Ingestion of trehalose (GI of 67) and galactose (GI of 20) resulted in lower plasma glucose and insulin responses prior to exercise and reduced the prevalence of rebound hypoglycemia (plasma glucose <3.5 mmol/L) compared with the ingestion of glucose (GI of 100).

However, no performance advantage was found following ingestion of galactose and trehalose compared with glucose.

Altering the timing of ingestion of CHO resulted in markedly differing glucose and insulin responses prior to the onset of exercise and this also had no effect on time trial performance (3). Of note, when the timing of CHO ingestion was delayed from 15 to 45, or 75 min before the start of exercise, more subjects developed rebound hypoglycemia (2 vs. 3 vs. 5 subjects, respectively ($n=8$)). It is clear from the studies above, that the number of individuals who develop rebound hypoglycemia is partly related to the GI of the ingested CHO and the timing of CHO intake prior to exercise.

However, it is not known why rebound hypoglycemia occurs in some individuals but not in others. In a recent study, Jentjens group has shown that the prevalence of rebound hypoglycemia ($n=10$) in 20 trained athletes was not accompanied by higher insulin sensitivity (4). These results suggest that the magnitude of insulin sensitivity does not play an important role in the occurrence of rebound hypoglycemia and it remains to be investigated why some individuals develop rebound hypoglycemia and others do not.

References

1. Jentjens RL et al. (2003). *Eur J Appl Physiol* 88: 444-452.
2. Jentjens RL, Jeukendrup AE (2003). *Eur J Appl Physiol* 88: 459-465
3. Moseley L et al. (2003). *Eur J Appl Physiol* 88: 453-458.
4. Jentjens RL, Jeukendrup AE (2002). *Int J Sport Nutr Exerc Metab* 12: 398-413

Bottom Line for you and your athletes:

Ingesting carbohydrate in the hour before exercise is unlikely to detract from exercise performance and is most likely to improve exercise lasting 1-2 hours in length. Specifically, in sports such as triathlon where the opportunities to consume carbohydrate during the exercise is limited, consuming carbohydrate during the hour before exercise is recommended. This can be in the form of a gel and/or a sports drink which should provide 50g of carbohydrate or more.

50g carbohydrate serve:

- 750ml of full strength sports drink (could be consumed over the hour before exercise)
- 2 carbohydrate gels – one consumed at an hour before exercise and one consumed at 10-15 minutes before exercise