

Issue 98

In a nutshell

Whilst there is agreement on the importance of taking adequate fluid in sport and other strenuous exercise, there is no consensus on what kind of fluid is best.

Some evidence suggests that a carbohydrate-electrolyte drink has some benefits over water alone. But we still don't know which fluid mixture and 'dose' is optimal.

Hydration in sport

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NUTRITION RESEARCH REVIEW

Study one: carbohydrate and electrolyte solution

Drinks with carbohydrate and electrolytes have advantages over water alone in recovery from exertion in hot conditions, according to recent English research.

Subjects: 13 healthy male volunteers.

Method: Cross-over placebo trial. After an initial treadmill exercise for 90 minutes (or to fatigue) in 35 degree Celsius heat, subjects consumed either 6.9% carbohydrate-electrolyte solution (active group) or non-carbohydrate sweetened water (placebo) during a 4 hour recovery period. They were then exercised again on the treadmill until exhaustion. Water was allowed freely during all exercise.

Results: The carbohydrate-electrolyte group performed better than the placebo group during the post-drink second exercise period (mean running times = 60.9 vs 44.9 minutes, $p < 0.01$).

Reference: Bilzon JL et al. Short-term recovery from prolonged constant pace running in a warm environment: the effectiveness of a carbohydrate-electrolyte solution. *Eur J Appl Physiol* 2000;82:305-312

Study two: how much carbohydrate ?

Carbohydrate in fluid replacement helps exercise performance in the heat, but not necessarily in a dose-dependent manner, according to Scottish research.

Subjects: Six healthy males.

Method: The subjects cycled to exhaustion at a temperature of 30 degrees Celsius. They consumed either no drink, a 15% or a 2% carbohydrate-electrolyte drink.

Results: The carbohydrate-electrolyte solutions were associated with significant increase in exercise capacity (time to exhaustion = 70.9 min without drink, 84.0 min with 15% carbohydrate fluid, 118 min with 2% carbohydrate fluid, $p < 0.05$). Other than a higher blood glucose in the 15% solution, there were no significant differences between the impact of the two carbohydrate solutions.

Reference: Galloway SD, Maughan RJ. The effects of substrate and fluid provision on thermoregulatory and metabolic responses to prolonged exercise in a hot environment. *J Sports Sci* 2000;18:339-351

Study three: fluids and women in labour

Increasing the intravenous fluid intake of pregnant women who are in labour enhances the outcome, according to recent American research.

Subjects: 195 nulliparous women in normal labour.

Method: Randomised controlled trial with women receiving either 125ml or 250ml of standard intravenous fluid.

Results: The higher fluid intake was associated with statistically significant reduction in the incidence of prolonged labour (frequency of labor lasting >12 hours = 13% vs 26%, $P < 0.05$) and a non-statistically significant reduction in labour duration (total and first stage) and requirement for oxytocin infusion (all measures $p = 0.06$).

Reference: Garite TJ et al. A randomized controlled trial of the effect of increased intravenous hydration on the course of labor in nulliparous women. *Am J Obstet Gynecol* 2000;183:1544-1548

Comments

Water and electrolytes (e.g. sodium, potassium) are important nutrients to consider when people are performing hard exercise, especially in hot conditions. Adequate status of these nutrients affects cardiovascular and muscular performance, and hence the ability of sportsmen and women to compete to their best advantage. Serious dehydration in this situation can be life threatening.

What is surprising is that, although there is universal agreement that it is important to replace the fluid and electrolytes lost during exercise in the heat, there is still uncertainty about exactly how and with what this can best be done. The consensus is certainly to take adequate fluid both before, during and after exercise whenever possible.

We also know that carbohydrate needs are increased even more when exercising in the heat, so it seems sensible to combine these three elements (water, electrolytes and carbohydrate) in one drink.

The American Dietetic Association has officially recommended that "consumption of sport drinks containing carbohydrates and electrolytes during exercise will provide fuel for the muscles, help maintain blood glucose and the thirst mechanism, and decrease the risk of dehydration or hyponatremia" ¹

Other approaches include hyperhydration before exercise, for example, by loading the body with hyperosmolar solutions of glycerol. Results of experiments on this approach have been equivocal ². Another question is whether there is any advantage in using intravenous rather than oral hydration as a routine measure in elite athletes, but a recent study found no such advantage ³.

The first two trials summarised above suggest that a carbohydrate-electrolyte drink does have some benefits over water alone, and certainly over not taking any fluids at all. These results confirm what many other studies have shown over the last decade.

But what we still lack, despite all the research, is a clear conclusion about what is the best fluid mixture, in what 'dose' and when it should best be consumed. A clear answer to this would have considerable commercial implications (e.g. for manufacturers of sports drinks).

In the meanwhile, nutritionists should at least emphasise to those doing strenuous exercise the importance of having **some** adequate source of replacement fluid and electrolytes.

Finally, the third study summarised above reminds us that sport is not the only endeavour in which fluid intake is important for 'athletic' performance. We are not aware of any comparable study of fluid intake for women in labour, but this single study does seem worth following up.

References:

1. Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. *J Am Diet Assoc* 2000;100:1543-1556
2. Wagner DR. Hyperhydrating with glycerol: implications for athletic performance. *J Am Diet Assoc* 1999;99:207-12
3. Casa DJ et al. Intravenous versus oral rehydration during a brief period: stress hormone responses to subsequent exhaustive exercise in the heat. *Int J Sport Nutr Exerc Metab* 2000;10:361-374

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