

## Hydration -- Part III

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This month we will conclude our series on hydration with a discussion of the optimal amounts of carbohydrates and electrolytes that should be in fluid-replacement or carbohydrate electrolyte drinks. It is critical not to confuse a carbohydrate-loading beverage with a fluid-replacement beverage. Carbohydrate-loaded drinks have over twice as many carbohydrates than do fluid-replacement drinks. They are designed to increase the body's glycogen stores in the days preceding competition and should not be consumed just prior to or during an event for the following reasons:

1. Ingesting solutions with high concentrations of carbohydrates can lead to osmotic imbalances in the stomach which causes the body to (a) increase fluid secretion for digestion, and (b) inhibit gastric emptying rate.<sup>1</sup> When this occurs, skeletal muscles do not receive the amount of fluid they require to function optimally (which is increased in times of exercise).
2. High carbohydrate beverages also cause a sharp increase in blood insulin levels. During exercise, skeletal muscles require smaller amounts of insulin than in the resting state. Therefore, this combination of increased quantity of insulin with a decreased requirement for insulin results in a powerful clearing of blood sugar leading to hypoglycemia.<sup>2</sup> Therefore, the consumption of carbohydrate-loading drinks should be terminated no later than four hours prior to competition.
3. When athletes consume beverages with large amounts of sugar right before or during competition, they will often have gastrointestinal complaints that may consist of nausea, vomiting, heartburn or a feeling of being "bloated."<sup>3</sup> Beverages with high carbohydrate concentration will cause osmotic imbalances in the intestines and are contraindicated for exercising athletes. This is another example of something that chiropractors have known years before other health care providers.

There continues to be debate over the optimal ingredients for fluid-replacement drinks. After many hours of research coupled with my experience with professional beach volleyball players, marathon runners, and triathletes, the following is my personal opinion of ingredients for fluid-replacement drinks:

1. Carbohydrates -- a good fluid-replacement drink should contain 6-7 percent carbohydrates which means approximately 14-17 gm. per 8 ounces or 55-70 calories per 8 ounces. I found one study where a 6 percent carbohydrate electrolyte solution was absorbed faster than distilled water.<sup>4</sup> Glucose polymers, fructose, and glucose are the types of carbohydrate a good sports beverage should include. The ratio should be 4:1, glucose polymer to fructose to glucose. I know of no brand that gives the carbohydrate ratio breakdown on the label, but as interest in fluid-replacement drinks continues, I feel that you will see these ratios appear in the near future. Furthermore, a phone call to the manufacturer should result in your receiving the carbohydrate ratio.

2. Electrolytes/Minerals -- It is my opinion that electrolyte contents in milligrams per 8 ounces of fluid-replacement drinks should be sodium 35-120 mg., potassium 30-100 mg., chloride 35-120 mg., chromium 15-50 mcg., and magnesium 50-100 mg. The above electrolyte/mineral recommendations seemingly wide range is due to a lack of consensus upon my review of the literature. What I did find was that the above are the most important electrolytes/minerals to be included in sports drinks. I expect that continuing research over the next few years should reduce these ranges. Note: A good sports drink should also contain an antioxidant. I recommend 25 to 100 mg. of vitamin C per 8 fluid ounces.

There are also substances that should not be in a sports drink, such as sucrose, aspartame, artificial colors, artificial flavors, preservatives, protein, and fat. Various companies may have vitamins and minerals that were not mentioned in this article. As long as the amounts are not too high, your athletes should not get in trouble with the addition of other nutrients, assuming the substances mentioned in this article are included in the correct ranges.

In conclusion, the research clearly demonstrates that fluid-replacement drinks will optimize the performance of your patient athletes by stimulating additional amounts of fluid intake, thus, leading to enhanced endurance during activity, and shortening recovery time following activity. Fluid-replacement drinks can be safely consumed before, during, and after competition. Science hasn't replaced water, it has just improved it a little bit.

### *References*

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