Sports Nutrition Update -- Abstracts from the American College of Sports Medicine 43rd Annual Meeting

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As there was no subject index published for the 43rd meeting of the American College of Sports Medicine supplement to their journal, Medicine and Science in Sports and Exercise (supplement to volume 28, number 5, May 1996), I reviewed all 1,256 abstracts to find the most interesting studies on sports nutrition. Abstracts are studies that have been performed, but have not yet gone through peer-review and been published in a refereed journal.

Part I: Carbohydrates and Exercise

Last year was the year of carbohydrate bashing. Carbohydrates got the blame for our increased obesity, and the decrease in athletic performance.

The 10 studies below from different researchers across the United States and around the world will make an interesting comparison to what you heard and read in the popular press last year.

1. Trained athletes performed 19 minutes of high intensity running after consuming 50 gm (200 calories) of liquid carbohydrate, solid carbohydrate, or placebo beverage. Time to exhaustion and blood glucose levels were higher in both carbohydrate trials compared to the placebo trial. The authors concluded that an intake of 50 gm (200 calories) of liquid or solid carbohydrate five minutes prior to vigorous anaerobic exercise both resulted in similar performance improvements as compared to placebo.

2. With a wealth of literature behind it, almost everyone agrees that carbohydrate feeding will improve performance in endurance events of moderate intensities over two hours. This study looked at higher intensity exercise of shorter duration (less than one hour). In this study cyclists were given either a 7.6% carbohydrate solution during an exercise timed trial of approximately one hour, or a placebo. Performance in the group consuming the carbohydrates during high intensity exercise was significantly increased.

3. In this very interesting abstract, male runners were given diets with the same amount of calories, but different percentages of macronutrients. The percentages were as follows: the normal diet of 16% protein, 61% carbohydrate, 24% fat; the fat diet of 14% protein, 53% carbohydrate, 33% fat; and the
carbohydrate diet of 13% protein, 72% carbohydrate, 15% fat. Each diet was consumed for seven days and then endurance performance to exhaustion was tested on a treadmill for 42 minutes at approximately 73% VO2 peak with a 3% grade increase every two minutes until exhaustion. Under these testing conditions, dietary manipulation of carbohydrates and fats had no effect (positive or negative) on performance.

4. This study compared runners who had a carbohydrate-rich meal three hours before exercise and then consumed a 6.9% carbohydrate electrolyte solution during exercise with another group who, after an overnight fast, just consumed a 6.9% carbohydrate electrolyte solution. The authors concluded that the combination of both a pre-exercise meal and a carbohydrate electrolyte solution improved endurance running capacity to a greater extent than ingestion of a carbohydrate electrolyte solution alone.

5. In this double-blind placebo-controlled study of 11 endurance-trained athletes, consumption of a carbohydrate electrolyte beverage significantly reduced their times in a six mile run. There were no differences in the time to complete the first three miles, but subjects who consumed a beverage with carbohydrates and electrolytes, as opposed to flavored placebo, ran miles four, five, and six significantly faster.

6. Subjects lifted weights and then consumed a carbohydrate supplement approximately one-half gram per pound of body weight or placebo after weight training. Carbohydrate supplementation increased plasma insulin and blood glucose. Urinary 3-methylhistidin was significantly lower in the group that consumed carbohydrate after exercise. Urinary urea nitrogen was also lower in the group that consumed carbohydrates. Muscle protein synthetic rate was elevated in the group that consumed the carbohydrate load following exercise. The authors concluded that the consumption of a carbohydrate at the rate of one-half gram per pound of body weight immediately following a resistance training bout can significantly decrease myofibrillar protein breakdown, and may increase muscle protein synthetic rate, thus resulting in a more positive protein balance.

7. Running performances in high temperatures were compared in 10 well-trained male athletes. They ran 15 miles on a treadmill with the first 12 miles at 70% V02 maximum; the last three miles were a timed trial. Subjects consumed equal amounts of carbohydrate electrolyte drinks that consisted of either six, eight, or ten percent carbohydrate. Five percent of the carbohydrate was in the form of high fructose corn syrup and the balance consisted of maltodextrin. Electrolyte profiles of sodium, potassium, and chloride were identical. The results of the three-mile timed trial showed that the group consuming the six percent solution had an average time of 41.3 seconds faster than when they consumed a 10 percent solution. Athletes consuming 8% versus 10% yielded a mean improvement of 37.8 seconds. This is one of the first studies I
have seen with head-to-head comparisons of similar amounts of dilute carbohydrate beverages. In this small abstract a six percent solution resulted in a slight performance enhancement over an eight percent solution, and significant performance enhancement over a 10 percent solution.

8. It is known that during high intensity exercise such as weightlifting, insulin levels normally reduce and cortisol levels increase. This increase in cortisol results in a decrease in protein synthesis and an increase in protein degradation. In this study, young (approximately 21 years old) and old (approximately 62 years old) weightlifters had their blood glucose, insulin, and cortisol levels measured before, during, and after exercise after drinking water or a carbohydrate solution. Ingestion of carbohydrate elevated blood glucose levels suppressed cortisol concentration and increased insulin concentration in both younger and older weightlifters. The authors stated that higher insulin levels combined with lower cortisol levels provides a favorable anabolic environment for weightlifters.

9. On three occasions, six men rode an exercise bike for 60 minutes at 45% V02 maximum. One hour prior to their ride they were fed 0.8 gm per kilogram body weight of glucose, fructose, or rode after an overnight fast (for 154 pound man this equates to 224 calories). Plasma insulin levels were as follows: glucose 38+5, fructose 17+1, and fasting 8+1 uU/ml. Whole body lipolysis was determined by measuring the rate of glycerol appearance (RGA) in the blood (lipolysis is the breakdown of triglycerides to glycerol and three free fatty acid molecules; once liberated, the fatty acids can enter muscles and be are broken down in the mitochondria to form energy. This process is called beta oxidation). After 25 minutes of exercise blood was drawn and the RGA was as follows: glucose ingestion 3.2, fructose ingestion 4.3, and fasting 6.9 umol/kg/min (higher blood glycerol levels indicate greater breakdown of fats). The authors stated that even a small increase in insulin concentration (9 uU/ml fructose versus fast) resulted in significant suppression of lipolysis (4.3 umol/kg/min fructose versus 6.9 umol/kg/min fasting; i.e., approximately 40%). The authors concluded that small elevations in plasma insulin prior to exercise can reduce fat oxidation during exercise.

**Comment**

Until last year most sports nutrition experts recommended that adequate carbohydrate intake will enhance athletic activity, both for long distance, moderate intensity sports as well as shorter higher intensity activities. Experts have also been recommending that carbohydrate ingestion is advantageous to anaerobic athletes such as weight lifters who train to increase lean muscle mass. These abstracts we have reviewed today reinforce these principles. I could not find any studies in this conference that showed carbohydrates inhibit athletic performance.
Ingestion of carbohydrates before, during, and after exercise does increase blood glucose and insulin levels. Insulin is an anabolic hormone and will reduce the amount of cortisol, a catabolic hormone. It also drives amino acids and glucose into the cells. When present, insulin does limit the amount of fat that is utilized for energy, however, insulin does not make a person fat: too many calories do. Carbohydrate ingestion also means calorie ingestion and if the goal of a person’s exercise program is to lose weight, more weight will be lost if fewer calories are consumed (not exactly rocket science). In conclusion, drink water if exercise is performed for the purpose of losing weight. Drink a dilute carbohydrate beverage before, during, and after activity when engaged in competitive athletics or exercising to increase endurance or build muscle.

References

5. Doyle J, Elliott M. Distance running performance is improved with carbohydrate intake. S129. 766.

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