



Honey:

The Natural Sports Gel

By R.B. Kreider, C.J. Rasmussen, CSCS; S.L. Lancaster, CSCS; C. Kerksick, CSCS; M. Greenwood, CSCS*^D
University of Memphis

In an effort to enhance performance, many athletes consume carbohydrate prior to and during exercise. The primary method of enhancing carbohydrate supplementation prior to exercise is consuming carbohydrate rich snacks and/or sport drinks (carbohydrate/electrolyte solutions). Both provide additional carbohydrate availability during exercise.

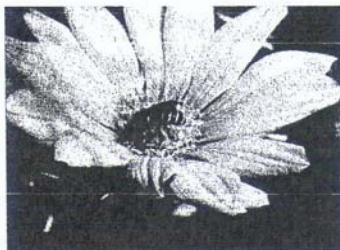
While total carbohydrate intake is a nutritional factor affecting performance, the type and form of carbohydrate consumed by athletes is also important because it may affect the digestion rate, glucose release in the blood and insulin response. Generally, liquids and gels are digested faster than semi-solid and solid foods. Additionally, carbohydrates with low to moderate glycemic indexes (e.g., fructose, starch, honey) increase glucose and insulin levels to a lesser degree than high glycemic index carbohydrates (e.g., sucrose, dextrose, maltodextrins). For this reason, it is generally recommended that athletes ingest carbohydrates with low to moderate glycemic indexes prior to and during exercise to promote a prolonged elevation in blood glucose.

Over the last few years, researchers in the Exercise & Sport Nutrition Lab at the University of Memphis have been evaluating the effects of carbohydrate on exercise capacity by having athletes ingest various types of carbohydrate gels prior to and during exercise. The focus of these studies was to determine the optimal type of carbohydrate for

athletes to consume prior to, during, and/or following resistance and endurance exercise. Also, a study was designed to determine whether honey in gel and powder form can serve as a natural and less expensive source of carbohydrate for athletes.

Our most recent study evaluated the effects on blood glucose, insulin, and cycling performance by athletes ingesting honey prior to and during endurance cycling. Based on results of our initial study in this series, we found that the carbohydrate profile and glycemic index response of honey was nearly identical to that of a popular sports gel. Furthermore, contrary to anecdotal myth, honey did not promote physical or psychological signs of hypoglycemia (abnormal decrease of sugar in the blood) in fasted subjects during resistance training or following resistance training. In this study, nine well-trained male cyclists performed three 40-mile time trials on their own racing bicycle attached to a computerized race simulator. Each race was separated by one week. Subjects were asked to prepare for each time trial as they would for a competitive race and to follow similar dietary intake the day before each time trial. In a double blind, randomized, and counterbalanced manner, subjects ingested 15 grams of a non-caloric flavored gel placebo, a dextrose gel or honey with 250 milliliters of water prior to and every 10 miles during each time trial. The placebo and carbohydrate gels were packaged in generic foil packets for double blind administration. Blood samples were taken prior to and every 10 miles during the race. In addition, power output, split times, heart rate and ratings of perceived exertion were determined throughout the time trials. Subjects were paid based on their performance during each time trial in order to encourage their best effort.

Results revealed that the subjects tolerated the gels with no complaints of symptoms of hypoglycemia or gastrointestinal upset. Total time to perform the time trials was significantly faster when subjects ingested the dextrose and honey gels compared to the placebo. Average power was also significantly higher when subjects ingested the carbohydrate gels during exercise. Additionally, mean heart rate and glucose values tended to be higher in



Effects of Ingesting Carbohydrate Gels on Cycling Performance

Total time to perform time trials	Placebo 131.3 minutes Dextrose 128.3 minutes Honey 128.8 minutes
Average power	Placebo 164 Watts Dextrose 175 Watts Honey 174 Watts
Mean heart rate	Placebo 171 beats/minute Dextrose 178 beats/minute Honey 177 beats/minute
Glucose	Placebo 5.4 millimoles per liter Dextrose 5.8 millimoles per liter Honey 6.0 millimoles per liter
Insulin	Placebo 5.3 milli-Insulin Units per milliliter Dextrose 5.1 milli-Insulin Units per milliliter Honey 6.0 milli-Insulin Units per milliliter

Table 1

the groups ingesting carbohydrate during the time trials. No significant differences were observed in insulin. (See Table 1 for trial statistics.)

These findings support prior research showing that carbohydrate consumption during endurance cycling can improve performance. The nuance of this research is that one source of carbohydrate was a non-commercial product — honey. The results of this study suggest that honey can be an effective and less expensive alternative for commercial sports gel.

REFERENCES

1. Leutholtz, B. and R.B. Kreider. Optimizing nutrition for exercise and sport. In: *Nutrition Health* T. Wilson and N.J. Temple, eds. Totowa, NJ. Humana Press, 2001. pp. 207-235.
2. Kreider, R., C. Rasmussen, J. Lundberg, P. Cowan, M. Greenwood, C. Earnest, and A. Almada. Effects of ingesting carbohydrate gels on glucose, insulin and perception of hypoglycemia. *FASEB J.* 14: A490, 2000.
3. Rasmussen, C., R. Kreider, J. Lundberg, P. Cowan, M. Greenwood, C. Earnest, and A. Almada. Analysis of the glycemic index and insulin response index of various carbohydrate gels. *FASEB J.* 14: A489, 2000.
4. Earnest, C., R. Kreider, J. Lundberg, C. Rasmussen, P. Cowan, M. Greenwood, & A. Almada. Effects of pre-exercise carbohydrate feedings on glucose and insulin responses during and following resistance exercise. *J Strength Cond Res.* 14: 361, 2000.
5. Kreider, R., J. Lundberg, C. Rasmussen, P. Cowan, M. Greenwood, C. Earnest & A. Almada. Effects of ingesting protein with various forms of carbohydrate following resistance-exercise on substrate availability and markers of catabolism. *J Strength Cond Res.* 14: 366, 2000.
6. Lancaster, S, R.B. Kreider, C. Rasmussen, C. Kerk-sick, M. Greenwood, P. Milnor, A.L. Almada, and C.P. Earnest. Effects of honey supplementation on glucose, insulin and endurance cycling performance. *FASEB J.* 15: LB315, 2001.