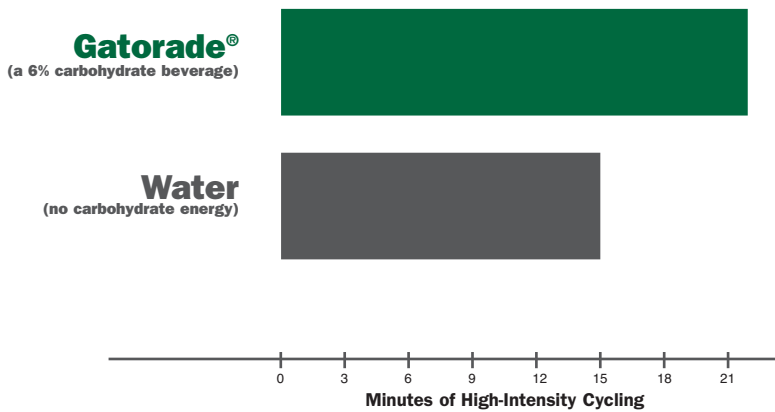


# Research Proves It

## A High Carbohydrate Diet is Essential

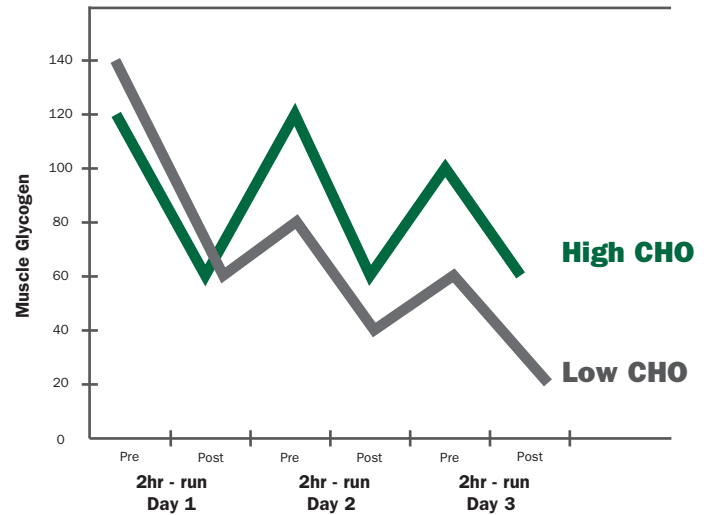
Carbohydrate before and during exercise improves **high-intensity exercise capacity**



Individuals undergoing 1-minute cycling sprints followed by 3 minutes of rest, continuously, until exhausted, were tested when consuming water or, when given a carbohydrate sports drink (Gatorade®).

The carbohydrate helped athletes improve the duration of exercise by performing 7 additional 1-minute cycling sprints.<sup>1</sup>

Impact of a high carbohydrate diet on **muscle glycogen levels**



Glycogen is a stored form of carbohydrate found primarily in muscle and in the liver. As seen above, after 2-hour exercise sessions on 3 consecutive days, athletes who consumed a high-carbohydrate diet virtually refilled their muscle glycogen stores daily. A lower-carb diet prevented athletes from adequately replenishing muscle glycogen in time for the next training session.<sup>2</sup>

### Stop & Go Sports

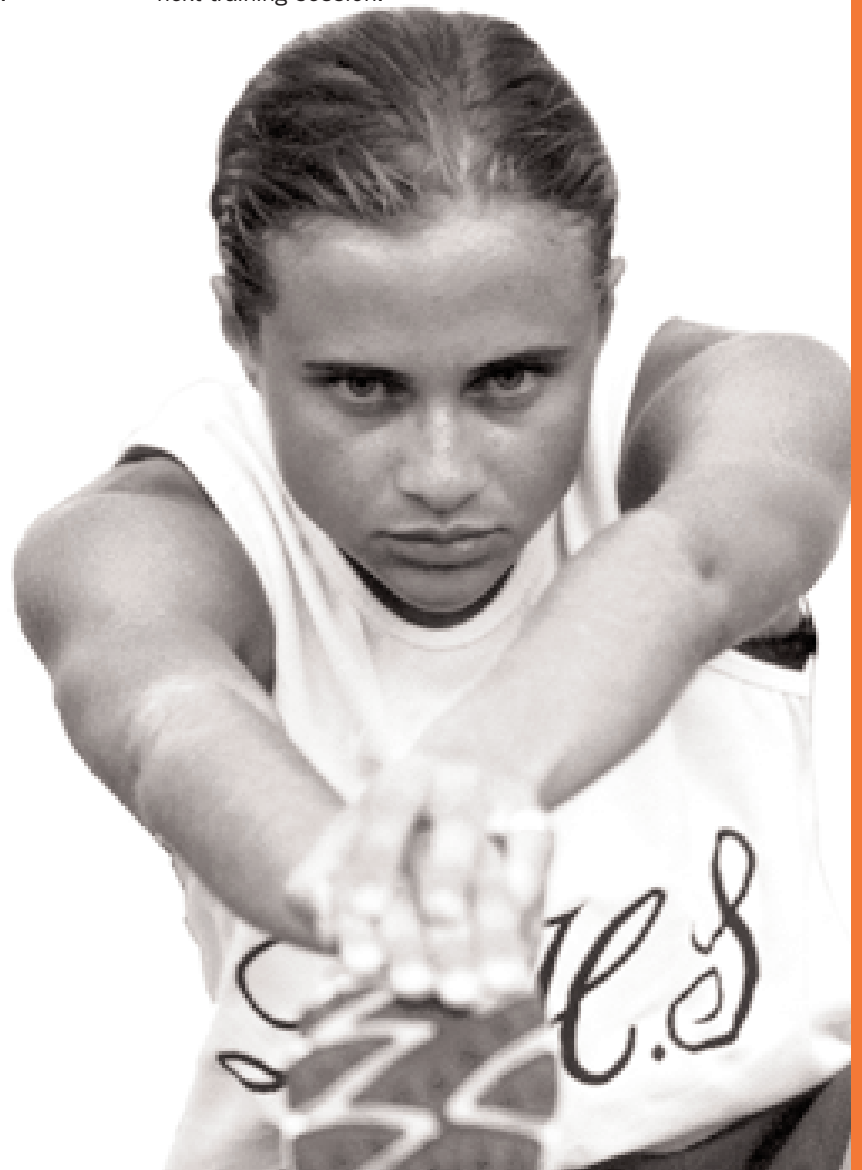
Sprinting is a component of virtually every sport and causes a rapid depletion of muscle glycogen. A single 30-second sprint can reduce muscle glycogen up to 27%.<sup>3</sup> After two 30-second sprints, it can drop as much as 47%.<sup>4</sup> By consuming a high-carbohydrate diet, performance of repeated sprints is improved due to increased energy reserves.

### Endurance Sports

During prolonged exercise, carbohydrate ingestion has been shown to blunt hormones<sup>5</sup> that might cause fatigue. The benefits may include: a reduced sense of effort, improved motivation, and better mood.<sup>6</sup>

### Strength Sports

Athletes who strength train should increase the amount of complex carbohydrates and healthful protein sources in the daily diet to achieve added muscle.<sup>7</sup> Complex carbohydrates, such as breads, cereals, rice and pasta, provide healthful sources of energy for the strength-training muscle.



# Three Energy Sources

## Fuel Your Athletes

Whether athletes train for endurance, high-intensity or stop-and-go sports, the fundamental nutritional requirements for each are similar. To gain a competitive edge, eat a balance of the following three energy sources:

### Carbohydrate – The primary fuel for muscles

Carbohydrate (CHO) is the primary fuel for most types of exercise and the most important nutrient for athletic performance.

Foods with a high concentration of CHO include: **fruit, cereals, rice, pasta, potatoes and other vegetables, and some dairy.**

“There is no question that carbohydrates represent a key element in high-intensity physical activity, but our capacity to store carbohydrates is limited. The athlete who finds a way to take carbohydrate energy breaks throughout the day has a definite competitive advantage.”

– Dr. Dan Benardot, Ph.D.,  
Co-Director, Laboratory for Elite Athletic Performance  
Georgia State University

### Protein – Builds and repairs tissues

Very little energy is derived from protein. The primary role of protein is to build and repair muscles, ligaments and tendons.

Good protein sources include: **lean beef, poultry, fish, yogurt, eggs, milk, beans and nuts.**

“Muscles don't use much protein for fuel, although small amounts of muscle protein are broken down during training and competition. Most athletes can meet their protein needs from eating a balanced diet.”

– Dr. Bob Murray, Ph.D., Director,  
Gatorade Sports Science Institute (GSSI)

### Fat – Helps sustain prolonged exercise

Fat is the primary fuel burned during low-intensity exercise, such as walking. The body's fat-storing capacity is large, but it can only store a small amount of carbohydrate. Tapping into the body's fat stores for energy during prolonged exercise requires carbohydrate to utilize the energy.

Fat has more than double the calories of carbohydrate (9 cal/g vs. 4 in CHO), and it takes longer to digest and metabolize. Everybody needs some fat in their diet to help support the nervous system and membranes of many cells in the body. Dietary fat comes in a variety of forms. Try to choose healthier sources such as: **raw organic nuts, oils, seeds, cold water fish, avocados and olives.**

## Nothing Replaces A Balanced Diet

**Young athletes should get their fuel from food, not supplements.** In general, nothing can beat a sound diet. Little long-term research exists on amino acid supplements and most experts agree that the majority of athletes who eat a balanced diet do eat adequate amounts of protein and don't need amino acid supplements like glutamine and creatine.

Before endorsing a supplement, learn the facts and educate your athletes on the pros and cons. Here are some questions to help guide you:

1. What claims have been made about the supplement?
2. Is there any scientific basis to these claims?
3. What is the supplement made with? Is it pure?
4. Does it work?
5. Is it legal?

“What kids need are not magic pills, but the virtues sports are meant to instill: discipline, training, sound nutrition, fitness, skills, goal-setting, teamwork, valor and winning and losing with class.”

– Dr. E. Randy Eichner, Ph.D., Team Internist, University of Oklahoma

### Vitamins

Vitamins provide no energy, and vitamin supplements will not enhance athletic performance of individuals already consuming a balanced diet.



# Expert Advice

Following are some sample meal suggestions to fuel your athletes from Julie H. Burns, M.S., R.D., of Sportsfuel, Inc., and nutrition consultant to the Chicago Bears, Chicago Blackhawks, Chicago Bulls, and Northwestern University Varsity athletes.

Breakfast	Lunch	Dinner	Snacks
<ul style="list-style-type: none"> <li>• Whole-grain waffles with maple syrup</li> <li>• A handful of walnuts</li> <li>• Low-fat milk or soy milk</li> </ul>	<ul style="list-style-type: none"> <li>• Bean burrito</li> <li>• Baked chips and salsa</li> <li>• 100% fruit juice</li> </ul>	<ul style="list-style-type: none"> <li>• Spaghetti with tomato sauce and sliced vegetables</li> <li>• Spinach salad</li> <li>• Low-fat milk or soy milk</li> </ul>	<ul style="list-style-type: none"> <li>• Whole-grain bagel with peanut butter</li> <li>• Grapes</li> <li>• Water</li> </ul>
<ul style="list-style-type: none"> <li>• Granola cereal with banana</li> <li>• Whole-wheat toast with fruit spread</li> <li>• Orange juice</li> <li>• Egg</li> </ul>	<ul style="list-style-type: none"> <li>• Grilled chicken sandwich</li> <li>• Baked potato with veggies</li> <li>• Iced tea</li> <li>• Fruit cup</li> </ul>	<ul style="list-style-type: none"> <li>• Vegetarian pizza</li> <li>• Water</li> <li>• Tossed green salad</li> <li>• Whole-grain roll</li> <li>• Apple crisp</li> </ul>	<ul style="list-style-type: none"> <li>• Raisins</li> <li>• Sliced turkey on whole-grain crackers</li> <li>• Water and/or Gatorade®</li> </ul>
<ul style="list-style-type: none"> <li>• Oatmeal</li> <li>• Nonfat milk</li> <li>• Canadian bacon</li> <li>• Fruit cup</li> </ul>	<ul style="list-style-type: none"> <li>• Turkey sub on whole-grain bread</li> <li>• Baked chips</li> <li>• Apple</li> <li>• Gatorade®</li> </ul>	<ul style="list-style-type: none"> <li>• Chili with beans and rice</li> <li>• 100% fruit juice</li> <li>• Mixed berries</li> </ul>	<ul style="list-style-type: none"> <li>• Popcorn</li> <li>• Peanuts</li> <li>• Water</li> </ul>
<ul style="list-style-type: none"> <li>• Whole-grain English muffin with peanut butter</li> <li>• Water</li> <li>• Banana</li> </ul>	<ul style="list-style-type: none"> <li>• Rice with vegetables and black beans</li> <li>• Garden veggie salad</li> <li>• Fruit cup</li> <li>• Low-fat milk or soy milk</li> </ul>	<ul style="list-style-type: none"> <li>• Grilled fish filet</li> <li>• Large green salad with vinaigrette</li> <li>• Steamed veggies</li> <li>• Iced tea</li> </ul>	<ul style="list-style-type: none"> <li>• Cottage cheese</li> <li>• Fruit smoothie</li> </ul>

## Here are a few resources for information and links to nutrition professionals:

[www.gssiweb.com](http://www.gssiweb.com)

Gatorade Sports Science Institute® – for scientific and practical information on sports nutrition and athletic performance.

[www.eatright.org](http://www.eatright.org)

American Dietetic Association — locate a local registered dietitian by specialty.

[www.sportsfuel.com](http://www.sportsfuel.com)

Click onto this site for sample athlete meals, recipes and a nutrition game-ready checklist.



For more information on sports performance and nutrition, visit the Gatorade Sports Science Institute® at [www.gssiweb.com](http://www.gssiweb.com).

1. Davis et al. *Int. J. Sports. Nutr.* 7: 261-273, 1997 2. Adapted from Costill & Miller, *Int. J. Sport. Med.* 1: 2-14, 1980 3. Esbjornsson-Liljedahl M. et al. *J. Appl. Physiol.* 87: 1326-1332, 1999 4. Hargreaves, M. et al. *Eur. J. Appl. Physiol.* 75: 188-192, 1997 5. Mitchell, J.B. et al. *Int. J. Sports Med.* 11: 33-36, 1990 6. Davis, J.M. in R. Maughan (ed.) *Nutrition in Sport.* Oxford: Blackwell Science Ltd, pp. 171-183, 2000 7. Williams, M. *Nutrition for Fitness and Sport.* Dubuque: Brown and Benchmark, 1992.

