

# Maltodextrin Nutrition

The priorities for nutrition during long rides, runs, walks, or triathlons are water, calories, and sodium.

For events under an hour, no special nutrition may be needed. For most events over an hour, concern yourself mainly with fluids and calories. For long-distance events that last most of a day or longer, sodium must also be considered.



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ARTICLE

This brief, specialized article is primarily about one source of calories—maltodextrins.

For more information about sports nutrition, download the book *Nutrition for Sports*, the *Nutrition Slide Show*, or *Maltodextrin Slide Show* at <http://arniebakercycling.com/>.

## Calorie/Energy Loss

It is typical for cyclists to use 2,500 to 3,000 calories during a century. Runners and walkers use 80 to 100 calories per mile.

Some of this energy comes from the body's stores of carbohydrate (glycogen) and fat. Some energy needs can be met by consuming calories while exercising.

Carbohydrates are the fuel of choice for exercising athletes. Depending upon your size, your body can use up to 300 ingested calories per hour to spare glycogen stores. As a rule, try to consume this many calories for every hour you exercise.

If not racing, cyclists do well to stop periodically and eat "real food"—especially early on in a long ride. Leftover breakfast items such as French toast or pancakes, fig bars, bananas, and Pop-Tarts (perfectly packaged for jersey pockets) are favorites for short stops.

The harder you work, the less you are able to tolerate solid food. Energy bars and gels do work, but after many hours become tiresome for most athletes.

Carbohydrates-in-solution are a convenient way to get calories. Typical sports drinks and diluted fruit juice have 100–125 calories per 16-ounce bottle. This usually works out to about a 6% sugar solution.

Beverages don't usually have more calories than this because solutions of higher concentration are difficult to digest. More concentrated than 6% solutions are associated with cramps, diarrhea, and other gastrointestinal problems.

There is a trick to increasing caloric content without increasing concentration: maltodextrin nutrition.

## Maximizing Calories

You'll often want to consume as many calories as you can to gain maximum benefit. But if you add too many—if the solution you are drinking is a concentrated one—the stomach will empty more slowly, and the gut will send in water from the body to neutralize the concentration of the fluid you have drunk, causing you to temporarily dehydrate yourself further.

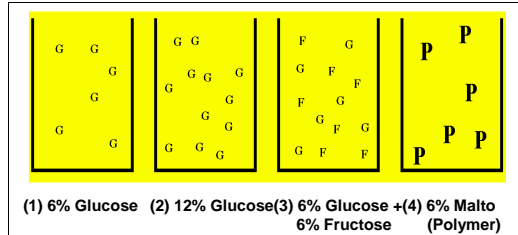
Your intestines may also try to eliminate this overly concentrated solution so you may get cramps or diarrhea. Studies have shown that for most people exercising at moderate levels of exertion, a 6% to 8% simple carbohydrate solution is the maximum that can be tolerated. This is represented by A in Figure 1.

Doubling the concentration of a glucose solution from 6% to 12% will double the calories, but usually cause gastrointestinal upset. This is represented by B in the figure.

You may be able to pack more calories into a given fluid volume by combining a variety of sugars. A 6% fructose and 6% glucose solution, for example, may cause less gastrointestinal upset than an 8% solution of either of these simple sugars.

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Further, increased water and electrolyte movement from the gut into the bloodstream may take place, as different mechanisms of transport are involved with these two simple sugars. The muscles may also take up and use more carbohydrate if energy is supplied by more than one type of simple sugar. This is represented by C in the figure.



**Figure 1. Energizing sugar solutions. About 6% solutions are generally well-tolerated. Increasing caloric content by increasing concentration (adding more scoops, 2), or adding different types of sugars (3) generally doesn't work. Increasing particle size with maltodextrins (glucose polymers) is the winning strategy.**

You may also be able to pack many more digestible calories into a given fluid volume by using maltodextrins, or glucose polymers. These glucose chains increase calories without increasing the number, or concentration, of particles. This is represented by D.

### What Are Maltodextrins?

Carbohydrates in nature are generally simple sugars or starches.

Food manufacturing processes can create intermediate length carbohydrate molecules much shorter than the thousands of sugars in starches, but longer than the one or two sugars in molecules of monosaccharides and disaccharides.

These intermediate-length carbohydrate molecules are called maltodextrins or glucose polymers.

Typical are those about 10 sugar units long.

In general, the shorter the maltodextrin, the sweeter it is. Most ten-sugar molecule maltodextrins are almost tasteless. This allows food processors to use maltodextrins in savory foods or add sweetness, if desired.

A 6% simple carbohydrate solution will have about 100 calories in 16 ounces, a standard water bottle. A 6% maltodextrin solution will have about 600 calories in 16 ounces.

Using maltodextrins allows more calories to be ingested without causing the gastrointestinal distress associated with the higher osmotic load of concentrated simple carbohydrate solutions. That's one reason why many specialty sports products (drinks, gels, and bars) that aim to provide calories during exercise use maltodextrins.

### Why Maltodextrins?

Maltodextrins are the fuel of choice for aerobic endurance athletes. They are:

- Caloric
- Carbohydrate
- Low osmolarity (particle concentration)
- Less likely to cause GI distress
- Minimal taste—use flavoring of choice
- Inexpensive

### Better Maltodextrin?

Most commercially available high-carb sports drinks and gels contain maltodextrins mixed into proprietary formulas for taste and color. Other ingredients, for example vitamins or herbs, may be added—generally for marketing purposes.

A few specialty sports drinks that contain maltodextrins provide more than 400 calories per bottle. Examples include the proprietary products Extran and Carbo Gain.

Powered products are generally less expensive than premixed solutions.

Powdered products sometimes have problems with dissolvability, palatability (taste), caking, or sludging.

You can make your own great solution inexpensively.

You can purchase a wide variety of pure maltodextrin products in 50 pound bags from commercial grain processors. The cost usually is less than \$1.00 per pound or one-tenth that of proprietary products. The bag generally has a shelf life of two years.

Maltodextrin is relatively tasteless; it has minimal sweetness. You can add a little lemonade, fruit juice, Kool-Aid, soda, to your own made-up solution for your personal favorite taste.

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Like many proprietary products, some commercial maltodextrins, especially those sold through beer-brewing stores, will cake.

Agglomerated products (processed to yield crystal clumps) are dustless and free-flowing. They are easy to handle. Agglomerated maltodextrins have excellent dispersibility and dissolution characteristics, quickly forming clear solutions when mixed with water.

The product that I use (MaltrinQD 500) can dissolve 3 cups (24 fluid ounces) of powder into 2 cups (16 ounces) of fluid—not that I use that amount. This works out to about 1,000 calories per bottle.

If I am planning on taking in only one 16-ounce waterbottle per hour, and no snacks, I mix one cup of maltodextrin in a 16-ounce bottle. This yields about 300 calories. I don't do this often.

If I plan on eating snacks, I usually reduce the amount of maltodextrin to about half this amount. I do this commonly.

If it's hot, I'll drink two or more waterbottles per hour. Again, I'll mix one-half a cup of maltodextrin, or less, in a 16-ounce bottle. This works out perfectly—as it's hot I'll tolerate a lower concentration than when it's cooler—but I'll still be able to average 300 calories of carbohydrates per hour because I'll be drinking more.

### **Summary: Buy Your Own Maltodex**

It's cheaper, easier to handle, and with better taste. You can split a \$100 order (100 pounds)—generally enough for four riders for a year.

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### **For More Information**

The following related publications are available through [arniebakercycling.com](http://arniebakercycling.com):

#### **Books**

Bicycling Medicine  
Nutrition for Sports

#### **Slide Shows**

Maltodextrin Nutrition  
Nutrition

#### **Articles**

Cyclists' Nutrition Quiz  
Endurance Sport Nutrition  
Favorite Foods  
Obesity  
Tips to Lose Weight  
Vitamin & Minerals

### **Product Reference**

Maltrin product information:  
<http://www.varied.com/food/maldescr.html>

Maltrin ordering, US West coast:  
E. T. Horn Company  
16141 Heron Avenue  
La Mirada, CA 90638  
Tel: 800-442-4676  
Fax: 714-670-6851  
Web site: [www.ethorn.com](http://www.ethorn.com)

Maltrin ordering, US non West coast:  
J. M. Swank Company, Inc.  
520 West Penn Street  
North Liberty, IA 52317  
Tel: 800-593-6375  
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Web site: [www.jmswank.com](http://www.jmswank.com)