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Carbohydrates

Going with the (Whole) Grain

We've come a long way from the days when one of the knee-jerk answers to the question "What should I eat?" was "Get a lot of carbohydrates." We now know that the staple of most diets, carbohydrates, aren't all good or all bad. Some kinds promote health while others, when eaten often and in large quantities, actually increase the risk for diabetes and coronary heart disease.



The resurgence of the Atkins diet and the rise of the South Beach and other low-carbohydrate diets have put the focus on the carbohydrates. While it may be true that easily digested carbohydrates from white bread, white rice, pastries, and other highly processed foods may contribute to weight gain and interfere with weight loss, that doesn't mean all carbohydrates are suspect. Regardless of what you've read or heard about the dangers of carbohydrates, they are an important part of a healthy diet. Carbohydrates provide the body with the fuel it needs for physical activity and for proper organ function. The best sources of carbohydrates - fruits, vegetables, and whole grains - deliver essential vitamins and minerals, fiber, and a host of important phytonutrients.

What are Carbohydrates?

Carbohydrates come from a wide array of foods - bread, beans, milk, popcorn, potatoes, cookies, spaghetti, corn, and cherry pie. They also come in a variety of forms. The most common and abundant are sugars, fibers, and starches. The basic building block of a carbohydrate is a sugar molecule, a simple union of carbon, hydrogen, and oxygen. Starches and fibers are essentially chains of sugar molecules. Some contains hundreds of sugars. Some chains are straight, others branch wildly.

Separating the Whole Grain From the Chaff

Food companies make it more difficult than it should be to spot a whole-grain food. Aware that consumers are interested in whole-grain products, companies often make foods sound like they're whole grain and healthy when they aren't.

That means you must read food labels carefully. True whole-grain products list as the main ingredient whole wheat, whole oats, whole rye, or some other whole grain cereal. If the label says "made with wheat flour" it may be an intact grain product or it may just be an advertising gimmick, since even highly processed cake flour is made with wheat flour.

As you can see from the [Healthy Eating Food Pyramid](#), it's important to include generous amounts of these healthy foodstuffs in your daily diet.

Carbohydrates were once grouped into two main categories. Simple carbohydrates included sugars such as fruit sugar (fructose), corn or grape sugar (dextrose or glucose), and table sugar (sucrose). Complex carbohydrates included everything made of three or more linked sugars. Simple sugars were considered bad and complex carbohydrates good. The picture is much more complicated than that.

The digestive system handles all carbohydrates in much the same way - it breaks them down (or tries to break them down) into single sugar molecules, since only these are small enough to cross into the bloodstream. It also converts most digestible carbohydrates into glucose (also known as blood sugar), because cells are designed to use this as a universal energy source.

Fiber is an exception. It is put together in such a way that it can't be broken down into sugar molecules, and so passes through the body undigested.

Carbohydrates and the Glycemic Index

A new system for classifying carbohydrates calls into question many of the old assumptions about how carbohydrates affect health. This new system, known as the glycemic index, measures how fast and how far blood sugar rises after you eat a food that contains carbohydrates. (1).

White bread, for example, is converted almost immediately to blood sugar, causing it to spike rapidly. It's classified as having a high glycemic index. Brown rice, in contrast, is digested more slowly, causing a lower and more gentle change in blood sugar. It has a low glycemic index.



The most comprehensive list of the glycemic index of foods was published in the July, 2002, issue of the American Journal of Clinical Nutrition (2). A [searchable database](#) maintained by the University of Sydney is available online.

Diets filled with high-glycemic-index foods, which cause quick and strong increases in blood sugar levels, have been linked to an increased risk for both diabetes (3, 4) and heart disease. (5, 6) On the other hand, lower GI foods have been shown to help control type 2 diabetes. (7)

One of the most important factors that determine a food's glycemic index is how highly processed its carbohydrates are.

Carbohydrates and the Glycemic Load*

Low Glycemic Load

- High-fiber fruits and vegetables (not including potatoes)
- Bran cereals (1 oz)
- Many legumes, including chick peas, kidney beans, black beans, lentils, pinto beans (5 oz cooked, approx. 3/4 cup)

Medium Glycemic Load

- Pearled barley: 1 cup cooked
- Brown rice: 3/4 cup cooked
- Oatmeal: 1 cup cooked
- Bulgur: 3/4 cup cooked
- Rice cakes: 3 cakes
- Whole grain breads: 1 slice
- Whole-grain pasta: 1 1/4 cup cooked
- No-sugar added fruit juices: 8 oz

High Glycemic Load

Processing carbohydrates removes the fiber-rich outer bran and the vitamin- and mineral-rich inner germ, leaving mostly the starchy endosperm. (See [Fiber](#) for more information on whole-grain foods.)

Other factors that influence how quickly the carbohydrates in food raise blood sugar include:

- **Fiber content.** Fiber shields the starchy carbohydrates in food immediate and rapid attack by digestive enzymes. This slows the release of sugar molecules into the bloodstream.
- **Ripeness.** Ripe fruits and vegetables tend to have more sugar than unripe ones, and so tend to have a higher glycemic index.
- **Type of starch.** Starch comes in many different configurations. Some are easier to break into sugar molecules than others. The starch in potatoes, for example, is digested and absorbed into the bloodstream relatively quickly.
- **Fat content and acid content.** The more fat or acid a food contains, the slower its carbohydrates are converted to sugar and absorbed into the bloodstream.
- **Physical form.** Finely ground grain is more rapidly digested, and so has a higher glycemic index, than more coarsely ground grain.

All these elements lead to sometimes counterintuitive results. Some foods that contain complex carbohydrates, such as potatoes, quickly raise blood sugar levels, while some foods that contain simple carbohydrates, such as whole fruit, raise blood sugar levels more slowly.

There is one thing that a food's glycemic index does not tell us: the relative amount of carbohydrate in a given food. Take watermelon as an example; the sweet-tasting fruit has a high glycemic index. But a slice of watermelon has only a small amount of carbohydrate per serving (as the name suggests, watermelon is made up mostly of water). Looking at the glycemic index alone may not tell us everything we need to know about a food's impact on blood sugar levels. So researchers have developed a new way of classifying foods that takes into account both the amount of carbohydrate in the food and the impact of that carbohydrate on blood sugar levels. This measure is called the glycemic load. (8, 9) A food's glycemic load is determined by multiplying its glycemic index by the amount of carbohydrate it contains. (For a listing of low, medium and high glycemic load foods, see the sidebar, [Carbohydrates and the Glycemic Load](#).)

Although the fine points of the glycemic index and glycemic

- Baked potato
- French fries
- Refined cereal products: 1 oz
- Sugar-sweetened beverages: 12 oz
- Jelly beans: 10 large or 30 small
- Candy bars: 1 2-oz bar or 3 mini bars
- Couscous: 1 cup cooked
- Cranberry juice cocktail: 8 oz
- White basmati rice: 1 cup cooked
- White-flour pasta: 1¼ cup cooked

*Glycemic load categorization adapted from Foster-Powell K, Holt SH, Brand-Miller JC. International table of glycemic index and glycemic load values: 2002. [Am J Clin Nutr](#) 2002; 76:5-56.

load may seem complicated, the basic message is simple:

Whenever possible, replace highly processed grains, cereals, and sugars with minimally processed whole-grain products.

And only eat potatoes - once on the list of preferred complex carbohydrates - occasionally because of their high glycemic index and glycemic load.

When Sugar Management Goes Awry

Digestible carbohydrates are broken down in the intestine into their simplest form, sugar, which then enters the blood. As blood sugar levels rise, special cells in the pancreas churn out more and more insulin, a hormone that signals cells to absorb blood sugar for energy or storage. As cells sponge up blood sugar, its levels in the bloodstream fall back to a preset minimum. So do insulin levels.

In some people, this cycle doesn't work properly. People with type 1 diabetes (once called insulin-dependent or juvenile diabetes) don't make enough insulin, so their cells can't absorb sugar. People with [type 2 diabetes](#) (once called non-insulin dependent or adult onset diabetes) usually start out with a different problem - their cells don't respond well to insulin's "open up for sugar" signal. This condition, known as insulin resistance, causes both blood sugar and insulin levels to stay high long after eating. Over time, the heavy demands made on the insulin-making cells wears them out, and insulin production slows, then stops.

Insulin resistance isn't just a blood sugar problem. It has also been linked with a variety of other problems, including high blood pressure, high levels of triglycerides, low HDL (good) cholesterol, heart disease, and possibly some cancers. [\(10\)](#)

Genes, a sedentary lifestyle, being overweight, and eating a diet filled with foods that cause big spikes in blood sugar can all promote insulin resistance. Data from the Insulin Resistance Atherosclerosis Study suggests that cutting back on refined grains and eating more whole grains in their place can improve insulin sensitivity. [\(11\)](#)

No Carbohydrates?

Some [popular diets](#), particularly the Atkins diet, treat carbohydrates as if they are evil, the root of all body fat and excess weight. While there is some evidence that a low-carbohydrate diet may help people lose weight more quickly than a low-fat diet [\(12, 13\)](#), no one knows the long-term effects of eating little or no carbohydrates. Equally worrisome is the inclusion of unhealthy fats in some of these diets.

If you want to go the lower carb route, try to include some fruits, vegetables, and whole-grain carbohydrates every day. They contain a host of vitamins, minerals, and other phytonutrients that are essential for good health and that you can't get out of a supplement bottle.

Adding Good Carbohydrates

Carbohydrates from fruits, vegetables, and grains should give you the bulk of your calories. For optimal health, get your grains intact from foods such as whole wheat bread, brown rice, whole-grain pasta, and other possibly unfamiliar grains like quinoa, whole oats, and bulgur. Not only will these foods help protect you against a range of chronic diseases, they can also please your palate and your eyes.

Until recently, you could only get whole-grain products in organic or non-traditional stores. Today they are popping up in more and more mainstream grocery stores. Here are some suggestions for adding more whole grains to your diet:

- ***Start the day with whole grains.*** If you're partial to hot cereals, try old-fashioned or steel-cut oats. If you're a cold cereal person, look for one that lists whole wheat, oats, barley, or other grain first on the ingredient list.
- ***Use whole-grain breads for lunch or snacks.*** Check the label to make sure that whole wheat or other whole grain is the first ingredient listed.
- ***Bag the potatoes.*** Instead, try brown rice or even "newer" grains like bulgur, wheat berries, millet, or hulled barley with your dinner.
- ***Pick up some whole wheat pasta.*** If the whole-grain products are too chewy for you, look for those that are made with half whole-wheat flour and half white flour.

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