

CARB CRAZY



**No-Carb?
Low-Carb?
High-Carb?**

**Never before has the role
of carbohydrates in our
diet been so thoroughly
discussed.**

**We'll try to cut
through
the hype to
give you
the
lowdown
on...**

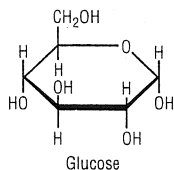
CARBOHYDRATES AND LOW-CARB DIETS.

By Brian Rohrig

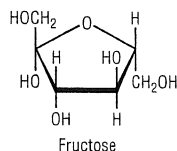
What are carbs?

The word carbohydrate reveals that all carbs are composed of three elements: carbon, hydrogen, and oxygen. There are three main categories of carbohydrates—monosaccharides, disaccharides, and polysaccharides.

Monosaccharides are composed of one sugar unit and are referred to as simple sugars. Their empirical formula is generally CH_2O . Some common monosaccharides are glucose and fructose. Although both have a formula of $\text{C}_6\text{H}_{12}\text{O}_6$, they have a different arrangement of atoms. Such compounds are called isomers. Glucose is produced by plants during photosynthesis. Glucose can be found



Glucose



Fructose

in sports drinks, providing quick energy when you need it. Glucose is the body's primary fuel source. It is broken down into energy through the process of cellular respiration. Carbon dioxide is released as a waste product. If glucose is not converted into energy, it is converted into glycogen to be stored.

Disaccharides, also known as double sugars, are composed of two simple sugar molecules. The most common disaccharide is **sucrose** or table sugar. In order to be used by our body as energy, sucrose must first be broken down into **glucose and fructose**. Food

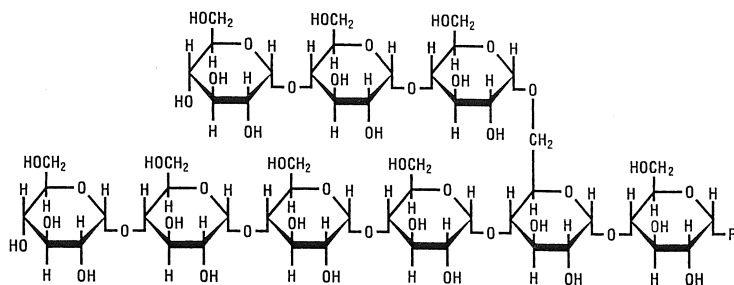
manufacturers are more often replacing sucrose in products with fructose, because it is cheaper to produce, and because it is sweeter, less needs to be used. Other common disaccharides are maltose and lactose (milk sugar).

Polysaccharides are complex carbohydrates. They are polymers composed of long chains of sugar units. A common polysaccharide is starch, which is composed of long chains of glucose molecules. Starch is used by plants as a way to store energy, and it can be found in foods such as potatoes, rice, corn, and wheat. Our body must break down starch into glucose, which it then uses for energy.

Other types of complex carbohydrates are not digestible by our body. Chief among these are cellulose, which forms the cell walls of plant cells, giving them structure and support. Its glucose molecules are linked together in such a way that our body lacks the necessary enzymes to break them down. These indigestible polysaccharides are known as fiber, and they contribute no calories because our bodies cannot convert them into energy. High-fiber foods—such as oats, bran, and whole grains—are an essential part of our diet, aiding in digestion.

Carbohydrates and blood sugar

To understand the effect of carbohydrates on our body, it is important to understand their role on blood sugar. Just like a car requires fuel, so does our body. The body's major fuel source is glucose, or blood sugar. However, this blood sugar is not automatically released into the cells. If a car's engine receives too much fuel, the engine becomes flooded, and it will not start. In the same way, the body must regulate how much blood sugar enters our cells. This occurs through the production of the hormone insulin, which is manufactured by the pancreas. Think of insulin as the gatekeeper to the cells—it opens the gates and allows glucose to leave the bloodstream and enter our cells.

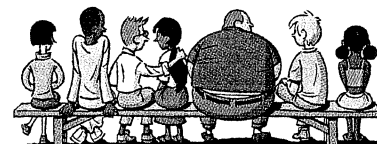


The polysaccharide glycogen is a stored form of glucose.

Once sugar enters our cells, it can do one of three things. It can be converted into energy through cellular respiration. Or it can be converted into glycogen in the liver and muscles, for use as an emergency fuel. **Glycogen** is similar to starch but is more extensively branched. Finally, it can be converted into fat if there is more sugar available than is needed.

Consider what happens when you wash down a glazed doughnut with a sugary soda. As your bloodstream is inundated with sugar, a temporary spike in blood sugar will occur. Your pancreas responds by producing a surge of insulin to quickly rid the bloodstream of this excess sugar. This quick release of insulin will cause your blood sugar to then drop suddenly. The sudden drop in blood sugar can cause weakness, fatigue, and intense hunger—often leading to a craving for more delicious glazed donuts. This can create a vicious cycle, where our blood sugar constantly rises and falls, leading to overeating and eventual weight gain. A well-balanced diet can help to reduce these sudden peaks and falls in blood sugar.

Over the long term, constant spikes in blood sugar and insulin are not a good thing. When so much insulin is produced for so long, your body may become immune to the effects of it, creating a condition known as insulin resistance—often a precursor to type 2 diabetes. For reasons not yet fully understood, the cells can become desensitized to the effects of insulin, with the result that glucose is not effectively taken into the cells and converted into energy. The liver then takes over, taking this excess blood sugar and converting it into fat—leading to obesity. And the overworked pancreas may get worn out from producing so much insulin.



**In the United States
one teen in seven is
overweight.**

DAN SHERID

Why not radically cut carbohydrates from the diet?

Eat as much bacon and eggs as you want as long as you forget about the toast and orange juice?! Such a suggestion is at the very least culinary, if not dietary, heresy. But as a result of two decades of rising obesity rates and the sheer popularity of low-carb diets, researchers, doctors, and dietitians began re-examining the theories of Dr. Robert Atkins, who published Dr. Atkins' Diet Revolution in 1972. He advocated eating all of the fats and proteins you wanted, and said that if you only cut out all those carbohydrates, you would lose weight.

"Controlled Carbs"



PHOTO BY STAFF

Numerous modifications of the Atkins' diet, such as the South Beach Diet and the Zone, have since appeared. Many of these modified diets have a more balanced approach, stressing the importance of avoiding unhealthy saturated fats found in red meat and dairy products, and emphasizing healthier unsaturated fats found in nuts, fish, and vegetable oils.

Millions have tried the diet with success and testimonials abound. By now, you've probably heard a friend or family member give the low-carb dieter litany: "I failed on other diets, but this diet worked for me because I wasn't hungry all the time." "I lost weight faster than on other diets, and I wasn't hungry all the time." Or even, "I failed on this diet, but at least I wasn't hungry all the time!"

How do low-carb diets work?

All diets work according to one basic principle: You must burn more calories than you consume. How many calories you burn depends on both metabolism and exercise. You cannot lose weight if you consume more calories than your body uses. By cutting out carbs, you are cutting back on a lot of calories. Cutting out just sugared sodas, potato chips, and candy bars can reduce your overall calorie consumption dramatically.

Another reason low-carb diets are successful is that fats and protein have better "staying power". Because carbohydrates are rapidly converted into glucose and then utilized by your body as energy, they do not keep us satiated for long. Fat and protein are absorbed more slowly by the body, so they stay with us longer. Even though low-carb diets claim you can eat all the fat and protein you want, in truth these foods fill us quicker, causing us to ultimately eat less.

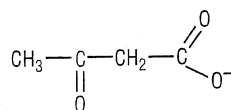
Ketosis: An inefficient way to burn fat

Although some claim that a reduced-carbohydrate diet is nothing more than a reduced-calorie diet in disguise, low-carb diets actually do one thing that is radically different than any other diet. The majority eliminate most, if not all, carbohydrates in the initial induction phase of the diet. When the body becomes carbohydrate-starved, it must find an alternate energy source.

The first source it taps is the glycogen found in the liver and muscle. But the body's glycogen stores can only last about two days. After this, our body turns to fat for energy. However, the breakdown of fat in this case does not produce glucose. Instead, the fat is broken down into ketones, through an unusual process known as ketosis. Normally, people burn fats without making ketones. Ketosis only occurs when people are carbohydrate-starved.

During ketosis, fat is not completely broken down and you don't receive the "normal" caloric value from burning it. The excess ketones produced during ketosis are secreted in our urine and breath. Sometimes this gives your breath a fruity odor, since acetone—a ketone—

may be released by the breath during ketosis. Because the kidneys flush out these ketones from the body, it is important to drink a lot of water on a low-carb diet. Dieters often confirm their body is in ketosis by checking their urine with ketone test strips (see "Lab on a Stick" in this issue).



Acetoacetate
(a ketone body)

Considerable debate has arisen among medical experts as to whether or not ketosis is dangerous. Some confuse ketosis with a more serious condition

known as ketoacidosis, which is an extreme form of ketosis sometimes suffered by type 1 diabetics. During ketoacidosis, the pH of the blood falls to dangerous levels, because of excessive buildup of acidic ketones. This can lead to coma and death if left untreated.

Some argue that the body functions even better when using ketones as fuel. Others claim that the brain cannot function as well on ketones, and the body will turn to muscle and organ tissue to try to scavenge glucose for fuel. However, most medical authorities today are leaning toward the view that ketosis is a safe bodily process as long as ketones are not produced faster than the body can get rid of them.

Are low-carb diets good for you?

The low-carb diet phenomenon is still too new to judge its long-term effects. However, two studies recently published in the *New England Journal of Medicine* offered some promising news for adult low-carb dieters. These studies found that participants who lost weight on low-carb diets had higher levels of HDL (good) cholesterol and lower levels of triglycerides, or fats, than those who lost weight on different diets.

There's no specific research on teenagers, but you should be wary of going on the diet, especially if you are still growing. Many participants sacrifice the health benefits of the nutrients found in milk, fruit, and whole grains. Osteoporosis can result from a long-term deficiency of calcium in the diet, which could result if milk was totally eliminated from the diet. Pregnant women should definitely not be on the diet, because the developing fetus can be harmed by the lack of nutrients. Athletes should also avoid low-carb diets, since peak athletic performance is dependant on

the quick availability of glucose for energy, as well as relying on glycogen reserves.

Any diet is only as successful as the ability to remain on it for life. And make sure you incorporate plenty of exercise in any weight-loss plan you choose. ▲



MIKE CIESIELSKI

All diets work according to one basic principle: You must burn more calories than you consume.



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