



The Brain and Its Most Important Fuel: **Glucose**



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Spotlight on Energy

Every living being needs energy—but none of them can generate it on their own. It has to be taken in from outside. We humans meet our needs through what we eat every day. If we want to use this energy on a targeted basis during physical and mental activity, we have to know how our bodies convert food into energy. Carbohydrates and most especially glucose (also known as dextrose) play a key role in this process.

Our Brain: A Fuel-Hungry Powerhouse

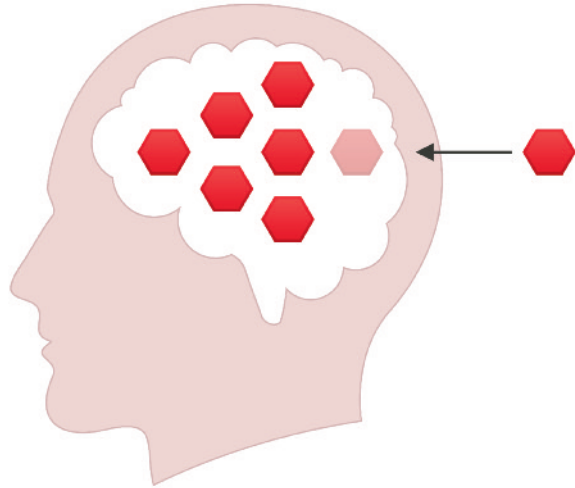
The brain is far and away the biggest user of energy in the human body. It's hard to believe that our brain—a real lightweight, at only about three percent of our total body weight—burns huge quantities of fuel at the same time, powering away like a turbine. That's because the brain is the body's all-powerful control center and the center of cognition, and it has to be able to cope with a flood of tasks at all times: By comparison to computer technology, the human brain manages a staggering ten trillion (that's a 1 followed by 13 zeroes) analog calculations per second.

A Guaranteed Energy Supply for the Multitasking Brain

The brain processes impulses from the sensory organs, regulates voluntary motions and the movements of the muscles and maintains a person's concentration, wakefulness, and attention. It also safeguards perception and memory, regulates metabolism, and, often, it is also tasked with keeping our sometimes turbulent emotional lives under control. With all these tasks to perform, this unique universal genius should never run low on fuel.

Glucose: The Elixir of Life for the Brain

Amid all this activity, the brain grants itself one very special luxury—it prefers glucose to meet its energy needs. And those needs are huge indeed: The brain needs more than half of the glucose present in the body. In stressful situations, when brain activity ramps up, the brain can commandeer even more of the available glucose, up to 90 percent. These kinds of peaks occur when the brain is asked to perform to its utmost, such as during a challenging test.



Glucose as VIP

But the brain itself cannot store even the smallest reserves of glucose. The only source from which it can draw glucose is the blood and the reserves stored by the liver. As soon as there is a risk that supply will drop too low and the brain starts looking for replenishment, what Professor Achim Peters has called the “brain pull principle” kicks in: The brain draws as much glucose from the blood as it wants to have at the time, ignoring the needs of the rest of the body. Only once the brain has gotten enough are the other areas of the body allowed to take their share.

Muscles: The Main Competitor

The muscles are the brain’s biggest competitors among the body’s other glucose users. During physical exertion, their glucose needs also rise sharply. Unlike the brain, they can store some glucose in a special form, but only for their own use.

Quick Info



Key Facts: Glucose

The brain needs a huge amount of energy. It prefers one source: glucose. It normally cannot function without glucose.

Glucose: An Essential Carbohydrate

Carbohydrates are an important part of our diet. In our culture, 40 to 55 percent of our energy comes in the form of carbohydrates, while fat and protein supply the rest. That means carbohydrates are the main element in our diet.

Glucose Seldom Comes Alone

Carbohydrates are absorbed especially quickly as a single component, the monosaccharide known as glucose or dextrose. In many foods, however, glucose is not present in this unbound,

easily absorbed form, but in complex structures instead. “Complex” means that the individual components are linked together, either as pairs or in short or long chains. When this happens, the compounds are called “polysaccharides.” This category includes sugars as diverse as maltose, beet sugar, and starch.

Sources of Glucose

Glucose is created in plants through photosynthesis: Plants use sunlight to convert carbon dioxide and water into the carbohydrates they need to live—various sugars and starch, for example. We humans consume most of our glucose in these forms, through the food we eat. Plant-based foods such as grains and vegetables are especially good sources of carbohydrates. Fruit is another one—and in fact, “grape sugar” has historically been another name for glucose.

Carbohydrate Percentages in Selected Foods

Glucose	100 percent
Grain	66–74 percent
Jam/jelly	69 percent
Bananas	23 percent
Grapes	18 percent
Potatoes	14 percent

Source: Elmadfa I., Leitzmann C.: Ernährung des Menschen (Human Nutrition), Stuttgart 1998

Composition of Various Carbohydrates



Monosaccharide



Disaccharide



Polysaccharide

The Creation of Energy

The carbohydrates we consume through food are broken down into individual components in the digestive tract—with glucose as the main product of this process. This kind of conversion takes time, however. The glucose now travels into the bloodstream via the small intestine. Once there, it appears in the form of blood glucose and is transported to the cells, where it is finally converted into energy. Now it is available for the brain and muscles.

Glucose that is not used right away is stored in the muscle cells and the liver in a special form called glycogen.

Glucose Travels Lightning-Fast to Where It Is Needed

However, if glucose is present in its pure form, it can travel freely straight to the blood. It passes directly through the intestinal wall and shows up in the blood just a few minutes afterward. The process could hardly be faster. The result? Blood sugar levels rise quickly and significantly.

Blood Sugar Level

The glycemic index (GI) is used to show how sharply blood glucose levels rise as a result of

eating a certain food. At 100, glucose has the highest possible GI, meaning that it reaches the bloodstream very quickly, while a food like whole-grain bread has an index value of just 40, meaning that its carbohydrates pass into the blood at a much slower rate.

The Glycemic Index (GI)	
Glucose	100
Honey	90
Cola	80
Refined sugar	70
Banana	60
Apple	40
Pure whole grain bread	40
Dark chocolate	30

Source: Leitzmann C., Müller C. et al.: Ernährung in Prävention und Therapie (Nutrition in Prevention and Treatment), Stuttgart 2009

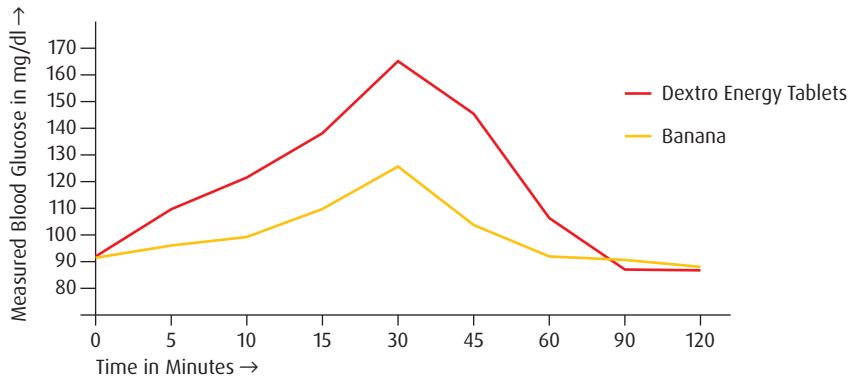
Scientifically Proven

Of all the foods we typically eat when we face peak energy needs, glucose is among the fastest-acting sources of energy. To prove this fact, the Institute of Sport and Sport Science (IfSS) at the University of Freiburg's nutrition department compared the glycemic index of glucose and other foods, such as bananas.

Glucose vs. Banana

In a test standardized according to German national (DIN) standards, the test subjects were given either pure glucose tablets or bananas with comparable carbohydrate content. The rise in blood glucose levels was first measured after five minutes. The result was significant: In just this short time, blood sugar levels in the subjects who had taken glucose had risen about 20 percent on

Comparison of Blood Sugar Levels in Test



Source: University of Freiburg, Nutrition Department, Institute of Sport and Sport Science (IfSS)

average. The average increase in those who had eaten bananas was only about five percent. This proved that glucose raised blood glucose levels four times as much as bananas. Even 30 minutes later, those who had taken glucose still had significantly higher blood sugar than those who had eaten bananas. The median increase for the glucose group was almost 80 percent, while it was just half as much—nearly 40 percent—for those in the banana group.

Quick Info



Pure Power

Pure glucose sends a jolt of energy to the head for immediate help with cognitive functions.

Diabetes: Risks and Support

Those who suffer from diabetes mellitus—the sugar disease—are impaired in their insulin functioning. Either the insulin is no longer able to transport blood glucose to the cells, or the pancreas no longer produces enough insulin. In both cases, blood sugar gets off track. It is often possible to counter diabetes by adopting a healthier lifestyle, getting the patient's blood sugar back on track.

Type 1 and Type 2

There are two main forms of diabetes. In type 1 diabetes, the disease develops in a very short time, often when the patient is still a child. This group is dependent on insulin injections. But type 2 diabetes accounts for a much larger percentage of those with diabetes, about 90 percent. In most cases, this form of diabetes is caused by years of

unhealthy eating, lack of exercise and excessive body weight—typical byproducts of our form of civilization. All over the world, there is a clear correlation between a country’s level of development and the prevalence of diabetes.

Living with Diabetes

For the sake of their health, diabetics have to monitor and stabilize their blood sugar levels. Having too much glucose in the blood on a long-term basis causes irreparable harm. Once a patient has been diagnosed with diabetes, the first steps in getting the disease under control are eating a balanced, healthy diet and getting regular exercise. That alone is enough for many people to bring their blood sugar levels into balance. Depending on the severity of the case, it may be necessary to take medications to lower the patient’s blood glucose or to inject insulin.

The Risk of Hypoglycemia

But especially when medications become necessary to help control a patient’s blood glucose level, the patient faces an elevated risk of hypoglycemia. This is the most common side effect of insulin treatment. The process is fast, and often goes unnoticed by the diabetic patient: Suddenly

there is excess insulin in the blood, and blood sugar is transported to the cells with excessive zeal. As a result, the level in the patient’s blood drops dangerously low. Some diabetics do not notice the first symptoms, such as difficulty concentrating and circulatory problems, until it is too late. But once the brain stops receiving enough sugar, glucose is needed as soon as possible.

First Eat, Then Measure

All of this means that the top priority whenever even the slightest sign of low blood sugar arises is not to measure the sugar level, but to take action right away—preferably by consuming carbohydrates in their purest form, glucose. This specific form is the best choice when help is needed right away, since glucose travels very quickly to where it is needed. Pure glucose passes fully into the blood right away, alleviating acute low blood sugar in minutes.

Quick Info



Glucose as the First-Choice Remedy

All diabetics should carry it in their purse or pocket and have some ready on their nightstand as well: glucose, within reach at the first sign of hypoglycemia.

Dextro Energy: About Our Products

Dextro Energy has been a popular product for generations. Dextro Energy cubes were first marketed in 1935—then as now, with each cube made up of individually packaged smaller tablets. Nowadays Dextro Energy is also offered in various other product forms.

Glucose—Always at Hand

Dextro Energy products are geared to the user's individual needs and situation as well as personal flavor preferences. With their handy format, they fit into even the smallest pocket. That puts glucose within easy reach, so it can travel directly to the brain and muscles right away.

Products at a Glance

Cubes Eight individually wrapped smaller tablets make up a 46-gram pack. Most varieties contain important minerals or vitamins. Also available in a jumbo pack of three cubes (0.5 carb units per tablet).



Sticks 14 smaller tablets supply a total of 47 grams for a quick burst of glucose. Various flavors supply additional vitamins or minerals (0.3 carb units per tablet).



Boxes Glucose in a handy dispenser box to suit all needs and all age groups:
Minis in four fresh and fruity flavors (0.1 carb units per tablet)
Schulstoff and Dextrosio Famosio with a fun fizzy effect (0.1 carb units per tablet)
Wickie, fruity and delicious (0.1 carb units per tablet)
Mintz, the freshness kick with three mint varieties (0.1 carb units per ball).





Dextropur and Dextropur Plus Versatile powder for those with added glucose needs. Can be stirred into hot or cold beverages or mixed with yogurt, muesli, or dessert (9.1 carb units per tablet).

Info

Cubes, sticks, boxes, and powder are also lactose-free and vegan.



Bars Tasty bars with a glucose-rich cream filling in two fresh and fruity flavors, sandwiched between crispy cereal layers (2.4 carb units per tablet).

Quick Info

Quick supply of glucose



Dextro Energy supplies glucose in a compact form.



Sports Nutrition

A compact range of sports nutrition products. All of the products provide fast, targeted support through all of the phases of athletic performance by providing energy—before, during and after training and competitions. This precision-tailored concept for optimum performance offers ideal conditions for success.

These carbohydrate electrolyte drinks, carbohydrate bars and carbohydrate concentrates, protein products and nutritional supplements are highly effective and easy to digest, taste good and are easy to use. That means Dextro Energy covers the full range of athletic needs.

For more information, please visit our website at www.dextro-energy.com and see our product and sports nutrition information brochure, "Dextro Energy Sports Nutrition."

Dextro Energy GmbH & Co. KG
Otto-Hahn-Strasse 4
40670 Meerbusch, Germany

Visit us online!
www.dextro-energy.com

Contact us at:
info@dextro-energy.com

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CONCEPT AND TEXT:

Snowdon & Lagoda, Hamburg
www.snowdon-lagoda.de

LAYOUT AND GRAPHICS:

Johannes Steil, Hamburg
www.brotschrift.de

