

Ketogenic Diets: A Key to Excellent Health

By Ellen Davis

KETOGENIC DIETS are those in which fats provide most of the calories. Carbohydrates (sugars and starches) are severely limited, and protein intake is moderate. The term *ketogenic* refers to the fact that when the body metabolizes fat for fuel, ketone bodies are created through ketogenesis. Ketone bodies are fragments of fatty acids created when your liver and kidney cells metabolize fats. Your cells can use ketones for fuel, and if fat burning is increased, it results in ketosis, which is an elevated level of ketones in the bloodstream.

Ketogenic diets are powerful, metabolically speaking. Switching to a high-fat, low-carbohydrates ketogenic diet can eliminate heartburn,^{1,2} improve cardiac risk factors^{3,4,52} and reverse the elevated blood pressure, high blood sugar, and dyslipidemia associated with metabolic syndrome.⁵⁻⁷

In addition, other research has shown that the metabolic effects of eating more fats and less carbohydrates can alleviate many serious health issues. Medical researchers and some physicians are using ketogenic diets to reduce the tremors of Parkinson's disease and help Alzheimer's patients regain memory and thought function,⁸⁻¹¹ drive various cancers into remission,¹²⁻¹⁶ give diabetics better control over their blood sugar and lipid profiles,^{17,18} and improve epilepsy treatment outcomes.^{19,20}

How can a simple diet have so much power? The secret is in the effect that eating ketogenically has on blood sugar, insulin, and ultimately, cellular energy processes.

What Makes the Ketogenic Diet So Effective?

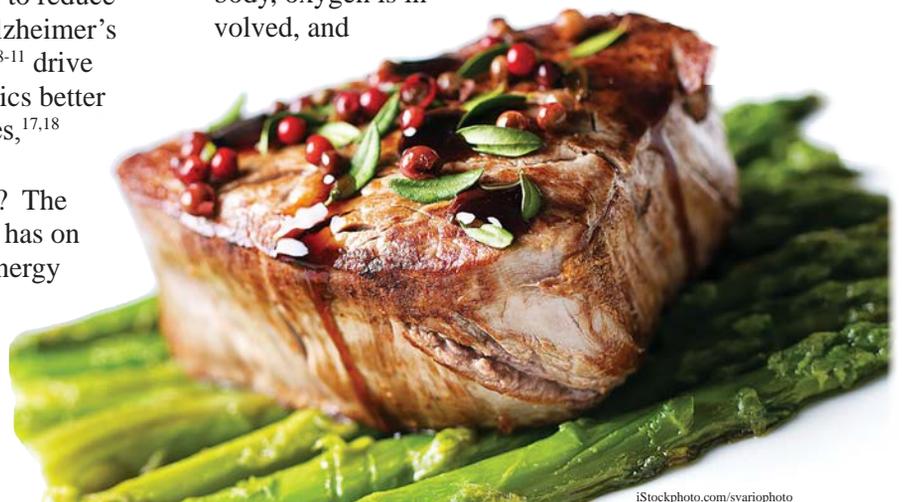
The effectiveness of the ketogenic diet starts with the metabolic effects of ketosis

and the influence it has on the trillions of cells in our bodies. Most of our cells contain mitochondria, which act as the power plants of the cell. These little organelles are responsible for generating cellular energy, and when they are healthy and running efficiently, well-being is greatly enhanced. In fact, mitochondrial health is an important factor in the pathology of diabetes and obesity,²¹⁻²³ brain function,²⁴ and aging.²⁵

Dysfunctional mitochondria result in disease, whereas robust mitochondria produce healthy bodies. And the food we eat has a direct consequence on mitochondrial power and productivity.

Inflammation and the Role of Excess Carbohydrates and Sugars

Aerobic cellular respiration is an intense metabolic process in which the mitochondria transform food nutrients into a cellular energy called ATP (adenosine triphosphate). As with any aerobic energy process in the human body, oxygen is involved, and



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this increases the likelihood of oxidative stress. Oxidative stress is what causes metal to rust, and cooking oils to go rancid when exposed to the air.

In the body, oxidative stress can create molecules called reactive oxygen species, or ROS. These molecules, commonly called free radicals, are chemically reactive and can damage internal cellular structures.

Small amounts of ROS are created as part of normal cellular respiration, and our cells have been equipped with various antioxidant molecules to disarm them. So far, so good.

But if inflammation is present, excessive amounts of ROS are created and overwhelm the cell's defenses, causing accelerated damage and eventually cell death. This is why inflammation is linked with so many types of disease processes.

Here is where our food choices become very important. Eating foods that are high in carbohydrates leads to increased ROS and inflammation²⁶⁻²⁹ because these foods increase the amount of glucose and insulin in the bloodstream. This is the main problem with high-carbohydrate diets. While glucose is an important fuel for the body, too much of it circulating in the bloodstream can harm body systems. How much is too much? Typically, a healthy individual will have less than one teaspoon of sugar dissolved in the bloodstream at any one time.³⁰

Compare that to a typical canned soft drink, which contains about ten teaspoons of sugar, or a bagel, which breaks down into about sixteen teaspoons of sugar in the bloodstream. These high-carbohydrate foods provide much more glucose than the human body can handle efficiently. Blood glucose is basically liquid sugar, and if you have ever spilled fruit juice or syrup on your hands, you know how sticky it can be. In the body, this "stickiness" is called glycation.

Glycation is a process in which excess blood sugar sticks to and damages the proteins of body tissues. These injured proteins stop functioning correctly, and this results in a chain of events that increases inflammation and creates substances called advanced glycation end-products (AGEs). Advanced glycation end-products interfere with cellular function, and are linked to the progression of many disease processes, including Alzheimer's,³¹ cardiovascular disease^{32,33} stroke,³⁴ and autism.³⁵

Eating a steady diet of foods that drive up your blood sugar increases glycation damage and inflammation, because the extent of glycation damage is directly linked to glucose and insulin concentrations in the bloodstream.^{36,37} The higher the blood sugar, the more serious the damage. Glycation damage is why diabetics with chronically high blood sugar experience neuropathy, higher rates of cancer and heart disease, kidney damage,³⁸ and blindness.³⁹ You want to minimize glycation damage and the resulting inflammation as much as possible for good health.

Ron Rosedale, M.D., writes about the glycation damage that a high-carbohydrate diet and excess blood sugar can do. He sums this up in one comment: "Health and lifespan are determined by the proportion of fat versus sugar people burn throughout their lifetime. The more fat that one burns as fuel, the healthier the person will be, and the more likely they will live a long time. The more sugar a person burns, the more disease ridden and the shorter a lifespan a person is likely to have."⁴⁰

People who eat a high-fat, low-carbohydrate diet have lots of energy, and it stays steady throughout the day.

Major Macronutrients

THE FOOD WE EAT IS comprised of three major macronutrients. We know them as fats, proteins, and carbohydrates.

Fats include monounsaturated oils such as olive oil, polyunsaturated oils such as sunflower oil, and saturated fats such as butter and coconut oil, which are solid at room temperature. Contrary to mainstream advice, saturated fats are the healthiest fats because they are the most chemically stable, and don't oxidize easily. Monounsaturated oils are the next healthiest, and polyunsaturated oils, which are highly reactive and chemically unstable, should be avoided as much as possible.

Proteins are important foods, as we need them to repair our body tissues, provide protection against bacteria and viruses, make important hormones and enzymes needed for biological processes, and maintain muscle mass. Protein is found in meat, poultry, fish, dairy products, nuts, and beans and in smaller quantities in vegetables.

Carbohydrate is found in large quantities in most of the processed foods you'll find on the grocery store shelves. Carbohydrates, however, are not essential nutrients, and you can get all the glucose you need from green vegetables and protein. And food that isn't high in fat or protein will usually be high in carbohydrates. This includes breads, crackers, pasta, cookies, cake, sugars, juice, and starchy vegetables such as corn, beans, and potatoes. Grains including rice, wheat, and oatmeal also contain carbohydrates. And there isn't much difference between a whole grain complex carbohydrate and a simple carbohydrate like sugar. They both get turned into excess glucose in your body. —E.D.

Keto-adaptation is the Key to Ketogenic Diet Success

MOST ADA-TRAINED dietitians will tell you that carbohydrates are essential to good health because the brain can only use carbohydrate-generated glucose for fuel. The logic goes that since the brain can only use glucose for fuel, you must eat carbohydrates or the body will break down your muscles to get the glucose it needs for the brain.

This is incorrect. As Jeff Volek and Stephen Phinney explain in *The Art and Science of Low Carbohydrate Living*, "The human brain is a carbohydrate dependent organ only if one routinely eats a lot of anti-ketogenic nutrients such as sugars and concentrated carbohydrates. When dietary carbohydrates are held to 50 grams or less per day, humans undergo a process called keto-adaptation.... After a few weeks of the keto-adaptation process, serum ketones increase several fold, reaching 1-3 millimolar (mM).

"Above 1 mM ketones, more than half the brain's fuel comes from ketones. The rest of the brain's fuel must indeed come from glucose, but this amount is easily produced endogenously...via a process called gluconeogenesis."

In other words, for most people 50 grams or less per day of carbohydrates allows the brain and heart to burn ketones for fuel. This is not written in stone. The less insulin resistant you are, the more carbohydrates you can eat. Some people can consume as many as 150 grams of carbohydrates a day and still efficiently use ketones for fuel. Ketogenic diets of short duration show little benefit. Our bodies require time to build the enzymes needed to burn fat efficiently and induce ketosis.

—Ellen Davis

In contrast to the inflammatory actions of glucose and glycation, the presence of fat-derived ketones in the mitochondria actually inhibits ROS production,⁴¹⁻⁴⁷ and provides a sort of defense for the ravages of cellular respiration. Because of the metabolic path they take in the mitochondria,⁴⁷ ketones enhance mitochondrial efficiency and reduce oxidative stress. In other words, ketones promote mitochondrial health.

And here is another benefit of ketosis: breaking down fat for fuel also provides a greater amount of ATP energy.⁴⁸ When cellular mitochondria use fatty acids to create energy, they can create more than three times the amount of ATP than they can using glucose. So not only is ROS production reduced, more cellular energy is made, and that means more energy overall. People who eat a high-fat, low-carbohydrate diet have lots of energy, and it stays steady throughout the day.

When your diet is higher in fat and lower in carbohydrates, all body systems work as they were designed to, and inflammation is reduced.

As you can see, using carbohydrates for body fuel is just not efficient. The presence of high amounts of glucose increases glycation and inflammation, ramps up oxidative stress and ROS damage, and creates less energy for cellular and body use.

Given that excess glucose can be toxic, and ketones are so beneficial, it makes sense to consider the idea that ketosis is the preferred nutritional state of the human body. Muscles use fatty acids constantly, and research has shown that the heart and brain utilize ketones as a

fuel source to a greater extent when carbohydrate intake is minimized.⁴⁹⁻⁵¹

When your diet is higher in fat and lower in carbohydrates, all body systems work as they were designed to, and inflammation is reduced.⁵² This is why a ketogenic diet has such a positive effect on health markers associated with metabolic syndrome⁵⁻⁷ and on more serious disease states such as neurological impairment,^{9,10} cardiovascular disease,^{3,4,52} cancer,¹²⁻¹⁶ diabetes,^{17,18} and epilepsy.^{19,20}

This is not to say all carbohydrate-containing foods should be avoided. There are certain cells in the body that can only use glucose for fuel, so we must have some glucose in the bloodstream. The idea is to avoid having too much glucose circulating by minimizing your consumption of concentrated carbohydrates. Fats, protein, and green leafy vegetables are better choices as these foods can provide the minimal glucose needed without causing glycation damage.

In summary, healthy natural unprocessed fats are good for you, and ketogenic diets can have a profound and positive effect on a multitude of health markers,⁵³ as they provide an excellent tool for regaining and maintaining health and well-being, right down to the cellular level. Δ

ELLEN DAVIS is the creator and owner of www.ketogenic-diet-resource.com, a website devoted to sharing information on the health benefits of ketogenic diets. She is an avid supporter of ketogenic diets in all forms, and attributes her devotion to personal experience. She reversed her symptoms of metabolic syndrome, regained excellent health, and lost over 80 pounds by switching from the standard American diet to a whole foods ketogenic diet. She also created www.healthy-eating-politics.com, a website that presents information about the health benefits of whole, nutrient dense foods, and helps dismantle the myth that saturated fat and cholesterol are at the root of heart disease. Ellen lives in Cheyenne, Wyoming, and can be reached via email at ellen.davis.web@gmail.com.

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