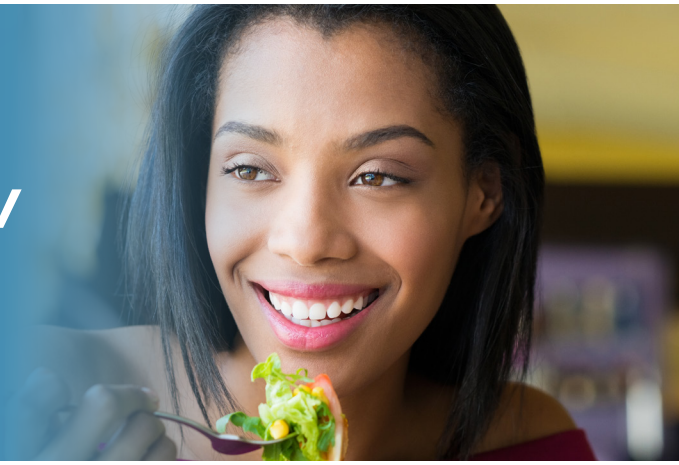
Ketogenic Diets:
What You Need to Know



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What Is a Ketogenic Diet?

A ketogenic ("keto") diet is very low in carbohydrate, very high in fat, and modest in protein. This forces the body to use fat instead of carbohydrate for most of its energy needs.[1] In general, keto diets get less than 10% of calories from carbohydrate.

The cells of the body prefer to run on glucose (blood sugar). When carbohydrate intake is slashed, at first the body will even turn protein into glucose!

Over time, some cells will begin to burn fat directly. However, brain and nerve cells cannot burn fat directly. They require glucose or a substitute. When carbohydrate-rich foods are scarce, the liver turns fat into substances called ketones. Ketones are the substitute that can fuel brain and nerve cells when carb intake drops (on a keto diet) or calorie intake drops (during fasting or starvation).

Making ketones is the body's emergency backup system—a last resort.

What's Missing on a Keto Diet?

Keto diets severely limit or eliminate most fruits, starchy vegetables, whole grains, and legumes (beans, lentils, and split peas)—foods that are packed with nutrition.

As a result, low-carbohydrate diets are often low in thiamine, folate, vitamin A, vitamin E, vitamin B6, calcium, magnesium, iron, and potassium.[2] Without vitamin supplements, those on "low-carb" diets are at risk of multiple deficiencies.[3]

Ketogenic diets are often low in fiber. Yet the good bacteria in our gut need fiber to thrive.[4] Healthy gut bacteria help us absorb nutrients, suppress appetite, improve immune function, and decrease inflammation.[5,6] Low intake of fiber can also lead to a breakdown of the protective lining of the gastrointestinal tract, leading to "leaky gut." [7]

Low-carb diets are also typically high in saturated fat and cholesterol, known to cause further health problems.[3,8,9]

What's the Evidence for Ketogenic Diets?

Researchers have tried using ketogenic diets to treat a variety of conditions. However, they work better on some conditions than others, and come with risks.

● Epilepsy

Ketogenic diets can decrease seizures, especially in people who don't respond well to medication. In adults with intractable epilepsy, 52% of those following a very strict, medical ketogenic diet and 34% following a modified Atkins diet had more than a 50% reduction in seizure frequency.[10] Medically supervised ketogenic diets have helped reduce and even eliminate seizures in children as well.[11]

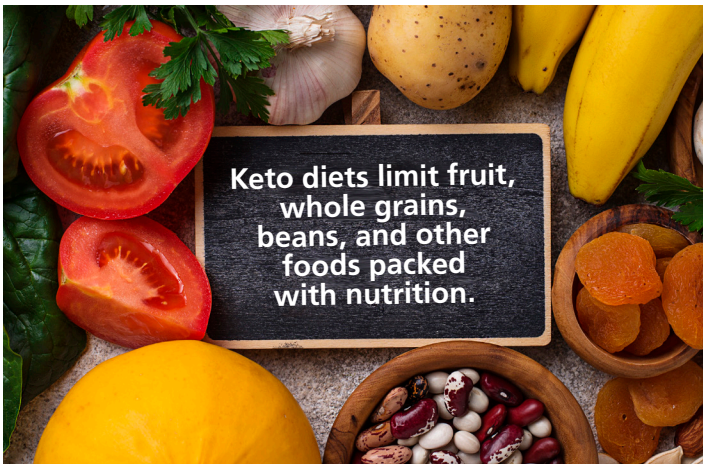
● Weight Management

Following a keto diet can lead to weight loss in the short term.[12-17] In fact, when starting a ketogenic diet, people often lose weight rapidly, which can feel encouraging. But most of the pounds lost in the first days and weeks on the diet are water weight.[18]

Early on in a keto diet, people actually lose less fat than they would on a balanced diet.[19]

What about in the long term? A 2013 analysis found that those on a ketogenic diet lost slightly more weight than those on a lower-fat diet (30% of calories from fat) after one year. However, after two years, that advantage disappeared.[14]

The science is clear: Any diet that cuts calories will cause weight loss, including a ketogenic diet. However, in the long term, ketogenic diets fare no better than other diet styles, and appear to be riskier, as will be discussed.[20]



Diabetes

Staples in ketogenic diets include fats (butter, ghee, coconut oil), meat, chicken, fish, eggs, and cheese, all of which have been linked to higher diabetes risk. On the other hand, foods linked to lower diabetes risk, including vegetables, fruits, beans, lentils, and whole grains, are minimized.[21-26]

The main symptom of type 2 diabetes is high blood sugar. When carbohydrate intake drops on a ketogenic diet, blood sugar improves.[27] As a result, patients—and even doctors—may think the diabetes is "better."

However, what happens when a person with diabetes on a ketogenic diet eats a healthy high-carbohydrate food, like beans or a sweet potato? Unless that person has lost a lot of weight, their blood sugar is likely to spike. While they've treated the symptom of diabetes—high blood sugar—they didn't fix the root cause.

Normally, when people eat carbohydrate-rich foods, those carbohydrates are broken down into glucose. Glucose is absorbed through the walls of the intestine into the blood. The body then makes insulin, which tells muscle cells to grab glucose from the blood and burn it as fuel. This feeds the muscle cells while bringing blood sugar down.

In type 2 diabetes, fat builds up inside muscle cells where it does not belong. This fat starts to block the insulin message from getting through.[28,29] Muscle cells don't know to take in glucose as they should, because fat is clogging the machine. So blood glucose (sugar) rises.

In summary, to fix the root cause of diabetes, fat must be cleaned out of the muscle cells, as illustrated in the story Diabetes, Keto, and Santa's Toy-Making Machine.

Cancer

Diets lower in carbohydrate have been linked to a higher risk of cancer death.[34] Many foods that appear to protect against cancer, like fruits and whole grains, are limited or avoided on ketogenic diets. People instead tend to eat more foods that raise cancer risk, like red and processed meats.[35,36]

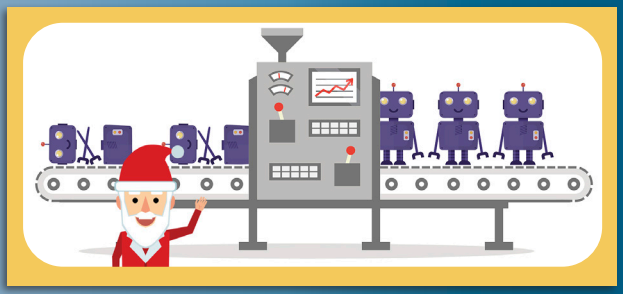
However, many cancer cells do like to use glucose as fuel. So scientists wondered if ketogenic diets might help treat cancer. Unfortunately, the research that has been done so far suggests that ketogenic diets alone do not appear to work against cancer.[37,38]

Side Effects

Ketogenic diets cause side effects. The most restrictive keto diets are associated with fatigue, headache, nausea, constipation, low blood sugar, and acidosis, especially when starting the diet.[1] People starting keto diets report "keto flu" symptoms like nausea, low energy, and brain fog.[39] Athletic ability may also suffer on a keto diet.[40]

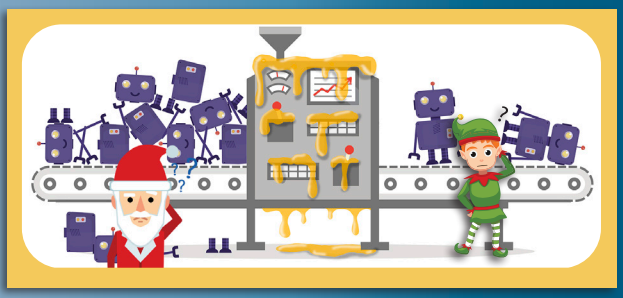
More serious side effects can also occur such as dehydration; inflammation of the liver and pancreas; high triglycerides, uric acid, and cholesterol; and dangerously low levels of magnesium and sodium.[41,42]

Diabetes, Keto, and Santa's Toy-Making Machine



Santa has a toy-making machine. It assembles parts into toys. When the machine is functioning well, it makes plenty of new toys.

This is analogous to muscle cells and other cells of the body. People eat healthy, glucose-rich foods like beans and sweet potatoes, glucose is burned as fuel, and people have good health.

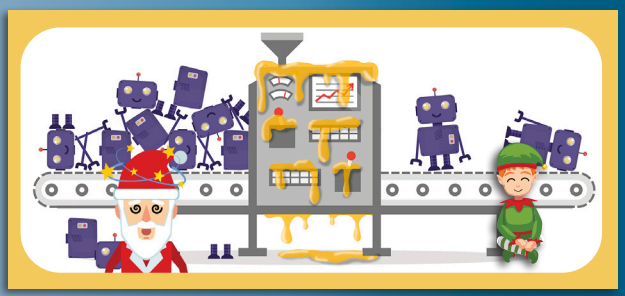


After years of neglect, though, Santa's toy-making machine has gotten more and more gunked up. It's moving slowly and only churning out a few toys. Toy parts start piling up, causing chaos in the workshop.

This looks a bit like diabetes in the body. The toy parts are the glucose, the machine is the muscle cell, and the gunk in the machine is fat buildup in muscle cells. When muscle cells get clogged with fat, long-term health suffers.

So, Santa calls his go-to elf and barks, "We've got to get these parts out of here! They're messing up the whole workshop!"

The elf thinks about it and comes up with a solution. Stop ordering toy parts! The machine is still a mess, but eventually it works through the backlog. The workshop is clean again. The elf congratulates himself.



This is keto in a nutshell for diabetes. By nearly stopping the inflow of glucose, the place looks better, right? Blood sugar drops. The cell still isn't functioning properly, but the symptom—high blood sugar—is gone. So why is Santa unhappy?

Over time, a keto diet may put people at risk for heart attacks and strokes by raising cholesterol and interfering with circulation.[43,44] Other longer-term effects include decreased bone mineral density, vision changes, anemia, and kidney stones.[42,45] Eating a lot of animal protein and fat can also increase the risk of getting chronic kidney disease and make people who already have it worse.[46-49] Low-carb diets during pregnancy have been linked to severe birth defects in children.[50]

Many studies show an increased risk of death from all causes (i.e., all-cause mortality) for diets that are low in carbohydrates.[51-56] These large-scale studies show that the lower the diet is in carbohydrates, the higher the death and heart disease rate. Interestingly, lower-carb diets high in plant protein and unsaturated fat appear to be better than unhealthy diets both high and low in carbohydrates.[56]

Keto Q&A

Q: Is keto the same as fasting?

A: No. Fasting triggers ketosis because little or no food is eaten. This is a survival mechanism. Keto diets slash carbohydrates and increase fat to trick the body into entering ketosis while people are still eating ample food.

Q: I have diabetes, and my doctor said I should do keto. What do I do?

A: Send your doctor a copy of this fact sheet and discuss your concerns. We also have a fact sheet on plant-based nutrition for diabetes you can share. Your doctor can earn free continuing education credits watching videos about ketogenic diets, nutrition for diabetes, and more on NutritionCME.org.

Q: My friend recently lost 20 pounds on a keto diet and swears by it. Why shouldn't I try it?

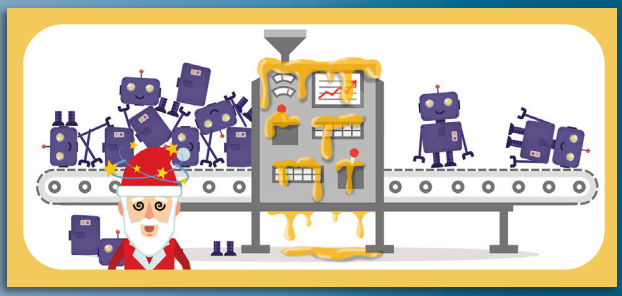
A: Any diet that cuts calories will lead to weight loss. An all-doughnut diet would cause weight loss, so long as calories were cut. (We don't recommend this!) However, diets low in carbohydrate, like ketogenic diets, have been linked to an increased risk of death from all causes.[34,52]

Q: What about "vegan keto"?

A: To date, no studies have looked at keto diets that exclude animal products. However, two studies looking at lower-carb diets focusing on plant foods suggest that vegan keto may be safer than standard keto.[57,58]

A Plant-Based Diet: The Healthiest Choice

Given that ketogenic diets carry risks and long-term safety is unknown, it's best to stick with what has been proven to work for weight loss, diabetes, heart disease reversal, and more: a vitamin B12-supplemented, whole food, plant-based diet.



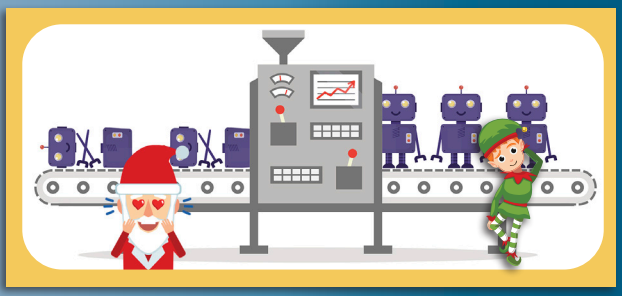
He knows what will happen when the Christmas crunch comes and they order more toy parts again. Since the machine still isn't working well, the workshop will be a mess again in no time.

This scenario is like reintroducing carbohydrates—even healthy carbohydrates like the ones in beans and sweet potatoes. In all likelihood, without profound weight loss, blood sugar rises.

The diabetes, which seemed to have disappeared, returns with a vengeance. The workshop, so to speak, is a mess. And the kids aren't going to get toys anytime soon.

So Santa tells the elf to clean the machine and get it back in working order.

This is like eating a low-fat, plant-based or nearly plant-based diet—even without weight loss.[30] (Although sustained weight loss by any means can also help.[31]) What's more, people who eat plant-based tend to have less fat in their cells in the first place and are less likely to have type 2 diabetes.[32,33]



Once the machine is spruced up, it starts cranking out toys again like a champ. Santa is happy, the elf is happy, and kids around the world rejoice.

This is like going on a low-fat, whole food, plant-based diet. Blood sugar comes down, and the body retains tolerance of health-promoting, carbohydrate-rich foods like fruits, veggies, legumes, and whole grains.

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