



The Ketone Diet - Scientific Rationale, Proven Health Benefits, Advantages and Disadvantages

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Abstract. The ketogenic diet is a drastic reduction in the proportion of carbohydrates in the menu and an increase in fat intake. The body then enters a state of metabolism that burns fat for fuel, called ketosis. A pleasant "bonus" can be considered the improvement of the cardiovascular system and the improvement of brain function. The ketogenic diet is also used to prevent cancer and improve the effectiveness of radiation oncotherapy.

Keywords: keto, keto diet, ketone diet, keto diet

History of occurrence

In the 1920s, the Johns Hopkins Hospital (Baltimore, Maryland) created an extremely low carbohydrate diet for children with epilepsy. Researchers have found that a complete cessation of nutrition for a short period of time reduces the frequency of seizures in patients. Such abstinence had a positive effect on cholesterol and blood sugar levels, and led to weight loss. But long-term treatment in this way is impossible. This is how the classic ketogenic diet was born. ^[1] At the same time, it turned out that complete or intermittent fasting was not necessary. Already with a sharp reduction in the diet of glucose from carbohydrate foods, the body perceived this as starvation, receiving a positive effect.

In the 1960s, this system became known as a technique for treating obesity.

The essence of the diet is that the use of all or almost all sugars and starches is limited. In the process of digestion, these complex substances are converted into simple sugars, which quickly raise blood glucose levels, causing an insulin response. High levels of glucose and insulin lead to the fact that excess calories are easily stored in the "reserves" of fat, leading to excess weight. This is due to the fact that the human body cannot store carbohydrate reserves for more than 24 hours in muscle tissue and in the liver in the form of glycogen. Glycogen for "long-term storage" is transformed into fats. With the continuation of carbohydrate nutrition, it is difficult for the body to gain access to body fat and it becomes problematic to lose weight.

If it is critical to reduce the proportion of carbohydrates in the diet, the level of glucose and insulin will be at a consistently low level, without jumps and dips. The body will use fat from "reserves" as fuel for energy processes. The end product of fat metabolism is ketones. Their content in the blood can be measured in the laboratory. At home, the presence of ketones can be easily checked in the urine using special test strips.

Therefore, even when eating enough calories and fat in food, excess fat will be burned and weight will decrease. At the same time, you do not feel hungry or do not engage in active physical exercises in the gym, trying to burn these calories.

The ketogenic diet is similar to the Atkins diet. She also calls for cutting out high-carbohydrate, sugary foods to boost your body's ability to burn fat. However, the keto diet is based on high healthy fats, low protein overall, and no processed meats. At the same time, unlike the Atkins diet, the effectiveness of the keto diet is confirmed by research. The keto diet can be called a healthy diet, which cannot be said about the Atkins diet. She simply recommends an increase in any kind of fat and a sufficiently high level of protein in the menu.

Principles of the ketone diet

- Reduce your protein load

The difference between the keto diet and its low-carb counterparts is that fat is considered more important than protein. After all, an abundance of protein in the diet can slow down the transition to ketosis, since the human body is able to transform protein into glucose in a small amount.

It is enough to consume 1-1.5 g per day. protein per 1 kg. your ideal weight. So, for a weight of 60 kg. it will be enough to use 60-120 gr. protein daily.

- Follow the proportion of BJU

BJU is proteins, fats and carbohydrates in your plate. You don't need to count calories on a keto diet, but keeping your net carbs and proteins within the right limits will be easier if you use special apps with keto calculators.

Use Keto Supplements for Greater Efficiency

Useful supplements for the keto diet are exogenous ketones and the amino acid leucine.

Exogenous ketones are also called "keto weight loss pills." They help you reach a state of ketosis earlier, and then stay in it more stable.

Leucine can be considered the most important amino acid for ketosis. If the remaining amino acids are converted to glucose, then leucine is converted to acetyl-CoA. This central metabolite of lipid metabolism is involved in the synthesis of ketone bodies. In the natural diet, it can be obtained from eggs and cottage cheese.

- Don't forget about water

Water is the most "correct" drink for a person. The ketone diet is no exception. Drink 1.8-2.5 liters of water per day. This will provide detoxification, reduce fatigue, help digestion and quell possible hunger. It's especially important to drink enough water when you're experiencing keto flu symptoms.

- Be honest with yourself

The ketone diet does not allow "free" days or "free" lunches. The strictness is due to the fact that carbohydrate foods can quickly get you out of ketosis. Everything will have to start over. In addition, the symptoms of "keto flu" may return. But if you have already reached a state of ketosis, then next time it will be easier and faster to return to it again.

Types of keto diet

The ketogenic diet is quite popular and has many versions. Whether your meal plan is safe and healthy depends on what type of Keto diet you are following.

Initially, the keto diet was designed for people with epilepsy. The content of macronutrients - in particular, carbohydrates - in the traditional version is very strictly regulated. But there are other options.

The most common are the following types:

1. **Standard ketogenic diet:** 75% of calories come from fats and fatty meats, 20% from protein foods, and only 5% are allocated to carbohydrates.
2. **Modified ketogenic diet:** calories from fat is 40%, and carbohydrates and proteins are divided by 30%.
3. **Cyclic ketogenic diet:** Suitable for athletes who want to build lean muscle mass. Not suitable for people with chronic diseases. Not designed for long-term compliance and not compatible with strength training. According to her, a few days a week - from Monday to Thursday - a strict keto diet, from Thursday evening and Saturday - a high-calorie carbohydrate diet, and Sunday is a transition day.
4. **Targeted Ketogenic Diet:** Allow carbohydrates and reduce fat on exercise days, and follow the standard keto diet on all other days.
5. **Restricted ketogenic diet:** Restrictions apply not only to carbohydrates, but also to calories. It is used for diet therapy in oncological diseases.
6. **High-Protein Ketogenic Diet:** Similar to the traditional keto diet, carbs remain at 5%, 30% of the calorie content of the diet is given to protein, and 65% remains fat. Designed for bodybuilders and the elderly, who care about maintaining muscle mass. However, it may not be suitable for people with kidney disease. For them, increasing the proportion of protein may go beyond personal restrictions on the recommendations of a doctor.
7. **Vegetarian or vegan ketogenic diet:** This is the replacement of animal products with products allowed in a particular diet. The carb limit is still enforced. The menu consists of keto fruits and low-starchy vegetables, leafy greens, nuts and seeds, healthy fats, high-fat dairy products, and oily fish where nutritional ideology allows. Combining a keto diet with vegetarianism, veganism, and/or pescatarianism has been called the keto tarian eating plan. Carbohydrates in it up to 15%.
8. **Dirty Ketogenic Diet:** With the same strict macronutrient proportions as the traditional keto diet of 70% - 20% - 5% for fats - proteins - carbohydrates, there is freedom to consume "unhealthy" keto foods. These are sausages, bacon, pork skin, carbonated water with no carbohydrates and numerous fast food products rich in fats. It is not recommended as a dietary plan, but rather as a necessary measure for nutrition while traveling.
9. **Lazy Ketogenic Diet:** Can be mistaken for the dirty keto diet. In fact, the error is not allowed in the choice of products, but in observing the proportions of proteins, fats and calories. Restrictions on carbohydrates are accepted as no more than 20 gr. net carbs per day. Less frightening for beginners, however, the results are also less pronounced.^[2]

Differences between keto and paleo diets

These two meal plans are found to be similar. Both are low carb diets. The paleo diet cuts out sugars, grains, dairy, and highly processed foods that are most often high in carbs and have a high glycemic index.

However, the ketogenic diet further restricts many carbohydrate fruits and starchy vegetables, and does not allow for natural sweeteners. Honey and maple syrup don't fit the keto plan. ^[3]

Benefits of the Keto Diet

- Weight loss fairly quickly

The diet can be used for people who are obese or overweight. The weight loss results achieved are more stable than with a conventional calorie-restricted diet with a reduction in fat below 30% of the total diet. This is confirmed by studies conducted in 2013 and recorded in the British Journal of Nutrition. ^[four]

This happens due to a hormonal effect. When insulin release is reduced on a low-carbohydrate diet, the body stops accumulating the excess in the form of fat stores. And stocks are depleted more intensively.

When eating hearty protein meals framed by healthy fats, cravings for sources of empty calories - sweets and other "food garbage" - decrease. In addition, all these products are simply excluded from the list of approved products.

Some problems of the endocrine system are solved. In studies, women with PCOS not only lost weight and significantly lowered their insulin levels, but some became infertile. ^[5] In another study, patients, in addition to weight normalization, had positive dynamics with lymphedema, which is caused by blockage of the lymphatic system. ^[6]

- Reduced risk of type 2 diabetes.

Due to the absence of sharp rises in blood glucose, insulin levels are kept at a stable level. Improves insulin resistance. As a result, type 2 diabetes symptoms are less likely to occur. If insulin production is lower for "empty" carbohydrates, the body receives less signals to store energy in the form of glycogen in the liver and muscles, and then in the form of fat.

Low-carbohydrate diets reduce postprandial glucose levels - that is, sugar levels 2 hours after a meal show fewer peaks. Diabetics taking insulin may need medical assistance to adjust their insulin therapy during and after the keto diet. This also applies to people who have problems with blood pressure. You may need to adjust your regular medication support.

- Reduced risk of cardiovascular disease

Despite the fact that the ketogenic diet encourages the use of fatty foods, cholesterol levels return to normal. The level of "bad" cholesterol decreases - triglycerides and low-density lipoproteins fall, as well as blood sugar. At the same time, high-density lipoprotein levels rise, which reduces the risk of atherosclerosis and other risk factors for cardiovascular disease. This is especially important for patients who are obese.

- Cancer protection

Research conducted within the framework of the National Institute of Neurological Disorders and Stroke at the National Institutes of Health (USA, Maryland) and at the University of Cancer at the Research University of Iowa (USA, Iowa) show the effectiveness of the ketogenic diet in the fight against cancer.^[7]

It has been proven that foods with high processing and a small amount of nutrients can stimulate the reproduction of cancer cells. Healthy cells in our body can change their metabolism and switch from eating carbohydrates to eating fats. Cancer cells don't do that. Therefore, the keto diet is an effective prevention and means of combating cancer.

- Protecting the brain from neurological disorders and cognitive impairment

Patients who have brain disorders - cognitive, such as epilepsy, Alzheimer's disease, manic depression, anxiety, or neurological disorders - can use the ketogenic diet to treat and manage symptoms. Actually, it was as a remedy for epilepsy that the keto diet saw the world in the 20s of the 20th century.

Their brain cells are often unable to receive normal nutrition due to problems in the functioning of cellular energy connections. This is a common characteristic of many disorders in the brain, although in general, these diseases are clearly different from each other.

If dietary changes cause the body to produce ketones and use them as fuel for cells, then it can significantly reduce the intensity of neurological disorders, cognitive impairment, including seizure activity, sleep disorders, headaches, multiple sclerosis, autism, brain cancer and consequences neurotrauma.

To stabilize patients suffering from epilepsy, MCT oil is widely used - medium chain triglycerides obtained from coconut and palm oils. MCT oil is more ketogenic and makes the diet more efficient or easier by allowing more indulgences in the form of carbohydrates in the diet, depending on the goals.

Studies in mice have shown a reduction in the rate of progression of Huntington's disease and Charcot's disease.

In the case of schizophrenia, pathophysiological processes are normalized, causing hallucinations, delusions, unpredictable behavior and lack of self-control. The studies done have been either animal or case studies, but the benefits of lowering carbohydrates and increasing dietary fats are promising for neurological problems.

- Increased life expectancy

A study covering more than 135 thousand people from 18 countries in the period 2003-2013. illustrates that high mortality risk is associated with high carbohydrate intake. And low overall mortality is associated with fats. At the same time, it has not been reliably proven that any particular type of fat or fat in general should be associated with myocardial infarction or mortality from cardiovascular diseases.

The keto diet also appears to stimulate autophagy. This is a process when the body's lysosomes literally digest intracellular debris, damaged cellular structures and aging cells that no longer carry functional benefits for the body. Autophagy is one of the biohacking techniques - cleansing the body of the signs of aging. The ketogenic diet is one way to achieve this.^[one]

Disadvantages of the Keto Diet

With the advantages described, however, the ketogenic diet also has disadvantages, such as:

- May harm the liver and kidneys due to high protein and fat content in the diet. Genetic predisposition to liver problems and the presence of kidney disease plays a significant role in this matter.
- Short-term effects for patients with type 2 diabetes - insulin resistance may increase again after returning to carbohydrate foods. How likely this effect is depends on the presence and severity of diabetes, as well as genetic factors.
- The symptoms of the "keto flu" can last from a few days to several weeks, and can also return if the diet is broken.
- Weight loss may be temporary. This is also affected by the difficulty of following a strict diet, adapting the body to a new metabolism. Weight may stop falling after six months on the diet, or even start to increase again. ^[eight]
- The risk of getting a lot of low-density lipoprotein (LDL) due to the abundance of fatty foods. An increase in "bad" cholesterol threatens with cardiovascular diseases. It is recommended that no more than 7 percent of the calorie content of the daily diet be allocated to the share of LDL.
- Lack of beneficial micronutrients derived from vegetables, fruits, grains, and legumes excluded from the ketogenic diet. This can lead to a lack of magnesium, phosphorus, selenium, vitamins C and group B.
- Constipation significantly reduces the effectiveness and health benefits expected from the diet. Constipation is caused by a lack of fiber from grains and legumes. Be sure to include fiber-rich vegetables in your diet and drink plenty of clean water.
- "Blurred" thinking, irritability, confusion may arise due to the minimization of carbohydrate sources in the diet. The brain needs glucose to function. Mood swings, reduced ability to concentrate, and other unpleasant effects can be caused by low-carbohydrate diets.

Be sure to check with your doctor and dietitian before switching to a ketogenic meal plan!

Other low-carb diets—Atkins or the paleo diet—are slightly different from the keto diet. However, the risks associated with excess fat and / or protein, and with a reduction in the proportion of carbohydrates, are inherent in all such methods. Carbohydrate-restricted diets provide excellent and fast weight loss results. Saturation with fats is more long-term than when eating carbohydrates. This leads to a decrease in appetite, which contributes to weight loss. However, this factor has not been studied in the long term. It is difficult enough to stick to restricted diets for a long time. After returning to the usual style of eating, with a high degree of probability, the weight will return. ^[9]

Are you afraid of the keto flu?

A diet that shows good results in weight loss reduces cravings for sweets. At the same time, it promises plenty of energy and a cheerful mood. You enthusiastically switched to a new nutritional system for your body ... and you feel worse than before. What happened?

Quite often, followers of this diet experience unpleasant side effects, which have come to be called “**keto flu**” symptoms. And for many, these symptoms can scare and stop the intention to try a new diet.

First of all, let's hasten to reassure - the discomfort will not be permanent. For most people, the symptoms will go away in a few weeks and sooner if the drinking regimen and a healthy diet are controlled.

What is the "keto flu"? This is a term that combines the side effects of the ketogenic diet. But why do they appear? The keto diet is generally a safe system that promotes health. But thanks to it, the body

endures global changes, one of which is the rejection of sugar and carbohydrates. On a ketogenic diet, your metabolism changes so that energy is no longer coming from burning carbs, but from burning fat.

The new state of metabolism in which ketone bodies are produced is called ketosis. It is thanks to ketone bodies that you will receive the expected benefits from the diet. But the body will get used to using fat as an energy source instead of glucose. For a while, ketones will not fully provide the body with nutrition, and the intake of glucose will already be drastically reduced. As a result, you will feel tired and possibly even "broken". But don't be afraid. After all, such a fundamental change in the principles of nutrition is probably happening for the first time in your life.

In addition to how you feel, fundamental changes will also occur in your microbiome. Numerous friendly and not-so-friendly bacteria that inhabit our bodies will also "sit down" on a diet with you. And there may be temporary digestive disturbances.

But do all people who switch to a ketogenic diet experience these symptoms? Different intensity and different duration. Everything will depend on the initial conditions - what style of nutrition you followed, what is your general state of health and many other factors, such as age, daily routine and activity, gender, age, genetic characteristics and stressful situations.

If you've been following a high-carbohydrate diet, it's likely that going on a keto diet will be quite stressful for your body.

The transition can be especially difficult for people who already have metabolic problems - diabetes mellitus or kidney failure.

In these cases, it is necessary to consult a doctor.

You can alleviate the condition if you follow a proper keto diet, eat healthy fats, sources of B vitamins, and drink regularly with the addition of electrolytes.

As symptoms of the "keto flu" you can expect:

- loss of strength, fatigue, lack of energy;
- dehydration;
- lack of appetite;
- the smell of "acetone" from the mouth;
- headache;
- dizziness;
- "cloudiness" of consciousness;
- sleep disorders;
- heartburn, nausea, sometimes vomiting;
- indigestion - constipation, diarrhea;
- low motivation for training, long-term recovery of strength after training;
- weakness, muscle pain;
- decreased libido;
- bad mood, irritability;
- Rarely, more severe symptoms such as elevated cholesterol levels, kidney stones, severe stomach and/or intestinal disorders, and growth retardation in adolescents following the keto diet are rare.

Typically, these symptoms begin to appear a few days after switching to a ketogenic diet. Glucose stores in the body are depleted within 2-3 days, and since carbohydrates in the diet are strictly limited,

the body begins to look for another source of food, moving into a state of ketosis. After adapting to ketone metabolism, the symptoms will stop bothering you and in the future you will be able to easily switch from a “carbohydrate” to a “fat” diet and back without the discomfort of the “keto flu”. ^[ten]

Safety of the Keto Diet

Whether the ketogenic diet is safe for long-term adherence remains to be seen. There were no follow-ups for more than one or two years of dieting. The safest time to follow a keto diet is two to six months. It is possible to follow a diet for up to two years, but already under the supervision of a patient by a doctor.

By observing animals on a keto diet in long-term studies, scientists have concluded that non-alcoholic fatty liver disease and insulin resistance can develop in rodents. Other studies have raised the question of the safety of the keto diet for people with a predisposition to heart problems, but there are no clear conclusions. ^[9]

Ketone diet for expectant mothers - is it necessary?

To date, the effect of the keto diet during pregnancy on the development of the child has not been studied. But the popularity of this technique in women of childbearing age requires detailed research. Due to ethics, observations on humans have not been made, so the conclusions are drawn from the study of mice.

We studied embryos of mice whose mothers adhered to the keto diet the day before and during pregnancy. On the 13th embryonic day, the subjects had a fairly large heart, but a smaller brain, cervical spinal cord, hypothalamus, and, in general, larger embryos from the control group. On the 17th day of intrauterine development, the embryos were already smaller, had a smaller heart and thymus, but at the same time an enlarged thalamus, cervical spine, midbrain, and other abnormalities compared to the average future mice. ^[eleven]

Obviously, the ketogenic diet leads to disproportions in the growth of organs in embryos, the effect on different parts of the brain and nervous system is especially noticeable. This can lead to disruption of the functions of internal organs and changes in the behavior of matured individuals.

Principles of Nutrition in the Ketogenic Diet

The ketogenic diet is based on the use of foods high in fat and low in carbohydrates. There is no strict nutrition plan in the diet, it is enough to adhere to the basic principles.

1. Healthy fats play a basic role on the keto diet - they take up to 80% of the total calorie content of the menu. These are good quality natural oils – olive oil, coconut oil, avocado oil, other vegetable oils, nuts and some seeds. Fats provide energy and relieve hunger, fatigue and weakness. Therefore, a key role in recipes belongs to fats.
2. Vegetables are also an important part of the diet. Given the restrictions on the amount of carbohydrates consumed, your choice should be stopped on non-starchy representatives of the cruciferous family - all kinds of cabbage, leafy greens, squash and zucchini, asparagus and cucumbers.
3. Much more moderately should be consumed protein foods with a minimum amount of carbohydrates in the composition. Ideally, this should be grass-fed meat, grass-fed bone broth, free-range poultry and eggs, wild-caught fish, and some high-fat, minimally processed dairy products.

4. Fruits are also included in the keto diet, despite the misconceptions about completely abandoning them. But these are not all types of fruits. It is necessary to choose with a minimum content of net carbohydrates. Portions of fruit should be small so as not to exceed the daily allowance of carbohydrates, and divided into meals so as not to interfere with the maintenance of ketosis.
5. High-carbohydrate fruits, dried fruits, high-sugar drinks (including natural fruit juices), low-fat dairy products, sweets, desserts, any baked goods, cereals and other products with a predominance of carbohydrates in the composition should be completely avoided, even if outside of the ketogenic diet, they are considered "healthy." You will have to give up all sources of "empty calories" - fast foods.

Based on these principles, we propose to compile a detailed list of foods that you can combine to your liking.

FATS

Fats should be included in the diet in large quantities and with every meal throughout the day. Contains no net carbohydrates.

- Monounsaturated and some types of polyunsaturated fats, especially omega-3 fatty acids. Every day it is desirable to use all types of the listed fats.
- Medium chain triglycerides (MCT oils, eng. *medium-chain triglycerides*), cold-pressed coconut oil and other quality "tropical" oils, extra-virgin olive oil, flaxseed and their oil, avocado and macadamia oils.
- Butter and ghee, ghee butter.
- Animal fats - lard, homemade lard, chicken or duck fat.

NON-STARCH VEGETABLES

They contain few carbohydrates, but a lot of fiber, which does not affect the level of glucose and insulin, and does not prevent the maintenance of ketosis.

- Garden and wild leafy greens and herbs - Swiss chard, rhubarb, sorrel, spinach, arugula, chicory, dandelion leaves, fennel, mustard, turnip, numerous types of salads.
- Cabbage - white cabbage, broccoli, cauliflower, Brussels sprouts and others.
- Zucchini, cucumbers, onions, leeks, green onions, celery stalks.
- Fermented foods - sauerkraut, kimchi, fermented dairy products, coconut kefir - will help the intestines.
- Low-carb vegetables and mushrooms - asparagus, bean sprouts, tomatoes, bell peppers, radishes.

PROTEINS

Animal proteins from meat and fish can be consumed to control hunger as needed. It is recommended on a ketogenic diet to give preference to fatty rather than lean pieces. Contains a small amount of carbohydrates.

- Various types of grass-fed meat (so the meat contains more omega-3 fats) and without the use of antibiotics. Beef, veal, goat, lamb, wild meats.
- Offal of the same animals, including the liver.
- Free range poultry - chicken, duck, goose, turkey, pheasant, quail, partridge, etc.
- Eggs and egg yolks.

- Fish - trout, salmon, tuna, sardines, perch, flounder, anchovies, etc.

BEVERAGES

- Clean water first.
- Unsweetened tea, coffee.
- Bone broth. ^[12]

Let's dwell on fruits in more detail, since there is a misconception that the ketogenic diet completely rejects the use of fruits.

fruits on a keto diet

Should I cut out all fruits on a keto diet? It's a common misconception that in order to achieve ketosis, you don't have to eat fruit.

Fruit can and should be incorporated into a low-carb, healthy diet.

Fruits are dominated by carbohydrates and a lot of fiber, which, passing through the human digestive system, comes out undigested. Therefore, fiber does not increase blood glucose levels, unlike carbohydrates. Insulin levels will also remain unchanged, which means that fiber does not affect ketosis and is safe to consume on a keto diet.

Instead of looking at total carbs on your menu, you should look at net carbs. Their amount is defined as the difference between the total amount of carbohydrates and fiber. For example, if the product contains 10 gr. carbohydrates, of which 3 gr. fiber, the difference gives 7 gr. net carbohydrates.

Keto fruits are those that are relatively high in fiber and relatively low in carbs. Add a few low-carb fruits to your ketogenic menu every day. This will supplement the diet with vitamins, minerals and antioxidants that are essential for a balanced diet. At the same time, the diet will not be felt as a strict rejection of all sweets and it will be much easier to endure it.

Top 10 Fruits for the Ketogenic Diet

To understand which fruits are suitable for a keto diet, you need to consider the amount of net carbohydrates in one serving (piece or cup if it is berries).

Here are the top 10 most nutritionally relevant keto fruits.

1. Avocado: 2 gr. net carbs in 1 medium fruit.
2. Lemon: 4 gr. net carbs in 1 medium fruit.
3. Lime: 5 gr. net carbs in 1 large fruit.
4. Blackberries: 6 gr. net carbs in 1 cup.
5. Raspberries: 7 gr. net carbs in 1 cup.
6. Strawberries: 8 gr. gr. net carbs in 1 cup tailless berries.
7. Watermelon: 10.5 gr. net carbs in 1 cup of peeled pulp.
8. Melon Cantaloupe: 11.5 gr. net carbs in 1 cup of peeled pulp.
9. Nectarine: 12.5 gr. net carbs in 1 medium fruit.
10. Peach: 12.5 gr. net carbs in 1 medium fruit.

Of course, you need to understand that even ketogenic-friendly fruits should be consumed in moderation.

For the keto diet to work, you need to maintain a state of ketosis. For this, it is allowed to eat no more than 30-50 grams per day. carbohydrates. But if you eat this amount of carbohydrates in one meal, it threatens to exit the state of ketosis.

Therefore, it is worth sticking to a diet with a predominance of healthy fats, non-starchy vegetables and protein foods, filled with nutrients. And very few carbohydrates to maintain a balance in the diet.

Avocado as a fruit that has more similarities with healthy fats, along with coconut, olive or ghee, is quite useful. It brings many benefits to the cardiovascular system, thanks to the content of omega-3 acids. But other fruits on the list contain more net carbs. They should be eaten less often and in small portions, to satisfy cravings for sweets - as a replacement for more harmful sweets and high-carb snacks.

To lower the glycemic index of such a snack, it is desirable to combine the carbohydrate component with fats or additional fiber.

For example, a dessert of a handful of berries is suitable, combined with good quality heavy whipped cream or unsweetened full-fat yogurt. Or a smoothie with half a cup of berries, non-starchy vegetables, coconut milk, collagen (can be substituted for bone broth), and aromatic herbs.

Fruits to Avoid on a Keto Diet

While many fruits are keto-friendly, not all are. Fruit juices and dried fruits should not be included in the diet. They are a concentrate of both natural sugars from the fruit, and are additionally enriched with glucose syrup or powdered sugar to give a presentation to the treats.

In raw form, there are also fruits that should be categorically excluded from the menu.

1. Grapes: 25.5 gr. net carbs per 1 cup.
2. Banana: 25.5 gr. net carbs per 1 medium fruit.
3. Mango: 22.5 gr. net carbs per 1 medium fruit.
4. Grapefruit: 21 gr. net carbs per 1 medium fruit.
5. Pineapple: 19.5 gr. net carbohydrates per 1 cup of refined pulp.
6. Blueberries: 17 gr. net carbs per 1 cup.
7. Orange: 16.5 gr. net carbs per 1 medium fruit.
8. Pear: 16.5 gr. net carbs per 1 large fruit.
9. Cherry berries: 16.5 gr. net carbs per 1 cup of seedless berries.
10. Plum: 16.5 gr. net carbs per 1 cup of pitted fruit [13].

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Summary: The keto diet is the most restrictive of the low-carbohydrate diets and has been used successfully for weight loss and to relieve the symptoms of epilepsy and other neurological problems. For athletes, a cyclic keto diet provides a "drying" effect. The production of growth hormone is stimulated, the fat goes away, and the muscles become voluminous and embossed. The diet is based on changing the habitual metabolism into a state of ketosis and fat burning. However, this diet has contraindications and is not designed for long-term compliance.