NUTRITION THERAPY INSTITUTE

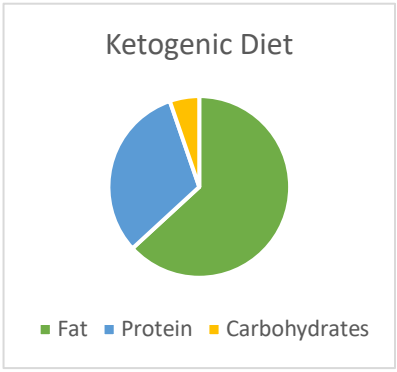
KETO

What is it and why is everyone talking about it?

The ketogenic diet has experienced a revival in recent years in the natural health community. Initially developed in the 1920's as a way to manage epilepsy in children, the ketogenic diet is now being researched and utilized for a variety of other purposes. In particular, it has shown to have a positive impact on conditions such as obesity and weight management, cognitive decline, and cancer.[1] While the term "keto" has become a trending word heard in conversation and read on food labels, what exactly is this specialized diet?

What is "Keto"?

The ketogenic diet is characterized by high fat, moderate protein, and low carbohydrate intake. A detailed macronutrient breakdown of the diet looks like 55-60% fat, 30-35% protein, and only 5-10% carbohydrates[2]. Essentially, it is a diet consisting primarily of fat. This is drastically different than the standard American diet consisting primarily of carbs. The purpose of the ketogenic diet is to put the body in a state of ketosis, which on a broad scale simply means the body runs on fat.



While sufficient fat consumption is key for satiety and optimal nutrient intake, it doesn't guarantee ketosis. So, how is ketosis achieved? It's all about carbohydrate restriction. In fact, following keto is focused more around keeping track of carbs than actual fat consumption. Carbohydrate intake is generally reduced to less than 50g of net carbs per day[2]. However, some practitioners recommend restriction as low as 20g of net carbs, depending on the individual and the diet's intended purpose. Why is carbohydrate restriction necessary? In order to answer this, let's look at how the body generates energy.

Why is carbohydrate restriction necessary?

Adenosine triphosphate (ATP) is the energy carrying molecule that fuels our cells. The body's primary source of ATP, aka energy, comes from glucose metabolism. Where do we get glucose? Carbohydrates! As carbohydrates are broken down in the body, they release a flood of available glucose molecules. These molecules are either used immediately or are stored for future use. Glucose metabolism is the quickest and easiest way for the body to generate energy. All types of cells are able to utilize glucose.

The methodology behind keto is to switch the body's primary energy source from carbohydrates (glucose) to fat. Regardless of fat intake, if glucose is available the body will utilize it first. This is why carbohydrate restriction is so essential for successful adaptation. It ensures depletion of the body's available and stored glucose, thereby forcing the switch. The

body enters into ketosis and becomes reliant on fatty acids and ketones to make ATP[3] rather than glucose.

How do fatty acids and ketones compare to glucose?

Fatty acids are derived from dietary fat, whereas ketones are produced in the liver from stored fat. Similar to glucose, ketones are able to pass through the blood-brain barrier to be used for fuel for the central nervous system, which includes the brain[4]. Fatty acids are unable to do this, which is what makes ketone production so crucial. Ketones are quite impressive. They are able to generate more energy per molecule than glucose, making them an efficient energy source[5]. This means the body is able to function at a higher level for a longer period of time before needing to refuel.

Why then include carbohydrates at all? Red blood cells and the liver need glucose as they are unable to use ketones or fatty acids for energy[2]. Therefore, a certain number of net carbs are required, as set by your practitioner, in order to function optimally. Also, it should be noted that some people have a harder time adapting, or potentially are unable to get into ketosis all together, and therefore require a higher carb intake. This is where bio-individuality comes into play.

Therapeutic Uses

The ketogenic diet has shown to have some powerful therapeutic uses. We'll briefly discuss a few below including epilepsy, metabolic disorders, cognitive decline, traumatic brain injury (TBI), and cancer.

Epilepsy

Ketones have shown to have anti-seizure, neuroprotective, and anti-inflammatory effects[6]. They also supply the brain with greater energy production. These factors, in addition to the limited glucose, have shown to stabilize brain function and reduce seizure activity[7]. Epilepsy was the intended purpose for the development of this diet, and over the years it has shown to be quite effective for this condition in both children and adults.

Metabolic Disorders

Arguably the most popular use of keto currently is for weight loss, particularly among those with obesity and/or prediabetes/type 2 diabetes. While seemingly counterintuitive at first, eat more fat to lose fat, this is precisely how it works. The body depletes fat stores in order to produce ketones. Since ketones are required for brain function during ketosis, your body wants to produce as many as it can. This is good news for combatting those fat cells. Also, the limited carbohydrate consumption ensures that there is no excess glucose in the body that might otherwise be converted to fat tissue for storage. Take a look at the chain reaction spurred by carbohydrate restriction below.

It comes as no surprise then that weight and BMI in obese individuals have been shown to drastically decrease while following a ketogenic diet[8]. Research studies have also shown the ketogenic diet improves insulin sensitivity[9], as well as positively impacts serum triglyceride levels and HDL cholesterol[10]. Helping to regulate insulin, triglyceride levels, and HDL cholesterol all play a role mitigating metabolic disorders. As we continue to see a rise in diagnosed cases among the western world, it is likely the ketogenic diet will also continue to rise in popularity.

Cognitive Decline

In addition to the neuroprotective effects of the ketones themselves, the ketogenic diet has shown to improve brain plasticity[4] and improve cognitive function of the hippocampus and prefrontal cortex. This suggests the benefits of keto for maintaining brain health and protecting against cognitive decline. Keto has also been shown to have a positive impact in regard to Alzheimer's, especially since the use of glucose in the brain is naturally reduced through carbohydrate restriction[11]. This has potentially huge implications for the management of neurodegenerative disorders moving forward. This is a particularly popular area of research in recent years.

Traumatic Brain Injury (TBI)

The same benefits of keto for cognitive decline contribute to its effectiveness for TBIs, especially the reduction of the brain's dependence on glucose. Research has shown that glucose metabolism may be impaired following a TBI, which could impair brain functioning and healing[4]. The use of ketones for energy production instead may result in a quicker recovery. This has become very popular for athletes. Many people I know personally have experienced drastic improvements in brain function while following a ketogenic diet after a TBI incurred during competition.

Cancer

Keto has shown to be highly effective as a supplemental therapy to cancer treatment. The main reason for this is the reduction in blood glucose. Similar to healthy cells, cancer cells require lots of energy. Unlike healthy cells though, most are unable to use ketones. Therefore, these cancer cells need glucose in order to survive and multiply[12,13]. Such severe reduction in carbohydrate consumption starves the cancer cells and leads to cellular death. Pre-clinical studies have also shown the ketogenic diet has anti-tumor effects by helping to suppress tumor growth[13]. This, once again, is due to the limited available glucose.

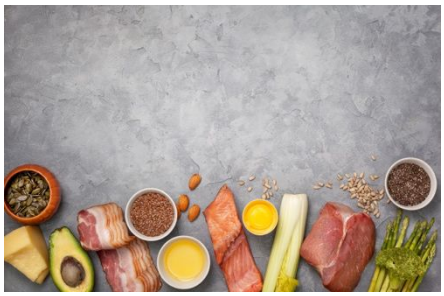
While ketones have powerful effects in their own right, I'm sure you have noticed a common factor in all of these benefits we discussed. Carbohydrate restriction is the key to achieving

ketosis, and it is also what makes the ketogenic diet such a potent supplemental therapy for so many health conditions.

How do I follow keto?

Keto can be rather difficult for people to follow when starting out. While images of breads, pastas, and baked goods flood our mind when we think of carbs, this category also includes vegetables and fruits. Therefore, while keto for some may require an increase in vegetable consumption to replace grains, others may have to drastically decrease vegetable intake. Whichever end of the spectrum you fall on, this poses a big challenge as you may find yourself (like many others) scrambling to figure out what you can eat.

Design your meals around healthy fats and a high-quality protein source. It is crucial to count your net carbs for every meal and snack on a daily basis. Net carb count is simply total carbs minus fiber. If the item has a nutrition label this is easily calculable, but for fresh produce you can look up net carb count online through FoodData Central. Be aware that some labels claim keto-friendly, but this may not be the case. It is important to still check the net carb count to know for sure. While tedious at first, this will get easier with time as you begin to know what and how much of various foods you can eat.



The best foods to incorporate are high-fat and nutrient dense. High fiber, particularly when it comes to vegetables and fruits, is important as well as it brings the net carb count down. Foods to avoid are ones that are high in carbohydrates with minimal fiber content. It is best to remove all refined grains and sugars in general if possible. Starchy vegetables, which are higher in sugar, may be incorporated in limited amounts if the daily net carb count allows. Starchy vegetables include items such as potatoes, yams, and squashes. Below is a general list of foods to include and avoid while on this diet to get you started. Please note that even with the “foods to include” list you still have to be counting net carbs and adjust meals/snacks accordingly.

Foods to Include

- Fatty, cold-water fish (i.e. wild-caught salmon)
- Pasture-raised eggs
- Pasture-raised meats/poultry
- Avocados
- Nuts and nut butters
- Seeds

- Non-starchy, high fiber vegetables
- Grass-fed butter/ghee
- Cold-pressed olive oil
- Cold-pressed coconut oil
- Hard cheeses
- Full-fat grass-fed plain Greek yogurt
- Full-fat grass-fed cottage cheese
- Berries
- Olives
- Dark chocolate

Foods to Avoid

- High starch vegetables
- High sugar fruits
- Grains (including gluten free grains)
- Juices
- Chips and crackers
- Baked goods
- Sweetened yogurt

Keto and Intermittent Fasting

When it comes to following the ketogenic diet, it is also worth mentioning intermittent fasting. Intermittent fasting is the concept of designating a specific eating period during the day and fasting the rest. It doesn't specify what you eat, but rather focuses solely on timing. The 16/8 rule is a common way to start. This means that for 16 hours you are fasting, and you have an 8-hour eating window where you consume all your meals. This is based on a 24-hour period. The effects of intermittent fasting are similar to keto in the sense that during the fasting period, the body uses up its glycogen stores and switches to producing ketones for energy[14]. While both intermittent fasting and keto can be followed separately, many people decide to combine them. During the designated eating window, they choose to adhere to a ketogenic diet. Intermittent fasting can increase the speed of getting into ketosis, as well as increase its efficacy.

How do I know if I'm in ketosis?

The most accurate way to know if you are in ketosis is to your measure blood ketone level using a specialized meter. It measures your ketone level by calculating the amount of beta-hydroxybutyrate (BHB) in your blood, which is one of the main substrates of ketone bodies. Nutritional ketosis is defined as blood ketones ranging from 0.5-3.0 mmol/L. It requires a small finger prick to draw blood[15].

If wanting to avoid a daily finger prick, a urine or breath sample can be taken instead. They monitor BHB levels as well. Early morning or post-dinner urine is deemed most reliable[16] compared to other times of the day. There are ketone testing kits of all varieties available to order online, as well as keto tracking apps. Daily testing is recommended to track progress.

Potential Side Effects (and how to minimize them)

The most common side effect of switching to a ketogenic diet is referred to as the "keto flu." Symptoms include nausea, vomiting, headache, dizziness, fatigue, and constipation. This is only temporary, however, as these symptoms typically resolve on their own within a few days to weeks. It is important to increase fluid and electrolyte consumption in order to minimize and potentially prevent keto flu. If choosing to remain on a ketogenic diet long-term, it's important to schedule regular blood tests to ensure optimal health. While nutritional ketosis is deemed generally safe, some negative long-term effects have been reported such as fat build up in the liver, low protein levels in the blood, kidney stones, and vitamin and mineral deficiencies[2]. Please consult your healthcare practitioner with any questions or concerns you may have.

Wondering what meals might look like on the ketogenic diet? Scroll to the next page to see a sample keto day!

Written by Haley Halteman, MNT

Sample Keto Day

Breakfast

Avocado Breakfast Bowl by Perfect Keto[17]
Net Carbs = 3g

Ingredients

- 1 avocado, halved and the pit removed
- 1 tbsp grass-fed butter
- 3 large free-range eggs
- 3 slices of bacon, cut into small pieces
- Pinch of salt and black pepper

Instructions

1. Scoop out some of each avocado half to make room for the eggs, leaving about ½ inch around the avocado.
2. Place a large saucepan on a low heat and add in the butter. While the butter is melting, crack the eggs into a bowl and beat them, adding a pinch of salt and pepper.
3. Add the bacon to one side of the pan and let them fry for a couple of minutes on their own. Then add the eggs to the other side of the pan and stir regularly as they scramble. The eggs and bacon should both be done 5 minutes after the eggs are added to the pan.
4. Mix the bacon pieces and scrambled eggs together, then spoon into the avocado bowls!

Lunch

Easy Chicken Salad by Perfect Keto[18]
Net Carbs = 0.4g

Ingredients

- 1.5 lb chicken breast
- 3 ribs celery, diced
- 1/2 cup mayo
- 2 tsp brown mustard
- 1/2 tsp pink Himalayan salt
- 2 tbsp fresh dill, chopped
- 1/4 cup chopped pecans

Instructions

1. Preheat oven to 450°F and line baking sheet with parchment paper.
2. Bake chicken breast until cooked throughout, about 15 minutes.

3. Remove chicken from oven and allow to cool. After completely cooled, cut chicken into bite-sized pieces.
4. In a large bowl, add chicken, celery, mayo, brown mustard, and salt. Toss until chicken is fully coated and ingredients are well-combined.
5. Cover bowl with lid or plastic wrap and refrigerate until chilled, about 1-2 hours.
6. When ready to serve, add fresh dill and chopped pecans and lightly toss.

Dinner

Egg Roll in a Bowl by Perfect Paleo[19]
Net Carbs = 3g

Ingredients

- 1 tablespoon coconut oil, butter, or ghee
- 1 small sliced onion
- 2 cloves garlic (finely minced)
- 4 cups cabbage slaw
- 1 teaspoon salt
- 1/4 teaspoon pepper
- 1/2 teaspoon chili paste
- 1/4 cup soy sauce or coconut aminos
- 4 cooked chicken breasts (shredded)
- 1/2 tablespoon sesame seeds
- 1/4 cup green onion

Instructions

1. Heat a large wok or pan under medium heat. Add coconut oil, onions, and garlic. Cook for 2-3 minutes.
2. Add cabbage slaw, cooked chicken, salt, pepper, chili paste, and soy sauce. Sauté and cook for 5-6 minutes until veggies are softened.
3. Season as desired. Top with sesame seeds and chopped green onion.

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