



A complete guide to the
ketogenic diet

A comprehensive resource for patients



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What is the ketogenic diet?

The ketogenic diet (KD), also known as the keto diet, is a high-fat, very low-carbohydrate, moderate-protein diet. The KD plan is simple: its purpose is to shift your body to a fat-burning metabolic state known as **ketosis**. The metabolic state in which the body relies on ketone bodies (derived from fatty acids) for energy as a result of glucose depletion is known as “nutritional ketosis”.

The KD was first developed in 1921 to treat epilepsy, and research has since demonstrated the benefits of the ketogenic diet for a number of health conditions, particularly in addressing pediatric epilepsy and metabolic conditions such as obesity.

How the keto diet works

Under normal conditions, glucose from carbohydrates is the primary source of fuel for the body. However, when carbohydrates are severely restricted from the diet and glucose stores are depleted, the body will metabolize and utilize fats as an alternative source of fuel.

When dietary intake of carbohydrates is limited, the body will first use available glycogen stores. Glycogen is the storage form of glucose found primarily in the liver and skeletal muscle. The body is able to store up to 600 grams of glycogen, representing approximately 2,000 to 2,400 calories of stored energy. However, this number may vary based on individual differences including diet, body mass, and activity level.

Once glycogen stores have been depleted, the body will undergo gluconeogenesis in which glucose is produced endogenously (in the body) from substrates such as lactic acid, glycerol, and certain amino acids. Finally, when endogenous glucose production is insufficient, the body will shift into ketosis and fat will replace carbohydrates as the primary macronutrient used in energy production. This shift will occur after approximately four days of consuming a reduced carbohydrate diet of up to 20 to 50 grams per day in a 2,000 calorie per day diet.

During the biochemical process of **ketogenesis**, the body metabolizes stored fats into fatty acids, which are then metabolized to ketone bodies. The most common ketone bodies, beta-hydroxybutyrate and acetone, are

formed primarily in the liver. A series of reactions convert ketone bodies to acetyl-CoA, which then enters the Krebs cycle, a metabolic process that releases energy, and is converted to the high-energy molecule adenosine triphosphate (ATP). ATP, known as the “universal energy currency”, provides energy to the body and drives biological processes.

Ketone bodies, used in various parts of the body including the heart, brain, kidneys, and muscle tissue, are able to produce more ATP than glucose, making them an efficient energy substrate. Additionally, ketones may enhance anti-oxidant capacity, reducing cellular damage from free radicals.

Signs of ketosis may include:

- Reduced hunger
- “Fruity breath” that occurs as a result of acetone, a byproduct of ketone metabolism, being eliminated through respiration
- Elevated ketone bodies measured in urine
- Weight loss



Who would benefit from the keto diet?

The KD may benefit individuals with certain conditions, including:

- Alzheimer's disease
- Amyotrophic lateral sclerosis (ALS)
- Autism
- Brain trauma
- Cancer
- Depression
- Epilepsy
- Migraines
- Obesity
- Parkinson's disease

Precautions

Studies have demonstrated the beneficial effects and safety of a short-term ketogenic diet for up to six to twelve months with a gradual transition back to a standard diet.

When switching to a ketogenic diet, you may experience short-term side effects such as nausea, headaches, fatigue, and dizziness, referred to as the "keto flu". This is because your body shifts from burning glucose to fatty acids. Although the keto flu is commonly experienced within the first few weeks of the diet, staying hydrated and consuming electrolytes throughout the day can help counteract some of these side effects over the long term. Season your food with sea salt or pink Himalayan salt, and sip on bone broth which is high in electrolytes. You can also consider speaking with your integrative healthcare practitioner about supplementing with electrolytes, which should contain a balance of magnesium, sodium, potassium, chloride, and calcium.

Long-term adverse effects of the ketogenic diet include hepatic steatosis (fatty liver),

hypoproteinemia (low blood protein levels), and kidney stones. Due to the diet's possible effects on the kidneys, it is essential to monitor renal function when you are on the plan.

In some cases, monitoring bone density may also be recommended as progressive reduction in bone mineral content has been observed in children with epilepsy on a long-term ketogenic diet.

In addition, contraindications exist for a number of health conditions including liver failure, pancreatitis, fat metabolism disorders, and porphyrias, as well as primary carnitine deficiency, carnitine palmitoyltransferase deficiency, carnitine translocase deficiency, and pyruvate kinase deficiency. Furthermore, individuals with diabetes who are considering following a ketogenic diet should consult a healthcare practitioner; if insulin or other hypoglycemic medications have not been modified to account for carbohydrate restriction, severe hypoglycemia may occur.

Following a ketogenic diet



The daily breakdown of calories from macronutrients should be approximately:

- 70-75% from anti-inflammatory fat
- 20-25% from good quality protein
- 5-10% from low-glycemic, nutrient-dense carbohydrates

On a 2,000 calorie per day diet, the carbohydrates consumed should be approximately 20 to 50 grams per day. Many individuals find using a dietary tracking app helps them stay adherent with the KD. See "Macronutrient tracking apps for the keto diet" found in the resources section for examples.

✂ Cut me out and stick me on the fridge!



Keto food list

The following list outlines foods to enjoy, moderate, and avoid on the KD. Note that the macronutrient content of foods may vary depending on the manufacturer or brand. It's important to check the ingredient list for any sweeteners or starches, as well as the nutrition facts label to view the amount of carbohydrates, fats, and proteins contained in a standard serving of the food.



Enjoy



Vegetables

- Asparagus
- Bell peppers
- Bok choy
- Broccoli
- Brussels sprouts
- Cabbage
- Cauliflower
- Celery
- Cucumbers
- Eggplant
- Garlic
- Green beans
- Leafy greens (e.g., collard greens, kale, lettuce, spinach, Swiss chard, turnip greens)
- Mushrooms
- Radishes
- Sea vegetables (e.g., dulse, kelp, nori)
- Zucchini

Fruits

- Avocado
- Coconut
- Lemons
- Limes
- Olives
- Rhubarb
- Tomatoes

Nuts & seeds

Raw or dry roasted nuts and seeds, or unsweetened nut and seed butters, such as:

- Almonds
- Brazil nuts
- Cashews
- Chia seeds
- Flax seeds
- Hazelnuts
- Hemp seeds
- Macadamia nuts
- Pecans
- Sesame seeds
- Sunflower seeds
- Walnuts
- Unsweetened nut and seed butters

Dairy

High-fat dairy products, such as:

- Cheese (e.g., brie, camembert, cheddar, goat, gouda, havarti, mozzarella, parmesan, provolone, Swiss)
- Ghee (clarified butter)
- Heavy cream
- Butter

Proteins

- Bacon
- Beef
- Chicken
- Eggs
- Fish (e.g., anchovies, cod, halibut, haddock, mackerel, salmon, sardines, trout, tuna)
- Lamb
- Pork
- Sausages (unsweetened, gluten-free)
- Seafood (e.g., crab, lobster, mussels, oysters, shrimp)
- Turkey

Oils & fats

- Avocado oil
- Chicken fat
- Coconut oil
- Duck fat
- Extra-virgin olive oil
- Lard

Condiments & other

- Bouillon or stock cubes
- Cacao or cocoa powder
- Certain vinegars (e.g., apple cider vinegar, red wine vinegar)
- Extracts (e.g., almond, vanilla)
- Herbs and spices
- Tamari (gluten-free soy sauce)
- Unsweetened homemade or store-bought condiments and sauces, such as:**
 - Hot sauce
 - Ketchup
 - Mayonnaise
 - Mustard
 - Pesto
 - Ranch dip
 - Relish
 - Salsa

Beverages

Unsweetened beverages, such as:

- Bone broth
- Coffee (unsweetened, black or with cream)
- Filtered water
- Herbal tea
- Iced tea
- Nut and/or seed milks
- Sparkling water
- Tea

Moderate

Vegetables

- Artichokes
- Beets
- Carrots
- Leeks
- Onions
- Sweet peas

Fruits

- Blackberries
- Blueberries
- Raspberries
- Star-fruit
- Strawberries

Beans & legumes

- Edamame beans
- Peanut butter (natural, unsweetened)
- Peanuts (dry roasted)

Dairy

Unsweetened, full-fat dairy products, such as:

- Cottage cheese
- Cream cheese
- Greek yogurt
- Ricotta
- Sour cream
- Whole milk

Proteins

- Deli meats (e.g., bologna, corned beef, ham, pancetta, prosciutto)

Condiments & other

- Dark chocolate (80% or higher)

Beverages

- Coconut milk (unsweetened)
- Dry wine
- Spirits (e.g., gin, rum, tequila, vodka, whiskey)

Sweeteners

- Monk fruit (luo han guo)
- Stevia
- Sugar alcohols (e.g., erythritol, xylitol)



Avoid

Vegetables

- Jerusalem artichokes
- Parsnips
- Potatoes
- Sweet potatoes

Fruits

- Dried fruit (e.g., apricots, cranberries, dates, figs, raisins)
- All other fruit

Grains

- Amaranth
 - Barley
 - Buckwheat
 - Corn
 - Millet
 - Oats
 - Quinoa
 - Rice
 - Rye
 - Spelt
 - Teff
 - Wheat
- Foods made from flour, such as:**
- Baked goods
 - Bagels
 - Bread
 - Breeding
 - Cereals
 - Crackers
 - Granola bars
 - Pancakes
 - Pasta
 - Tortillas
 - Waffles

Beans & legumes

- Beans (e.g., adzuki beans, black beans, kidney beans, navy beans, white beans)
- Chickpeas
- Lentils
- Peas

Dairy

Sweetened and low-fat dairy products, such as:

- Condensed milk
- Skim milk
- Yogurt

Oils & fats

Industrial seed and vegetable oils, such as:

- Canola oil
- Corn oil
- Peanut oil
- Safflower oil
- Soybean oil

Condiments & Other

High-glycemic condiments, such as:

- Chutney
- Honey mustard
- Honey garlic sauce
- Hummus
- Jam, jelly
- Ketchup
- Relish
- Salad dressings

Beverages

- Beer
- Chocolate milk
- Iced coffee (flavored and/or sweetened)
- Energy drinks
- Fruit juices
- Fruit smoothies
- Hot chocolate
- Lattes (flavored and/or sweetened)
- Milkshakes
- Soda

Sweeteners

- Agave nectar
- Corn syrup
- Honey
- Maple syrup

All sugar, such as:

- Beet sugar
- Brown sugar
- Cane sugar
- Coconut sugar
- Confectioner's sugar
- Turbinado sugar
- White sugar



Artificial sweeteners, such as:

- Acesulfame potassium (e.g., Sweet One)
- Aspartame (e.g., Equal, NutraSweet)
- Saccharin (e.g., Sweet'N Low, SugarTwin)
- Sucralose (e.g., Splenda)



Tips & resources for success

Helpful tips

Avoid keto “junk foods”

Minimize processed and unhealthy keto foods, including diet sodas, damaged or trans-fatty acids (e.g., vegetable shortening, margarine, fried foods), and excessively processed animal products (e.g., hot dogs, canned meat, processed cheese).

Quality over quantity

When choosing meat and other animal-derived products, quality is key. Meat and animal products from organic or well-raised animals are higher in omega-3 fatty acids than their conventional counterparts. The antibiotic use in conventionally-raised animals is also significantly minimized in organically-raised animals. Opt for organic, grass-fed, or pasture-raised animal meats and dairy; pasture-raised, omega-3 enriched, or free-range eggs; and wild-caught and sustainable sources of fish and seafood.

Dining out on keto

Many restaurant dishes can be modified to comply with the KD. Review the restaurant's menu online or call to notify them of your dietary restrictions beforehand. Ask the server to omit the bread or rolls that are brought to the table. Request a salad or an extra serving of vegetables to replace any carbohydrate sides (e.g., pasta, rice). Ask to omit or replace any sauce in the dish that is sweetened or contains flour or starch (e.g., gravy, cream sauces). Alcoholic beverages may also contain carbohydrates, so stick with water, dry wine or spirits with soda water.

Plant slant

With proper planning and education, it's possible to follow a plant-based ketogenic diet. While you don't need to strictly cut out all animal products, it's best to incorporate plant-based foods such as nuts, seeds, leafy greens, coconut, and avocado. These foods provide vitamins, minerals, antioxidant and anti-inflammatory polyphenols, and a variety of fiber, which helps to maintain digestive regularity and support healthy gut microbiota.

Planning is key

Meal planning, shopping, and preparation will ensure that you always have food available that complies with the KD. Save time and make the most of your meals by cooking extra servings and reusing leftovers. Meals such as soups, stews, and casseroles can be made in batches ahead of time and frozen or refrigerated for quick, convenient dishes. Ensure you always have a snack on hand in your car, purse, or bag to eat if you get hungry on the go.

Always read food labels

Be sure to read the nutrition facts and ingredient labels on any packaged foods. Check the amount of carbohydrates per serving, keeping in mind whether the serving size on the label matches the serving size you would typically consume. The Nutrition Facts label found on the next page can help you identify potential sources of carbohydrates. Be sure to follow this simple rule: “When in doubt, leave it out!”

Understanding carbohydrate content in foods

The sample Nutrition Facts label below demonstrates where you can see the amount carbohydrates per serving on a food label.

Nutrition Facts	
8 servings per container	
Servings size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	13%
Dietary Fiber 4g	14%
Total Sugars 12g	
Includes 10g Added Sugars	20%
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a healthy diet. 2,000 calories a day is used for general nutrition advice.

Compare the serving size on the label to the serving size you typically consume. If you consume a larger portion, the amount of carbohydrates will also be higher.

This is the amount of carbohydrates per serving to use when calculating your daily carbohydrate intake.



Frequently asked questions

How long does it take to achieve ketosis?

The transition time to nutritional ketosis will depend on many factors, including individual glycogen levels (stored glucose), activity level, age, extent of carbohydrate restriction, and your overall diet. While many individuals will enter ketosis after approximately four days of following a ketogenic diet, some individuals may take longer.

Do I need to track calories?

The KD does not restrict calories consumed per day. However, to maintain ketosis, it's essential to limit carbohydrates to approximately 20 to 50 grams per day, which can be monitored using a tracking app. For a list of macronutrient tracking apps, see "Macronutrient tracking apps for the keto diet" found in the appendix section.

Can I ever eat sweets or desserts?

The best keto-friendly choices for a sweet tooth include a couple of squares of high-quality dark chocolate (80% or higher), berries with whipped heavy cream, and homemade desserts made with zero-calorie sweeteners such as monk fruit, stevia, and erythritol. You can include these options in moderation and within your daily carbohydrate limit. Many adherents find that their cravings for sugar and carbohydrates decrease on the KD, making it easier to skip desserts.

How long should I follow the diet for?

Studies have demonstrated the beneficial effects and safety of a short-term ketogenic diet for up to six to twelve months. How long you follow the diet will be up to your individual health goals and health status. Work with your integrative healthcare practitioner to determine what is best for your wellness plan.

What are exogenous ketones?

Exogenous ketones are ketones that come from dietary supplements, such as beta-hydroxybutyrate (BHB) or acetoacetate. Supplementing with exogenous ketones may increase ketone levels in the blood and be used to complement the KD. However, consuming these supplements outside of the context of a low-carbohydrate diet is unlikely to shift your metabolism to a fat-burning ketogenic state.

Is alcohol keto-friendly?

Some alcoholic beverages are high in carbohydrates and should be restricted on the keto diet, including most beer, dessert wines, coolers, and cocktails made with juice, syrups, and soda. Pure spirits, such as tequila, rye, whiskey, vodka, and gin, contain zero carbohydrates and can be mixed with water or soda water and a splash of lemon or lime juice. You may also choose to consume dry white, red, or sparkling wine in moderation.

What's the difference between ketosis and ketoacidosis?

Nutritional ketosis is sometimes confused with ketoacidosis, a serious complication of diabetes in which individuals have high blood glucose and ketone levels as a result of inadequate insulin production. In comparison, nutritional ketosis, induced by severely restricting carbohydrate intake, does not cause high blood glucose levels or changes in blood pH.

Can I follow a keto diet while vegetarian or vegan?

Individuals who follow a more inclusive vegetarian eating style, such as lacto-ovo vegetarian, may be able to implement the KD successfully. Individuals who eat a strict vegan diet, which restricts all animal products, should be cautious when implementing a KD. For sources of amino acids, which are the building blocks of protein, the vegan diet relies heavily on grains, beans, and legumes, foods which are also high in carbohydrates and are restricted on the KD. Special attention and planning should be given to ensure that nutrient needs are met in vegan individuals following the KD. Supplementation may be required to meet nutritional needs.

What's the difference between ketogenic, low-carbohydrate, and paleo diets?

A low-carbohydrate diet commonly consists of consuming between 20 to 70 grams of carbohydrates per day, without specific intake requirements for protein or fat. A keto diet is one type of very low-carbohydrate diet, permitting only 20 to 50 grams of carbohydrates per day while encouraging fat intake. On the other hand, the paleo diet consists of consuming only food that our prehistoric ancestors would have eaten during the Paleolithic era, such as lean meats, fish, nuts, vegetables, and fruit. A typical paleo diet does not restrict carbohydrates, and may in fact be high-carbohydrate depending on the amount of starchy vegetables, fruit, and permitted sweeteners (e.g., honey, maple syrup) consumed.

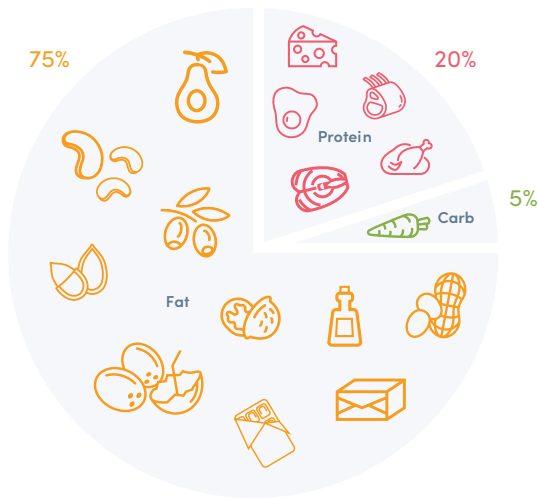


Comparing the ketogenic, low-carbohydrate & paleo diets

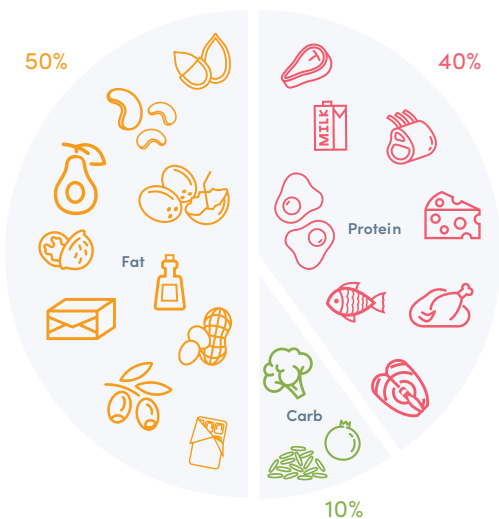


The approximate breakdown of calories from macronutrients for each diet is represented below.

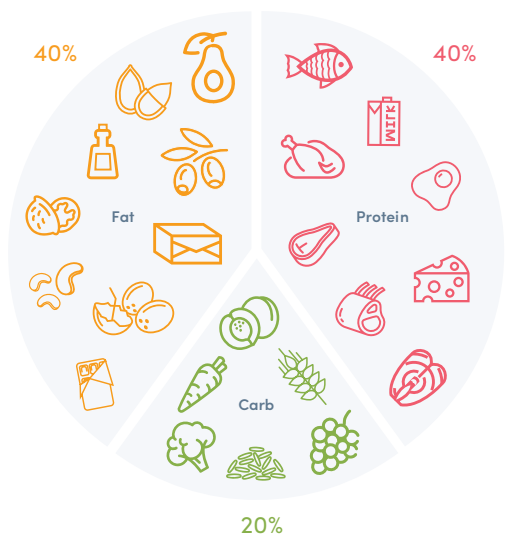
Ketogenic meal



Low-carb meal



Paleo meal





Appendix:

Keto diet resources

Grocery shopping list



The following list includes foods that should be favored on the keto diet. This list can be printed and used as a resource when shopping.

Vegetables

- Asparagus
- Bell peppers
- Bok choy
- Broccoli
- Brussels sprouts
- Cabbage
- Cauliflower
- Celery
- Collard greens
- Cucumbers
- Dulse
- Eggplant
- Garlic
- Green beans
- Kale
- Kelp
- Lettuce
- Mushrooms
- Nori
- Onions
- Radishes
- Spinach
- Swiss chard
- Turnip greens
- Zucchini

Dairy

- Brie cheese
- Butter
- Camembert cheese
- Cheddar cheese
- Ghee (clarified butter)
- Goat cheese
- Gouda cheese
- Havarti cheese
- Heavy cream
- Mozzarella cheese
- Parmesan cheese
- Provolone cheese
- Swiss cheese

Meat, fish & shellfish

- Anchovies
- Bacon
- Beef
- Chicken
- Cod
- Crab
- Eggs
- Halibut
- Haddock
- Lamb
- Lobster
- Mackerel
- Mussels
- Oysters
- Pork
- Salmon
- Sardines
- Sausages (unsweetened, gluten-free)
- Shrimp
- Trout
- Tuna
- Turkey

Low-glycemic fruits

- Avocado
- Berries (in moderation)
- Coconut
- Lemons
- Limes
- Olives
- Rhubarb
- Tomatoes

Oils & fats

- Avocado oil
- Chicken fat
- Coconut oil
- Duck fat
- Extra-virgin olive oil
- Lard

Nuts & seeds

- Almonds
- Brazil nuts
- Cashews
- Chia seeds
- Flax seeds
- Hazelnuts
- Hemp seeds
- Macadamia nuts
- Pecans
- Sesame seeds
- Sunflower seeds
- Walnuts
- Nut or seed butters (natural, unsweetened)

Herbs & spices

(fresh or dried, check the label for added sugars)

- Allspice
- Anise
- Basil
- Bay leaves
- Black pepper (freshly ground)
- Cayenne pepper
- Chili powder
- Cloves
- Cilantro (coriander)
- Cumin
- Cinnamon
- Dill
- Fennel
- Fenugreek
- Ginger
- Lemon balm
- Marjoram
- Nutmeg
- Oregano
- Parsley
- Pepper
- Rosemary
- Saffron
- Sage
- Salt (sea salt or pink Himalayan salt is best)
- Savory
- Tarragon

Other

- Apple cider vinegar
- Bouillon or stock cubes
- Cacao or cocoa powder
- Dark chocolate (80% or higher)
- Extracts (e.g., almond, vanilla)
- Red wine vinegar
- Tamari (gluten-free soy sauce)
- White wine vinegar

Beverages

- Bone broth
- Coffee
- Herbal tea (unsweetened)
- Nut or seed milks (unsweetened)
- Sparkling water
- Tea

Sweeteners

- Erythritol
- Monk fruit (luo han guo)
- Stevia
- Xylitol



Notes

Hidden sugars

Did you know that there are over 60 different names for sugar? Typically, you will be able to recognize if an ingredient is present in a food by referring to the ingredient label. However, certain dietary ingredients may be listed under a different name or may be derived from a certain food, making them difficult to recognize. You can find hidden sugars by checking the food's ingredient list for the names listed below.

- Agave nectar
- Barbados sugar
- Barley malt
- Barley malt syrup
- Beet sugar
- Brown sugar
- Buttered syrup
- Cane juice
- Cane juice crystals
- Cane sugar
- Caramel
- Carob syrup
- Castor sugar
- Confectioner's sugar
- Corn sweetener
- Corn syrup
- Corn syrup solids
- Date sugar
- Dehydrated cane juice
- Demerara sugar
- Dextrin
- Dextrose
- Evaporated cane juice
- Fructose
- Fruit juice
- Fruit juice concentrate
- Glucose
- Golden sugar
- Golden syrup
- Granulated sugar
- Grape sugar
- High-fructose corn syrup (HFCS)
- Icing sugar
- Invert sugar
- Malt syrup
- Maltodextrin
- Maltol
- Maltose
- Mannose
- Molasses
- Muscovado
- Panocha
- Powdered sugar
- Raw sugar
- Refiner's syrup
- Rice syrup
- Saccharose
- Sorghum syrup
- Sucrose
- Sweet sorghum
- Syrup
- Treacle
- Turbinado sugar
- Yellow sugar



Macronutrient tracking apps for the keto diet

An online macronutrient tracking app can be a useful tool for tracking daily macronutrient intake on the KD. Examples of available apps include:

- **Carb Manager: Keto Diet App** (web, App Store, Google Play)
- **Daily Carb** (App Store)
- **Keto.app** (App Store, Google Play)
- **KetoDiet** (App Store, Google Play)
- **My Keto Low Carb Tracker** (App Store, Google Play)
- **MyFitnessPal** (App Store, Google Play)



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