



# **Low-Carb High-Fat Diet**

## *An Overview of the Research*



Leif Oxenmyr



## **Low Carb High Fat Diet**

Low-carbohydrate diets restrict carbohydrate consumption relative to the average diet. Foods high in carbohydrates (e.g., sugar, bread, pasta) are limited and replaced with foods containing a higher percentage of fat and protein (e.g., meat, poultry, fish, shellfish, eggs, cheese, nuts, and seeds), as well as low carbohydrate foods (e.g., spinach, kale, chard, collards, and other fibrous vegetables).

There is a lack of standardization of how much carbohydrate low-carbohydrate diets must have, which has detailed research. From the American Academy of Family Physicians, one definition specifies low-carbohydrate diets as having less than 20% carbohydrate content.

There is no good evidence that low-carbohydrate dieting confers any particular health benefits apart from weight loss. Low-carbohydrate diets achieve outcomes similar to other diets, as weight loss is mainly determined by calorie restriction and adherence.

An extreme form of low-carbohydrate diet – the ketogenic diet – was first established as a medical diet for treating epilepsy. Through celebrity endorsement, it has become a popular weight-loss fad diet. Still, there is no evidence of any distinctive benefit for this purpose, and it carries a risk of adverse effects. The British Dietetic Association named it one of the "top 5 worst celeb diets to avoid in 2018".

## **Macronutrient ratios**

The macronutrient ratios of low-carbohydrate diets are not standardized. As of 2018, the conflicting definitions of "low-carbohydrate" diets have detailed research into the subject.

The American Academy of Family Physicians defines low-carbohydrate diets as diets that restrict carbohydrate intake to 20 to 60 grams (g) per day, typically less than 20% of caloric intake. A 2016 review of low-carbohydrate diets classified diets with 50g of carbohydrate per day (less than 10% of total calories) as "deficient" and diets with 40% of calories from carbohydrates as "mild" low-carbohydrate diets. The UK National Health Service



recommends that "carbohydrates should be the body's main source of energy in a healthy, balanced diet."

### **Foodstuffs**

There is evidence that the quality, rather than the quantity of carbohydrates in a diet, is essential for health. High-fiber slow-digesting carbohydrate-rich foods are healthful while highly refined and sugary foods are less so. People choosing a diet for health conditions should have their diet tailored to their requirements. For people with metabolic diseases, a diet with approximately 40-50% carbohydrate is recommended.

Most vegetables are low- or moderate-carbohydrate foods (in some low-carbohydrate diets, fiber is excluded because it is not nutritive). Some vegetables, such as potatoes, carrots, maize (corn), and rice, are high in starch. Most low-carbohydrate diet plans accommodate vegetables such as broccoli, spinach, kale, lettuce, cucumbers, cauliflower, peppers, and most green leafy vegetables.

### **Adoption**

The National Academy of Medicine recommends a daily average of 130 g of carbohydrates per day. The FAO and WHO similarly recommend that the majority of dietary energy comes from carbohydrates. Low-carbohydrate diets are not recommended in the 2015–2020 edition of Dietary Guidelines for Americans, which instead recommends a low-fat diet.

Low-carbohydrate diet proponents emphasize research saying that low-carbohydrate diets can initially cause slightly more significant weight loss than a balanced diet, but any such advantage does not persist. The successful long-term weight maintenance is determined by calorie intake and not by macronutrient ratios.



The public has become confused by how some diets, such as the Zone diet and the South Beach diet, are promoted as "low-carbohydrate" when they would more appropriately be termed "medium-carbohydrate" diets.

### **Carbohydrate-insulin hypothesis**

Low-carbohydrate diet advocates, including Gary Taubes and David Ludwig, have proposed a "carbohydrate-insulin hypothesis" in which carbohydrates are said to be uniquely fattening because they raise insulin levels and cause fat to accumulate unduly. The hypothesis appears to run counter to general human biology, whereby there is no good evidence of any such association between the actions of insulin, fat accumulation, and obesity. The hypothesis predicted that low-carbohydrate dieting would offer a "metabolic advantage" of increased energy expenditure equivalent to 400-600 kcal(kilocalorie)/day, in accord with the promise of the Atkin's diet: a "high-calorie way to stay thin forever."

With funding from the Laura and John Arnold Foundation, in 2012, Taubes co-founded the Nutrition Science Initiative (NuSI) to raise over \$200 million to undertake a "Manhattan Project For Nutrition" and validate the hypothesis. Results published in the American Journal of Clinical Nutrition did not provide convincing evidence of any advantage to a low-carbohydrate diet compared to other diets. In 2017 Kevin Hall, an NIH (National Institutes of Health) researcher hired to assist with the project, wrote that the carbohydrate-insulin hypothesis had been falsified by experiment. Hall wrote, "the rise in obesity prevalence may be primarily due to increased consumption of refined carbohydrates, but the mechanisms are likely to be quite different from those proposed by the carbohydrate-insulin model."



## Health Aspects

### Adherence

It has been repeatedly found that in the long-term, all diets with the same calorific value perform the same for weight loss, except for the one differentiating factor of how well people can faithfully follow the dietary program. A study comparing groups taking low-fat, low-carbohydrate, and Mediterranean diets found at six months, the low-carbohydrate diet still had most people adhering to it. Nevertheless, after that, the situation reversed: at two years, the low-carbohydrate group had the highest incidence of lapses and dropouts. The finds may be due to the comparatively limited food choice of low-carbohydrate diets.

### Bodyweight

In the short and medium-term, people taking a low-carbohydrate diet can experience more weight loss than people taking a low-fat diet. Such people have very slightly more weight loss initially, equivalent to approximately 100kcal/day, but that the advantage diminishes over time and is ultimately insignificant. The Endocrine Society stated that "when calorie intake is held constant [...] body-fat accumulation does not appear to be affected by even very pronounced changes in the amount of fat vs. carbohydrate in the diet."

Much of the research comparing low-fat vs. low-carbohydrate dieting has been of low quality. Studies that reported large effects had garnered disproportionate attention compared to those that are methodologically sound. A 2018 review said, "higher-quality meta-analyses reported little or no difference in weight loss between the two diets." Low-quality meta-analyses have tended to report favorably on the effect of low-carbohydrate diets: a systematic review noted that 8 out of 10 meta-analyses assessed whether weight loss outcomes could have been affected by publication bias, and 7 of them concluded positively. A 2017 review concluded that a variety of diets, including low-carbohydrate diets,



achieve similar weight loss outcomes, which are mainly determined by calorie restriction and adherence rather than the type of diet.

### **Cardiovascular health**

Low-carbohydrate dieting tends to raise LDL cholesterol levels, but it is unclear how this might affect cardiovascular health. Potential favorable changes in triglyceride and HDL cholesterol values should be weighed against possible unfavorable LDL changes and total cholesterol values.

Some randomized control trials have shown that low-carbohydrate diets, especially very low-carbohydrate diets, perform better than low-fat diets in improving cardiometabolic risk factors in the long term. Studies suggest that low-carbohydrate diets are a viable option alongside low-fat diets for people at risk of cardiovascular disease.

There is only poor-quality evidence of different diets' effect on reducing or preventing high blood pressure. Still, it suggests the low-carbohydrate diet is among the better-performing ones, while the DASH diet (Dietary Approaches to Stop Hypertension) performs best.

### **Diabetes**

There is limited evidence for the effectiveness of low-carbohydrate diets for people with type 1 diabetes. It may be feasible for specific individuals to follow a low-carbohydrate regime combined with carefully managed insulin dosing. This can be hard to maintain, and there are concerns about the diet's potential adverse health effects. In general, people with type 1 diabetes are advised to follow an individualized eating plan.

The proportion of carbohydrates in a diet is not linked to the risk of type 2 diabetes. However, some evidence shows that diets containing certain high-carbohydrate items – such as sugar-sweetened drinks or white rice – are associated with an increased risk. Some



evidence indicates that consuming fewer carbohydrate foods may reduce biomarkers of type 2 diabetes.

In a consensus report on nutrition therapy for adults with diabetes, the American Diabetes Association (ADA) states, "Reducing overall carbohydrate intake for individuals with diabetes has demonstrated the most evidence for improving glycemia (blood sugar) and may be applied in a variety of eating patterns that meet individual needs and preferences."

The report also states that reducing overall carbohydrate intake with low- or very low-carbohydrate eating plans is a viable approach. While other sources say that there is no good evidence that low-carbohydrate diets are better than a conventional healthy diet in which carbohydrates typically account for more than 40% of calories consumed. Low-carbohydrate dieting does not affect the kidney function of people who have type 2 diabetes.

Limiting carbohydrate consumption generally results in improved glucose control, although without long-term weight loss. Low-carbohydrate diets can be useful to help people with type 2 diabetes lose weight, but "no single approach has been proven to be consistently superior." According to the ADA, people with diabetes should be "developing healthy eating patterns rather than focusing on individual macronutrients, micronutrients, or single foods." They recommended that the carbohydrates in a diet come from "vegetables, legumes, fruits, dairy (milk and yogurt), and whole grains," while highly refined foods and sugary drinks should be avoided. The ADA also wrote that "reducing overall carbohydrate intake for individuals with diabetes has demonstrated the most evidence for improving glycemia and may be applied in a variety of eating patterns that meet individual needs and preferences." For individuals with type 2 diabetes who can't meet the glycemic targets or where reducing anti-glycemic medications is a priority, the ADA says that low or very-low-carbohydrate diets are a viable approach.



## **Exercise and fatigue**

A low-carbohydrate diet has been found to reduce endurance capacity for intense exercise efforts. Depleted muscle glycogen following such steps is only slowly replenished if a low-carbohydrate diet is taken. Inadequate carbohydrate intake during athletic training causes metabolic acidosis, which may be responsible for impaired performance, which has been observed.

## **Ketogenic diet**

The ketogenic diet is a high-fat, low-carbohydrate diet used to treat drug-resistant childhood epilepsy. In the 2010s, it became a fad diet for people wanting to lose weight. According to dietitian Keri Gans, the "keto diet" was, disappointingly, the most popularly searched for diet on Google in 2018. Users of the ketogenic diet may not achieve sustainable weight loss, as this requires strict carbohydrate abstinence, and maintaining the diet is difficult. Side effects may include constipation, high cholesterol, growth slowing, acidosis, and kidney stones.

It has been hypothesized that some people have an atypical metabolism and would benefit metabolically from taking a ketogenic diet. Still, as of 2020, there had been no long-term research into this.

## **Safety**

High and low-carbohydrate diets that are rich in animal-derived proteins and fats may be associated with increased mortality. On the contrary, with plant-derived proteins and fats, there may be a decrease in mortality.

As of 2018, research has paid insufficient attention to the potential adverse effects of restricted carbohydrate dieting, particularly for micronutrient sufficiency, bone health, and





cancer risk. One low-quality meta-analysis reported that adverse effects could include "constipation, headache, halitosis, muscle cramps and general weakness."

Ketosis induced by a low-carbohydrate diet has led to reported cases of ketoacidosis, a life-threatening condition. This has led to the suggestion that ketoacidosis should be considered a potential hazard of low-carbohydrate dieting. They are significantly restricting the proportion of carbohydrates in diet risks causing malnutrition and can make it challenging to get enough dietary fiber to stay healthy.

As of 2014, it appeared that concerning the risk of death for people with cardiovascular disease, the kind of carbohydrates consumed is essential; diets relatively higher in fiber and whole grains lead to a reduced risk of death from cardiovascular disease compared to diets high in refined grains.

## **History**

### **First descriptions**

In 1797, John Rollo reported treating two diabetic Army officers with a low-carbohydrate diet and medications. A very low-carbohydrate, ketogenic diet was the standard treatment for diabetes throughout the nineteenth century.

In 1863, William Banting, a formerly obese English undertaker and coffin maker, published "Letter on Corpulence Addressed to the Public," described a diet for weight control giving up bread, butter, milk, sugar, beer, and potatoes. His booklet was widely read, so much so that some people used the term "Banting" for the activity now called "dieting."

In the early 1900s, Frederick Madison Allen developed a highly restrictive short-term regime described by Walter R. Steiner at the 1916 annual convention of the Connecticut State Medical Society as The Starvation Treatment of Diabetes Mellitus. This diet was often administered in a hospital to ensure compliance and safety better.



## **Modern low-carbohydrate diets**

Other low-carbohydrate diets in the 1960s included the Air Force Diet and the Drinking Man's Diet. In 1972, Robert Atkins published *Dr. Atkins' Diet Revolution*, which advocated the low-carbohydrate diet he had successfully used in treating people in the 1960s. The book was a publishing success but was widely criticized by the mainstream medical community as dangerous and misleading, limiting its appeal.

The glycemic index concept was developed in 1981 by David Jenkins to account for variances in different carbohydrates' digestion. This concept classifies foods according to the rapidity of their effect on blood sugar levels – with fast-digesting simple carbohydrates causing a sharper increase and slower-digesting complex carbohydrates, such as whole grains, a slower one. Jenkins' research laid the scientific groundwork for subsequent low-carbohydrate diets.

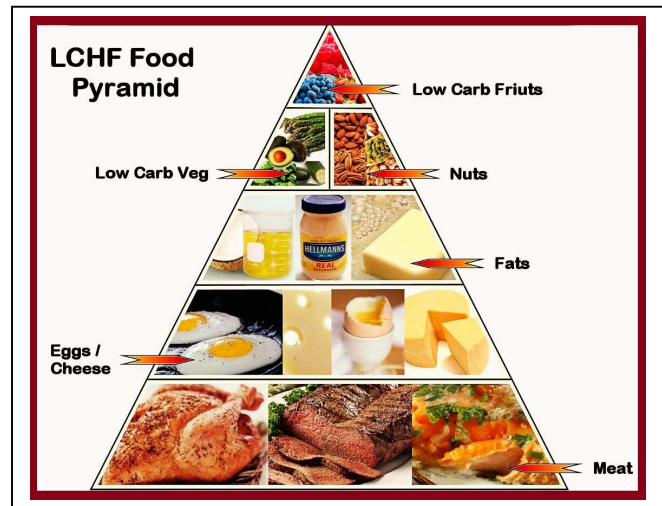
In 1992, Atkins published an update from his 1972 book, *Dr. Atkins' New Diet Revolution*, and other doctors began to publish books based on the same principles. During the late 1990s and early 2000s, low-carbohydrate diets became some of the most popular diets in the US. By some accounts, up to 18% of the population used one type of low-carbohydrate diet or another at the peak of their popularity. Food manufacturers and restaurant chains noted the trend, as it affected their businesses. Parts of the mainstream medical community have denounced low-carbohydrate diets as dangerous to health, such as the AHA in 2001 and the American Kidney Fund in 2002.



## What to Eat? - A Guide to Eating Less Carbs

### DO'S

- Meat
- Fish
- Egg
- Above-ground vegetables
- Natural fat (butter)
- Dairy products with a high-fat content
- High-fat sauces
- Nuts
- Berries (in moderation)



### DONT'S

- Sugar (sweets, soft drinks)
- Bread
- Potatoes, Rice and Pasta
- Root vegetables (okay but in moderation)
- Porridge
- Muesli
- Fruit
- Beer
- Diet- and Light products