Low-Carb Diets: Separating Food Fact from Food Fiction

The Gladstone Connection

With astounding rapidity, the low-carb diet has caught fire, capturing the imagination of dieters and Madison Avenue alike. It's as if the idea of being able to eat fats while shunning carbohydrates and still lose weight has touched a national nerve. And maybe it has, not for any proven scientific merits but because everyone knows that we as a nation do have a weight problem.

By every measure, obesity in America is a huge epidemic. In 1999–2000, 65% of adults were overweight, and 31% of those were obese, as defined by the body mass index. Since the 1970s, the percentage of children who are overweight has doubled to 15%.

All that weight can't be good, and it isn't. At least one of five obese people develops type 2 (adult-onset) diabetes, and nearly half of all obese people over age 60 have impaired glucose tolerance, a pre-diabetic state. Just as obesity is a major risk factor for diabetes, diabetes and impaired glucose tolerance are major risk factors for cardiovascular disease (including heart attacks and strokes), kidney failure, nerve dysfunction, and blindness.

That being the case, one might think that any reasonable diet can only be a good thing, but that isn't always true. Though some diet plans have well-documented merits, many others are either ineffective or even detrimental. Where do low-carb diets fall on the spectrum?

How to Calculate BMI

$$\text{BMI} = \frac{\text{Weight in lbs.} \times 703}{\text{Height in inches}^2}$$

Being overweight is defined as having a body mass index (BMI) of 25–29. Obesity is defined as having a BMI ≥ 30.

The Gladstone Lipid Clinic in the Gladstone Institute of Cardiovascular Disease has treated thousands of patients at risk for heart disease from many factors, including excess weight, high cholesterol, and diabetes. Following is a review of low-carb diets and their effects on weight loss and risk factors for cardiovascular disease.

The Glycemic Index

The glycemic index categorizes foods according to their ability to raise blood sugar levels as compared to white bread.

A low-glycemic-index food raises blood sugar less than a high-glycemic-index food. Low-glycemic-index foods are usually higher in fiber and are less refined than high-glycemic-index foods.

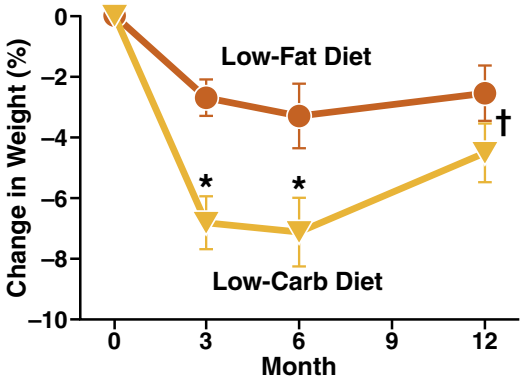
This index describes the quality of the carbohydrate, rather than the quantity.

Low GI	High GI
Whole-grain bread	White rice and white bread
Slow-cooking oats	Most breakfast cereals
Lentils/beans	Potatoes

Recent Clinical Trials

The Atkins, South Beach, The Zone, Sugar Busters, and similar diets are all variations on the idea of restricting carbohydrate intake. Some encourage a reduction of all carbohydrates. Others restrict certain carbohydrates, such as high-glycemic-index carbohydrates. Low-carb diets have been the subject of just four scientific studies that examined the effectiveness of low-carb versus low-fat diets and lasted as long as six months to one year (see last page for references). The length of any behavioral study is crucial: long-term outcomes can often be dramatically different—and often much less encouraging—than the short-term results.

Weight Loss on Low-Carb Diets



* Significantly different from low-fat diet value. † Not significantly different. Foster *et al.*, 2003

Participants in the four studies were instructed on how to follow either a low-carb or low-fat diet. Initially, the low-carb groups were to consume no more than 20 to 30 grams of carbohydrates per day (by contrast, on average, North Americans consume approximately 300 grams of carbohydrates per day). As weight loss progressed, small amounts of additional carbohydrates were allowed. Meat consumption was not restricted, and participants were not instructed to reduce their caloric intake. The low-fat groups were to consume low-fat, calorie-restricted diets.

At six months, subjects on the low-carb diets had lost more weight than those on low-fat diets: 5–13% versus 1–7% of body weight. At one year, though, the difference in weight loss was not statistically significant: the low-carb dieters had lost 4–7% of their body weight, and the low-fat dieters had lost 2–5%.

Weight loss occurs when fewer calories are consumed than are expended; consequently, any low-calorie diet will produce weight loss. However, low-carb advocates theorize that low-carb diets provide metabolic advantages that result in weight loss independent of caloric intake. In fact, one six-month study showed greater weight loss in the low-carb group, even though both groups reduced their caloric intake by 450 calories/day. This finding suggests that there may indeed be a metabolic advantage to a low-carb diet in the short term. However, in the one-year study by Stern, the total caloric intake was 354 Kcal/day lower on the low-carb diet than on the low-fat diet, suggesting that the greater weight loss on the low-carb diet may be explained by a lower caloric intake. Hence, it remains unclear whether a reduction in calories accounts for all of the weight loss or whether there is a metabolic advantage to the low-carb diet.

Overweight and obesity are risk factors for:

- Diabetes
- Heart disease
- Stroke
- Hypertension
- Gallbladder disease
- Osteoarthritis (degeneration of cartilage and bone of joints)
- Sleep apnea and other breathing problems
- Some forms of cancer (uterine, breast, colorectal, kidney, and gallbladder)

Obesity is also associated with:

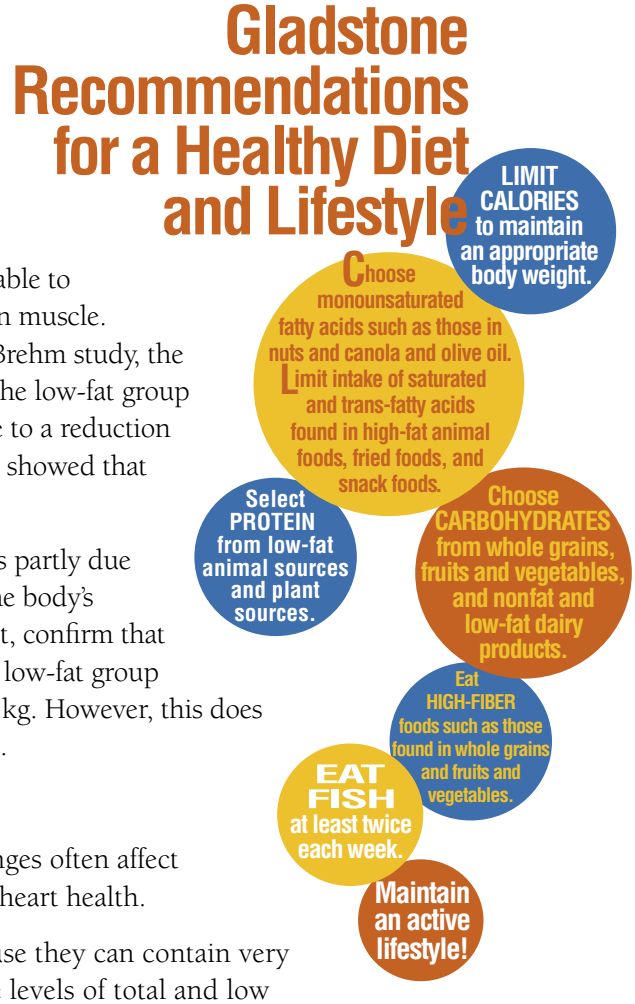
- High blood cholesterol
- Complications of pregnancy
- Menstrual irregularities
- Hirsutism (excess body and facial hair)
- Stress incontinence (urine leakage caused by weak pelvic-floor muscles)
- Psychological disorders such as depression
- Increased surgical risk

Source: National Institute of Diabetes & Digestive & Kidney Diseases

The greater initial weight loss on the low-carb diets might suggest that a low-carb diet is easier to follow initially because the high fat and protein content makes the food more satisfying, allowing participants to lower their caloric intake more easily than on a low-fat diet. On the other hand, research has shown that appetite is affected by the total amount of food consumed (weight and volume). Therefore, consuming a diet rich in fiber, such as whole grains and other complex carbohydrates (which will increase the weight of the food but not its caloric level) may result in feelings of fullness, reduced caloric intake, and weight loss. Clearly, more research is needed to determine the ideal composition of diets to maximize feelings of satiety and satisfaction.

Low-carb diet advocates claim that weight loss occurs because the body starts to use stored fat for energy when carbohydrates are lacking. Using stored fat for energy results in the formation of ketone bodies, which are byproducts of fat metabolism, leading to a meta-

bolic state called ketosis, a natural response that, under normal circumstances, is not detrimental. The one-year Foster study showed no relationship between weight loss and ketosis during the study, so it is difficult to know if fat was being preferentially burned as is claimed by advocates of low-fat diets.



Low-carb diet advocates also claim that this diet is preferable to a low-fat diet because it targets loss of body fat rather than muscle. However, the data have not supported this claim. In the Brehm study, the low-carb group had lost more body fat and muscle than the low-fat group at six months, indicating that the weight loss was not due to a reduction in body fat alone. In addition, the six-month Yancy study showed that weight loss was not due to preferential loss of body fat.

Those opposed to low-carb diets report that weight loss is partly due to loss of body water, which occurs when one relies on the body's stores of glycogen for energy. The Yancy study did, in fact, confirm that the low-carb group lost significantly more water than the low-fat group during the first two weeks of the study, 1.1 kg versus 0.5 kg. However, this does not account for all of the weight loss on the low-carb diet.

Cardiovascular Disease Risk Factors

Weight loss is only one effect of diet changes. Such changes often affect many other health factors, particularly those relating to heart health.

For example, low-carb diets have been a concern because they can contain very high levels of total fat and saturated fat, which raise the levels of total and low density lipoprotein cholesterol (LDL-C, or "bad" cholesterol). High LDL-C is a risk factor for heart disease.

Surprisingly, none of the studies found a significant increase in LDL-C in the low-carb groups at either six months or one year compared to the low-fat groups. This counterintuitive finding might reflect the fact that the cholesterol measurements were done while the subjects were still losing weight. LDL-C levels are usually lower during weight loss than when a steady weight is maintained.

The low-carb groups also had greater reductions in triglyceride levels than the low-fat groups at both six months and one year. Triglycerides decreased by 17–47% on the low-carb diets and by 0–15% on the low-fat diets.

The low-carb diet also had beneficial effects on the levels of high density lipoprotein cholesterol (HDL-C, or "good" cholesterol). In three of the four studies, HDL-C levels were 10–13% higher in the low-carb groups than in the low-fat groups. In the Stern study, HDL-C did not increase on either diet but had decreased less on the low-carb diet (2.4%) than on the low-fat diet (12%) at one year, still a beneficial effect.

Some caution is warranted concerning low-carb diets and heart disease. The risks of coronary heart disease associated with high-fat diets are well established, and the improvements in the cholesterol profiles of subjects on the low-carb diets may not be sustained when the weight-loss phase is over. In addition, subjects on the low-carb diets reported more constipation, headaches, muscle cramps, diarrhea, bad breath, general weakness, and rashes.

Comparing Popular Diets

DIET	CLAIM	WHAT TO EAT	WHAT TO AVOID	IS THIS DIET HEALTHY?
Dr. Atkins' New Diet Revolution	Avoiding carbohydrates will change a body's metabolism and result in using stored fat for energy.	Start by eating cream, butter, and most types of high-fat protein foods, such as meat, poultry, eggs, and cheese. Carbohydrates are slowly reintroduced into the diet.	Carbohydrates, including milk, fruits, "starchy" vegetables, and breads and grains.	This diet is high in fat. It also lacks fruits, vegetables, and whole grains, which protect against heart disease.
The New Glucose Revolution	Eating low-glycemic-index (GI) carbohydrates is the key to health. High-GI carbohydrates break down quickly, leading to high blood sugar levels.	Low-GI carbohydrates.	High-GI carbohydrates.	Low-GI carbohydrates are generally healthier because they are less processed and contain more fiber and disease-preventing substances.
The South Beach Diet	Avoid "bad carbo-hydrates" because they cause the release of high levels of insulin and result in hunger and weight gain.	Start by eating normal-sized portions of meat, poultry, shellfish, vege-tables, eggs, cheese, and nuts. By the end of the diet, eat high-GI carbohydrates, lean protein and dairy, unsaturated fats, fruits, and vegetables.	Start by avoiding fruit, bread, rice, potatoes, and pasta. By the end of the diet, just avoid refined grains and low-GI foods.	The diet starts with a very strict meal plan, high in protein. However, by the end of the diet, the meal plan is very well balanced.
The Zone	Eating the right proportion of calories from carbohydrates, fats, and proteins keeps your insulin at the right level and keeps you at your physical peak.	Must eat in blocks of 40% carbohydrate, 30% fat, and 30% protein from low-fat protein sources, such as poultry, seafood, and lean meat. Fruits, most vegetables, low-fat dairy, and nuts are allowed.	High-fat foods, such as whole-milk dairy products, fatty meats, and butter. Limit some carbohydrates, such as sweets, grains, potatoes, carrots, and bananas.	Overall, this is a healthy eating plan, but it may be difficult to sustain due to strict food combining.

Gladstone Diet Recommendations

Based on these four scientific studies, low-carb diets appear to result in greater weight loss in the short term (six months) but show no differences from low-fat diets over the course of a full year. Weight loss advantages diminished as the studies continued for one year, possibly because long-term compliance is difficult. Low-carb diets appear to improve heart risk factors at both six months and one year, but the longevity of those improvements, particularly after the weight-loss phase has been completed, is yet to be verified.

One key point of these studies is that weight loss was achieved on both low-carb and low-fat diets. One diet was not better at weight loss than the other at one year, and both reduced calories. Therefore, approaching weight loss by restricting calories from either fat or carbohydrates (especially from refined carbohydrates, such as white rice and white bread) seems reasonable.

Studies Cited

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