

Commentary

Was Dr Atkins Right?

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There has been a recent resurgence of interest in low-carbohydrate/high-fat diets such as the Atkins diet (1-3). Many dietitians and other health professionals as well as people in the general public are often confused by the fact that many people are able to lose weight on these diets. Recent studies also seem to provide some evidence that high-protein diets may have beneficial effects on cardiovascular disease (CVD) risk factors such as high-density lipoprotein (HDL) and triglycerides. As Dr Atkins wrote a few months before he died, "At what point am I allowed to say, 'I told you so?'" (4).

The purpose of this article is to find common ground among seemingly contradictory information about different diets, present an evidence-based rationale for optimal nutrition, and describe many of the half-truths and distortions of the Atkins diet and other similar diets. For example, the message of many recent articles has been "Americans have been told to eat less fat; the percentage of calories from fat is lower, yet Americans are more overweight than ever. Thus, dietary fat is not responsible for obesity." In fact, per capita consumption of fat has risen by 10 lb/year since 1975, whereas per capita consumption of simple carbohydrates has increased even more, by 20 lb/year (5). The percentage of calories from fat has decreased, but the amount of fat consumed has increased (6).

WHY PEOPLE LOSE WEIGHT ON LOW-CARBOHYDRATE/HIGH-FAT DIETS

As all dietetics professionals know, there is no mystery in how to lose weight: burn more calories and/or eat fewer calories. It is all about energy balance. You can burn more calories by exercising. You can eat fewer calories by consuming less food. That is why you can lose weight on any diet that restricts portion sizes, but it is hard to keep it off because you may feel hungry and deprived.

REDUCE FAT

An easier way to consume fewer calories is to eat less fat because fat (whether saturated, monosaturated, or unsat-

urated) has 9 kcal/g, whereas protein and carbohydrates have only 4 kcal/g. When you eat less fat, you consume fewer calories without having to eat less food, thereby increasing satiety without adding calories. In other words, when you change the type of food, you don't have to be as concerned about the amount of food.

At Pennsylvania State University, researchers found that healthy women instinctively ate about 3 lb of food a day, whether high or low in calories. The primary drive was volume not calories (7). Thus, by eating less fat, you reduce calories by reducing energy density without having to reduce volume. You can lose weight without feeling hungry or deprived.

In a survey of food consumption data from the United States Department of Agriculture's National Food Consumption Surveys (NFCs) and the Continuing Survey of Food Intakes by Individuals (CSFII), "Individuals of all ages who consume a diet with fewer than 30% of calories from fat consistently have lower energy intakes. The data suggest that reducing fat intake is one effective strategy for also reducing total energy consumption. . . . Given the increasing rates of obesity in the United States at an earlier age, dietary-fat reduction may be an effective part of an overall strategy to balance energy consumption with energy needs" (8).

One reason that people often lose weight when they reduce their intake of carbohydrates is that they are usually reducing their intake of fats as well. If they stop eating pasta, they are often avoiding sauces that are high in oil or cream (olive oil is 100% fat and only 1 tablespoon has 14 g fat). If they stop eating bagels, they may also stop eating the cream cheese. If they stop eating desserts, they consume less fat as well as less sugar.

REDUCE SIMPLE CARBOHYDRATES

The other way people get too many calories is by consuming too many simple carbohydrates. In my numerous debates with Dr Atkins, we agreed that many Americans eat excessive amounts of processed foods high in simple carbohydrates, including sugar, high-fructose corn syrup, white flour, white rice, and alcohol. Because these foods are low in fiber, large quantities of calories can be consumed without feeling full.

The processing and lack of fiber may cause these foods to have a high glycemic index and often a high glycemic load; they are absorbed quickly, causing blood glucose levels to spike, which causes insulin surges. These surges may cause a reactive hypoglycemia, increasing hunger and a desire to eat more simple carbohydrates in a vicious cycle, sometimes called "carbohydrate cravings." In addition, excessive insulin enhances the growth and proliferation of arterial smooth muscle cells, promoting atherosclerosis (9). Insulin accelerates the conversion of calories into triglycerides, which may contribute to hypertriglyceridemia. Over time, in some people, insulin surges may

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lead to insulin resistance, causing further weight gain. Insulin may also raise the secretion of lipoprotein lipase, increasing the uptake of fat into cells, leading to weight gain (10).

When people go on a high-protein diet, they may lose weight and lower triglycerides if, like most Americans, they had been eating a diet high in simple carbohydrates. Even better would be to reduce the intake of simple carbohydrates and most fats, which results in losing even more weight while enhancing health rather than potentially harming it.

SUBSTITUTE SIMPLE WITH COMPLEX CARBOHYDRATES

Although Dr Atkins and I agreed on the diagnosis—that many Americans eat too many simple carbohydrates—we disagreed about the prescription. Dr Atkins advocated substituting simple carbohydrates with high-fat, high-animal protein foods such as bacon, sausage, butter, steak, pork rinds, and brie. I would love to be able to tell you that these are health foods, but they are not. Telling people what they want to believe is part of the reason that the Atkins diet has become so popular.

A more healthful and evidence-based choice is to substitute simple carbohydrates with complex (unrefined) carbohydrates including whole foods such as fruits, vegetables, legumes (including soy products), and whole grains (such as brown rice and whole wheat flour). These are rich in fiber, which enhances satiety without adding significant calories. Fiber also slows the absorption of food, thereby preventing blood glucose from rising too rapidly and reducing insulin surges. Eating a high glycemic index food along with mostly low glycemic index foods may reduce the overall glycemic load of the meal. Body weight is inversely associated with dietary fiber and carbohydrates and positively associated with protein intake (11). Meat has virtually no dietary fiber.

In addition to fiber, complex carbohydrates and whole foods are rich in phytochemicals, bioflavonoids, carotenoids, retinols, sulfuraphanes, isoflavones, and polyphenols and other substances that may reduce the risk of many chronic diseases. These foods are low in cholesterol, saturated fat, oxidants, and other disease-promoting substances—a double benefit (12). In contrast, an Atkins diet is high in disease-promoting substances and low in protective ones—a double whammy. Other high-protein diets such as the Zone and the South Beach diets are somewhat better but still emphasize consumption of meat, eggs, and butter.

WHAT IS THE EVIDENCE THAT COMPLEX CARBOHYDRATES ARE BENEFICIAL?

Whereas simple carbohydrates tend to have a high glycemic index/glycemic load and may be harmful for reasons discussed earlier, complex carbohydrates usually have a low glycemic index/glycemic load and are beneficial. Increased whole grain intake was associated with decreased risk of CHD in 75,521 women followed for 10 years (13). A diet high in whole grains was associated with a reduced risk of type 2 diabetes in 42,898 men followed for 12 years. The relative risk of developing type 2 diabetes was 58% lower when comparing the highest with the lowest quintile of whole grain intake (14).

Whole grain consumption improves insulin sensitivity in overweight and obese adults (15). Fiber from whole grains, but not refined grains, was inversely associated with all-cause mortality in 11,040 postmenopausal women followed for 11 years (16). Total fat and animal fat intake were higher and carbohydrate intake was lower in those with recently diagnosed diabetes or previously undiagnosed diabetes in the multinational, multicenter study of the Mediterranean Group for the Study of Diabetes (17).

CLAIMS THAT AN ATKINS DIET IS BETTER THAN A LOW-FAT DIET

Three recent studies suggested that an Atkins diet is superior to a low-fat diet with respect to short-term changes in weight, triglycerides, and HDL cholesterol (HDL-C) (18-20). However, an Atkins diet was compared with a conventional 30% fat American Heart Association/National Cholesterol Education Program (AHA/NCEP) diet, which is not very low in fat and often high in simple carbohydrates (which increase triglycerides). An Atkins diet often shows a greater reduction in triglycerides by comparison. In addition, patients on an Atkins diet are counseled to take n-3 fatty acids in the form of fish oil (something else we agreed on), which is known to reduce triglycerides significantly.

In one of these studies, low-density lipoprotein cholesterol (LDL-C) increased from 118 to 121 mg/dL on an AHA/NCEP low-fat diet and increased from 114 to 118 mg/dL on a high-protein/low-carbohydrate diet (19). Other studies have documented that an AHA/NCEP diet is not very effective in lowering LDL-C (21). An AHA/NCEP 30% fat diet reduces LDL-C by only about 5% to 7% in most patients (22-24). Thus, neither an Atkins diet nor a 30% fat diet is very effective in lowering LDL-C or in maintaining long-term weight loss (25).

To some, the fact that an Atkins diet does not significantly raise LDL-C is surprising given the amount of saturated fat and cholesterol in the diet. This is somewhat akin to the story of Dr Johnson's dog walking on its hind legs: it does not do it very well, but it is amazing that it can do it at all. Insulin stimulates 3-hydroxy-3-methylglutaryl coenzyme A reductase (which statin drugs inhibit), increasing lipid production, which may help to explain why high-protein diets do not always exacerbate hypercholesterolemia (26).

The level of LDL-C is regulated by the LDL receptor, a cell surface glycoprotein that removes LDL from plasma by receptor-mediated endocytosis (27). Dietary cholesterol and saturated fats increase plasma LDL-C in part by down-regulating LDL receptors in the liver (28). The amount of dietary cholesterol and saturated fat in either a 30% fat diet or an Atkins diet may saturate and suppress the LDL receptor system, thereby leading to little fall in plasma LDL-C levels (29).

However, even in those with reduced numbers of LDL receptors who are not very efficient in metabolizing dietary saturated fat and cholesterol, decreasing the intake of these to a greater degree has a much bigger impact. It was found that a diet containing 10% of calories from fat with little saturated fat and dietary cholesterol (30,31) decreased LDL-C by an average of 40% after 1 year in ambulatory patients not taking lipid-lowering drugs (32).

This reduction in LDL-C is much greater than on an Atkins diet and is comparable with the effects of statin drugs.

In another study, 100 people were randomly assigned to one of four diets for 1 year: an Atkins diet; a 30% fat diet; a 15% fat, calorie-controlled diet; or a 10% fat, whole foods diet with an emphasis on complex carbohydrates. Weight loss was 1 lb/week on the 10% fat diet and 0.6 lb/week on the Atkins diet. Reductions in total cholesterol, LDL-C, triglycerides, and total-to-HDL cholesterol ratios were significant only in patients who were following either a 10% fat diet or a 15% fat, calorie-controlled diet. Only patients following the Atkins diet showed a worsening of each CVD risk factor (LDL-C, triglycerides, total cholesterol, HDL-C, total-to-HDL cholesterol ratio, homocysteine, Lp(a), and fibrinogen), despite achieving statistically significant weight loss. After 1 year, there was a 52% decrease in LDL-C on the 10% fat diet compared with a 6% increase in LDL-C on the Atkins diet (33).

DISTINGUISHING BETWEEN RISK FACTORS AND ACTUAL MEASURES OF DISEASE

In our debates, Dr Atkins often claimed that his diet can reverse coronary heart disease (CHD) but never published any peer-reviewed data to support this assertion, nor has anyone else, including advocates of similar diets such as the Zone and the South Beach diets (34). Unfortunately, most studies of the Atkins diet and other high-protein diets measure only risk factors for CHD such as weight and lipids.

The only peer-reviewed study that examined the underlying disease processes found that blood flow to the heart improved on a very low-fat, whole foods diet but worsened on an Atkins diet (35). Although this study was limited by not having a randomized control group, the burden of proof is on the advocates of high-protein diets to show otherwise, especially given the large amount of data from other epidemiological studies, animal research, and randomized controlled trials linking the intake of a diet high in animal fat and protein with the incidence of CHD.

Several studies that used serial coronary arteriography to assess CHD patients who were consuming a conventional 30% fat diet revealed that the majority showed progression (worsening) of coronary atherosclerosis (22,36). However, CHD patients who followed a 10% fat, whole foods diet demonstrated significant regression of coronary atherosclerosis after 1 year as measured by quantitative coronary arteriography (37) and even more regression after 5 years (the amount of exercise was not significantly different between groups, but the experimental group was also practicing yoga and meditation) (32). There was a direct correlation between the intake of dietary cholesterol and fat and changes in coronary atherosclerosis.

Ninety-nine percent of experimental group patients were also able to stop or reverse the progression of CHD as measured by cardiac positron emission tomography (PET) scans (38). They lost 24 pounds during the first year and kept off more than half of that weight 5 years later and had 2.5 times fewer cardiac events than the control group. In contrast, control group patients following a 30% fat diet showed more progression of atherosclerosis

after 5 years than after 1 year. These studies need to be replicated, although similar findings were found by others (39,40).

HDL-C decreased 9% from 40.0 to 36.3 mg/dL after 1 year, yet these patients showed clear improvement in coronary atherosclerosis, myocardial perfusion, and cardiac events. Thus, we need to move beyond simplistic notions that anything that raises HDL-C is beneficial and anything that lowers HDL-C is harmful.

WHAT ABOUT HDL?

The reduction in HDL-C that may occur on a low-fat diet is another example of a half-truth that is confusing to many people. HDL returns cholesterol to the liver for metabolism, a pathway known as reverse cholesterol transport. Most Americans consume a diet high in saturated fat and cholesterol, so those who are able to increase HDL-C in response to this diet are at lower risk than those who cannot, since they will be more efficient at metabolizing excessive dietary fat and cholesterol. In simple terms, those with higher HDL-C levels have more “garbage trucks” (HDL) to get rid of the “garbage” (excessive fat and cholesterol).

However, reducing dietary fat and cholesterol may cause a decrease in HDL-C because there is less need for it. This does not confer the same risk of atherosclerosis as in Americans with low HDL levels who are consuming a high-fat diet (41). In other words, when you have less garbage, you need fewer garbage trucks to remove it, so a reduction in HDL on a low-fat diet is not harmful.

There are no data showing that the physiologic reduction of HDL-C levels with a low-fat diet is detrimental, especially in that LDL-C usually decreases more than HDL-C (42). In locations such as Asia, where a low-fat diet has been the norm, HDL-C levels are low, yet the incidence of CVD is among the lowest in the world (43). In rural China, for example, the average LDL is less than 95 mg/dL.

In contrast, someone who increases the amount of fat and cholesterol in their diet (eg, an Atkins diet) may increase their HDL-C because their body is trying to get rid of the extra garbage (fat and cholesterol) by increasing the number of available garbage trucks (HDL). Eating a stick of butter will raise HDL-C in those who are able to do so, but that does not mean that butter is good for the heart. HDL-C is predictive of relative heart disease risk only in populations in which everyone is eating a similar high-fat diet, such as the Framingham population.

To understand better the mechanism of this phenomenon, Breslow and colleagues studied the turnover of HDL apolipoproteins (apo) A-I and A-II in 13 subjects on two contrasting metabolic diets. Upon changing from high to low intake of saturated fat and cholesterol, the mean HDL-C decreased 29%, whereas apo A-I levels fell 23%. Mean apo A-II levels did not change. The fractional catabolic rate (FCR) of apo A-I increased 11%, whereas its absolute transport rate decreased 14%. The decrease in HDL-C and apo A-I levels correlated with the decrease in apo A-I transport rate but not with the increase in apo A-I FCR. In contrast, within each diet, the HDL-C and apo A-I levels were inversely correlated with apo A-I FCR both on the high- and low-fat diets but not with apo A-I transport rate (44).

Therefore, diet-induced changes in HDL-C levels correlate with and may result from changes in apo A-I transport rate. In contrast, differences in HDL-C levels between people on a given diet correlate with and may result from differences in apo A-I FCR. The mechanism of the effects on HDL-C levels of changing from a high- to low-fat diet differs substantially from the mechanism explaining the differences in HDL-C levels between individuals who are eating a high-fat diet.

In summary, decreases in HDL-C due to a low-fat diet have a very different prognostic significance than someone who cannot raise HDL-C as much on a high-fat diet.

RAISING AND LOWERING HDL—BENEFICIAL OR HARMFUL?

An example of the half-truth of saying that anything that raises HDL-C is beneficial whereas anything that lowers it is harmful came at the November 11, 2003 annual scientific session of the American Heart Association. A paper was presented from Tufts University titled "One Year Effectiveness of the Atkins, Ornish, Weight Watchers, and Zone Diets in Decreasing Body Weight and Heart Disease Risk." The researchers concluded "All diets resulted in significant weight loss from baseline and all but the Ornish diet resulted in significant reductions in the Framingham risk score" (45). This study was widely reported and caused many to say, "See, another study showing that the Atkins diet is good for your heart." It sounds good, but it is not true.

The Framingham risk score is calculated from age, sex, total cholesterol, HDL, smoking, and systolic blood pressure (46). Only total cholesterol and HDL changed in this study, so these were the only factors in determining the risk score. Total cholesterol decreased much more on the Ornish diet than on any of the other diets. However, HDL increased more on the other diets, so the differences in the Framingham risk score were due primarily to changes in HDL.

The abstract did not mention that people lost the most weight on the Ornish diet, it was the only one to significantly lower LDL-C, and it was the only one to significantly lower insulin (even though one of the main premises of the Atkins and Zone diets is their purported effect on insulin). Also, C-reactive protein and creatinine clearance were significantly lowered only on the Ornish and Weight Watchers diets.

As stated earlier, a low-fat, whole foods diet has been proven to reverse heart disease using actual measures of coronary atherosclerosis and myocardial perfusion, whereas none of the other three diets has been shown to do so. It was terribly misleading when this abstract made it appear as though the Atkins diet is better for your heart. This is especially incongruous when, as mentioned earlier, the only study to examine blood flow on the Atkins diet found that it actually worsened (35).

WHAT EVIDENCE SUPPORTS THAT HIGH-PROTEIN DIETS MAY BE HARMFUL?

A wide body of scientific evidence links the consumption of animal protein, saturated fat, and cholesterol with CVD, cancer, and other chronic illnesses (47-51). High-protein diets may cause loss of calcium and decreased

levels of urinary citrate, leading to osteoporosis and kidney stones (52). Urinary excretions of calcium and acids are correlated positively with intakes of animal and non-dairy animal protein but are correlated negatively with plant-protein intake (53).

A case report in a peer-reviewed journal described the fatal ventricular fibrillation arrest of a 16-year-old girl who had started a high-protein/low-carbohydrate diet 2 weeks earlier and presented profound hypokalemia and hypocalcemia during resuscitation attempts (54). Ketone bodies formed on a high-protein diet undergo urinary excretion with a cation to maintain electrical neutrality, resulting in the loss of cations such as calcium, magnesium, and potassium (55,56). An Atkins diet may increase postprandial lipemia and increase free fatty acids, which may have harmful effects on platelet aggregation and may promote ventricular arrhythmias (57,58). This case report is not proof, but it is worrisome, especially in that these disorders of electrolytes and free fatty acids that increase the risk of sudden cardiac death may be seen in high-protein diets.

In another study, 70% of patients on an Atkins diet for 6 months were constipated, 65% had halitosis, 54% reported headaches, and 10% had hair loss (59). (This study was funded by the Atkins Center for Complementary Medicine.) Your body excretes toxic substances through your bowels, breath, and perspiration, so this is not surprising. You may lose weight and start to attract people to you, but, when they get too close, it may be counterproductive.

High total protein intake, particularly high intake of nondairy animal protein, may accelerate renal function decline (60). Also, in a randomized controlled trial, ketogenic diets such as the Atkins impaired cognitive performance in higher order mental processing after only 1 week (61).

ENHANCING HEALTH AND LOSING WEIGHT

Losing weight is important, but the history of medicine is replete with examples of weight-loss approaches that were harmful to health (eg, amphetamines, fen-phen). The goal is to lose weight in ways that enhance health rather than in ways that may harm it. A person is likely to lose more weight by reducing intake of both simple carbohydrates and fat than from simple carbohydrates alone.

In educating patients in an evidenced-based practice, it may be helpful to summarize an optimal diet as one that is high in good carbohydrates (complex carbohydrates), good fats (n-3 fatty acids) (62), and good protein (plant based) and low in ones that are less healthful. This optimal diet is based predominantly on fruits, vegetables, grains, and legumes in their natural, unrefined forms.

People have a spectrum of choices. For someone trying to reverse heart disease, for example, the diet needs to be rather strict to accomplish this. For those simply trying to lose weight or lower their risk factors moderately, less extensive changes may be required. Some people are able to handle more simple carbohydrates and/or more cholesterol and saturated fat in their diet than others.

In practice, someone trying to lose weight may begin by moderately reducing their intake of simple carbohydrates and fat and moderately increasing their level of exercise.

This is the premise of organizations such as America on the Move (63). If moderate changes are not sufficient to achieve the desired goals, then the patient can be encouraged to make more intensive ones. The advantage of small changes is that the barriers to change are low, but the benefits are also modest. Paradoxically, it may sometimes be easier for people to make more comprehensive changes in diet and lifestyle because they experience the benefits so quickly and to a much greater degree (25,64).

The concept of a dietary spectrum empowers people with information and freedom of choice rather than the feeling of constraint or restriction. This becomes a way of eating rather than a diet with rigid "eat this" and "don't eat that" guidelines. For example, someone may indulge himself or herself one day and eat more healthfully the next. To the degree that people reduce their overall intake of simple carbohydrates and excessive fat and increase their intake of whole foods such as complex carbohydrates, they are likely to lose weight and gain health.

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