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The Atkins Diet: An Unresolved Debate

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## Introduction

From bony Calvin Klein models to the proliferation of low-fat foods at the supermarket, it is easy to see why American culture is considered to be obsessed with thinness. And yet, our society is anything but thin. Obesity is on the rise, reaching what some might consider to be epidemic proportions. As of the third National Health and Nutrition Examination Survey (NHANES III) (1988-1991), 33% of the U.S. general population was obese, compared to 25% a decade earlier (1). Far from being purely a cosmetic or comfort issue, obesity has dire implications for other aspects of health, having been linked to conditions such as coronary heart disease, congestive heart failure, and diabetes (1).

With obesity being as common as it is, and with many more Americans being overweight to a lesser degree, dieting and weight loss have become vital issues of public health. It is estimated that Americans spend a total of \$33 billion on weight-loss programs, products, and pills (2). With this high level of spending has come numerous popular diet programs to fill the economic niche created. One such diet program is the Atkins diet, named for its creator Dr. Robert C. Atkins, a cardiologist. The Atkins diet first appeared with the publication of Dr. Atkins' book *Dr. Atkins' Diet Revolution* in 1972. A second book, *Dr. Atkins' New Diet Revolution*, was published in 1992; it has sold in excess of ten million copies worldwide, and has spent five years on *The New York Times* bestseller list (3). Because of this diet's tremendous popularity, it is particularly important that the claims made by the diet and the scientific theories underlying it are subject to serious scrutiny. The medical community owes a thorough analysis of this diet both to the millions who are trying it, and to the tens of millions who are in need of a viable strategy to overcome their weight problems.

## What is Atkins?

The basic principle behind the Atkins diet is that carbohydrate consumption is responsible for weight gain (4). Under normal conditions, the body uses energy derived from carbohydrates as fuel, but when one ceases to consume carbohydrates, the body is forced to burn fat for fuel, and weight loss results (4). Every person has an individual threshold for carbohydrate consumption below which weight loss can occur, as well as a threshold appropriate for maintenance of one's current weight (4). Exercise is considered an essential component, and dieters are encouraged to take vitamin and mineral supplements to compensate for the lost contents of carbohydrate-containing foods that are consumed in very limited quantities (4).

The diet is divided into four phases. The first is called "Induction," and during this two-week phase carbohydrate consumption is extremely limited. The dieter is allowed to eat as much fat and protein as he likes, but only 20 grams of carbohydrate may be consumed per day, mostly in the form of salad greens and vegetables; no fruit, bread, pasta, grains, starchy vegetables or dairy products other than cheese, cream or butter may be eaten (5). This is the stage at which the body's metabolism shifts; lipolysis (burning fat for fuel) and ketosis (conversion of fatty acids to ketones for energy, the surplus of which are excreted in the urine) are achieved (6). The next two phases (Ongoing Weight Loss and Pre-Maintenance) are longer term, and involve gradual reintroduction of carbohydrates into the diet to allow continued weight loss at a slower pace (7). In addition, a greater variety of carbohydrate-containing foods are allowed (7). In the final and

indefinite phase (Lifetime Maintenance), the dieter continues to eat the maximum threshold amount of carbohydrates determined in the earlier phases for maintenance of his current (target) weight (8). The exact amount is individually determined, and could be as much as 80 or 90 grams per day.

### Opposing Views on Weight Loss

To say the least, Dr. Atkins and his diet program are not without their critics. Especially subject to attack is the supposedly miraculous weight loss (often 2 or 3 kg) experienced during the Induction phase of the Atkins diet (9). Dr. Margo A. Denke (9) argues that this weight loss is not the result of burning fat, but rather of diet-induced diuresis. This diuresis is the result of two processes that are caused by carbohydrate fasting. The first is mobilization of glycogen stores. Since each gram of glycogen is stored along with 2 grams of water, glycogen use can account for approximately 1 kg (total) of water loss. In addition the generation of ketone bodies during ketosis, the second process, increases renal sodium delivery to the lumen of the nephron, thereby causing further water loss.

The degree of weight loss during subsequent phases of the Atkins diet is also a matter of debate, and no clear solution has emerged. One study (10) took twenty-four obese subjects and placed them on a diet modeled after the Atkins approach contained in his first book. There was no control group; the status of the subjects before the study diet was compared with that afterwards. Nearly all of the subjects experienced weight loss, but at the same time it was noted that the high protein/fat and low carbohydrate diet resulted in a reduction of total caloric consumption by approximately 500 kcal per day. It was estimated that such a caloric reduction could account for about 0.45 kg of weight loss per week. In the study, the rate of weight loss, assuming that the majority in the first two weeks was due to salt and water loss alone, was still 0.68 kg per week. This was somewhat higher than 0.45 kg, leading the authors to admit the possibility that the composition of the diet itself had some advantage, though they suspected inaccuracy of dietary records or additional water loss as being the true culprit.

A more recent study (11) pitted two diet models against each other in the quest for the optimal hypocaloric diet for reducing cardiovascular risk factor. The two diets were similar in caloric value, but one was 25% carbohydrate, the other 45% carbohydrate. Both groups experienced similar weight loss, suggesting that caloric intake may be the determining factor. In this study, the low carbohydrate group did benefit from greater improvement of fasting blood insulin, the glucose to insulin ratio, and blood triglyceride levels.

Even if a low carbohydrate diet does not have any advantage over other diets that have similar caloric intake, such a diet may still have an advantage in decreasing caloric intake in the first place. Research into the effects of diet composition on appetite suggest that this might indeed be the case (12). It was found that protein causes satiety more readily than carbohydrate, and carbohydrate more so than fat. In addition, the ketosis experienced in a low carbohydrate diet may also have a negative effect on appetite (9). Both of these factors could contribute to positive results in the Atkins diet; even though the diet allows unlimited consumption of certain foods, the resulting decrease in appetite could lead to decreased caloric intake and therefore to weight loss by conventionally accepted means.

## Harmful Side Effects

Much of the concern about the Atkins diet is not related to its weight loss claims, which seem to be undisputed to a certain extent in existing studies, but rather to potential side effects which could render the diet unhealthy in the long term. There has been much concern about the high saturated fat intake in the Atkins diet, the result of unlimited consumption of high fat meats and dairy products (9). One study already mentioned (10) found that subjects following an Atkins-style diet for eight weeks experienced significant increases in LDL cholesterol, but no significant change in total cholesterol or HDL, and a significant decrease in triglycerides. Another study was more positive, finding no significant difference between high- and low- fat diets in terms of total cholesterol or LDL, but higher HDL and lower triglycerides in the high-fat diet (13). Based on their results, the authors suggested reconsideration of current dietary guidelines for coronary heart disease, which encourage replacement of dietary fat with carbohydrate.

Other proposed side effects of the Atkins diet include heart arrhythmias due to free fatty acid influx; deficiency of micronutrients and phytochemicals present in carbohydrate-containing foods (Atkins tries to mitigate those effects with supplements); elevated BUN and greater uric acid load to the kidney due to high levels of protein intake; osteoporosis due to metabolic acidosis; and development of kidney stones (9). A randomized double-blind study compared ketogenic and non-ketogenic diets similar in energy and protein content, in order to assess the effects on cognition (14). It was found that the two subject groups performed similarly on attention tasks, but that the ketogenic subjects performed worse on a "trail making task" involving higher order mental processing and flexibility. Thus, while ketosis may have positive effects in terms of reducing appetite and as a result of fat metabolism, it may pose dangers to the brain, though the duration and permanence of such dangers are as yet unknown.

## Current Research

The studies mentioned above, as well as most of the other studies in this area, tended to deal with relatively small sample sizes over the short term. This is clearly inadequate, considering the amount of time the Atkins diet (as well as other low-carbohydrate/high-protein diets) has been on the market. The general public deserves to see long-term studies that identify with more certainty the benefits and harms associated with the Atkins diet, as well as the potential for maintenance of a healthy weight. Currently there are two studies in progress that show promise for shedding more light on the long-term effects of the Atkins diet.

The first is part of a US Department of Agriculture (USDA) program to assess the health and nutrition effects of popular diets (15). This study has begun with an analysis of existing data, specifically the Continuing Survey of Food Intake by Individuals (CSFII), which involved 10,014 adults aged 19 and older. Their diets were divided into categories of vegetarian and non-vegetarian, the latter of which were further divided into low-, medium-, and high-carbohydrate diets (these categories were subdivided as well). Though this data cannot speak directly to the efficacy of diet programs, it was significant in its association of lower BMIs with vegetarian and high-carbohydrate groups, and the highest BMIs with the low-carbohydrate group. Perhaps more promising is the goal of developing a research protocol to guide prospective studies specifically targeted towards popular diets, though actual results may come some years from now.

According to the Atkins Nutritionals web site, a team under Dr. Eric C. Westman at Duke University is conducting a study on 41 obese men and women (admittedly a small sample) following the Atkins plan with nutritional supplements and counseling (16). After six months, all of the patients lost weight (averaging 1-3 lbs/week), and they experienced a 6.1% average drop in total cholesterol, a 39.9% average reduction in triglycerides, an 18.9% improvement in cholesterol to HDL ratio and a 7.2% average increase in HDL. This study is ongoing, a positive sign for more long-term data, and the results to date are under review for publication. Another project being undertaken at Duke is a controlled randomized study comparing the Atkins diet to the American Heart Association Step I diet for 120 obese hyperlipidemic adults (17).

### Conclusion

In calling his diet a "revolution," Dr. Atkins must have foreseen the controversy that would arise in the nutritional and medical communities. Indeed, severe restriction of carbohydrates from the diet seems like a radical and even unnatural approach to losing weight. But for all of the heated debates, little compelling research has been done to compare the Atkins diet to more traditional low-fat diets. Most studies have been short term and small in sample size. What they have discovered is that Atkins diet weight loss in the long term is most likely due to caloric (and not carbohydrate) restriction; data on cholesterol effects are more varied. A number of harmful side effects have been considered, but again more long-term research would be welcome; there are certainly enough willing Atkins dieters to fill such a study. In judging the Atkins diet, opposing researchers would do well to compare the Atkins diet not only to other diets, but also to the state being obese. For many, this diet, with its unlimited protein and fat consumption and resulting appetite suppression, may be the only diet for which they can maintain consistent adherence. If the weight loss is genuine, it bears consideration whether this diet, if not ideal, can have merit on an individual basis. A moderate carbohydrate rich diet may be right for people of normal weight, but not for some obese people, just as a glass of red wine per day is healthy for most people, but certainly not for alcoholics. One can only hope that future research will facilitate wise judgment regarding the Atkins diet.

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