

Nutrition Performance

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Low-Carb Diets and Extra Lard A Story Beyond Urban Legends

“We can no longer dismiss very-low-carbohydrate diets... Dr. Atkins deserves credit for his observations that many persons can control their weight by greatly reducing carbohydrate intake and for his funding of trials by independent investigators.”

Prof. Walter
Willett

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Annals of Internal Medicine, 2004 18;140:836-837

The leading exercise physiology textbook tells us a *“low-carbohydrate diet sets the stage for a significant loss of lean tissue as the body recruits amino acids from muscle to maintain blood glucose via gluconeogenesis [the formation of glucose from non-carbohydrate molecules such as amino acids].”* Consequently, many exercise scientists maintain that the low-carbohydrate diets suck donkey balls because you will lose muscle mass rather than body fat. However, this is clearly not the case. Further, many scientists still claim a calorie is a calorie no matter what you eat. This article separates facts from the urban legends.

It’s Not Low-Carb, it’s No-Carb!

Although several studies suggest that pre-exercise muscle glycogen stores (glycogen is the principal form in which carbohydrate is stored in tissues) determine capacity for prolonged exercise, there’s no clear requirement for dietary carbohydrates for human adults. Current carbohydrate recommendations are based on 1) preventing ketosis and 2) providing glucose beyond minimal needs.

However, it’s clear that ketosis is not harmful, except in the high levels seen in type 1 diabetes. Also, the need to provide glucose above minimal needs is exactly what has *never* been demonstrated. Indeed, the National Research Council has not established Recommended Dietary Allowances (RDA) for carbohydrate, probably because the human body can adapt to a carbohydrate-free diet and manufacture the glucose it needs.

Metabolic Effects of Low-Carb Diet

The hormonal changes associated with a low-carbohydrate diet include a reduction in the circulating levels of insulin along with increased levels of glucagon. These changes indeed favor gluconeogenesis. However, the body limits glucose utilization to reduce the need for gluconeogenesis.

When the rate of mobilization of fatty acids from fat tissue is accelerated, as, for example, during low carbohydrate intake, the liver produces ketone

bodies: acetoacetate and 3-hydroxybutyrate. However, the liver cannot utilize ketone bodies and thus, they flow from the liver to extra-hepatic tissues (e.g., brain, muscle) for use as a fuel. This spares glucose metabolism via a mechanism similar to the sparing of glucose by burning of fatty acids as an alternative fuel.

Indeed, the use of ketone bodies replaces most of the glucose required by the brain. In comparison with glucose, the ketone bodies are, in fact, very good fuel. Importantly, catabolism (breakdown) of lean body mass is reduced by ketones, which probably explains the preservation of lean tissue observed during very low carbohydrate diets.

Diabetic Ketoacidosis vs. Dietary Ketosis

Many health care professionals and scientists confuse diabetic ketoacidosis with dietary ketosis. Even the *MedLine Medical Dictionary* claims ketosis is “*an abnormal increase of ketone bodies in the body in conditions of reduced or disturbed carbohydrate metabolism (as in uncontrolled diabetes mellitus).*” So, let’s face the facts.

Diabetic patients know that the detection in their urine of the ketone bodies is a danger signal that their diabetes is poorly controlled. Indeed, in severely uncontrolled diabetes, if the ketone bodies are produced in massive supranormal quantities, they are associated with ketoacidosis (an abnormal condition of reduced alkalinity accompanied by ketosis). However, during very low carbohydrate intake, the regulated and controlled production of ketone bodies causes a *harmless* physiological state known as dietary ketosis. In ketosis, the blood pH remains buffered within normal limits.

WARNING: *Diabetics must use caution in transitioning from a high-carb diet to a low-carb diet. The risk of hypoglycemia (low blood sugar) is high without immediate medication adjustment. Thus, such change should be made under the close supervision of medical personnel experienced with low-carb diets.*

So, if you are diabetic and want to try a low-carb regimen, I strongly suggest you first talk with your physician and perhaps ask him/her to purchase a copy of a recent paper by Dr. Daniel O’Neill and co-workers (*Metabolic Syndrome and Related Disorders* 2003;1:291-298). They found that a strict diabetic program— including a restriction on carbohydrate intake to about 30 grams per day— can lead to excellent blood sugar control. For your information, good blood sugar control is though to be of paramount importance in preventing the many long-term complications of diabetes.

Low-Carb Diets and Metabolic Advantage

Low-carb/high-protein diets indeed provide “metabolic advantage,” a greater weight loss/fat loss per calorie consumed compared to isocaloric (having similar caloric values) high-carb diets. The idea that metabolic advantage might violate laws of thermodynamics (“Manninen dude, don’t confuse me with the facts, a calorie is always a calorie”) has some immediate appeal, but is not theoretically correct.

The first law of thermodynamics can be written as follows:

Change in energy stores = energy intake – energy expenditure

Although this principle always applies, the application to living organisms is certainly not simple. Indeed, the abovementioned equation only applies to *closed* systems. However, if matter can be exchanged between system and surroundings, the system is *open*. Thus, all living organisms that have ever existed are open systems. The system takes in food from the environment and uses it to maintain body temperature and power all the biochemical pathways of its body.

The second law of thermodynamics tells us that whenever energy is exchanged, the efficiency will be imperfect and some energy will escape—usually in the form of heat. *Importantly, the metabolic pathways that macronutrients (i.e., carbs, fats, proteins) follow may be very different due to the differences in hormonal state and enzymatic activity.*

As noted above, the hormonal changes associated with a low-carbohydrate diet include a reduction in the circulating levels of insulin along with increased levels of glucagon. These changes favor gluconeogenesis, which is, of course, an energy-consuming process. In addition, a low-carb diet increases turnover of body proteins; protein turnover spends significantly more energy than previously appreciated.

Thus, although supported by the prominent obesity authorities, the old nutritional mantra “a calorie is a calorie” is misleading. Different diets (e.g., low-carb/high-protein vs. high-carb/low-protein) lead to different biochemical pathways (due to the hormonal and enzymatic changes) that are *not* equivalent when correctly compared through the laws of thermodynamics.

The recent review by Drs. Richard Feiman and Eugene Fein published in the *Nutrition Journal* stated, “*Metabolic advantage with low-carbohydrate diets is well established in the literature... The extent to which metabolic advantage will have significant impact in treating obesity is unknown and it is widely said in studies of low-carbohydrate diets that "more work needs to be done." However, if the misconception is perpetuated that there is a violation of physical laws, that work will not be done, and if done, will go unpublished due to editorial resistance. Attacking the obesity epidemic will involve giving up many old ideas that have not been productive. "A calorie is a calorie" might be a good place to start.*”

Landmark Study by Dr. Volek

Dr. Jeff Volek and colleagues examined the effects of a six-week carbohydrate-restricted diet on total and regional body composition and the relationships with fasting hormones. Twelve healthy normal-weight men switched from their habitual diet (48 percent carbohydrate) to a carbohydrate-restricted diet (eight percent carbohydrate) for six weeks and eight men served as controls, consuming their normal diet. Subjects were *encouraged* to consume adequate dietary energy to maintain body mass during intervention.

Fat mass was significantly decreased (-3.4 kilograms) and lean body mass significantly *increased* (+1.1 kilograms) at week six. However, there were no significant changes in body composition in the control group. The authors concluded that a carbohydrate-restricted diet resulted in a significant reduction

in fat mass and a concomitant increase in lean body mass in normal-weight men.

Cycling Low-Carb/High-Carb for Muscle Building?

Some feel cycling between low-carb and high-carb regimens (i.e., the Metabolic Diet) manipulates the anabolic and fat-burning processes in the body so they maintain or increase muscle mass while decreasing body fat. For example, it's been shown that the low-carb phase of the diet makes the insulin response to the high-carb diet even greater than it normally would be. Contrary to popular belief, insulin is not the enemy. Insulin is a problem *only* when it's chronically high or extremely variable.

It has been suggested that there's an acute anabolic effect on muscle when a short-term low-carb diet is altered with carb loading. Cellular hydration is maximized by the water and carb loading, and insulin sensitivity is increased, purportedly leading to an intense anabolic stimulus. Although these theories have some merit, there are no published studies examining the effects of the Metabolic Diet on muscle mass or fat loss.

Low-Carb Diets and Blood Lipids

Low-carbohydrate diets have been avoided because of the high-fat nature of the diets and the "predicted" associated hypercholesterolemia (the presence of excess cholesterol in the blood). However, blood lipids generally *improve* with the low-carbohydrate diet, especially the triglyceride and good cholesterol (HDL) measurements. In contrast, high-carbohydrate diets, which reduce good cholesterol and raise triglyceride levels, exacerbate the metabolic manifestations of the insulin resistance syndrome.

Although not always appreciated, *all* fats raise good cholesterol. Thus, it's clear that replacement of total fat (or any fatty acid distribution) with carbohydrates results in significant reductions in good cholesterol. Indeed, recent studies of carbohydrate intake and its relationship to the development of coronary heart disease and type 2 diabetes have been rather revealing, showing that an *increase* in carbohydrate intake is related to *increase* in both conditions.

Low-Carb Diets and Water Balance

Some well-meaning, yet misinformed, scientists have claimed that additional weight loss on low-carbohydrate diets is entirely explained by dehydration (an abnormal depletion of body fluids). However, this is simply not true. The classic paper by Dr. Rabast and co-workers stated, "*From the findings obtained it appears that the alterations in the water and electrolyte balance observed during the low-carbohydrate diets are reversible phenomena and should thus not be regarded as causal agents of the different weight reduction.*"

Useful Supplements in a Low-Carb Diet

- *Multi vitamin-mineral supplement.* This one is a must.

- *Fiber supplement.* Insoluble fibers enlarge the stools, easing passage, and speed the transit time. Thus, fiber supplementation prevents constipation.
- *Fish oil supplement.* If you have problems with eating fish on a regular basis, I recommend a fish oil supplement.
- *Low-carb meal replacement products.* MRPs give you standard macro- and micronutrients. Thus, they are convenient and sometimes even less costly than whole foods you can get at the supermarket. Nevertheless, if you are willing to put in the time and effort, you can do as well or better by just buying the whole foods.
- *Ephedrine-caffeine-aspirin.* ECA promotes fat loss while decreasing muscle breakdown. However, ECA is not for everyone and should be used responsibly. Nevertheless, the recent ephedra ban is clearly not supported by the well-controlled scientific studies (*Toxicology Letter* 2004;150:97-110). We simply don't need misinformed, yet well-meaning Big Brother telling us what we can put in *our* bodies.
- *L-carnitine.* This substance might be an effective supplement in low-carb/high-fat diets to increase free fatty acid utilization. It appears that at least two grams (2,000 milligrams) or more per day are needed for the desired effects.

Bottom Line

If your primary goal is to shed extra lard, you may want to try a low-carb diet, especially if you need to lose some 30 to 40 pounds. In my opinion, *The Greenwich Diet* by Dr. Carlton Colker is a very well designed and user-friendly low-carb plan. *The Greenwich Diet* book is available from Advanced Research Press (631-751-9696 or 1-800-653-1151). However, if you just don't have enough energy for your workouts, eat more carbs after training.

If you are a relatively lean dude and want to burn only a few pounds of fat while increasing muscle mass, I feel it's a better idea to gradually drop carbs and fats. The reduction in calories needed to lose weight should not be at the expense of protein, as energy restriction increases protein requirements. Therefore, a low-protein weight loss diet is the best way to *lose* muscle mass!

Finally, if your primary goal is to increase muscle mass, a low-carb diet is not your best choice. I suggest you follow a moderate-carb, moderate fat, high-protein diet and consume a carb-protein drink before, during and after resistance training to boost muscle protein synthesis.

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