

The benefit in replacing dietary carbohydrate with protein.

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For a biochemist, the study of metabolic pathways provides a fascinating insight into chemical reactions and the way they function in living systems but, in the end, even a biochemistry professor still has to answer to answer the question “What should I eat.” Adam Cambell, an editor at Men’s Health magazine once asked me: “You’ve just had a meal that conforms to your idea of good nutrition and satisfying portions of food but you’re still hungry. What should you do?”

“Think of a perfectly-cooked juicy steak or perfectly-prepared fish, or some similar high protein food that you usually like,” I suggested. “If that sounds good, you’re hungry and you should eat something. If it doesn’t sound good, you’re not hungry. You may want desert. You may want something feeling good in your mouth, but you’re not hungry.” What I meant, of course, is that foods that are high in protein, and lower in carbohydrate, tend to be more filling. This satiating effect of protein is well-known in the biochemical literature and is one of the advantages of diets that restrict carbohydrates and keep protein high. The fact that protein is satisfying also means that it provides its own control over intake and, for that reason, “concerns” about high protein intake that you hear from nutritional expert are not usually a real problem. In the obesity epidemic where there was a large increase in carbohydrate consumption and a general decline in fat consumption, protein stayed about the same. When nutritionists carry out experiments in which people can eat freely, they generally do not change their protein consumption. In fact, it now seems likely that most people are not getting enough protein. Recent studies show that people benefit from replacing carbohydrate in their diet with protein, the benefit is in better weight control, in an improved ratio to lean body mass compared to fat and in better control of blood insulin and glucose. I will describe some of the features of this problem with references to papers in the scientific literature that are either open access or have been made publicly available and not require a subscription.

Official recommendations may not specify enough protein

Nutritionists who study protein think that we need modification of official recommendations for protein consumption. Donald Layman at the University of Illinois has reviewed some of the important research on this question and he came up with several important points:

- Protein is a critical part of the adult diet. Beyond physical growth which is only important for a brief period in your life, there is a continuing need to repair and remodel muscle and bone
- Protein needs for adults relate to body weight not, as you sometimes see, as a per cent of total calories. So, if you are reducing calories, protein needs to stay high and may be a higher percentage of total calories. In choosing a diet, you should establish the grams of protein first.
- The amount of protein at each meal can be important. Research indicates that an ideal is 30 g of protein per meal although this may not be practical for everybody. It is recommended that breakfast be high in protein.
- Most adults benefit from protein intakes above the minimum RDA (recommended daily allotment) and this is especially true for an aging population with increased risks of poor health. The RDA represents a minimum daily intake for active healthy adults but most people will benefit from replacing at least some carbohydrate in the diet with protein.

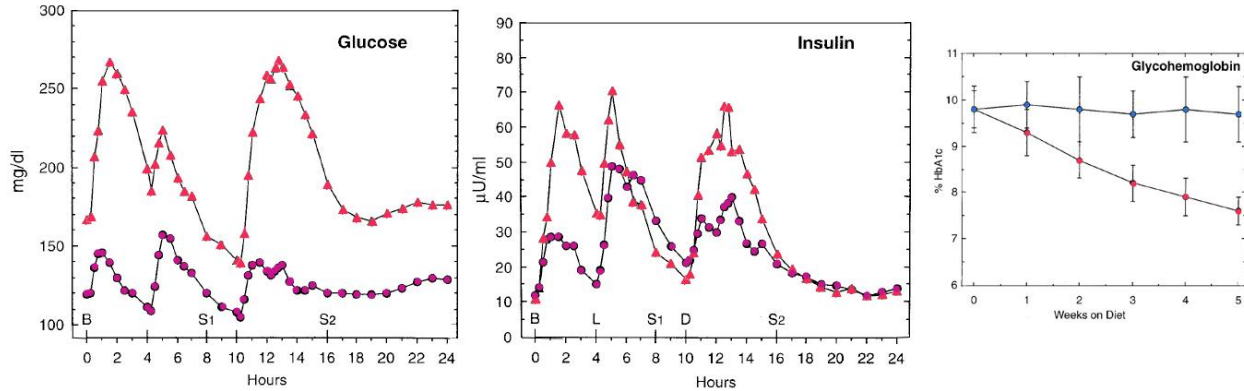
The full story on protein recommendations can be found at Nutrition & Metabolism (no subscription required: <http://www.nutritionandmetabolism.com/content/pdf/1743-7075-6-12.pdf>)

A look at the science

Proteins are generally more complicated molecules than fat or carbohydrate. Like starch, they are polymers (think chain of beads). Most starches are homopolymers (all the beads are the same, glucose in this case), but protein molecules are made of 20 different kinds of beads (amino acids). About half are interchangeable or can be made from other nutrients and are said to be non-essential. The other half are required in the diet and are said to be essential amino acids, or, for some reason, the more modern term is indispensable. Now your body is continually breaking down and re-synthesizing its own proteins, the most obvious function of dietary protein is supplying amino acids to replenish body proteins so high quality dietary proteins will be those that supply all the essential amino acids. Meat, fish and eggs are high quality proteins but combinations of vegetables can also supply the full complement of amino acids. Many web sites and other sources will give you information about how vegetables can be combined to supply amino acids, but there is another aspect of protein nutrition that should be considered. Amino acids, like carbohydrate are not just sources of cell material but may have a signaling function. Remember that it is not just that glucose supplies energy but that it stimulates the release of insulin which further controls metabolism. Amino acids also perform this function and stimulate insulin release and trigger other physiologic processes, in particular, synthesis of new body protein and provide control over blood glucose. One essential amino acid in particular, leucine, is of greatest importance in this role. In comparative studies, diets that are high in leucine improve the ratio of lean body mass to fat. Whey and other milk proteins are particularly high in leucine; red meat is also a good source.

... benefit accrued even though no weight was lost

The benefit in substituting protein for carbohydrate is greatest for people with diabetes. The studies from the laboratories of Mary Gannon and Frank Nuttall are pretty remarkable and I show you a picture of the actual results from their experiments. They studied the effect of reducing dietary carbohydrate on responses of people with diabetes. The figure shows that after 5 weeks on a diet with 20 % available glucose (circles in the figure), the response to meals is drastically improved compared to the response if the traditional diet is continued (triangles). As the diet proceeded, hemoglobin A1c was also reduced. Gannon and Nuttall have also showed that diets with slightly higher glucose may be effective but the response depends on how much glucose is in the diet. A very important feature of the studies of this study is that the diets were designed so that patients maintained their weight, in other words, benefit accrued even though no weight was lost. Given how hard it is to lose weight, this has to be considered a real plus for the higher protein, lower carbohydrate diet. You can see the whole study, again, without subscription at: <http://www.nutritionandmetabolism.com/content/pdf/1743-7075-3-16.pdf>



Is there a danger of too much protein?

How many times have you read an article in the media, or even in the medical literature, warning you about the dangers of high protein diets for your kidneys, or for kidney stones, or whatever. Probably quite a few. Are they for real? To answer that question, think of how often you have read an article in the media describing somebody who actually had kidney problems or stones due to a high protein diet? That number is zero or close (there's always a case study someplace with an isolated patient).

To understand the danger in a high protein diet for people with normal kidneys, consider the following conversation I had with an expert on kidney disease when I was the editor of *Nutrition & Metabolism*.

RF: I received a manuscript today that rather strongly and categorically says that there is no danger in high protein diets for people with normal kidneys.

Nephrologist: That's right.

RF: It is? Can we document that?

N: How do you document that there are no people with three eyes. We have looked very hard for it and we never found it.

So, what's wrong. Mostly what's wrong is that we never got around to agreeing on what high protein is. Diets that encourage you to replace carbohydrate with protein are only trying to counteract the high carbohydrate message. Few people actually eat huge amounts of protein. As discussed above, protein tends to be more satisfying than carbohydrate and what might be considered high protein is pretty average.

In other words, there is common sense. A healthy high protein diet is currently estimated to have a daily intake of about 1 to 4 g of protein for every kg (2.2 lbs) of body weight while the USDA recommendation is only 0.8 g/kg). So, if you weigh 175 lbs., an optimal level of protein will be at least 80. The diet shown below is actually quite a bit higher. Is this really unusual? In fact, if you ate 3 eggs or even bigger portion of brisket, do you think something terrible will happen. Is this dangerous? To say that normal eating, even with occasional over-indulgence, is dangerous requires real proof and that's what's always been missing.

Finally, it is likely that for people with diabetes, there is great danger to kidneys from continued high blood sugar and most physicians would say that this risk is real while any risk from high protein is conjecture.

The bottom line: Substituting protein for carbohydrate in the diet improves blood glucose and insulin control. As part of a weight loss diet, higher protein preserves lean mass compared to higher

carbohydrate diets but the benefits of higher protein, lower carbohydrate diets provide benefit even in the absence of weight loss.

Food	Carbohydrate (g)	Protein (g)
Breakfast		
2 Eggs	2	12
1/2 slices tomato	3	0
Lunch - Lox & Salad		
Lox 6 OZ	0	32
4 Cups of Lettuce	4	4
Oil & Vinegar, salt & Pepper (2 TBSP)	0	0
Onion	1	1
2 Stalks of Celery	1	0
1 Tomato	5	1
4 Radishes	1	0
Dinner – Brisket & 2 Sides		
1 Cup Chicken Broth	0	3
Brisket - see recipe	3	40
Broccoli, 1 cup chopped	11	4
Cauliflower Mashed Potatoes	7	3
2 Coffees		
Heavy Cream 1 TBSP	0	0
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Total:	38	100