

UCLA
Nutrition Bytes

Title

"Net Carbs": The Lowdown on Low-carb Labeling

Permalink

<https://escholarship.org/uc/item/0wb1k8g5>

Journal

Nutrition Bytes, 10(1)

ISSN

1548-4327

Author

Benalt, Wendi A

Publication Date

2005-05-26

Peer reviewed

The Low-Carb Craze

Lately it seems that you can't walk down the aisle of the local supermarket without being confronted with evidence of America's low-carb dieting obsession. With a growing body of evidence showing that low-carb diets can help people to lose weight, improve their lipid profile, and reduce their risk of heart disease^[1,2], American consumers are increasingly seeking out low-carb products. This increased demand certainly isn't lost on food manufacturers who are jumping on the "low-carb" bandwagon. To make their products more appealing, several manufacturers have invented a whole new category of carbohydrates that they alternately call "net", "effective" or "impact" carbs. To be clear, this number does not reflect the total carbohydrates in the product nor even the total carbs in one serving. For example, an energy bar from Powerbar's "Carb Select" line has a total carbohydrate content of 30 grams, but the label would have us believe that only 2 of these carbohydrates have an "impact." Needless to say, these claims can be confusing, leading the uninformed consumer to wonder why only a fraction of the total carbohydrates in a given product actually "count." What does it all mean? What are these "net carbs"? Could it be true that some carbohydrates just don't count?

The Glycemic Index

The idea that the body responds differently to different types of carbohydrates is not a new one. In 1981, Jenkins *et al* introduced the idea of the glycemic index (GI), which compares the postprandial blood glucose levels evoked by different foods to the response evoked by a control dose of glucose.^[3] According to this system, the glycemic response evoked by glucose is assigned a value of 100 and the glycemic response evoked by the test food is expressed as a percentage of that value.^[4] Thus, foods with a high GI more closely approximate the effects of an enteral dose of glucose, causing a sharp rise in blood glucose and a corresponding spike in serum insulin levels. Alternately, foods with a low GI are more slowly digested and absorbed, and cause a more gradual change in blood glucose and insulin.

The average American diet has a high glycemic index.^[5] This is problematic because short-term studies in lean healthy people, obese individuals, and people with diabetes show consistently higher day-long insulin levels with diets based on high GI foods in comparison with low GI diets of similar nutrient composition.^[5] Since insulin promotes glucose uptake into adipocytes and inhibits mobilization from fat stores, it follows logically that hyperinsulinemia would make weight loss more difficult. Stated simply, low-carb diets like the Atkins diet are based on this principle that carbohydrates raise insulin and insulin prevents weight loss. However, as we've already discussed, different carbohydrates evoke different insulin responses. This is where the idea of "net carbs" comes in. In the Atkins diet, carbohydrates which cause an insulin spike are considered important, whereas carbs "digested by your body, but not turned into glucose" and carbohydrates that are not digested at all "do not count."^[6] Two types of carbohydrates that are commonly included in this category are dietary fiber, which is indigestible^[6], and sugar alcohols, which are variably absorbed and incompletely metabolized.^[7] Products which feature "net", "effective" or "impact" carb labeling arrive at these numbers by subtracting the grams of fiber and sugar alcohols from the number of total carbohydrates. Since these carbohydrates have a "minimal impact on blood

sugar”^[6], Atkins maintains that they needn’t be considered by the carb-counting consumer.

Does the science back up these “net carb” claims ?

Yes and no. Sugar alcohols (also called polyols) are saccharide derivatives in which a ketone or aldehyde group is replaced by a hydroxyl group.^[7] They are popular sugar replacers because they are sweet tasting (though, not as sweet as sucrose) and provide similar structure and “mouth feel” to foods^[8], while evoking minimal glycemic responses. However, much like carbohydrates, it turns out that not all sugar alcohols are created equal. In 1997, Natah *et al.* studied plasma glucose and insulin levels in non-obese subjects after the ingestion of 25g lactitol, xylitol, or glucose.^[9] They found that ingestion of either polyol resulted in much smaller rises in plasma glucose and insulin levels compared to glucose ingestion. The glycemic indices of the two polyols were found to be 7 (xylitol) and -1 (lactitol).^[9] These findings are presumably due to the polyols’ low absorption and incomplete metabolism and are consistent with the theory that sugar alcohols can be meaningfully subtracted from total carbohydrate counts in the expression of “net carbs.” In contrast, Felber *et al* conducted a similar study evaluating changes in plasma glucose and insulin following ingestion of 30g of either maltitol or sucrose.^[10] While they found that the elevations in plasma glucose and insulin were significantly smaller following maltitol ingestion than sucrose, the responses evoked by maltitol were far from zero. The maltitol-associated rise in plasma glucose was 21±4mg/dl compared to 38±4mg/dl for sucrose, and insulin elevation was 9.3±2.7 μU/ml compared to 25.5±5.0 μU/ml for sucrose. Far from negligible, studies have shown the GI of maltitol to be as high as 35^[11], a value two points higher than the GI of M&Ms!^[6] How could this be? Maltitol is composed of a molecule of glucose and a molecule of sorbitol joined by an α-1,4 glycosidic linkage.^[10] It has been shown that this linkage can be slowly and partially hydrolyzed by an intestinal enzyme, allowing for the absorption of sorbitol (GI=9)^[11] and glucose.^[10] Interestingly, Atkins preferentially uses maltitol, as well as sorbitol and isomalt in their confections, claiming they “behave most like sugar” and “cause the fewest gastrointestinal side effects.”^[8] How can Atkins use maltitol in their products – a compound with a reported GI as high as 35^[11] – and then dismiss it as having a “minimal impact on blood sugar?” Is that misleading? Is it illegal?

The Labeling Debate

While “net carb” claims can be confusing, the issue of legality is ultimately decided by the FDA. According to the FDA Obesity Working Group Report, the terms “low-carb,” “reduced-carb,” and “carb-free” are “nutrient content claims,” meaning that they characterize the amount of a nutrient, in this case carbohydrates, in a food product. As such, these claims must be made “in accordance with an authorizing regulation.”^[12] In other words, if a manufacturer claims that their product is “low-carb,” their meaning must be consistent with the FDA definition of the phrase. Currently, however, FDA regulations do not define any terms to describe the amount of carbohydrate in food.^[13] Similarly, the terms “net carbs,” “effective carbs,” and “impact carbs” lack legal definitions. This is notable because the FDA has defined several terms to describe the amount of other nutrients in foods. For example, in order to advertise itself as “low fat,” a product must contain 3g or less per serving, while “fat free” foods must contain less

than 0.5g per serving.^[13] Also, in order to call itself a “good source” of a given nutrient, one serving of the food product must contain 10 to 19 percent of the Daily Value for that nutrient.^[13] The grey area seems to surround FDA regulations of “implied claims.” According to the FDA, “These types of claims are prohibited when they wrongfully imply that a food contains or does not contain a meaningful level of a nutrient.”^[13] This seems to strike at the heart of the “net carb” labeling debate; however, the FDA has yet to act conclusively on the matter.

Under the Nutrition Labeling and Education Act of 1990 and FDA's implementing regulations (Title 21, Code of Federal Regulations Part 101), nutrient content claims that are not already defined by FDA can be requested through a petition process.^[12] Accordingly, on February 2, 2004, the Grocery Manufacturers of America – the world's largest association of food, beverage and consumer product companies, filed a petition to establish new regulations for carbohydrate nutrient content claims.^[14] On the same day the Center for Science in the Public Interest, a nonprofit advocacy group, called on the FDA to regulate implied low-carb claims like "carb counting," "carb fit," and "carb options" as though they were "low carb" or "reduced carb" claims.^[15] At this point, the FDA has filed the petitions and has expressed its intention to “initiate rulemaking proceedings” for nutrient content claims for carbohydrates.^[12] In addition, the agency intends to provide guidance to food manufacturers on the use of the term "net" in relation to the carbohydrate content of food.^[12] The USFDA Center for Food Safety and Applied Nutrition (CFSAN) 2005 Program Priorities identifies 123 “A-list goals.”^[16] Among them are: “Publish proposed rule for carbohydrate nutrient content claims” and “Publish an Advance Notice of Proposed Rulemaking (ANPRM) for the terms used in relation to carbohydrate content of foods, e.g., ‘net’ and ‘effective.’” It is the stated goal of the CFSAN to complete at least 90 percent of these “A-List” items by the end of the current fiscal year, September 30, 2005.^[16]

What's all the fuss about?

Even if these terms are misleading, are they really hurting anyone? There are certainly those who would argue that the answer is yes. For the consumer seeking out low “net carbs” for the purposes of weight loss, the consequences can be significant. “Net carb” labeling implies to the consumer that the grams of dietary fiber and sugar alcohols in a product don't count. This may lead some consumers to believe, incorrectly, that low-carb foods are low in calories – a misconception that invariably leads to over-eating and weight gain, not to mention diarrhea. While polyols contribute fewer calories than an equal amount of sugar (averaging about 2 calories per gram^[7], instead of 4), they are certainly not calorie-free. In fact, many foods sweetened with sugar alcohols are high in fat and calories.^[7]

Perhaps more worrisome are the potential consequences of “net carb” confusion for diabetic patients. For diabetics who are dependent on insulin injections to regulate their blood sugar, interpreting the “net carb” label can be challenging. If these patients base their preprandial insulin dose on the total number of carbohydrates, they may inject too much insulin prior to a snack that contains predominantly polyols, precipitating an unexpected hypoglycemic episode.^[7] However, if they use the “net carb” measure, trusting that the sugar alcohols have a “minimal impact on blood sugar”, they may underdose their insulin, resulting in impaired glucose control. The recommendations of

the American Diabetes Association on this matter have been somewhat unclear. A 2002 article by Franz *et al* in *Diabetes Care* (the journal of the ADA) advises that “for individuals requiring insulin, the total carbohydrate content of meals and snacks is the first priority and determines the premeal insulin dosage and postprandial glucose response.”^[17] However, an undated article on the current ADA website instructs patients to “subtract half of the sugar alcohol grams from the total carbohydrate and count the remaining grams.”^[18] So which is it?

Final Thoughts

It seems to me that the crux of the “net carb” debate lies in a fundamental misconception about carbohydrates. Whether polyols are subtracted out in their entirety, or only half are included as “impact” carbs, the calculations are based on the fallacy that sugar alcohols are a homogenous group of compounds which are fundamentally different from “other carbohydrates.” The evidence shows that this simply isn’t true. For example, it has been reported that chocolate sweetened with maltitol can elicit the same plasma glucose response in normal subjects as chocolate sweetened with sucrose.^[7] Clearly, separating carbohydrates into sugars, fiber, polyols, and “other” is an oversimplification which ignores the full spectrum of glycemic responses evoked by carbohydrates. If one’s goal is to classify carbohydrates in a meaningful way based on their glycemic and insulinemic properties, the current “net carb” method is far too simplistic. Only by studying the responses evoked by individual products in large sample populations can meaningful conclusions be drawn as to their glycemic properties. Realistically, classifying foods in this way would be a massive undertaking and likely beyond the scope of the FDA, which defines the nutrient content of food products as opposed to their metabolic effects.

References

1. Stern L, Iqbal N, Seshadri P et al, The Effects of Low-Carbohydrate versus Conventional Weight Loss Diets in Severely Obese Adults: One-Year Follow-up of a Randomized Trial. *Annals of Internal Medicine*. 2004;140(10):778-785.
2. Dashti HM, Bo-Abbas YY, Asfar SK et al, Ketogenic diet modifies the risk factors of heart disease in obese patients. *Nutrition*. 2003;19(10):901-2.
3. Jenkins DJ, Wolever TM, Taylor RH et al, Glycemic index of foods: a physiological basis for carbohydrate exchange. *American Journal of Clinical Nutrition*. 1981; 34:362-366.
4. Jenkins DJ, Kendall CW, Augustin LS et al, Glycemic index: overview of implications in health and disease. *American Journal of Clinical Nutrition*. 2002;76(1):266S-273S.
5. Brand-Miller J and Foster-Powell K. Diets with a Low Glycemic Index: From Theory to Practice. *Nutrition Today*. 1999;34:64-72.
6. Anonymous. “The Skinny on Net Carbs” © Atkins Nutritionals, Inc., 2002. Available

- at: <http://atkins.com/Archive/2002/10/9-819097.html>. Accessed January 14, 2005.
7. Wolever TMS, Piekarz A, Hollands R, Younker K. Sugar Alcohols and Diabetes: A Review. *Canadian Journal of Diabetes*. 2002;26(4):356-362.
 8. Bruns P. "Net Carbs and Sugar Alcohols" © Atkins Nutritionals, Inc., 2004. Available at: <http://atkins.com/Archive/2004/7/16-927112.html>. Accessed January 14, 2005.
 9. Natah SS, Hussien KR, Tuominen JA, Koivisto VA. Metabolic Response to Lactitol and Xylitol in Healthy Men. *Am J Clin Nutr*. 1997;65(4):947-50.
 10. Felber JP, Tappy L, Vouillamoz D et al, Comparative Study of Maltitol and Sucrose by Means of Continuous Indirect Calorimetry. *Journal of Parenteral and Enteral Nutrition*. 1987;11(3):250-4.
 11. Livesy G. Health potential of polyols as sugar replacers, with emphasis on low glycaemic properties. *Nutritional Research Reviews*. 2003;16(2):163-91.
 12. FDA Obesity Working Group. "Fact Sheet: Carbohydrates" March 12, 2004. Available at: <http://www.fda.gov/oc/initiatives/obesity/factsheet.html>. Accessed January 14, 2005.
 13. Anonymous. "The Food Label" US Food and Drug Administration; May, 1999. Available at: www.fda.gov/opacom/backgrounders/foodlabel/newlabel.html. Accessed January 14, 2005.
 14. Anonymous. "GMA Calls for Carbohydrate Labeling Regulations" © US Newswire, 2004. Available at: <http://releases.usnewswire.com/GetRelease.asp?id=25778>. Accessed January 14, 2005.
 15. Anonymous. "CSPI Urges Crackdown on Carb Claims" Center for Science in the Public Interest; February 2, 2004. Available at: <http://www.cspinet.org/new/200402021.html>. Accessed January 14, 2005.
 16. US FDA Center for Food Safety and Applied Nutrition. "CFSAN 2005 Program Priorities" US FDA CFSAN; December 1, 2004. Available at: <http://www.cfsan.fda.gov/~dms/cfsand04.html>. Accessed January 14, 2005.
 17. Franz MJ, Bantle JP, Beebe CA et al, Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications. *Diabetes Care*. 2002;25:148-198.
 18. Anonymous. "Sweeteners and Desserts" American Diabetes Association; n.d. Available at: www.diabetes.org/nutrition-and-recipes/nutrition/sweeteners.jsp. Accessed January 14, 2005.