What's up with the "Bonk"?

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There seems to be a lot of fuss these days about "bonking". Without even knowing what it means the word just gives off a negative vibe. As a fuddy-duddy old dad who'd never heard the term before and didn't know any better; had I overheard my daughters talking about bonking, I'd probably have run to get the nearest shotgun to track down the idiots they were planning to do it with.

It doesn't seem that long ago that runners, and in particular marathon runners, who ran into trouble during their event would "hit the wall" usually somewhere around the 18-20 mile mark. I'm all too familiar with the concept myself having met this unfortunate fate in both my marathon journeys. I swear that my nose is still at least a ½ inch flatter now, although those who know me might beg to differ. So as a marathon Medical Director I recently thought it incumbent upon me to familiarize myself with the nuances of "the bonk"; an obviously more hipper and fashionable version of the dreaded sequence of events behind all the fuss.

For the better part of 60 years or so, since the early part of the last century, the cause of bonking (I.e., "hitting the wall") was accepted as simply due to the body running out of fuel, particularly carbohydrates and more specifically glycogen. For those unfamiliar with either term and fortunate enough not to have had the experience, hitting the wall or bonking is a systemic collapse of multiple bodily functions during endurance events. It is typified by feelings of extreme fatigue, with legs that feel either like spaghetti or a pair of concrete blocks.

Carbohydrates in the form of glucose and glycogen are the principal nutrients that our body's use as an energy source during exercise. Glycogen is stored in the liver and muscles and for years the traditional dogma concerning hitting the wall was simply thought to be the result of a depletion of the glycogen available to the muscles. Once out of "carbs" the body turns to alternative energy sources, principally fat, which leads to a far less expedient and efficient energy producing process.

Conversely and equally as rudimentary was the universally held belief that prevention of hitting the proverbial wall was merely a function of stuffing carbohydrates into one's body in the days leading up to the race. "Carbo-loading" as this came to be known was usually accomplished by first avoiding carbs for several days followed by another three or four days of cramming enough carbohydrates into the body as was humanly possible. For decades, pre-event "carbo-loading" remained in vogue with only minor modifications eliminating the early carbo depletion phase but continuing to make carbohydrates approximately 75% of nutritional intake during the week leading up to the race. Eventually it became apparent to scientists that the brain is also in need of liver derived glucose and glycogen and that if not properly nourished during the activity could lead to a loss of agility, fatigue, and in the most extreme cases hallucinations and

delirium. This was discovered to be easily corrected by glucose replenishment during the activity and led to the creation of the sport replacement drink.

Gradually over the past 30 years or so the science of sports nutrition has evolved in ways that have challenged the conventional wisdom. For years it was felt that slower metabolizing carbohydrates with a lower glycemic index were preferable to those more rapidly digested. This no longer may be the case since it seems that during exercise the body has adaptions that allow it to use all carbs equally. It also turns out that energy metabolism is perhaps a bit more complex than simply involving carbohydrate ingestion but is probably due to a multifactorial synergistic interplay of carbohydrates, proteins, fats, and associated hormonal balance. Proteins in combination with carbohydrates, perhaps in precise ratios, are now believed by some to have beneficial effects on performance by enhancing insulin secretion that leads to more effective glycogen replenishment and has led to newer engineering in sport replacement drinks and products. As with most things in science, the case in this regard is far from closed with some scientists believing that performance enhancement may be due more to the number of calories consumed rather than the exact ratio of these nutrients in the diet.

Nonetheless, protein has a number of important features that those involved in endurance training cannot ignore. This includes its important role in rebuilding tissues aiding recovery from exercise; slowing the digestion of carbohydrates allowing them to be more efficiently converted to an available energy source; assisting with proper brain function; and can also be converted into carbohydrates by the liver if carbohydrate depletion occurs. Therefore, if the body is not properly supplied an adequate amount of protein, an individual may lose muscle mass as a result. It's easy to see how this may contribute to premature fatigability.

From what I can see now most scientists who study the bonking phenomenon agree that the concept of muscle glycogen depletion as the sole reason for the limitation of prolonged exercise performance is unlikely. Perhaps this is at the core of what separates the bonk from its more simplistic cousin, "hitting the wall". One concept that gets noted attention is the notion of "central fatigue" which again is related to brain function. Although the exact mechanisms I believe are still not completely understood, the brain for one reason or another simply convinces an individual that he or she is done regardless of whether or not adequate energy sources are available. It appears that this may be a type of a self-preservation method that the brain uses to protect itself, and there is a growing body of evidence suggesting that this is indeed the case. All of this makes perfect sense to me since I've bonked at much shorter distances than a marathon and on some days a lot quicker than what is typically associated with hitting the wall. Therefore, it's clear to me that bonking more likely results from a complex interaction of multiple factors that not only include proper nutrition but also the effects of proper training in general.

These factors, I believe, are probably the summation of what I like to call "Heat, Hydration and the Grocery List". All aspects of the exercise process are involved including those before, during, and even after working out. Bonking or not in my opinion is likely to be the culmination of the effects of proper preparation with the avoidance of overtraining, proper or improper

fluid balance, and the external environmental factors with appropriate or inappropriate acclimatization. Each individual is probably affected by each of these things in very personal ways so that what works for the guy running next to you may do nothing for you. An essential part of the prepatory training phase involves a bit of experimentation to determine what works best and even then there may be things on any given day that are outside of one's control.

So as with most things in medicine and science it turns out that what's thought to be obvious may not always turn out to be. Although it still appears that for distance events carbs will always be king, it is equally true that runners cannot live by bread alone. Doing so is at one's own peril and in the end may lead to less than optimal performance. Additionally, the old chestnut the more things change the more they stay the same is also true; follow the old axioms if you want to do your best on race day (I.e., prepare properly, rest and recover appropriately and eat a well-balanced diet).

Sounds like you can't keep the old fuddy-duddy dad out of the Medical Director for long; now can you?