

THE BIG IDEAS



The Accepted Dogma
vs. Compelling data.

Two Fuel Tanks
Take your pick.

Keto-Adaptation
How to.

Protein
Necessary, but in moderation.

Fat
Your most important fuel.

The Macro Breakdown
Here it is.



The Art and Science of Low Carbohydrate Performance

BY JEFF S. VOLEK AND STEPHEN D. PHINNEY · BEYOND OBESITY LLC © 2012 · 172 PAGES

“If you are completely content with your body, health and performance on a high carbohydrate diet there is probably no reason to consider a low carbohydrate diet. If it isn’t broke, don’t fix it. But if you have hit a plateau, are in a rut, suffer from overtraining, have trouble recovering from your workouts, want to change your body composition, or simply want to experiment with how your body adapts to restricting carbohydrate, then this book is for **‘You.’**”

‘You’ might be an elite athlete, coach, trainer, dietician, physician or scientist. **‘You’** might be a casual fitness enthusiast or wannabe athlete. **‘You’** might be new to exercise, a weekend warrior, or a veteran of the gym but aren’t satisfied with your progress or feel drained. If any of these people are **‘you’** then this book may have something valuable to offer.”

~ Jeff S. Volek and Stephen D. Phinney from
The Art and Science of Low Carbohydrate Performance

We recently did a Note on a book called [Ketotarian](#) which is a great introduction to going keto—especially if you orient from a vegan or vegetarian perspective. It’s a super simple take on how to get the ball rolling.

And, not too long ago, we did a Note on Mark Sisson’s [The Keto Reset Diet](#). That’s a more thorough look at the process of going keto. It’s perfect if you’re approaching things from a more primal/Paleo lens.

Plus, we have our collection of Notes on [Phil Maffetone](#). Although he’s not about ketosis and low-carb per se, he is ALL ABOUT burning fat for fuel, eliminating all sugar and flours and understanding our levels of “carbohydrate intolerance” then acting accordingly.

(And, we have more Notes on books in the same basic genre such as [Fat for Fuel](#), [Eat Fat Get Thin](#), and [Always Hungry?](#))

Now, when I first got this book (I can’t remember how I found it but I think it might have been from [Mark Sisson](#)!), I thought it was a somewhat obscure title that would be helpful in my quest to take my performance nutrition to the next level. It wasn’t until after I read it that I realized it’s really popular—with over 500 reviews on Amazon (the vast majority 5 stars).

It’s written by two of the leading guys in the whole keto movement. Jeff Volek and Stephen Phinney are both academic researchers and professors who have been studying sports nutrition, ketogenic diets and peak performance for decades.

To put it in perspective, Dr. Stephen Phinney coined the phrase “keto-adapted” in 1980. He has a SUPER impressive pedigree. As per his bio: “*Dr. Phinney received his medical degree from Stanford University, holds a Doctorate in nutritional biochemistry and metabolism from the Massachusetts Institute of Technology and completed post-doctoral research at Harvard University.*”

*“Perfection is not attainable.
But if we chase perfection,
we can catch excellence.”*

~ Vince Lombardi

This is a straight-forward, practical approach to exactly what the title suggests: the art and science of performing well (athletically and otherwise) on a low-carb diet. If that sounds like fun, I think you'll enjoy the book. (Get a copy [here](#).)

It's packed with Big Ideas and I'm excited to share some of my favorites so let's jump straight in!

THE ACCEPTED DOGMA

"We cannot solve problems by using the same kind of thinking we used when we created them."

~ Albert Einstein

"It is accepted dogma within the science of sports nutrition that carbohydrates are essential and that they are the preferred fuel for athletes. Indeed, over the last 45 years a great deal of progress has been made in understanding how to use carbohydrates to optimize the metabolic response to physical activity. This understanding in turn has driven the development of nutritional approaches to prevent fatigue and improve exercise tolerance. We don't want to play down the extraordinary work of researchers who have contributed to this knowledge. However it is instructive to point out that ever since the observation over four decades ago that low muscle glycogen was associated with fatigue, most of that progress has been focused on ways to enhance glycogen levels and carbohydrate oxidation (e.g., carbohydrate loading, use of multiple sources of sugars, etc.). Little effort has been devoted to developing methods to decrease the body's dependence on carbohydrate during physical activity. The result is a billion dollar sports beverage and supplement industry that aggressively promotes rapidly absorbed sources of carbohydrate before, during, and after exercise. We contend that there's a limit to what can be achieved by consuming sugary drinks and gels in hopes of delivering optimized fuel flow, and that it is time to take a serious look at the other side of the coin."

OF COURSE our bodies' preferred fuel is carbohydrates, right?

I mean, you need to carb load before a marathon and other endurance events to make sure you're ready to rock and then you've gotta hammer gels and quick-burning sugary drinks to stay properly fueled and avoid bonking, right?

Well, um. Hmm... Not necessarily.

Just because that's been the accepted dogma for decades doesn't make it so.

(As [Yuval Noah Harari](#) says, just because our culture has bought into an "imagined orders" doesn't mean it's either natural or true. :)

Yes, fatigue is associated with low levels of muscle glycogen. But... That doesn't necessarily mean that figuring out ways to keep the glycogen levels high (via carb-loading before your marathon and pounding quick-burning sugary drinks and gels during an event) is the best way to avoid fatigue.

What if there was a better way to fuel ourselves that simply didn't rely on glucose as the primary source of fuel?

Hmmmm... That would be fascinating, wouldn't it?

Alas, that's what Volek and Phinney have been investigating for decades.

Enter: Our next idea on two fuel tanks.

P.S. Real quick: Let's remember: There are essential fatty acids and essential amino acids (building blocks for protein) but NO essential "carby acids." (lol)

As Volek and Phinney put it: "*Factoid: Within the class of nutrients called 'carbohydrates,' there is no molecule that is essential for human health or well-being. This does not mean that blood sugar is completely unimportant, but rather that blood sugar can be well-maintained via metabolic processes such as gluconeogenesis without dietary carbohydrates in the keto-adapted human.*"

"One implication of this adaptation is protection from 'hitting the wall,' an event primarily associated with inadequate fuel for the brain. This problem (aka 'bonking') occurs in the non-keto-adapted athlete when muscle and liver glycogen reserves are exhausted, leaving muscle and brain to compete for the relatively small amount of glucose that can be made by gluconeogenesis from protein. In addition to improving fuel availability during prolonged exercise, the keto-adapted state may also protect against central fatigue."

*~ Jeff S. Volek and
Stephen D. Phinney*

THE FAT FUEL TANK

"Fat, or more specifically fatty acids, are stored in the body as triglycerides consisting of three fatty acids linked to a single 3 carbon glycerol. Triglycerides coalesce into fat droplets that occupy ~85% of adipose tissue cells (i.e., fat cells, aka 'adipocytes'). Unlike our limited storage of glycogen, fat cells have a vast capacity to store fat. Since fat contains 9 kcal per gram and is stored within minimal water, they are an efficient storage form of energy and can be mobilized quickly when blood insulin levels are low. Even in a very lean athlete, the total amount of energy stored as fat will typically be more than 20 times the maximum level of carbohydrate stored in the body. Thus, whereas vigorous exercise can deplete glycogen reserves in just a few **hours**, when adapted to burning primarily fat, this thin athlete has enough fat to fuel several **days** of exercise.

Which fuel tank do you want access to?

Glycogen Tank: 2,000 kcal

Fat Tank: > 40,000 kcal."

Let's pretend we know nothing about how to best fuel our bodies. We haven't been conditioned to believe anything one way or the other.

No "imagined realities." No dogma.

Completely blank slate.

And...

You're offered a choice.

Option 1. Would you like to have a body that can tap into a source of fuel that can get you through a few **HOURS** of vigorous activity?

Or...

Option 2. Would you prefer to have a body that can tap into a source of fuel that can get you through a few **DAYS** of vigorous activity?

Hours or days? What will it be? How long would you like to be able to go?

Now, you may or may not actually believe what Volek and Phinney (and others) are saying but you'd be CRAZY to go with *hours* when you can have *days*, right? Right. (lol)

And, btw: Just to be clear: If our super-ancient ancestors needed a constant source of glycogen (aka carb) fuel to keep them going at a high level during their inevitable periods of "famine" you and I wouldn't be here today.

Fact is, we can burn either fat for fuel or sugar for fuel. And fat is WAY (!!) more efficient. Period.

Phil Maffetone makes a similar point in [The Big Book of Endurance Training and Racing](#). He puts it this way: "If you want to achieve optimal endurance, then you need to burn more fat. It's that simple. Your body has plenty of fat stores, where most of the fat you eat is first deposited. This stored fat, even the small amounts in super-lean athletes, represents a tremendous reserve of potential energy. For example, an endurance runner who is six feet tall and weighs 150 pounds has enough potential energy stores from his fat stores to power a run for over 100 hours. Trying to obtain more energy from sugar won't come close to that feat."

P.S. In the future, odds are that there won't be too many cars using gas to get around. A new, more sustainable and cleaner-burning fuel source will be dominant: electricity.

Likewise, if all goes well (fingers crossed), humans will upgrade to a cleaner source of fuel: FAT rather than the dirty sugar that's killing us (by the billions!) today.

KETO-ADAPTATION

"The primary nutrient that stimulates insulin is dietary carbohydrate. Some forms of carbohydrate stimulate insulin more than others. Thus, consumption of insulin-stimulating carbohydrates is a surefire way to inhibit your access to the energy stored as body fat during and after exercise."

~ Jeff S. Volek and
Stephen D. Phinney

"Inducing a state of nutritional ketosis and maintaining it long enough to complete keto-adaptation requires a conscientious effort to restrict carbohydrates for two or more weeks. The level of carbohydrate restriction required to optimize fat burning varies from person to person, but the most consistent effects will be achieved at levels of carbohydrate below 50 grams per day. If this sounds frightening to you, that's understandable because you may be accustomed to consuming 10 times that amount. Don't despair, however—it's not as restrictive as you may think. Even 50 grams per day of carbohydrate opens the door to eating copious amounts of low-carbohydrate/high-fat, highly satiating and satisfying foods."

As I mentioned in the intro, Stephen Phinney (Mr. Ph.D. from MIT and MD from Stanford) is the guy who came up with the concept of "keto-adaptation." (< In 1980... Almost 40 years ago!!)

So, it's nice to go to the source on HOW to become keto-adapted.

First, know this: You know that super-stocked fat fuel tank that can keep you going for days? Well, you need to be able to access it. If your body still prefers to burn sugar for fuel, you won't be able to. You need to make the switch and become "keto-adapted."

Volek and Phinney tell us that the process takes at least a couple weeks.

The key? Reduce your carbohydrate intake.

Couple things to note: *"The primary nutrient that stimulates insulin is dietary carbohydrate. Some forms of carbohydrate stimulate insulin more than others. Thus, consumption of insulin-stimulating carbohydrates is a surefire way to inhibit your access to the energy stored as body fat during and after exercise."*

And: *"Although variable from person to person, to get your blood ketones above 1 millimolar typically requires that you consume less than 50 grams of carbohydrates per day."*

Also: Check out the book for more details, but they talk about the fact that you want to just rip the Band-Aid and "just do it!"—going all the way down to <50 grams of carbs lest you find yourself in a kind of no-man's land: *"The other concern with easing into a low carb diet is that once you are eating less than the 150 grams of carb needed to feed your brain with glucose, but still more than the 50 gram threshold below which ketosis is dependably operating, your brain's fuel supply becomes pretty tenuous. If there's not enough glucose to meet the brain's 600 Calorie daily energy habit, and blood ketones remain below the 0.5 millimolar threshold where they can begin to pitch in, your body's two options are: a) burn up protein (for gluconeogenesis to fill the gap) or b) binge on carbs."*

In our clinical experience, the 'Nike approach' is better. Particularly if you use broth/bullion to get enough sodium and eat plenty of low carb vegetables to get enough potassium, your adaptation period will be short and relatively symptom-free."

PROTEIN: NECESSARY, BUT IN MODERATION

"We can all agree that protein is the essence of your body's power. After all, protein is derived from the Greek word for primary. Our muscles, tendons, ligaments, lungs, heart, red blood cells, and enzymes are all constructed primarily of protein. However, like so many other things in life, it's important to get enough but not too much of it. In the context of both our fear of fat and now maybe cutting back on carbohydrates, deciding how much protein to eat requires a bit of diligence."

Protein. It's super important. But let's not go nuts.

Three key takeaways from this chapter: 1. *"Too little or too much protein can be problematic in*

"The direct metabolic benefits of keto-adaptation translate into two general effects relevant to most athletes."

1. Improved body composition (power-to-weight ratio)
2. Improved prolonged endurance performance resulting from better sustained fuel delivery."

~ Jeff S. Volek and
Stephen D. Phinney

the keto-adapted state” and 2) “Aim for a protein intake between 0.6 to 1.0 grams per pound of lean body mass” and 3) “Rather than consume large portions of meats or other protein foods, focus on small to moderate protein portions and combine them with generous portions of good sources of fats (e.g., sauces, butter, olive oil).”

And... Keep the *quality* super high. No factory farmed anything and reduce the processed meats!

So... Quick check in: How's *your* protein intake? (And... Your carb? :)

FAT: YOUR MOST IMPORTANT FUEL

“The argument that you need a high carbohydrate intake and high insulin levels to replenish glycogen reserves is a moot point if you are keto-adapted, since your use of glycogen during exercise will be dramatically reduced. This would be like worrying about putting regular gasoline in your tank when your vehicle has a diesel engine.”

~ Jeff S. Volek and
Stephen D. Phinney

“Fat is your friend when you’re consuming a low carbohydrate diet. It serves as your body’s predominant fuel during both rest and exercise, and it adds flavor and satiety to your diet. Fat consumed in your food does not interfere with keto-adaptation since it has virtually no impact on blood glucose or insulin levels. Since carbohydrates are necessarily limited and protein is kept within a relatively moderate range, it naturally follows that the majority of calories to support your daily activity (including training and competition) must be obtained from fat. *Therefore a key to successful keto-adaptation is figuring out ways to specifically increase your fat intake without over-consuming carbohydrate and protein.*”

Fat. It’s our best friend on our quest to become keto-adapted. We’ll talk more about the proper macro-nutrient allocation in a moment. For now, I want to focus on the QUALITY of fats.

Get this: “Most Americans consume about ten times the amount of omega-6 they need due to frequent intake of soy, corn, cottonseed, peanut, sunflower, and safflower oils. By contrast, many of us barely meet our daily minimum 1% for omega-3.”

We’ve talked about the importance of getting our omega-3 to omega-6 ratios right in other Notes (lest our inflammation goes nuts via an overconsumption of omega-6s). For now, know that if you’re really (!) serious about Optimizing (ahem), you’ll ditch the veggie oils. No more soybean, safflower, canola, corn, etc. oil. Those aren’t helping the cause.

Again, note: They’re everywhere. Other than a few select salad dressings (highly recommend Mark Sisson’s Primal brand!), almost all salad dressings have veggie oils (look at the ingredients!) so make you’re own with olive oil, algae oil, perilla oil or avocado oil. And... Almost all restaurants use veggie oils. So, ask what your food is cooked in and adjust accordingly!

P.S. In addition to all the well-known clinical reasons why we want to avoid veggie oils to reduce inflammation, there’s also research on the fact that: “Peak aerobic power, also called VO_2 max, is negatively associated with biomarkers of inflammation... This implies that reducing inflammation facilitates cellular energy metabolism and increases work performance.”

THE MACRO BREAKDOWN

“There are many resources to help you get started on a low carbohydrate diet. Not all of the low carbohydrate diet books and cookbooks are 100% in line with our operational definition of a ‘well formulated low carbohydrate diet.’ If you have low carb cookbooks and recipes you may need to tweak them to ensure the carb count is low enough, protein is moderate, and the right types of fat are emphasized.

When trying to determine what you actually eat on a daily basis, keep these seven important principles in mind.

1. Low in Carbs: Enough to induce nutritional ketosis and accelerate fat burning; less than 50 g/day for most people
2. Moderate Protein: 0.6 to 1.0 grams per pound of lean body mass
3. Enough Fat: Majority of energy; variable depending on goals of weight loss or maintenance

"During endurance sports, maintaining high carbohydrate availability is challenging, whereas switching to lipid fuels with the selective partitioning of ketones among organs could be revolutionary for athletes."

~ Jeff S. Volek and Stephen D. Phinney

4. **The Right Kinds of Fat: Eat monos and saturates for fuel; limit high polyunsaturated sources (soy, corn, cottonseed)**
5. **Mineral Management: Supplement sodium 2g/day; replace magnesium to stop muscle cramps**
6. **When in Doubt, Eat Less Carbs**
7. **When in Doubt, Eat More Fat"**

There ya go. That's the basic how-to.

Obviously check out the book and other resources for more details but keep in mind those 7 tips—which can be boiled down to these three basic things:

1. Carbs low enough (<50 g/day)
2. Moderate protein (0.6 to 1.0 grams per pound of lean body mass)
3. Good fats (No veggie oils like corn, soybean, safflower, canola, etc.!!)

So, that's our macro nutrient breakdown. As we discussed in *Ketotarian*, one of the drawbacks of some keto approaches is that they can get too focused on the macro precision and then forget about the QUALITY of those calories.

So, if you're feeling so inspired, let's make sure we're mindful about BOTH the macro allocation between carbs and proteins and fats AND the *quality*—making sure we're getting tons of phytonutrient greens and the best-possible quality proteins.

There ya go. That's a super-quick look at *The Art and Science of Low Carbohydrate Performance*. Hope you enjoyed and here's to Optimizing our energy engines. Let's do this! :)

B

Brian Johnson,
Chief Philosopher

If you liked this Note, you'll probably like...

[The Keto Reset Diet](#)

[The Maffetone Method](#)

[Natural Born Heroes](#)

[Headstrong](#)

[Ketotarian](#)

[Keto for Cancer](#)

[Fat for Fuel](#)

[Eat Fat Get Thin](#)

[Always Hungry?](#)

[Brain Maker](#)

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Brian Johnson loves helping people optimize their lives so they can actualize their potential as he studies, embodies and teaches the fundamentals of optimal living—integrating ancient wisdom + modern science + practical tools. Learn more and optimize your life at optimize.me.