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Take Control of Your Health

What I'm Learning About Low Carb, Cortisol and Glucose

Analysis by Dr. Joseph Mercola Fact Checked | June 18, 2023

STORY AT-A-GLANCE

- If your fat intake is higher than 30%, glucose will be metabolized through glycolysis and not in the mitochondria, which increases lactic acid. The fat percentage limit for most healthy people is likely around 35%, whereas diabetics and the obese may need to limit their fat intake to 15%
- Your body releases cortisol to produce endogenous glucose when your blood sugar is low. Cortisol breaks down your lean muscle, bones and brain to make amino acids that your liver then converts to glucose. Cortisol also promotes inflammation
- The best complex carbs are ripe fruits that grow in tropical conditions, such as oranges, tangerines, mango, melon, watermelon and grapes. Cooked starches such as potatoes and white rice are also good if well-cooked. Avoid resistant starches, as they promote endotoxin production in your colon

This interview features repeat guest Georgi Dinkov who is a virtual firehose of information and an expert on the work of the late Ray Peat,[1,2] Ph.D., an author and pioneer in nutrition, bioenergetic medicine, environmental factors and regenerative processes.

This is among the best interviews I've done in years, and we take deep dives into a wide variety of topics. The full interview is over three hours long, so I'm dividing it into two parts. This is Part 1.

This year, on a near-daily basis, I've been listening to Dinkov's podcast for two to three hours at a stretch, and I sometimes repeat them two or three times, because each

episode is just so chockful of information. If you want to get a deep understanding of biochemistry and bioenergetic medicine, his **podcasts on his YouTube channel** and **blog** contain a treasure trove of information that is well worth your time exploring.

The good news is that you don't have to pay anything to learn this information. No books to purchase, no membership sites to join; it is free for the taking, at least for the time being. Georgi doesn't have his own channel, but merely is a guest on other people's channels, which makes him hard to deplatform.

But who knows what the future holds? If this material interests you even a bit I would encourage you to start listening while you can before it disappears.

And, as mentioned, I would also strongly recommend that you listen to my podcast with Georgi multiple times as I am sure that 99.9% of listeners will not understand or fully understand this information unless you are exposed to it multiple times.

What I'm Learning About Cortisol and Glucose

During our first interview, Dinkov shared mind-bending information about cortisol, and how these details require a radical rethink of the low-carb diet, because your body releases cortisol to produce glucose when you don't have enough.

In medical school, we learned that cortisol is a glucocorticoid. Gluco means glucose (sugar) and cortico means it comes from the adrenal cortex. It's also another word for steroid. We were told that cortisol is responsible for maintaining glucose homeostasis, but were led to believe its primary purpose was for inflammation.

Well, that's simply not true. Cortisol contributes to glucose balance. While it has several important functions, its primary purpose is to raise your blood sugar. If your blood sugar drops too low, you can go into a hypoglycemic coma and die, because your brain requires blood sugar.

The same thing goes for fasting. Both low-carb and fasting are great interventions in the short-term for those who are overweight and metabolically inflexible, but when used

chronically they can damage your metabolism and lead to health complications.

How Does Cortisol Work?

If you don't have enough glucose in your bloodstream, your body makes glucose by secreting cortisol, which breaks down your lean muscles, bones and brain to make amino acids that then convert to glucose in your liver. In one of his recent podcasts, Dinkov explained that the primary benefit of anabolic steroids is that they're anti-cortisol. That's how anabolic steroids work to build muscle mass.

Cortisol also uses up stored fat in a process called lipolysis. While this may sound like a great thing, the problem is that it doesn't get rid of the harmful visceral fat found around your internal organs that causes inflammation. It burns your good fat, the peripheral and subcutaneous fat, which is useful.

So, ultimately, cortisol also is going to cause inflammation and impair your immune function. It also increases food cravings. So, you do not want your cortisol to be elevated. Hence, a chronic low-carb diet is not a good idea.

Cortisol is also one of the primary drivers of aging. It accelerates the aging process, which is something very few in the longevity community are even aware of. If it is chronically elevated, you simply will die prematurely as it is highly catabolic, meaning it will break down your body tissues. To stay healthy as you age you need to be anabolic and build healthy tissues like muscle and mitochondria. Elevated cortisol will seriously impair those efforts. Dinkov comments:

> *"I think there's hardly a chronic condition where you don't see cortisol implicated, and usually, in the majority of cases, it is elevated cortisol, not low cortisol. In fact, the only situation in which low cortisol becomes problematic is probably Addison's disease, which is adrenal failure. And that's very rare.*
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> *Studies as far back as the 1950s and '60s demonstrated that you can produce every single phenotype of aging if you inject cortisol, or at least create a state of relative glucocorticoid excess in the animal. So you can do it either by*

injecting synthetic or natural glucocorticoids, or you can do it by reducing the levels of the natural anti-cortisol steroids in the body.

Those are pregnenolone, progesterone and DHEA. In males, testosterone and also dihydrotestosterone. If you reduce the levels of those anti-cortisol steroids and keep the cortisol levels normal, you will still achieve the same kind of phenotype of aging. And that's pretty much what happens to people as well.

It has been shown that cortisol levels do not decline with age unless you have adrenal failure, while the levels of all of these anti-cortisol, youth-promoting hormones decline with age. Multiple intervention studies have demonstrated that if you administer agents that oppose cortisol at the receptor level, or reduce its synthesis, you can achieve both health results and improve the way you look."

High Cortisol Is Bad for Your Brain and Mental Health

Importantly, cortisol not only shreds lean muscle, but also brain tissue, so elevated cortisol promotes brain atrophy, which is a hallmark of both dementia and depression. Dinkov cites studies showing that administering anti-cortisol medication to people with treatment-resistant depression put them into remission within as little as 48 hours.

"So I think it's a very good argument that cortisol is catabolic to the brain, and clearly, if it's catabolic to the brain, it's probably not going to improve your mood, if anything is going to worsen it," he says.

Important Cautions Before You Increase Carbs

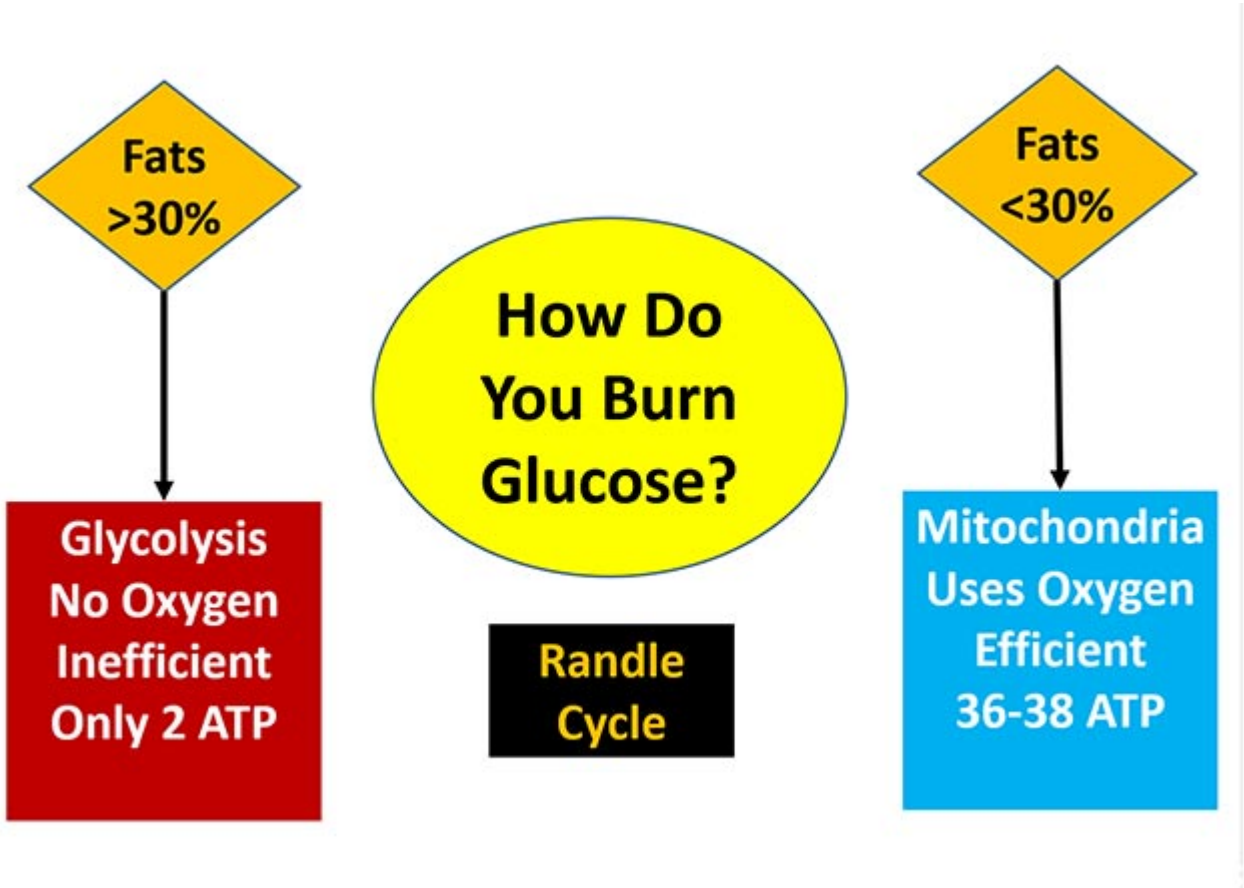
So, it's clearly important that you need to be doing everything you can to keep your cortisol levels and chronic inflammation low. But it would also be a major mistake to increase your carb intake if you are still on a high-fat diet. I did this experiment in the mid-'80s after I read the book by Harvey and Marilyn Diamond, called "Fit for Life".

They suggested having fruit only for breakfast, which I tried. Then I did my lab work and found my fasting triglycerides and lipoprotein profiles had exploded for the worse. I prematurely concluded that a high-fruit diet was nonsense and remained relatively low-carb, eating little to no fruit for nearly four decades.

I recently reevaluated this approach after encountering Ray Peat's work. I now understand that I was missing important parts of the strategy. I decided to experiment with my eating and now incorporate healthy carbs, primarily from ripe fruit, a few times a day.

The Vital Metabolic Switch You Need to Understand

This is one of the most important principles in food science that I had never learned or understood until recently. My strong guess is that this is also true for most natural medicine clinicians. That is why I created the figure below to help you visualize so you can better understand this vital concept.



Low-carb diets have helped at least tens of millions of people improve their health for a very good reason, and that is there is a stealth switch that controls what fuel your mitochondria can burn, as they can only burn one fuel at a time: either fat or glucose.

The switch has been given the name the Randle Cycle, but it is more helpful to visualize it as a railroad switch that changes the tracks of the train, and the train can only travel down one track, not both. This is because only one type of fuel can be burned at a time.

The best-case scenario is you metabolize, or burn, glucose in your mitochondria without any reductive stress (a term I will explain in my upcoming interview with Georgi Dinkov). When you do this, you will only generate 0.1% reactive oxygen species (ROS).

Not only does this route generate less ROS, but it also is incredibly efficient at energy production by creating 36 to 38 ATPs for every molecule of glucose that is metabolized. It will also generate metabolic water and carbon dioxide, which are also important for your health.

For this to occur, as indicated in the figure above, you will need to consume less than 30% of your calories as fat. When you consume significantly more than that amount, the switch changes to burn fat in your mitochondria and you will not be able to burn glucose until your fat decreases to less than 30% of calories.

Since glucose is unable to be shuttled into the mitochondria to burn, it winds up backing up into your bloodstream, raising your blood sugar. This is a major contributor to diabetes. What little glucose is burned for fuel is done by using glycolysis, which is a primitive pathway that bacteria and cancer cells use.

It is great we have this pathway as you absolutely need it for quick fuel when you are activating your type II muscle fibers. But if this is the primary way you burn glucose, you are in a catastrophic metabolic state as you are creating loads of lactic acid as a waste product instead of healthy CO_2, and you are only generating 2 ATPs for every molecule of glucose, which is 95% less energy.

Lactic acid increases reductive stress, which causes reverse electron flow in the mitochondria and causes reductive stress, which increases the ROS to 3 to 4%, which is 30 to 40 times more than when glucose is burned efficiently in the mitochondria.

Why Lactic Acid and CO_2 Are so Important

Remember, when you are burning glucose efficiently in your mitochondria, the glucose is converted not only to 36 to 28 ATP, but when the electrons from the glucose are ultimately handed off to oxygen, metabolic water (deuterium-free) is made and, very importantly, carbon dioxide.

This is vital to understand, as carbon dioxide is a potent stimulator of mitochondrial biogenesis, which will increase the number of mitochondria that you have so you can make even more energy.

Conversely, when you are burning glucose far less efficiently in glycolysis, you are only generating two ATP and rather than creating life-sustaining carbon dioxide, you are generating life-damaging lactic acid, which will degrade your mitochondria and make them die sooner.

Too Much Dietary Fat Impedes Glucose Metabolism

Remember, the metabolic switch happens at about 30% fat. So, if you're eating more than 30% fat you're going to be mostly burning fat, and glucose metabolism (oxidation) will be inhibited. If you're obese, the cutoff for fat is likely even lower. According to Dinkov:

> *"I've noticed that between 15% and 20% [dietary fat] is probably where most people, in their current health state, can metabolize the fat without causing problems for the glucose through the Randle cycle. Especially Type 2 diabetics.*
>
> *Most of them are overweight or obese, which means they have two sources of fats — one through the diet and the second one from their fatty tissue, because*

there's always some lipolysis going on. So for diabetic people, it's probably a good idea to lower the intake of fat from the diet, because they already have a lot coming from their own bodies.

There's so many clinics around the world that treat and even cure Type 2 diabetes by putting them on a really restrictive diet until they lose most of their fat. And then suddenly, the metabolism of glucose gets restarted. I think this directly shows you that the problem with glucose wasn't the glucose itself.

It wasn't the glucose that was fattening them up. They had too much fat in their bodies, and once you get rid of that fat, no matter how you do it, the problems when metabolizing glucose disappear which, to me, is a great testament to the Randle Cycle."

You also don't want fat to be too low, say, less than 15%. Between 15% and 30% might be the sweet spot, although, as noted by Dinkov, the ideal ratio of macronutrients isn't known. That said, he believes, based on epidemiological studies, that an approximately equal ratio of calories from fat, carbs and protein (i.e., about 33% each) appears to be optimal for long-term health.

I respectfully disagree with this, as I believe 33% protein may be too high unless you weren't eating many calories. Eating more than 35 to 40 grams of protein at a meal is likely counterproductive, as their absorption will be impaired, and you will be left with having to remove the ammonia and nitrogen, which could damage your kidneys.

At present, I believe that obtaining 15% of your overall calories from protein is probably about right when eating between 2,000 and 3,000 calories per day. Most people don't need more than 120 grams of protein per day. Beyond that, you start burdening your kidneys. I've long used the formula of 1 gram per kilo of lean body mass (not total bodyweight), which Dinkov agrees seems to be an ideal way to determine your daily protein intake.

Weight Loss Rebound Explained

The Randle Cycle also helps explain why many people who lose large amounts of weight end up rebounding and gaining it all back, even when they're still restricting calories. Dinkov explains:

> *"There's always some baseline lipolysis going on. And in the rested state, your muscles prefer to oxidize fat. So, if you have a decent amount of muscle mass, you can burn most of this fat through this baseline lipolysis. The ratio of lean muscle mass to total body weight is the primary determinant of your basal metabolic rate. So, it's very important to not lose lean muscle mass.*
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> *I think a lot of people get themselves in a situation where, through extreme fasting or extreme exercise, they lose a lot of body weight, but they're not paying attention to how much they're losing of each of the two components — fat mass and lean muscle mass.*
>
> *Multiple studies have shown that over long-term fasting or a long-term exhaustive exercise, people lose a lot of body weight, but about 80% of that is lean muscle mass. So, they were much leaner, but their basal metabolic rate was much lower than what they started with because they lost most of their muscle mass.*
>
> *So, when they went back to their normal lives and stayed on a reduced calorie regimen, they still regained all of their weight, and they were devastated. They said how is this possible?*
>
> *Well, of course, what do you expect? Your basal metabolic rate went down by 50%. So, unless you stay on this severely restricted-calorie diet, you will regain all of those pounds.*
>
> *So, the main thing is, maintain muscle mass, restrict a little bit of your dietary intake, and don't overshoot with the lipolysis. Every time you stress yourself, you're going to increase the rate of lipolysis. And if you float too much fat into the bloodstream, you will shut down the glucose oxidation, which will contribute to the lactic acid and all the other downstream effects mentioned."*

Not All Carbs Are Created Equal

When most people hear it's OK to eat carbs, they think it's an invitation to eat bread, pasta and processed foods and snacks. Nothing could be further from the truth. If your fat intake is over 30% and you throw junk carbs on there, you're going to disrupt your lipoprotein profiles and increase your risk for heart disease, because you're not metabolizing the carbs and are contributing to endotoxin production in your large intestine.

You also need to eat the right types of carbs to avoid endotoxin production, which is a major driver of increased cortisol and inflammation. High-fructose corn syrup (HFCS) is a processed carb that you should avoid. Most process including any processed foods that use HFCS because it is so cheap.

Other carbs to avoid would be resistant starches from legumes, beans, lentils, most grains, uncooked potatoes, green bananas, and pasta. Oatmeal can also cause trouble for many. You'll know it's incompatible with you if you get gas and/or constipation, or if it slows your digestion. Oatmeal is also high in linoleic acid (LA), which is why I avoid it.

The best complex carbs are ripe fruits that grow in tropical conditions, such as oranges, tangerines, mango, pineapple (keep intake moderate as it contains serotonin), melon, watermelon and grapes. Cooked starches such as potatoes and white rice are also acceptable. Potatoes contain oxalates, which can be problematic, but oxalates are water-soluble, so most will be radically lowered if you boil the potatoes.

If you have small intestinal bacterial overgrowth (SIBO), you may need to avoid starches like rice and potatoes, as you have inhibited ability to break down the starch into glucose. As a result, these kinds of starches may impede your recovery.

Incorporating Exercise for Optimal Results

The older you get, the more important your muscle mass becomes. Not only are strong muscles a requirement for mobility, balance, and the ability to live independently, but

having reserve muscle mass will also increase your chances of survival[3] when sick or hospitalized.

Muscle is lost far more easily and quicker than it's built, so finding ways to continuously promote and maintain your muscle mass is crucial, especially as you get older.

Age-related loss of muscle mass is known as sarcopenia, and if you don't do anything to stop it you can expect to lose about 15% of your muscle mass between your 30s and your 80s.[4] An estimated 10% to 25% of seniors under the age of 70 have sarcopenia and as many as half those over the age of 80 are impaired with it.[5]

While declines in muscle mass and strength are relatively well-synchronized in the 35- to 40-year-old group, strength dramatically drops off as you get into the 75-year-old and over groups, with 85-year-olds usually seeing dramatic declines in strength and function relative to the decline in muscle size.

Blood Flow Restriction Training

One of the reasons I'm so passionate about blood flow restriction (BFR) training is because it has the ability to prevent and widely treat sarcopenia like no other type of training.

There are several reasons why BFR is far superior to conventional types of resistance training in the elderly. Importantly, it allows you to use very light weights, which makes it suitable for the elderly and those who are already frail or recovering from an injury. And, since you're using very light weights, you don't damage the muscle and therefore don't need to recover as long.

I am also a huge fan of walking on the beach and typically go every day for about an hour. I also use the sauna and do targeted stretching daily.

More Information

To learn more, be sure to listen to the entire interview, and keep your eyes peeled for Part 2, which will follow shortly. Also check out Georgi's blog at **www.haidut.me** or **follow him on Twitter**. He also has hundreds of videos on **YouTube** on a plethora of topics. A major sampling of Ray Peat's work is also available for free on these two sites: **wiki.chadnet.org/Ray-Peat** and **RayPeat.com**.

Sources and References

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