

# Hyperglycemia II - Part One

Hey, everybody. In this presentation, we're going to talk about the treatment of hyperglycemia. As with other conditions in functional medicine, treatment of hyperglycemia involves addressing underlying causes and pathological mechanisms.



The main considerations in this case are diet, physical activity, sleep, stress management and HPA axis dysfunction, the gut, and nutrient balance, which includes replacing nutrients that are low, such as vitamin D, and then reducing nutrients that might be high, such as iron. Beyond these basic considerations, we can also use supplements and, when necessary, medication to restore normal blood sugar levels.

So, let's start with diet. Not surprisingly, the best starting place in my opinion is a Paleo-type diet. This has been shown to be very effective for glucose control, and some studies have even shown complete reversal of type 2 diabetes. A common misconception is that Paleo has to be low-carb to work for blood sugar control, but in virtually all published studies on the Paleo diet and blood sugar disorders, the version of Paleo that was used was a moderate-carbohydrate approach, somewhere between 25 to 35 percent of calories as carbohydrate. The most important factor, as we've discussed, in most cases is not the quantity of carbohydrates but the quality. Starchy tubers and fruits, whole fruits, don't have the same impact as high-refined carbs such as flour and sugar. We've discussed this elsewhere in the context of cellular versus acellular carbohydrates, so I'm not going to go into detail here, but the point is that if someone has trouble, gains weight, and develops blood sugar issues eating pizza and drinking beer, that doesn't mean they're going to have the same issues eating sweet potatoes and blueberries.

Paleo has been shown repeatedly to reduce weight, waist circumference, nonalcoholic fatty liver disease, blood sugar, triglycerides, and C-reactive protein and to increase HDL levels. Remind the patient not to snack between meals. Snacking can decrease blood sugar control in people with pre-

existing issues, especially if their second-phase insulin response is impaired. Diet should always be the starting place for treating these conditions, and sometimes it's the only thing you'll need to do.

If the standard Paleo approach isn't sufficient, you can try a low-carb or even very-low-carb or ketogenic version. This can be useful in cases where blood sugar is really high and when beta cell destruction has already occurred. These patients may have very low carbohydrate tolerance, even with real-food carbs such as starchy tubers and fruit. I'd suggest beginning by restricting carbs to about 15 percent of calories, and if that doesn't work, go down to 10 percent. Below 10 percent will often be ketogenic, but it depends on the patient, so you can use something like Ketostix or special glucometers that measure ketones to make sure that they're going into ketosis. You want to shoot for a mild-to-moderate ketosis, not a severe ketosis.

In some cases, after a period of carbohydrate restriction and resetting blood sugar, the patient will be able to add more carbohydrates back into his diet, while in other cases, the carbohydrate intolerance persists. If a patient has to follow a long-term, very-low-carb diet, I suggest using prebiotics and probiotics to ensure a healthy gut microbiota because some anecdotal research suggests that long-term, very-low-carb diets have an adverse effect on the gut flora, and this, of course, makes sense if you understand what the substrate is for the beneficial bacteria in the large intestine.

Some studies have shown that intermittent fasting can reduce blood sugar and improve insulin sensitivity. It can also reduce triglycerides; small LDL-P, which is a marker primarily of metabolic function; inflammation, as expressed in C-reactive protein; NLRP3 activation; and oxidative stress. The easiest way to implement intermittent fasting, in my opinion, is compressing food intake into an eight-hour window each day.

So, for example, the patient would only eat from 12 p.m. to 8 p.m. They can eat as much as they are hungry for during that eight-hour window, and they can extend the benefits by doing a full 40-hour fast once or twice a month, so that would be not eating from 8 p.m. on Thursday until 12 p.m. on Saturday, for example.

However, intermittent fasting does have some cautions and contraindications. I wouldn't recommend it during pregnancy or nursing; for patients with significant HPA axis dysfunction, particularly hypocortisolism; or for patients with eating disorders. Additionally, there are some health risks associated with diets that are too low calorie, including concerns around nutritional deficiencies, electrolyte abnormalities, and potentially more serious risks if extreme diets are undertaken without the appropriate supervision. So, see my blog article and podcast on this topic for specifics. We're going to link to those in the resources sections, and I will also have a handout for you on intermittent fasting.

## PSMF: **allowed foods**

Lean red meat: all lean cuts of beef (no ribs or rib-eye), veal, buffalo, venison, ostrich

All shellfish

Organ meats: liver, kidneys, heart, tongue

Eggs

All poultry, except duck and goose (but without skin)

Nonfat dairy products (if tolerated)

Lean pork

Non-starchy vegetables, raw or cooked

All fish (fatty, lean, white, oily, raw or cooked)

Extras: coffee, tea, vinegar, natural flavorings, spices, herbs, pickles, sauerkraut, lemon, salt, mustard (gluten-free)

Another approach that can be helpful is called a protein-sparing modified fast, or PSMF for short. This is a high-protein, low-carb, low-fat, and low-calorie diet. However, it's not voluntary calorie restriction. Patients will spontaneously reduce their calorie intake simply because it's restricting both carbohydrates and fat. Studies have shown that the PSMF can have a dramatic effect on weight, blood sugar, and lipids. Unlike like other low-calorie diets, however, it doesn't lead to muscle breakdown because the protein intake is much higher. It's also easier to follow than severe calorie-restricted diets because protein is the most satiating macronutrient, and the patient can eat as much as he wants of all of the allowed foods.

There are some caveats. It should be done under medical supervision, as with all calorie-restricted diets. It's not easy to follow, even though it's easier than a lot of other very-low-calorie diets. Compliance tends to be low because basically the patient is only eating meat and non-starchy vegetables. If the patient does a protein-sparing modified fast for more than two weeks, I think he should be on a multivitamin to ensure adequate nutrient intake.

## Other PSMF **patient guidelines**

Eat at least 1 lb. of **fatty fish** per week (salmon, sardines, mackerel, herring)

If doing PSMF >2 weeks, take a **high-quality multivitamin** like Nutrient 950 with Vitamin K

Take 1 tsp/day of high-vitamin **cod liver oil**

**2 free meals a week** are permitted

Drink 1-2 liters of **water** each day

Average weight loss on PSMF is **1 lb. every 3-4 days**; some go faster, some slower

If constipation is a problem, take a **prebiotic** like Biotagen from Klair Labs

Do PSMF until target weight is achieved, or **4 months** - whichever comes first

Consume **fermented vegetables** (sauerkraut, kimchi and sauerbraten) and/or a **probiotic** supplement to maintain beneficial gut flora

If you notice **hypothyroid or HPA-D symptoms**, stop the PSMF

So I've put the basic guidelines to implementing a protein-sparing modified fast in the chart on this slide here. Note that it doesn't have to be all or nothing. One option would be to do a protein-sparing modified fast for three to four days a week and eat normally for other days. Weight loss would be slower in this circumstance, but compliance will be higher. I have a patient handout for how to do a protein-sparing modified fast for you in the resources section for this week.

Finally, a somewhat counterintuitive option for blood sugar control is the all-potato diet. This has been around since the 1800s as a weight-loss approach and digestive system reset. Here are a couple of quotes on the slide from the book called *The Potato Diet*. It was written in 1849. "Few are aware of the great value of the potato as an article of diet. It may astonish some our readers when we assert that potatoes alone are sufficient to sustain the human body in a state of firm and vigorous health." And then the other one is, "Lean men grow fat, and fat men become lean, lean as they ought to be, and so all grow better in health."

This diet, although it has been around for a long time, fell out of favor, but it's been recently resurrected and popularized by the author Tim Steele in his book *The Potato Hack*. Also, you may recall a few years back that Chris Voight, who was I think the president of the Washington State Potato Commission or something like that, ate 20 potatoes a day for 60 days with nothing else and experienced significant improvements in blood sugar and blood lipids. His fasting glucose went from 104 to 94. His triglycerides went from 135 to 75, which is a pretty dramatic difference. His weight went from 197 to 176, so he lost more than 20 pounds, and his lipids improved. These were greater improvements than would be typically observed with medications or even other dietary approaches.

Eating nothing but white potatoes may seem crazy when the patient has high blood sugar. However, there are a few reasons why it can be dramatically effective. First, several studies have shown that low-calorie, low-fat, and high-carbohydrate diets can be effective for diabetes treatment. Now, these in the real world don't tend to work very well because patients can't stick with them, and some patients certainly do have impaired carbohydrate tolerance, but that doesn't mean they don't work well for some people. Second, though not often necessary, you can modify the potato diet so the patient is only eating potatoes that have been cooked and cooled and then possibly reheated. This converts much of the starch in the potatoes, which would have an impact on blood sugar, to resistant starch, which means that it will not have a significant impact on blood sugar because resistant starch is not absorbed in the human digestive tract.

Third, the potato diet spontaneously decreases calorie intake, which in and of itself can lead to significant weight loss, and weight loss is one of the fastest and most effective ways of reducing blood sugar when the patient is overweight. Fourth, the potato diet reduces inflammation and improves gut microbiota, and both of these can indirectly improve blood sugar.

This explains the kind of testimonials such as the one here on this slide that was written to Tim Steele from someone who had read his book. "Dear Mr. Steele. I've just become aware of your work in the last several days. I'm 56 years old. I've been eating low-carb, high-fat, at times in ketosis over the past 15 years. I've been blessed with excellent health and energy, except about two years, my hemoglobin A1c was 6 on a blood test taken as part of a routine physical. The doctor said that it was prediabetic and advised that I eliminate sweets without ever asking how I was eating, and I'd already eliminated all carbs except for veggies and nuts. I'm a morning-fasted exerciser. Over the past few months, exercise on an empty stomach would send my fasting glucose to the 120 or 115 range. I posted about this on the Reddit keto board and was sent a private message by a kind soul who shared the amazing results he'd obtained after reading your work. A few days ago, I bought your book and 10 pounds of potatoes. On day one of the potato hack, I enjoyed blood sugar readings in the 80s, which I'd not seen in years. I have continued potato hack this past week and have seen readings in the 70s. I am amazed. By the way, I'd like to report another interesting observation. I use a Concept2 rowing ergometer on a near-daily basis. I noticed over the last few years that using perceived exertion as my guide I was slowing down significantly. I reluctantly attributed this to aging. During the past week of the potato hack, without significantly increasing perceived exertion, my output has risen dramatically. Again, I'm amazed."

So, I've used this to a limited extent in my own practice, and I've seen some good results. As you might expect, compliance is sometimes a challenge, but there are some tricks and variations that can be helpful.