Carbohydrates

Transcript

Hello and welcome to our *Energy Recharge Coaching* module on carbohydrates. I'm Dr. Ritamarie Loscalzo and I'm excited to talk to you about this subject which tends to be very misunderstood, very confusing, a lot of conflicting information out there, and I'm sure all the conflicting information leaves you quite confused.

Let's get started. Before we begin, let me make sure that you understand that this information is not intended to replace a one-on-one relationship with a qualified healthcare professional. It's not medical advice. It's intended as a sharing from my knowledge, my clinical experience, my research to you, and I would encourage you to make your own healthcare decisions based upon your own research, and in partnership with a qualified healthcare professional.

Let's just do the bird's eye view. Let's just do an overview first of what we are going to learn: *What are carbohydrates? Introduction to the carbohydrate family members,* (it's a fun family to read)*; Food sources of carbohydrates; What's the difference between refined carbohydrates and whole carbohydrates? How do you know what carbs work best for you? What are some of the therapeutic diets out there that are related to carbohydrates?* And finally, *What's best for you: low, medium or high carb intake?*

It's really important for you to make that decision based on how your body reacts and based on some science that I'll share with you.

Let's get started with: *What are carbohydrates?* What you see on the screen right now is a picture of a glucose molecule, and glucose is the cornerstone of all carbohydrates. A lot of people don't realize this. We look at glucose as sugar, and sugar is bad, but indeed glucose is at the heart of every carbohydrate including vegetables such as broccoli, carrots, beets and spinach. It's not bad: it's the context in which it's done that determines whether it's good or bad for you. What are carbohydrates? Well, they are large molecules that consist of carbon, hydrogen and oxygen atoms.

Usually the ratio is 2:1 of hydrogen to oxygen, and relatively equal amounts of carbon to oxygen. Let me say that again. It's oftentimes, and usually the formula for most carbohydrates, about a 2:1 ratio between the hydrogen, and the oxygen and carbon; and the oxygen and carbon are usually equal but not necessarily 100% of the time.

The formula chemically, and I won't geek out too much on chemistry but it's important to see some of the chemistry here so you understand this, is $C_6H_{12}O_6$ that's glucose. That's what you're seeing on the screen and it's usually formed in that shape. We will look at some other sugar molecules and see that some of them are shaped a little bit differently.

Basically they are hydrates of carbon: water (H_2O) + carbon. You can see that that formula fits right, CH_2O (carbon plus water) and that's basically what they are. They are also known as saccharides and you are going to see this word a lot and I want to make sure you understand what the various saccharides are. There is a monosaccharide which is one sugar which is what you are seeing right there, glucose. There are disaccharides, which are two sugars.

I'm going to give you an example of sucrose, which is a combination of glucose and fructose. Oligosaccharides mean short chains of saccharides, between 3 and 9 sugars generally; and then polysaccharides can be many, many, many. We will look at all of these to try to demystify a little bit because I think when you break it down to the building blocks and you demystify it you get a better sense of what's what and how it all works.

Let's look at the *function of carbohydrates*, energy, because glucose is the energy currency that gets into the cells and then does the magic: the Krebs Cycle, to turn it into ATP for energy. They are not structural like proteins. They provide fiber for intestinal function and to help keep things moving through you in a nice, steady pace.

They can also provide spare protein for use as energy. They can spare protein for use as energy because when your body gets low, blood sugar gets low; or you're in an emergency situation, oftentimes protein is broken down and there are certain amino acids called branch chain amino acids that can be used for energy.

If you have enough carbohydrate in the diet, then you can spare the protein because otherwise, if you don't have any carbohydrate in the diet, protein and fat are going to be used to try and make your energy. They are also sometimes carriers for the transport of proteins to the blood, so they'll be molecularly bound to protein in order to carry them around.

Let's look at *carbohydrates in foods*. We've got a picture at the bottom, which depicts a lot of carbohydrates: some refined, some not; some simple, some complex; some good for you, some not to so good for you. We've got sugar, candy, white flour anything, these are all simple carbs. White flour anything: crackers, cookies, pizza crust, cake, bagels, white rice is another simple carb, all kinds of flour products.

And there is some debate about whether to take a whole grain, such as whole grain rice or whole grain wheat, and ground it into a flour, is that really a simple carb? Or is it still a complex carb because, after all, it hasn't been refined. The rice grows in a whole state, in a brown rice state. It's got bran and germ and those contain a lot the nutrients quite frankly.

When you take those off you are left with the white: just pure starch core. Yes, there are a few other things, but most of the B vitamins and minerals are stripped away, as well as the essential fatty acids that are in there to begin with. When you take a carbohydrate and you refine it down, what happens is, it increases the rate of absorption.

They are all sugar molecules, even your broccoli contains sugar molecules, but it's because of the kinds of fiber and how intact the food is, that will determine how quickly it will get absorbed to sugar. We know that if we take a whole grain compared to a white grain, in general the whole grain is going to be absorbed, and the sugars are much less more slowly absorbed than the refined.

If you blend the food it's going to make it more highly absorbable and more rapidly absorbed than if you juice the food. For example, if enjoy vegetable juice and you make yourself a big cup of vegetable juice without the fiber and you drink that down too quickly, the sugars that you've released in there can actually raise your blood sugar.

It's really complex the way this all works. Suffice it to say very simplified, an over simplification perhaps, is that simple carbs tend to be the less nutritious and more adversarial, meaning worse for your blood sugar management; whereas complex carbs tend to, in general, be a bit more slowly absorbed and still have a lot more good nutrition intact.

Let's look a little bit further at the *complex carbs*. We have legumes, for example: beans and lentils and things like that. They are considered complex carbs. They have a fair amount of protein, a fair amount of carbs, probably around equal, give or take a little bit, depending on which particular legume you are looking at.

But the complex carbs in the legumes tend to make them be more slowly absorbed and not be as detrimental to raising blood sugars: but again that differs from person to person. We've also got whole grains and when I say whole grains I don't mean flour. I don't mean whole grain muffins, I mean whole grains, the way they grow.

Quinoa, millet, whole wheat (which I don't recommend at all because of the gluten), brown rice, these are the whole grains versus the refined. And nuts and seeds have complex carbs in them. Nuts and seeds are not a big source of carbs but they do have carbs. Most of our foods have a combination of protein, fat and carbs. Nuts and seeds, while they are mostly fat, have a little bit of protein, and a little bit of carb.

And then vegetables: vegetables are loaded with complex carbs and they are in a very tight structure within the fiber or cellulose, which tends to slow down the absorption. And fruits: fruits are near complex carb although, in some cases, it acts more like a simple carb. If you eat a banana, it may tend to raise your blood sugar quickly, because the sugar from the fruit gets into your bloodstream quite quickly: same thing with the very juicy fruits that are sweeter.

It's a matter of perspective as to whether you are going to adversely react to it. Tubers and root vegetables, for example carrots, beets and potatoes, are more complex carbs; although we can argue about potatoes because potatoes cause the blood glucose to go up quite rapidly.

Let's talk about *monosaccharides*. We talked about the fact that the starches, the carbohydrates, are saccharides: *mono*, *di*, *oligo* or *poly*. We are going to start with *mono*. Mono means 1. Monosaccharides are carbohydrates that contain one sugar molecule. There are three different ones: there is glucose, there is fructose and there is galactose.

Glucose is found in a lot of different places and it looks like this (see slide). Another way you might see it, if you see it depicted, is like this (see slide), when the carbons are not written in, in the ring. Either way, that's glucose, it's a single sugar. Very common in nature, some of your fruits have a lot of glucose like grapes have more glucose than fructose.

But most of the fruits actually contain more fructose. The fructose still has 6 carbons but it's structured differently. The ring is actually a 5-carbon ring. Actually it's not all carbon, one of them is oxygen, so the ring is actually 5 atoms, and in glucose it's 6. You can see that one of the carbons has been moved out.

Again we sometimes see it without the carbons listed and it would look like that. Now galactose is milk sugar and it looks very, very similar to glucose. In fact, to the naked eye, it's hard to tell what the difference is. If you ever did, when you were a kid, those 'one of these things is not like the others', you can look at glucose and galactose and see that the only difference is right here where the position of the hydrogen and the OH, which is the hydroxyl group, are flipped, that's it.

Galactose is the sugar that's found in milk and that's what that looks like without the carbons showing. We are going to go through all of these, and then we are going into more of the practical stuff. I just want to give you a sense. You are not going to remember all this, but you'll recognize and you will understand, as we talk about bonds and breaking the bonds, and how certain carbs are easily absorbed and others aren't.

You'll understand it more when you have a little bit of an understanding of the science. Here we have disaccharides (see slide). There are three disaccharides; sucrose, lactose and maltose. Sucrose is the one you hear most commonly. It's common table sugar, they derive it from beets sometimes, or cane. Cane is actually a good source of it. Sucrose is two molecules: one glucose and one fructose, and they are holding hands.

You see the O in between them, that's oxygen. Oxygen pulls them together so they are holding hands. Think about sucrose as glucose and fructose going steady, that's what they are. Now to break those down into monosaccharides requires an enzyme to break the bond at the O to tear their hands apart.

Lactose consists of: one glucose and one galactose. You see one has the OH up there, the other has it there, and again there's a bond between them, which contains oxygen. Again, breaking it down requires an enzyme. Then maltose is two glucoses, and maltose is what we are typically going to see in starches. We are going to see a long, long, long, long, long, long string of maltoses to make what we call a polysaccharide, which we will talk about in just a moment.

Next we are going to talk of the *oligosaccharides*. Some of the oligosaccharides you may have heard of them. Oligosaccharides are just a few up to about 9, some books say up to 12, but no more than that, and they are glucose and fructose, or glucose, depending on which of the oligosaccharides we are talking about.

One of the oligosaccharides you might have heard about is called fructo-oligosaccharide (FOS). The reason you might have heard about it is, it is commonly put in probiotics. The commonality between fructo-oligosaccharides and oligosaccharides is that our bodies don't really break them down. They are resistant to breakdown and they end up going down your large intestine intact, which makes them food for your good gut bacteria. They are not so pleasant for the bad gut bacteria.

The picture here (see slide) shows us the glucose and fructose bound together. There's some number of those in the middle, and then one on the end. It could be 3, it could be 5, it could be 7, it could be 9. Fructo-oligosaccharides can be very helpful for people with candida or fungal overgrowth because they provide fuel and food for the good bacteria to help it grow.

What we see on the right hand side is parts of pectin: amylose and amylopectin. These are fibers and are hard to break down, so that's another oligosaccharide. Let's look a little bit more closely at fructo-oligosaccharides: they are good food for bacteria, gut bacteria; they are not digestible by pancreatic enzymes, so the bonds between the molecules don't break down well from the pancreatic enzyme, so they escape, intact, lower down; we don't get to take the fuel from them.

They are also known as prebiotics because they feed the probiotics, and there's the other diagram to show you what that looks like. Where do you get these? Well you could take a supplement that contains FOS, or you could look for food sources, and I have listed a good 10 or 11 foods that contain it.

They are not uncommon, it's not that hard to get. Jerusalem artichoke, looks like a little baby potato, and is available in groceries stores and health food stores. Yacon is a syrup, it's actually a root but it's mostly sold as a syrup. Yacon comes from South America and it's very strong for oligosaccharides: it has something called inulin in it.

Blue agave, which I don't recommend because of the high sugar content. Bananas, which I say proceed with caution until you know for sure if you are blood sugar sensitive. Onions, which are very therapeutic foods for those who can tolerate all the sulphur in them, it's very, very cleansing.

Chicory root, garlic, asparagus, jicama, tomato and leeks. These are all good sources of FOS (fructo-oligosaccharides). Let's look at polysaccharides because we've already looked at *mono* which is one sugar, *di* which is two, *oligo* which could be anywhere from 3 to 9. Let's look at *polys*.

That's what a starch molecule looks like (see slide). You can see this string of sugar molecules all holding hands, all going steady. We have glycogen: where starch is a plant concept, it comes in plants like starchy vegetables, and starch in grains. Glycogen is actually starch in your body. It is where your body strings a whole bunch of these glucoses together, and stores it in your liver and muscles so you have ready fuel when you need it.

If you've ever heard about athletes the night before big events they will load themselves up with carbs. I don't think it's a great idea but they do it, and the reason is to help build up the glycogen store so they have lots of glycogen as they are doing their event and they don't burn, and they don't run out of fuel.

Let's look at *cellulose*. Cellulose is also glucose by the way. Cellulose is a non-digestible fiber and it come in lots of different foods, we'll talk about that in a moment. It comes in your vegetables and it's the hard structure that also can bind up nutrients, that's why it's really important to chew.

Let's talk about a very controversial, and also quite confusing, topic: *sugar alcohols*. You'll also see them referred to as polyols. Even though they say it is alcohol, they don't contain any ethanol; they just have OH groups that are considered alcohol. Their sweetness is similar to fructose so you actually need less of it than you think. They take fewer calories than sugar.

They are naturally occurring, and can be delivered without raising blood sugar. That covers the things you need to know about sugar alcohols. The main point is, they are used as substitutes for sugar when people are trying to do a low-carb diet. You may have used them yourself. Some of the sugar alcohols are: erythritol, sorbitol, mannitol and xylitol.

Those are the main ones. They are sugar alcohols that can provide that sense of sweetness and satiety for a short while. The reason that sugar alcohols don't raise blood sugar is that we, for the most part, can't metabolize them. They don't get broken down by the pancreatic enzymes, so they are not metabolized into sugar, and they go through the intestinal tract intact.

When they get down to the large intestine, they tend to feed or be fermentable by some of the bacteria back there, in particular the not so good bacteria. If you have an overgrowth of some sort of undesirables down in your gut, then you probably will have a little bit of trouble with the sugar alcohols and they may cause gas and bloating. For the most part people tolerate xylitol, although a number of people do get the GI upset.

Almost everyone tolerates erythritol because it actually gets absorbed in the small intestines. Most of it doesn't make it down to the large intestine (maybe 85%) where it could ferment. If you are going to choose a sugar alcohol, erythritol would be the one to go with. Let's take a look at the chart with these in it.

We'll compare those sugar alcohols. I put erythritol at the top because I believe that, that's the best choice, and sorbitol is the worst. Sorbitol, in just about everybody, causes GI upset: gas bloating, even diarrhea. If we look that their sweetness relative to sucrose, erythritol and xylitol are at the top. Xylitol is one: meaning that it's equal in sweetness to sucrose, so you can use it 1:1. If you want to use a teaspoon of sucrose you would substitute it for a teaspoon of xylitol.

For erythritol it's about 80% as sweet, so you would have to use a little bit more erythritol to get the same effect. But if you look at mannitol and sorbitol they are 0.5 (50% as sweet) and 0.6, so you need to use quite a bit more. The sheer volume of using more to get the same level of sweetness, can trigger that fermentation by the gut bacteria.

Let's look at the energy. The energy has to do with how much of a product is actually absorbed by our bodies, versus utilized un-breakdownable (if that's a word) fiber. When you look at erythritol, it is at the bottom at 0.21 (kcal/g), so it's almost 100% not utilized by our body. This means if you have a teaspoon of erythritol, and you think a teaspoon of sugar is going to be about 20 calories, then that teaspoon of erythritol would be less than 1 calorie. That's the basics.

When you look at the sweetness per calorie (basically that's what sweetness per food energy means), you see that erythritol is 15 versus table sugar is 1.0, because it's comparing it to sucrose and the others are significantly less. We are looking at erythritol being the lowest calorie, the least likely to produce gut upset and, I think, the best choice of the bunch.

There are several products available and I'll show you a picture of some of those for erythritol. One of those is called *Zero* and it's organic. It's quite expensive because it's a proprietary product. You can find it on Amazon, at Whole Foods, and at natural food chains.

The other one is called *Smart Sweet* and is quite reasonably priced. It's non-GMO and it's non-corn. Neither contains corn, soy, gluten, or other problematic foods. I found *Smart Sweet* on Amazon: 4.5 pounds for $36. It's certainly a lot more expensive than sugar.

You can probably get a 5-pound bag of sugar for under $5 (though I haven't bought one in many years so I don't know). Amazon gives you a little bit of information about it: *Smart Sweet* is all natural, free of GMO, gluten, wheat, soy and corn; has zero calories, zero glycemic index, safe for diabetics, high digestive tolerance, and is 70% as sweet as sugar. Most of it, as I said, is absorbed in the small intestine, and a lot of it is excreted in the urine.

It's been said if you are one of those people who likes to drink their own urine, and you take erythritol, it's probably going to taste quite sweet because the un-metabolized erythritol gets absorbed and then spit out in the urine: only about 10% of it. So you really have to take large amounts to get that laxative effect, unless you are very, very sensitive or you've got a lot of gut dysbiosis (meaning bad life in the gut).

It's generally free of side effects in regular use. In doses over 50 grams it causes nausea and stomach rumbling. Fifty grams is a huge amount. You are not going to be taking in 50 grams at a time, unless you are going on a sugar binge and doing it with erythritol. It's more difficult for the intestinal bacteria to digest than any of other sugar alcohols, so it's less likely to cause gas and bloating.

Erythritol is naturally occurring in some foods, for example: pears, melons, grapes, mushrooms, wine, soy sauce, and cheese; so that's probably what gives it some of its sweet flavor.

Let's take a look at *how cooking affects carbohydrates* because chances are if you are eating grains or high carbohydrate foods you are cooking them. Does cooking damage? Well let's see. Cooking accelerates the conversion of starch to sugar.

When you take in a high carbohydrate food that has a lot of starch in it, for example: grains, potatoes, sweet potatoes and those sorts of things; a lot of that starch is going to be converted to sugar right in the cooking process. If that's the case then, when you eat that food, you will tend to see a larger increase in blood sugar than if you ate that same food raw.

In fact, I have found that to be true. I'll give you an example. One of the foods I have eaten both cooked and raw is carrots. In the raw state they barely raised my blood sugar 10 points. When I eat them in the cooked state they send my blood sugar into unhealthy ranges and sometimes, depending on the amount I eat, up to 135.

Suffice it to say, I don't eat cooked carrots very much anymore. Occasionally they are in something that someone else has made for me but generally I just don't eat cooked carrots unless it's just a small part of a large meal. It increases the glycemic index, which means it increases the available calories, because calories are going to be utilized and burned more quickly.

It decreases what's called the resistant starch content: the starch content that doesn't get digested by us and thus passes through us as non-caloric. When you look at labels you will be able to see that. High heat, especially dry heat (it doesn't seem to be as problematic with steaming), in baking and roasting, creates a substance called acrylamide, which is a known carcinogen.

All those things said, it's probably in your best interest to avoid, or limit, the amount of cooked carbohydrate, and especially avoid the baked. The worst offenders for acrylamide would be French fries and chips, but there are also some surprising foods. Here is the list of the top 20 acrylamide foods by average intake in the US.

Potato chips and French fries are at the top, even the oven baked ones, because of the high heat, and potatoes seem to be the worst offenders. Breakfast cereals, they are high heat processed and they are not lightly steamed. Toast, pies and cakes, you can read through the list. Use this list to choose which foods you are going to minimize.

We talk about carbs, and our society in this day and age tends to demonize carbs. There's a ton of low-carb diets out there starting with the Atkins, which was probably the first one to gain popularity many decades ago. We also have the Zone diet, and the South Beach diet. We've even got more of the non-mainstream diets like the rainbow green diet from the Green Gabriel Cousins that's a low-carb diet.

There are going to be times when you need a higher carb diet. And I say you generically. Maybe not you per se, but there are times that certain people and conditions in which a higher carb intake is needed. If this fits you, then you need to look at increasing the amounts of good healthy carbs.

Let's take a look at what some of those specific situations are. Generally, it's when there is a need for a large amount of calories because of various conditions. Let's talk about those right now. People who need to gain weight, people who are underweight, and no matter what they do, they don't gain weight. If they go on a raw foods diet, or a vegan low-carb diet, or a Paleo diet, they just wither away.

These are people who need to eat to gain weight, and they do better with a higher carb diet, as long as the carbs are well chosen. They need to choose the healthy carbs versus the unhealthy carbs. The whole foods, things like sweet potatoes and roots, tend to be the healthiest of the carb foods.

Grains like quinoa and millet, which are non-gluten and don't cause problems. Rice tends to cause a higher glycemic response in a lot of people, as does buckwheat. I tend to direct people towards millet and quinoa, which tend to be higher in protein as well as higher carb foods.

Competitive athletes oftentimes need to have more carbs: they need more calories. Having more protein and fat are going to produce more metabolic byproducts, and they need to have higher carbs. When you balance the higher carb intake with lots of greens, so you have a plate that's 75% vegetables (non-starchy vegetables) and 25% starch; that could be really well balanced and can help to offset some of the negative effects of carbs, which might raise the blood sugar.

Growing children tend to need more carbs. I know a lot of people will try to raise their kids on a high raw or all raw diet, and the kids are hungry all the time. We need to introduce a little bit of carb in there: a healthy carb like quinoa. It makes a world of difference. For my kids I would make a big pot of quinoa then add sea vegetables, chopped up leafy greens, broccoli, and all the brassicas, and make that as a meal.

Then I would take that, wrap it in a nori sheet and give them even more of the vegetables and the greens, so they were getting a high density, and they do well on that. My kids don't appreciate eating an all raw or mostly raw diet. They feel like they need their carbs, and they always get just healthy carbs.

Then finally pregnancy, because you need more calories, unless the person is in insulin resistance, in which case the low-carb diet during pregnancy is probably more advisable.

Let's look at some of the *types of carbs*. We've briefly gone over this but I would like to summarize the foods that are carbs.

Grains, whole grains or processed grains, are all high carb foods. So you might be eating a high carb diet even if you are not eating processed foods. Legumes, fruits, vegetables; fiber soluble versus insoluble: let me touch on that a little bit. You'll see that on labels. Soluble fiber is fiber that's water-soluble. Things like peptin are soluble fiber, and things like cellulose are insoluble, they just go through intact.

Some people's GI tracks are too sensitive to take on much in the way of insoluble fiber. I think of it as a broom going through the intestinal tract sweeping away a lot of the debris, which is a good thing. But if somebody has Crohn's Disease or ulcerative colitis, which are inflammatory diseases of the bowel; or, if they have irritable bowel, and so a little bit of inflammation and leaky gut, the insoluble fiber may be too much and can cause GI upset.

And then sugar, of course, is a carb. Sugar is the core of the carbs. When we say sugar, in our society, we are generally looking at sucrose and fructose. We are looking at high-fructose corn syrup, which is probably the worst of all. It doesn't tend to raise blood sugar, but wreaks havoc in the liver when processing it.

Examples that are sugar, and contain sugar, whether it be sucrose, fructose or a combination, are: maple syrup, agave nectar (which is mostly fructose), honey, and coconut nectar.

These are all foods that have been put out as healthy sugars but, in fact, most of them do raise the blood sugars substantially and should be really carefully chosen, or avoided, in people with blood sugar imbalance.

And finally sugar alcohols, which we talked about in depth. These are the types of carbs, and when you are deciding how much carb to be in your diet, you have to go by how you feel. You can't go by what I tell you or what someone else tells you. For other types of nutrients there are specific ways to assess, and this is true of carbohydrates.

The most common way to test carbohydrate status is to look at your fasting blood glucose. I mean how much sugar is in your blood. Your fasting glucose tells you how well your body is able to bring your glucose down to the baseline. It doesn't tell you a lot about what it's doing with the food in between.

It is actually quite a late warning sign of blood glucose imbalance and diabetes. Fasting blood sugar: you can do it through a lab, they take blood out of your vein. You can do it with your own meter; you poke your finger and put it on the meter. It's very easy to test blood glucose. But I like to do the kind of testing we do at home, which will be post meal. You will also see that called postprandial.

Then there is after exercise blood glucose. After activities, you can actually see what the various activities and foods in your life, do to your blood glucose, this is very important. This gives you a much better look at how well your body is managing sugar versus relying on the fasting blood glucose.

Another way to do more of a global look is something called hemoglobin A1C. Hemoglobin A1C is a measure of the glycosylation of your red blood cells. What does glycosylation mean? It's a measure of how much sugar coating is happening in there. When the hemoglobin A1C is high, meaning a high percentage of your blood cells have sugar on them, this means that your body sugar has been uncontrolled even if your blood glucose fasting is normal.

This is a much more sensitive indicator of your carbohydrate glucose status. Hemoglobin A1C will give you the average over a three-month period, because that's how long it will take through those red blood cells to replace themselves.

But there is another marker that's becoming more popular now called fructosamine that can be measured in the blood and that gives you the average over a month. Between hemoglobin A1C and fructosamine, we get an idea of how well controlled it is.

If you are working, your family member has a fasting blood glucose let's just say 85, which is perfectly normal, but you have a hemoglobin A1C of say 6.8 that means that your average blood glucose based on your hemoglobin A1C is somewhere in the range of 120s which means you are getting some high blood sugar spikes, so we want to bring that down.

It gives us a peak into the future of how well controlled we are. That's when we start to look at all of the things that we looked at in our *B4 Be Gone* program, and in terms of these charts that I've given you, to evaluate your blood sugar. Finally, insulin is a good assessment because, if the insulin is what's secreted by your pancreas in response to your carbohydrates, it's sugar getting into the blood.

If the insulin is high, it's going to give you an idea of how well controlled it is. If the insulin is ultra low, especially after a meal, then that could indicate you have some really late stage problems. Generally that's not going to happen without warning because usually that happens in diabetics who have been that way for a long time and their pancreas finally gives out.

Generally speaking we find that fasting insulin is higher than it should be, meaning that the body is becoming insulin resistant. Those are the ways to measure carbohydrates. Here is how to read a label with carbohydrates. The red is around the total carbohydrate content but that number can be deceiving. If you are looking to decide if a certain food is good for you, first of all you have to read the label. If it has a label it's not fresh, and I generally don't think it's good for you (but that's beside the point).

It should be fresh like apples, which generally don't come with labels, although I'll show you a picture of one that does (see slide). Total carbohydrates, in this case is 15 grams. The next thing I look at is sugar: so 4 of those grams are sugar. What are the other 9? Well 3 of them are sugar alcohols, so that accounts for 7 out of 15. Where are the other 8? 4 of them are fiber. The sugar alcohols and the fiber are not going to really contribute to your carbohydrate count.

That's 7 out of 15, which is about half. The rest, which are not listed and would be starches, are the polysaccharides. In this particular case if you are very sugar sensitive you may want to avoid this food because it's got 4 grams of sugar. Generally, I look at not taking in anything that has more than 2, but that's because I'm genetically programmed for diabetes. I'm really careful. You have to find out for yourself.

If you look at the rest of this label, it is really not good food: wheat flour, which is refined (whenever it says wheat, versus whole wheat, it means that it's going to be a refined food), unsweetened chocolate, erythritol, so far so good, and inulin. I didn't mention inulin before, but inulin is one of those longer chain starches.

That's where fructo-oligosaccharides, a whole bunch of fructo-oligosaccharides put together, make inulin which is the equivalent of a starch but it's made up of all these oligos. Oat flour, cocoa powder, evaporated cane juice (that's sugar), whey protein powder (that's from dairy), cornstarch (low glycemic), natural flavors, salt, baking soda, wheat, gluten, and guar gum.

This is not a product I would recommend, but it was a good picture that I could find that depicted how to read the label.

When in doubt eat fresh food. Just eat real food, real food that's come from nature. It doesn't mean you are not going to have a problem with the carbohydrate content. For a green apple, which is lower sugar than a red apple, it may be good enough for you to tolerate, but you may not tolerate pineapple, which may be very high in sugar.

That's where testing the blood glucose is useful, and we guide you through that extensively in the *B4 Be Gone* program. That was a quick look at the carbohydrate content in food. It's a little bit challenging to read on the screen, but you have a printout of it that you can go through.

I would go to www.whfoods.com and then just look up whatever food you are curious about. These are included as PDF documents on the website page, so no worries about not being able to read them in the slide. There's also a great federal government database http://ndb.nal.usda.gov/ndb/nutrients, which I referred to, where you can look up any food you have a question about.

Let's just take a brief look at some of the special carbohydrate diets and carbohydrate intolerance. Lactose intolerance: you've probably heard people say that, or maybe even found yourself to be lactose intolerant. Lactose is milk sugar. If a person doesn't have the lactase enzyme to digest the milk sugar, they are going to get problems like gas and bloating and discomfort in their gut. It could be diarrhea as well.

It is said that the lactase enzyme is something that we grow out of, that we don't need past the age of four or five when we are weaned. That's really nice if we get people that are breastfed until they are four. It's not usually the norm in our society but it's the norm in our indigenous cultures. Lactose intolerance persists in a lot of people.

Some people genetically adapted to keep and maintain the lactase enzyme, but in general, most adults have some degree of lactose intolerance.

Low glycemic diets: these are for people who have found they are diabetic, that tend to have blood sugar swings, and are pre-diabetic insulin resistant as well.

My belief is that you should eat as many carbohydrates in their whole fresh form as your body tolerates, while maintaining healthy blood glucose levels. I'm not a big fan of doing a low-carb diet without good reason, but for a lot of people it's necessary because of their blood sugar.

But if you eat a banana and bananas keep your blood sugar below 100, I have no problem with you eating a banana. I do have a problem with you eating anything with gluten in it especially if you have any kind of health problems which understandably if you are listening to this and you are in the *Energy Recharge Coaching* program, you've come to it because you've had a problem with your energy, or had persistent health problems you are trying to avoid.

If you haven't heard enough from me, gluten free is super important, and it's one of those carbohydrate intolerant diets. It's really the protein that we are intolerant to in gluten, but it comes as a package, like nature provides it, and it's a very high carb food.

There is something called the Specific Carbohydrate Diet and in it they only allow monosaccharides. Disaccharides are disallowed because it's said that disaccharides aggravate the gut. They become fodder for the bad bacteria and they can cause bloating, gas and inflammation. People with Crohn's Disease often have really good results when they follow the Specific Carbohydrate Diet.

My problem with the Specific Carbohydrate Diet is if you do it as it's published, it's extremely high in meat. Dr. Natasha Campbell-McBride, who wrote the book the GAPS diet, appears to be very anti-vegetarian, and very anti-vegetables as a source of nutrition. She seems to think that they are just condiments and that we should mostly be eating meat. You can tell I really disagree with that. I thrive on a vegetarian diet, a lot of people do.

A lot of people thrive on what's called a plant strong diet, which is high plant food. Though a Specific Carbohydrate Diet, as it's laid out, gets rid of all of these foods, which I have a problem with that. They do include a lot of fermented fruits, which I do enjoy I think that's great. They think that only fermented vegetables are tolerable. In the case of people with Crohn's or ulcerative colitis, in the acute stage this is true.

Avoiding the fermentable and the disaccharides, which are harder to digest and break down and can be problematic, or can be a good thing to do for many people. I have created a chart and I have it in this module for you. It is a modified Specific Carbohydrate Diet or GAPS diet and I have actually incorporated that. There are two versions of it.

One of them is in the digestive model but a new version of it, which incorporates something else called FODMAPS: Fermentable, Oligosaccharides, Disaccharides, Monosaccharides, And Polyols. What the people who came up with this plan discovered, is that certain of the oligosaccharides, disaccharides, monosaccharides and polyols (sugar alcohols), are fermentable by the bad gut bacteria.

When I said fermentable, people who are into sauerkraut and believe fermentation is good, why is that bad? Well fermentation is good when it is by desirable bacteria because it increases their count and it allows them to grow. But fermentation by bad gut bacteria actually produces more toxic byproducts.

I have created two versions of these special carbohydrate diets. One is a Specific Carbohydrate Diet with a 'yes you can' and 'no you can't.' If you are going to eat meat you can have grass fed, and you can have deep ocean fish. I've also taken out the dairy products, as they allow some dairy products.

I have seen dairy products in general are not good for people who have gut issues and for most people in general, unless it's very therapeutic dairy products like colostrum for example can be very healing for the gut. FODMAPs and Specific Carbohydrate Diet (SCD you might see it as) are gaining a lot of popularity these days. Again I've modified it so it's not such a high meat diet, and you can follow it by using very specific plant based foods in a small manner if you desire.

Let's finish with the *Good Carbs, Bad Carbs*: the good cops, bad cops, who is there, who is right. When we look at when we define a food as good or bad, we are getting into very judgmental type things. And when we do that it tends to trigger the rebel in you to say, 'oh well if you say I can't eat that, I want to eat that'.

I'd like you to look at these in terms of the ones that are really healthy for you that you are going to increase, and the ones that are not healthy that you are going to choose to avoid or minimize. When you talk about it 'I choose to avoid or minimize this particular type of food in my diet' it's a very different message that you send to your subconscious than 'I have to'. 'I get to' is even a more evolved way.

'I get to avoid gluten because gluten messes up my gut, and when I avoid gluten I feel much better'. It's much easier to say to somebody, or much better for your body to handle and to follow than 'oh-oh I have to avoid gluten, I don't get to eat my favorite foods anymore, poor me'. It's all about the attitudes really.

We are going at look at the good carbs and bad carbs so you can see which carbs are detrimental to your body, then you can choose to minimize them. Let's look. When we are deciding which carbs are good and which carbs are bad, a lot of it is personalized to the individual.

Yes, there are some specific rules that are applicable to all. Refined carbohydrates and simple carbohydrates tend to be more problematic than complex. Foods that have been refined, where all the bran and germ and nutrition have been stripped away, are not going to be good for most people. And sugars for sure, in just isolated sugar, over time will lead to the breakdown of pancreatic ability to produce the insulin, and the insulin to be up taken by the cells.

Processed tends to be bad for everyone as I previously said. Gut health can temporarily restrict some. The diet I was just talking about, the SCD, the GAPS, and the FODMAPs, it's recommended that you only follow these temporarily because you are restricting a lot of really healthy foods from them, some good vegetable and some good fruits. The state of your gut can temporarily restrict you from some foods. But once your gut is healed you don't want to go back to eating the processed foods that created the problem in the first place. It's really is so dependent on the individual.

Your glucose tolerance plays a major role, meaning how quickly your body causes a rapid rise in the blood sugar and how quickly your body can clear that.

I found when I first started blood sugar testing myself that the very sweet fruits like mango and pineapple and papaya, the ones that were among my favorites, all spiked my blood sugar and I had to avoid them for a long time. Even blueberries made my blood sugar go up somewhat so I avoided all carbohydrates for a while. Whatever is in vegetables, I kept eating.

Then I introduced things back and now I can tolerate more of them, although I haven't necessarily tried all of them because I like the way I feel. And that's really it: I like the way I feel, so do I really need to play with pineapple? Generally, when you have to restrict good carbs, if you look at that list and you have to leave out spinach or broccoli or something like cauliflower, and that's restrictive, know that it's just temporary while your gut is healing.

When you go back onto those foods, you retest and you reintroduce to make sure your body tolerates them. Generally those good carbs can be incorporated back once you get your gut flora balanced again, all the good bacteria we talk about in the digestive module, and once you've restored the integrity of, and healed the leaky gut.

This concludes our module on carbohydrates. I've given you a lot of information to think about. What I'd like to do is to kind of bottom line it. What's next? What do you do with this information? Well you take a careful look at your diet and you see what foods you are eating that are processed, or have processed sugars or carbohydrates in them, which could be detrimental, and you just start to minimize those, replace those with healthier choices.

If you are still having gluten or dairy (as we've been talking about throughout the program, and starting in *Foundations*), these are foods that could be problematic especially for gut healing, but also for hormone balancing. So look at those foods that are high carbohydrate that you are still having.

Get a blood glucose meter. Go to the *B4 Be Gone* blood sugar balancing part of the program, to review how to test your blood sugar and get it into balance. And if you haven't done that module yet, or if you missed going through it live with us, plan when you are going to go through that module.

Finally take on the attitude that you get to avoid the foods that are not serving you, that you get to eat only foods that are nourishing you that are full of life and vitality that make you feel good. Remember that nothing tastes as good as healthy feels. When you keep that in mind you decide for yourself what you are willing to do, what it takes to get things in balance, and make sure that your carbohydrate intake is optimized to you. This is really critical to your hormone health and your overall health and wellbeing. Thank you and we'll see you on the next video.