Micronutrients:
Introduction to Minerals

Transcript

Welcome to our minerals presentation as part of the micronutrient module. I'm excited to share with you the amazing miracle of minerals and how mineral deficiencies can be creating a lot of the issues that you're going to be seeing in your clients and what you can do to help your clients to correct them. Let's go ahead and get started.

Before I begin, as I usually do, I like to just make sure that you're aware in this presentation and also when you're working and explaining this to your clients that the information is education. It's not intended to replace a one-on-one relationship with a qualified health care professional, nor is it medical advice. It's my knowledge, my information, my research, my clinical experience that I'm gleaning and sending off to you, but I encourage you to encourage your clients to make their own decisions based on everything you tell them and in partnership with a qualified health care professional if they're on medication or if they have one because they have a diagnosed medical condition. You are obligated to share that with people, just because it's important for them to realize this and not come back and say, "But you said I should go off my medication and take copper instead." Yikes. You don't want that.

Let's just start with talking a little bit about minerals in general. What are they? They're catalysts. They keep the battery going and help it to hold its charge. Minerals are actually just from the earth. They're elements. They're elements from the periodic table of the elements. Unlike vitamins, which are more complex organic compounds consisting of things like carbon and hydrogen and oxygen and stuff like that, the minerals are actually single elements, very simple, very single elements, but they're very important. They actually compose about 4% of the human body. A big part of it is the skeleton. The skeleton contains a lot of minerals. We can't produce them, obviously. They're from the earth, so we have take them in through food or through supplements, hopefully as much as possible through foods.

Our soil is 45% minerals, so the minerals from the soil seep into the plants, and especially if the plants are grown organically and not artificially bumped up with pesticides and herbicides and all because the organic nutrients in the soil can be taken up into the plant. Our soils really are currently depleted because of our agricultural techniques, the things related to lots and lots of pesticides and herbicides and not giving back.

Really, it's like we have to always be giving back. When we don't replenish the soils with organic materials ... There's lots of it, lots of organic farming classes and permaculture things and ways that you can learn how to give back, but that's not the conventional agricultural processes.

The soils become very depleted, which is why I believe that sea vegetables are reliable, because we can't take away the minerals from the ocean. Now, of course, we can pollute the oceans, and that becomes a problem with sea vegetables. You've got to have people be very, very careful about where they're buying their sea vegetables. It has to be from a reliable source and from pristine waters that are far away from industrial waste. It's getting harder and harder even with the sea, so we've got to know how to maximize the amount of minerals coming in and to supplement when needed, and to know with your clients and patients, when they're going to need supplementation.

This is just a picture of the periodic table of the elements. I'm sure you all have seen this in high school chemistry classes. It's maybe not a class that you paid a whole lot of attention to because you didn't see the value of going into labs and doing all kinds of crazy things with these compounds because you weren't going to be a chemist. Now, you are an organic chemist, or biochemist, really, because it's really important for you to understand biochemistry, the chemistry of life, the chemistry of the body and having a familiarity with the minerals in the periodic table. Basically, you can go through and find all of our minerals on here. You can also find all the toxic elements on here, and then there's some that just have absolutely no effect on human ... or that we know of, no impact on human metabolism, although I have a hard time believing that, really, because everything has an effect on us if we're consuming it. What I mean by "consuming," I mean either eating it or consuming it through the skin or our nasal passages through respiration. That's the periodic table of the elements.

This is just a quote about minerals. They're essential nutrients. They're needed in small amounts to keep you healthy. They don't have any energy. They don't have any calories. They just help with lots of the very major functions in the body. As we go through our presentations in the mineral module or part of the module, you're going to see how major these minerals are. Your body can't make them, obviously. You have to obtain the minerals from the diet.

There's different types and categories of minerals. There's macrominerals, where you need larger quantities, and these are measured usually in milligrams, larger milligram amounts. The things that we need in larger amounts are calcium, phosphorus, magnesium, sodium, potassium, chloride, and sulfur. They all have different amounts, but generally, we're looking at a 3-figure milligram, like 100, 200, 300, 500, 1,000 milligrams in these cases. Then we have microminerals, and they're needed in small amounts.

They're usually measured in either micrograms or a small number of milligrams, like a double digit, usually less than 20, like iron, zinc, manganese, chromium, molybdenum, copper, iodine, cobalt, fluoride, selenium. These are all microminerals. We'll be going through each and every one of these to a lesser or greater extent depending on their importance in key, critical endocrine metabolites, metabolism, throughout this program.

Let's look at the general function of minerals. As we go through each individual mineral, we'll go through the individual functions of the minerals. Similar to vitamins, they act as cofactors for enzyme reactions. There are certain enzymes in the body that will not function properly unless they have their cofactor. They'll function very slowly if they don't have their cofactor, or not at all, so we really need to have these minerals there in proper quantities to support these basic, critical, biochemical reactions.

Minerals also help to maintain the pH within the body. In particular, things like potassium and magnesium and chloride are really important there. They also facilitate the transfer of nutrients in and out of the cell membranes. There's pumps. There's electron pumps that take things from one side to the other, and minerals support them — in particular, sodium and potassium. They're also important for proper nerve conduction, the transmission of a nerve from one nerve to the other, neurotransmitters, and the firing of the end of one nerve to the beginning of the next. They help to contract and relax muscles. The ones that are mostly important there would be things like potassium and magnesium and calcium, and they work together. They help to regulate tissue growth, growth and repair, and they also form a structural and functional support. For example, calcium, boron, magnesium, silica — there's all kinds of nutrients that are needed to form our skeleton, to form our muscles and have the muscles function properly. That's it in a nutshell, and we'll go into more detail about the specific functions of the minerals as we go through.

What do you need to know about minerals? In general, like vitamins, pretty much, we need to be able to look for deficiency signs. How do we know if our client is showing a deficiency of a particular mineral or set of minerals? What happens if they take in too much? There are toxicity reactions that can happen. Indeed, there are toxicity reactions that happen with most minerals. How do you help your clients choose the best food sources? You have to know what minerals are in the foods and what the best sources are and what the most digestible, best sources are in the foods because you might have a food that has very high quantities, but it's bound up in a way that makes it hard for the digestive tract to take it down.

How do you choose the supplements? How do you know the best quality of the supplements? Also, for individual nutrients, how do you know which of those supplements forms is best for your particular client or is going to be best absorbed? Because there's many different things that the minerals can be compounded with to take them into the body. Then, looking at factors that help to hinder absorption or to help absorption, improve absorption. Then, when to use lab testing, how to assess, and what lab tests are important?

Because there's a lot of tests out there that don't really give you an accurate status. They just tell you what's in the blood, for example. For a lot of these minerals, a blood level's not going to tell you very much because only a small percentage of the available nutrient mineral is in the blood, so you have to know when to test differently.

All of this stuff is going to take time to master. You need to have reference guides because you're not going to memorize all this. You're going to get the big picture. You're going to understand the minerals, but you're not going to memorize all the enzymes and all the cofactors that they're part of. It's important for you to be able to organize this and be able to access this stuff in an easy way. There's an abundance of information about minerals on the Web, yet it's hard to sort through and understand what's important, what's not, unless you have the foundations. Once you have the foundations of this, you'll be able to read through some of the research articles and some of the blog articles and decide, is it valid, or is it somehow misconstrued?

This is a general list of the minerals that we're going to be going through. Let's go through this in general. I'm going to give you an overview. You've got this chart. It's just a few of the major functions of the particular minerals. It's not everything. The everything is going to come in the longer presentations. This is to give you an overview and to have you have a cheat sheet and have this handy.

Basically, calcium, bones, teeth, and muscle contraction are its major claims to fame. We need approximately 1 gram a day, 1,000 milligrams. That's what the RDA has been put up to. I tend to take exception to that because I think that people who are on a standard American diet, which is very high in protein and processed foods, do end up leaching a lot of their calcium out, and they do need quite a bit of calcium, but I've seen studies that show that people who are on a high plant-based diet, all clean, whole foods, probably don't need more than 400 or 500 milligrams a day of calcium. The kinds of things you'll see in a deficiency of calcium would be osteoporosis, osteomalacia, and tetany, contraction of the muscles that doesn't stop.

The next one is chloride. Chloride is important for enzyme activation, pH control, and the synthesis of your stomach acid. Your stomach acid is hydrochloric acid, and so the, "-chloric," is chloride. It's important for the synthesis of your stomach acid. Some of the symptoms you might see with chloride problems are loss of appetite, weakness and lethargy, and acidosis, so the body tends toward a more acid pH than a more alkaline pH, which is more optimal for function. There's a chart that I'm giving you in this module that you can print out and keep handy. It's a 3-page document that's just basically all the deficiency signs for each of the minerals. That's a really good, handy cheat sheet. This is just really general. That has long lists for each one.

Then, we have magnesium. Magnesium's important for nerve impulses, and it's also important for protein synthesis, muscle relaxation, and about 325 different enzyme reactions in the body. Magnesium deficiency can show up in so many ways, way more than I can put on this little summary chart. The RDA is considered to be about 350 to 400 depending on whether you're male or female. That's in milligrams. Calcium, chloride, milligrams. Magnesium, milligrams. We're going through the macrominerals first. It's important for neuromuscular hyperexcitability. If somebody's like, "Rrrr," really can't calm down, oftentimes that's magnesium. Muscle weakness. A muscle cramping, like the calves that cramp at night, is oftentimes a magnesium deficiency. We'll go into way more detail about that in the magnesium presentation.

Then, we've got phosphorus. Phosphorus is an important component of bone. It's part of phospholipids, which are super important for your nervous system and the myelin sheaths. It's important for the production of ATP, which is the energy currency, and pH regulation. Again, you're going to see neuromuscular problems, similar to what you saw with magnesium and calcium, and skeletal and heart muscle symptoms, so poor bone structure. Excess phosphorus leads to impairment of the whole bone metabolism process, and you get osteoporotic symptoms and then heart symptoms.

Potassium. Potassium is important for the water balance in the body. The sodium potassium pump is super important for maintaining water and electrolyte balance and also pH balance. Things that you see when people have low potassium are weakness, just muscular weakness, apathy, arrhythmias, and fragile bones. In addition, it's linked to, again, the muscle cramping, similar to magnesium. If you've got somebody whose legs are cramping in the middle of the night, you're going to need to differentiate what the issue is, whether it's a magnesium issue or a potassium issue or both or calcium or the balance between all of them.

The next one is sodium. Sodium is important, again, like potassium, for the water pH and electrolyte balance, for nerve transmission, muscle contraction. One of the things we see a lot of is when people have excess sodium is sometimes they get edema, or high blood pressure, also anorexia, nausea, muscle atrophy, and weight loss.

With sulfur, it's part of all the sulfur-containing vitamins, and lipoic acid is part of that whole process that creates antioxidants. Sulfur's important for, say, the glutathione synthesis, for protection, for antioxidant protection, and for the pathways that use ... Of course, methionine is a sulfur-containing amino acid, and that's important in methylation pathways and in DNA repair.

Chromium. The only thing we really know that chromium does is blood sugar maintenance. It helps with insulin sensitivity at the cell level. You need 25 to 35 micrograms a day for maintenance. What we find in people who have blood sugar imbalances, who have insulin resistance, diabetes, or metabolic syndrome, that they need a lot more.

The doses for it that have clinically been found to be relevant for insulin resistance are more in the 800 micrograms a day. Minimum required is 25 to 35, but you're going to see people taking and prescribe a lot more when people are in the throes of insulin resistance, and then you should be able to get it back down.

Copper. It's important for neurotransmitter synthesis, for actually making the neurotransmitters and some pigmentation. The dose is 900 micrograms. When you don't- You can see copper-deficient anemia, neutropenia, which is low white blood cell count, and bone irregularities when it's deficient. You also have to be careful with copper and zinc because there's a very important ratio that needs to be maintained because excess zinc can thwart copper; excess copper can thwart zinc.

Iodine is important for thyroid hormone. It's the core mineral in the thyroid hormone, combined with tyrosine to make T3 and T4. It's also important in breast health. People with low iodine can tend to get fibrocystic breasts. You also might see people who have ovarian issues or fibroids that get helped when they get iodine. Usually, that's using iodine painted vaginally. We'll talk more about that when we get to iodine. It's important. If you have a problem with it, it's thyroid dysfunction. The RDA on iodine's about 150 micrograms. However, what we find in people with thyroid dysfunction and with breast problems, fibrocystic breasts, breast cancer, we need to give them much higher doses. In fact, up to 50 milligrams is often given when people have a documented iodine deficiency. You'll also see increased blood lipids, and part of that is because of the thyroid dysfunction. That leads to high cholesterol and triglycerides.

Iron is the oxygen-carrying capacity of the blood, the hemoglobin. Iron is the core of hemoglobin, and hemoglobin carries oxygen throughout the blood. You get anemia and fatigue and palpitations when you don't have enough iron. The RDA is in the range of 20 milligrams a day.

Manganese is important for collagen formation. In people who are spraining a lot of ankles and have traumatic injuries, in addition to vitamin C, manganese is super important for forming that collagen. It's also got some functions in the brain and in glucose metabolism. Its deficiency can lead to slow repair, impaired growth. You're not getting over these injuries fast enough because you can't create the collagen, the strong collagen structure. Collagen is that glue that binds things together in the musculoskeletal system.

Molybdenum. Molybdenum is really important for DNA repair, for pyrimidines and purine synthesis and pterins and aldehydes. It's important for converting alcohols to aldehydes. When you don't have enough molybdenum, you get a buildup of sulfur byproducts, so it's really important, especially in people with genetics that tend them towards not having good sulfur metabolism, that molybdenum levels are up. Sometimes, people who have sulfur problems, and they get issues when they take in garlic and onions and brassicas that have high sulfur compounds, they can be helped by giving them molybdenum.

Selenium is important in free radical protection. It's important for some of those antioxidants like glutathione. It's also super important for the conversion of T4 to T3 in the thyroid. Actually, that conversion doesn't just happen in the thyroid. It usually happens more peripherally, in the level, in the gut, the kidneys. When you don't have enough selenium, you're going to get, of course, thyroid dysfunction and symptoms of thyroid dysfunction, even if all the rest of the labs look normal. You might get the low energy and all the other thyroid symptoms. Plus, you're going to get things like myopathy, which is a pathology in muscles, fragile cells, and degeneration of the pancreas.

Next, we have silica. Silica's a super important mineral for the formation of bones, teeth, hair, and nails. There's a structural component. We only need between 9 and 14 milligrams a day, but in its absence, we could contribute to osteoporosis, along with deficiencies of some of the other structural minerals, but also weak skin and nails and brittle hair. People who tend to have those nails that they can't keep straight, they're very weak, or their hair's falling out, you can see that, when you supplement with silica, silica-rich foods, that is, that you can end up with more fulling out of the hair and the nails that don't break as much.

Then, zinc. Zinc's important for just about so many things, 100 different, 125 actually, different enzymes that are supported by zinc. It's important for energy, for protein synthesis, for sex hormones, for digestion, and so, so much more, as we'll see. Poor wound healing is one of the things you'll see in people that have zinc deficiency. They get cut, they get injured, and they just don't heal fast enough. Anorexia and hormone balances.

That's an overview in a nutshell of the nutrients. It's important, as we go through them — and we'll be presenting that in each of the individual presentations — that you understand that there's interactions between them, ratios that need to be maintained. Excess of one can lead to a deficiency of another. It's not okay to just randomly and haphazardly start to take a whole bunch of minerals just because you read an article about it. You're going to see a lot of patients that do that, and they can create other imbalances and not even be aware that this high level that they're taking of, let's say, magnesium or zinc is impairing their levels of phosphorus or copper. It's really important to keep these things in mind. We'll give you the details in each of the presentations.

There's some mineral chart resources that you can look at. There's this one that's a link on the Web on the slides. It's health-alternatives.com/minerals-nutrition-chart.html. That'll give you a more detailed list. I gave you a summary chart. They have a much more detailed chart that gives summaries of the different nutrients, minerals. Then, Advanced Nutrition and Human Metabolism, the textbook for this course, is a really good source. They've got charts for the macronutrients and the micros, and they give you a little bit more detail on the functions and where you get them in the nutrients. It's nice to actually get the charts together and print them out and have them handy by your desk so that when you have somebody come in, you can pore through them and help yourself.

The other chart that's really important is the one that I gave you called Nutrient Assessment Chart. That's in this website in this module, and that will give you lists for each of the nutrients of just the deficiency signs. That one I find as a handy cheat sheet as you're going through a client and actually ... When you're first learning this, before you get really fluent with each of the nutrients, I would say, go through that chart and have one, just print one copy of it, for each patient or client, or do a Web version of it and go in and highlight the symptoms that they're having because when you see clusterings of those symptoms, you're going to have the ability to know where some of their problems lie and what their major nutrient imbalances might be.

Deficiency signs. Again, these are just a summary. You're going to see lots of these in detail in each of the individual presentations. Hormone imbalances. There's a lot of different hormones. We've already talked about thyroid, and then there's sex hormone and adrenals. They all have minerals that are important for them. We've got fatigue, very commonly associated with mineral deficiencies; osteoporosis, obviously; anemia; digestive problems, low hydrochloric acid, low enzymes. You've got immune problems. A lot of these are important for cofactors and enzyme systems that are important in immune function. Immune problems and allergies. We've got a lot of the histamine reactions and responses to food, and that relates to the digestion, too.

We've got depression. Depression is big in neurotransmission. You've heard as I went through the summaries that a lot of these minerals are important with neurotransmission. Anxiety is very common when there's a mineral deficiency, as are skin problems because the skin can't heal. The zinc's super important for the skin healing. It's also part of the immune process and the healing and the collagen synthesis and all that. Then, neuropathies, when people have pain syndromes that just won't go away and inflammation because of lack of these minerals and the important functions that they do in executing metabolic pathways.

To supplement or not to supplement? How do we do it? How do we know? An insurance for an already healthy diet, not a replacement for eating junk food. So many people just eat their stuff, and they go, "Don't worry about it. I'm just taking nutrients." Yeah, you can take isolated nutrients, and there's so much more in the food that we don't know about. There's the proper ratios in the food. Yes, of course, our soils are depleted. Yes, we're not going to get the full gambit. Yes, most people probably will have to supplement, but when you know the food sources and the concentrations that people can take it in, you can get away with not using as much supplementation. I always look at supplementation as something that you might be doing over time to accelerate what the food can do for people.

For some people, because of genetics, because of damage that's been done over the years, they may have to supplement indefinitely, but I like to give people on supplements and say, "We're hoping that this is just temporary, that what we want to do is to move you to be able to get it from food or from concentrates," and under adverse conditions that increase the needs for specific minerals, and we want to add some extras. You have a cold, or you're exposed to people that are coughing and sneezing around you. You certainly want to boost your immune system. When there's an injury, and we're needing extra nutrients to support the repair of bones and collagen and reducing inflammation. When there's an infection. That's an important piece, too, to stimulate and make those pathways work much more effectively.

It's not a substitute for eating well, and it's not to make up for deliberate binges. Sure, people are going to fall off the wagon, and there are nutrients that you can give them to help make up for that, but we don't want them to feel like, "I could just binge, and then all I have to do is take my extra minerals and vitamins, and I'm fine." We want to really get them in the mindset that the food is the critical piece, and we have to start with a foundation of good food.

I'm going to review the hierarchy of ways to supplement. I like, personally, to use whole food concentrates. That would mean powdered, dehydrated versions of foods that are high in particular minerals. Greens powders tend to be a good way to do it, spirulina powders, things like that, what tend to be good, whole food concentrates.

Liquid minerals from concentrated whole food sources. I gave you a picture of Liquid Light, fulvic acid mineral from Sun Warrior. Ionic liquid minerals. Ionic liquid minerals are really in a state that the body can just utilize right away. It doesn't have to go through the whole digestive process. It can get absorbed through mucus membranes. That's why usually I have people take ionic liquid minerals with a little bit of water on an empty stomach. Some people can't do it because they get nauseous, and if they can't, they can't. That's why we're giving you the hierarchy. Powders that can easily dissolve in water or green juice. You can get a calcium citrate powder. You can get a magnesium powder, and you can stir that into the water and drink it. These are all going to be much, much better than capsules and tablets because they're much more readily utilized by the body.

Then, you can get capsules without excipients, so no magnesium stearate to slow it down, no talc added to it, no junk that is typically in the over the counter stuff that your clients may be coming to you with that they bought at Walgreens or Kmart or Costco. There's different types, and we'll go into the details when we go through each of the minerals. There's amino acid chelates, which means that the mineral is bound to some amino acids, and that helps them to be more organic and get into the system better. Then there's organic salts. We'll go through what those are when we look at the specific. Then, last, but it's certainly a possibility if that's all they'll do: tablets without binders and preservatives. This is the hierarchy.

You work with your client where they're at. You try to explain to them the importance of, if you're supplementing, to get really super high quality supplements, so you don't waste your money. Just because it costs $5 at Sam's Club and $20 at order online at a high quality, professional only site, then they have to know that there's a difference. If they're seeing those vitamins coming out in their stool, and it's not getting absorbed, then it's worth the extra money. It's really a matter of educating your patients to be aware of this.

The ingredients to avoid. You always want to avoid ones that say they have hydrogenated oil, or they have heated oils of any kind because that's going to be basically a trans fat, and that's going to affect the absorption. You want to avoid the ones with talc. I see that a lot in these ones that they sell. Talc is a known carcinogen. Why would we want to eat it in our vitamin that we're taking to get better? It makes no sense. I also see sugar in them, and sugar is masked often as dextrose or maltodextrin, which is really a starch derivative, but I see that a lot in there and other kinds of things like that.

We don't need to have our supplements taste good, yet somehow, somebody believes that they have to look good and taste good, so they put sugar and artificial sweeteners, and they put FD&C colors. Do I really want to take vitamins that look like a rainbow? Yeah, it's nice to know the difference between one and the other, but I don't need that at the expense of my health. You look at these picture here, and you've got those bright blue and red and green. Those colors are artificial colors. We know that all those FD&C colors, most of them have been found to be in somewhat carcinogenic or mutagenic.

Stearates, oftentimes magnesium stearate or vegetable stearate. Those are fatty acids that make the whole process easier for the supplement company to get their tablets and capsules through the machinery, but it doesn't make it easier for you to absorb. It makes it harder for you to absorb. Sodium benzoate is often a preservative in the liquids. When there's sodium benzoate in there, and you take that with vitamin C or with any kind of acid — lemon juice, apple cider vinegar — anything acid combined with that sodium benzoate is going to help turn into benzene, which is a very potent carcinogen. Have them avoid anything there. Then, titanium dioxide.

What I'd recommend you do when you're working with people face to face is that you can have them bring their shopping bag in and have one session. By now, hopefully, you are or you're thinking about offering packages of sessions, not individual sessions. When you offer a package, you can actually count that in one of your sessions is that, "We're going to look at your supplements, and we're going to find the optimal supplements for you." That's one of your sessions. You have them bring a shopping bag in full of their supplements, and you teach them how to read the labels, and you say yea or nay to their supplements. It's a hard thing to do because people are like, "I spent money on this."

I have people who are like, "Okay, I'm just going to give it to somebody. I'll give it to my house cleaner. I'll give it to my neighbor. I'll give it to somebody else, but I won't take it." That's the things to avoid in them.

Here's a little bit more on magnesium stearate: it is actually a lubricant, and it's done so the vitamins don't stick to one another or to the equipment. I've spoken to some of the vitamin manufacturers. I've spoken to Thorne, who does not use mag stearate, and they say, yeah, it takes a lot longer for the capsules to go through the machinery because they have to stop it, and they have to clean it, and they have to stop it when it starts to heat up. It takes longer, but they're committed to quality. I talked to another supplement manufacturer — I won't say who — who said, "That's a whole bunch of hooey that Thorne made up," but it's not just Thorne. It's Thorne and Premier Research. Pure Encapsulations doesn't use them. Mostly, Seeking Health does not use them. There's a lot of companies that don't or several, a handful, that don't, but a lot of them do, and I'm really careful.

Unless I find a specific blend that I really like, need, and it's unique, and I find that it's effective, then I take them off of the mag stearate. I don't use it personally. The safety controversial, some people say that it creates immune suppression or cancer, and others say that it creates a biofilm that blocks absorbing the other needed nutrients. Some studies say that it's just a good lubri- It's hard to say. There's no clear evidence. Yeah, there's a whole bunch of studies in humans and animals that link it to cancer. I just think, when in doubt, leave it out.

Testing minerals — how do we do that? Symptoms are my favorite way. It's easy. It's cheap. You can do it quickly. I've given you scorecards, and that's in your history taking section. You can look at exam findings. You can look at exam findings, so specific markings on a person's body. We'll go through those with each of the nutrients that we go through. Then you can do lab testing, direct or indirect, functional testing or direct measurement in particular body pieces, blood or urine or saliva or stool. That's the way you test them. We'll go through the details in each one of the minerals.

Let's just look in general at some functional tests. Like I said, we'll go through more detail. Repetition is good because the more you hear something, the more it's going to stick. The reason that all this information is so easy for me is repetition. It's been 23 years of over and over, the stuff that I use. The stuff that I don't seal out or I don't use a lot, I always have to look up because it's not as familiar. Familiarity does not breed contempt. It breeds mastery. Mean corpuscular volume, MCV, is done in a CBC test, a complete blood count, a very common test. That can give you an indirect measure of iron. I've put the abbreviations here, so you get used to the abbreviations. That's what you're going to see in a lot of literature and the studies. We saw when we looked at vitamins, or you will see when you look at vitamins, that MCV also can be indicative of some of the vitamins like B6, B12, folic acid, or folate, I mean, and vitamin C.

Another thing that you can do for a functional test of mineral status is iron binding, total iron binding capacity. When you look at the iron binding capacity, that's basically a test of iron. If you've got a lot of iron binding capacity, it could be that a lot of your iron is tied up with the binding protein, and not a lot of it is available for metabolic function. If you have a low total iron binding capacity, you may end up with excess iron in the system. Then, that gets stored as ferritin. That may be a clue that there's some iron ferritin storage problems, like hemochromatosis.

You can look at uric acid as an indirect measure of molybdenum and copper. A lot of the things I'm pulling out that have a specific mineral that they're related to has to do with their affinity because of enzymes that are dependent on those minerals. Hemoglobin and ferritin are both iron, again. Hemoglobin is that red blood cell oxygen-carrying capacity. If you don't have enough iron, you're certainly not going to have enough hemoglobin. Other things go into hemoglobin, but we'll go into that when we have our blood chemistry analysis module. Ferritin is the storage form of iron. Actually, if you look at ferritin, and it's very low, it means that even if the iron is good in the serum, you're heading towards a deficiency, and the diet is probably deficient. It has to be ideal.

GGT, which is a liver enzyme, is magnesium-deficient. If GGT tends to be too low, it might be an indication that magnesium is off. All of these ... This one is indirect. It could be other things, but if it's low, we expect magnesium. Same with alkaline phosphotase, which is a liver enzyme, also important for bone metabolism. That's a zinc-dependent enzyme, so if it's very low, you might suspect that there's some zinc stuff, especially if the person also has zinc signs like poor wound healing, et cetera.

Then you've got the organic acids, which tests for all of them in various pathways. If we see that certain pathways are blocked, and those are dependent on particular minerals, then we know that functionally, we don't have enough. Organic acids are done by Genova or Metametrix in Great Plains. Those are two different places that do it. You've got the NutrEval from Genova, and that tests the minerals. It also tests vitamins and a whole bunch of other stuff like amino acids, fatty acids, et cetera. Then, SpectraCell, which looks at the white blood cells, and it looks to see the levels of these nutrients in the white blood cells. These are ways that you can test for minerals. Like I said, we'll go through those in more detail.

You can always also use what's called the lingual taste test. That's basically where you taste test the minerals. You can do that with the Zinc Assay from Premier Research, Thorne, Biotics. A lot of companies have it. You're basically swishing a metered amount of it, usually about a teaspoon, in your mouth of that mineral. Swish, swish, swish, swish, swish. If you immediately have a bad taste, then that person is likely to be in excess or just fine in that mineral. They don't need anymore, and you don't want to be supplementing somebody who immediately tastes bad with.

Then, if it takes til 30 seconds, and they don't have a taste at all, then that makes you suspect that there's a severe mineral deficiency. Also, if it tastes ... I'll talk about the bio body. That's on the Zinc Assay.

Now, the company called E-Lyte or BodyBio has created these 8 different mineral tests that you can get. This is a picture of the kit. It comes with these 8 ounce bottles that are mostly water with one metered dose of that nutrient, and it's very specific to each one. Some of them might be 3 drops. Some of them, it might be 12 drops. You mix 8 ounces of water with that 12 drops of that mineral. They tested this on thousands and thousands of people to see how well the test correlates to symptoms on labs and on functional testing. Once they found that it works, then they submit it for use. It used to be, when I first got these kits, it only had 7, and then they came out with the selenium and said, "Yeah, we've been testing it, and it works." They have an iodine, but they've been testing it for years, and it doesn't seem to correlate, so they don't release it as a test kit.

That's an easy, at home thing. You can buy these mineral kits and keep them in your office, and you can test people when they come in. You can also have people buy it. They can buy them on Emerson Ecologics or Amazon, even, and they can have their own kit at home. You can even have a session on the phone or Skype where you share with them how to do their mineral testing, and it could be really awesome. It's easy. It's fairly economical. Then, they know what to supplement rather than just randomly supplementing whatever minerals they think they need.

Some of the other tests for mineral status, urine toxic and essential elements. It's either a 24-hour, or it's a spot, and you can either do it where you provoke or not provoke. When you provoke on the elements test, it basically means you take a chelating agent, and you measure before the chelating agent and then after the chelating agent to see what the difference is in the amount that they're excreting. Usually, that's done for toxic. For the essentials, I just run it on a random sample or a 24-hour sample. Doctor's Data has that, Urine Toxic & Essential Elements. It's not really very expensive. It's in the hundreds range, hundred range. I've done it on quite a number of people. Some are more accurate than others. You can also do stool testing, but that's pretty much good for toxics. Hair analysis will show the toxic and the essentials, but I've only really seen evidence that it's accurate for the toxics. Then, what I just talked about with you just now is the lingual testing.

There's also blood tests for mineral status that are fairly accurate. These are the ones that are fairly accurate. You could do others, and it's questionable how accurate they are. There hasn't been enough research. Iron, calcium, potassium, sodium, chloride, phosphorus, magnesium in the red blood cells, not in the serum, and copper. These are the ones that have been shown to be fairly effective by testing directly.

Finally, I want to end this piece with additional resources about minerals. There's a book called Advanced Nutrition and Human Metabolism, which was a textbook for this course. They have a lot of great information in detail. I highly recommend that you just pick one at a time and really dig deep into it, so you understand it more fully. Again, you don't have to memorize everything because we have books, and that's what they're for. You want to be able to have a grasp of the general functions of various things and where you get them food-wise so that you can support and talk to your people and understand what's going on. You're always going to look things up when things aren't as straightforward as they might be.

There's a website called The World's Healthiest Foods, whfoods.com. They have a /nutrientstoc.php, /nutrientstoc.php. It's on the slides. That is a place where you can see all the different nutrients and then get important information about what foods they're in. They have good charts on there. Then, the Linus Pauling Institute has a really nice layout and a lot of good stuff on minerals. It's a hard URL to read. It's in the PDF, and it's in the slides. It's lpi, for Linus Pauling Institute, lpi.oregonstate, for where they're located at the university, so lpi.oregonstate.edu. Then it's /mic, for micronutrients, /minerals. Now that you've got associations with those pieces, let me read it again: lpi.oregonstate.edu/mic/minerals. A lot of great information about each of the minerals and if you want to dig in to a lot more depth.

That's the end of our presentation on the introduction to minerals. I look forward to you learning more and more on the individual mineral presentations.