Micronutrients: Zinc

Transcript

Welcome to our micronutrients presentation on zinc. Zinc is one of our most important micronutrients. It's super important for so many functions in the body. It doesn't have quite as much the number of enzymes that it works for for as magnesium. But it's pretty darn close, with a hundred twenty-five different enzymes in the body and different systems and wide-spread effects all over the place. I'm excited to be here to share that with you.

As usual, I like to start with medical disclaimers, basically saying that this is not medical advice. We are just talking about ways for us to educate our clients abut how they can bring their body in balance, identify micronutirent deficiencies and give them tools and tricks to use diet, lifestyle and supplementation to restore balance. There's no diagnosis here. There's no medical treatment. It's just stuff that we share and if they have a medical practitioner involved in their case, if they're on any medications, they should always run that by their doctor before taking action.

Let's talk about zinc. Good old zinc. I love zinc. I love talking about zinc because its got so many wide-spread functions in the body. It's considered one of the microminerals, as opposed to magnesium, which is a macromineral, and calcium and all the rest, because it's required in small milligram doses. Fifteen to twenty versus several hundred for calcium, magnesium and the rest. Important for a hundred plus. It's actually a hundred twenty-five that I've seen listed. Different reactions, different enzyme reactions in the body and the categories that it spans; growth and repair, hormones, immune system, neurotransmitters, digestion and so much more.

Let's get started and jump right in with zinc. What we're going to talk about is, why is zinc so important? What are some of the signs and symptoms of deficiency? What happens if you take too much? Where do you find zinc in the food supply? When to supplement and the best types. Factors that help or hinder absorption. When to use lab testing.

Let's just jump right in and begin. Here's an example. I thought I would start with a picture, an example of zinc as a cofactor in fat metabolism and fatty acid metabolism and in particular, in the elongation of the short-chain Omega-6 and -3 fats into the long-chain Omega-6 and -3 fats. There's an enzyme called delta-6-desaturase and guess what? It's a zinc dependent enzyme. It's also dependent on quite a number of other things, including magnesium and some of the vitamins.

But this is an enzyme that, without zinc, this enzyme does not work efficiently. What happens when this doesn't work efficiently, you get a shortage of EPA, DHA. That can effect things all over your body. Mood, mind, memory, behavior, inflammation, immune system, autoimmune disease flare-ups, blood sugar balance, injury repair, so many things that are effected. This is one of the ways that zinc jumps in and affects so many different systems in the body.

Let's look at some of our zinc-dependent enzymes. We're not going to go into massive detail about each of these. We're just going to start with a little summary. There's something called carbonic anhydrases which is important for erythrocytes, which are red blood cells. Alkaline phosphatase, which is for bone and liver. Alkaline phosphatase is an enzyme that is zinc-dependent. It is usually looked at as an enzyme that is a problem if it's high. Conventional medicine doesn't really look at what does a low alkaline phosphatase mean. But when we're doing that and looking at that on a blood test, and we see low alkaline phosphatase, it means that we probably have a zinc deficiency. Or we might have a zinc deficiency. We might not be able to go all the way to "probably." If it's high, it's an enzyme that gets activated when there's damage going on in bone and in liver. Oxidative stress and things like that.

Alcohol dehydrogenase, it converts alcohol to aldehydes. It's important when people are consuming alcohol to be able to take it, alcohol dehydrogenase, and move it out. But it also is important when we make alcohol. For example, candida, an overgrowth in the gut and that actually impairs the alcohol dehydrogenase enzyme. We're not able to convert alcohol to aldehydes. You could couple that with most of the time people who are doing a lot of excessive drinking, are impeding their zinc and other mineral absorption and utilization and, probably not getting all that much in their food supply. Having that combination of the zinc being important to the alcohol dehydrogenase and them not getting enough zinc makes for lots of liver damage.

There's another one called, carboxypeptidase A which affects protein digestion from the pancreas. The pancreatic enzymes that are produced, this carboxypeptidase A helps to create those enzymes. You see where zinc is important here in digestion. Same thing with aminopeptidase, it's important for protein digestion. It's important to have zinc in order to be able to have that enzyme working and that enzyme is helping us to create those enzymes that break down our food.

Aminolevulinic acid dehydratase is important for heme synthesis, which is your blood cell creation. Like hemoglobin, heme, and that's important for creating blood cells. When zinc is low, we're going to have problems in blood cell production.

Superoxide dismutase, often abbreviated "SOD," is a really powerful antioxidant. It's up in the neighborhood of glutathione and catalase as being our top three very potent antioxidants.

When you can't have the action of superoxide dismutase because you're low in zinc, then there's going to be a lot of oxidated stress on the system. There's going to be a lot of free radical build-up. There could be lots of problems.

There's collagenases which digest collagen in the gut. That's actually when we're eating foods that contain collagen, which is basically animal products, then the collagenases help to digest that. Without zinc, it's not going to do its job.

Phospholipase C is related to phospholipid metabolism. Phospholipids are very important for integrity of nerve cells and membranes and for things related to lipid metabolism, as well.

Then there's polyglutamate hydrolase, which is important in the digestion of folate. If you've got somebody who's eating a lot of green leafy vegetables but they don't have enough zinc, they may not be pulling enough folate out to support their methylation pathways. That's a pretty important thing. Because methylation pathways are important for liver detox and for hormone metabolites and for DNA repair. If you've got somebody who's got a zinc deficiency and they're low on this enzyme or this enzyme isn't working efficiently, they're not going to be supporting those methylation pathways, at least from food and they are going to need some heavy duty supplementation.

There's lots of other enzymes. We said about a hundred and twenty-five. Polymerases, kinases, nucleases, transferases, phosphorylases, transcriptionases. Anything that has "ase" on the end is an enzyme. You can generally tell by what it says what kind of activity it's doing. A transferase is going to move molecules from one place to another, from one component to another. Nucleases are going to affect the nucleus. There are all these different enzymes. We're not going to have time to go into every detail, but I highly recommend if you want more details on these, that you do some searching on the web and Medline and even just Google itself. Then also, our book. The book that we recommended. There's a lot more detail about that, "Advanced Nutrition and Human Metabolism."

You can go into a lot more detail. The thing is, if I were to go into a lot of detail on these today, you're not going to remember it. It's pathways. But you have the general idea of the areas that the zinc-dependent enzymes affect; blood cells, bone, liver, converting alcohol so detox pathways, protein digestion, blood cell production, antioxidant protection, digestion. These are all places that zinc just jumps in. This gives you an idea of how zinc jumps in and has an effect.

What are some of the specific zinc functions? It affects your taste buds. A lot of times if you don't have enough zinc, you're not going to taste things. Things aren't going to taste as good as they should. You also have stomach acid and digestive enzyme support.

It's an important part in creating the hydrochloric acid that helps to digest your protein and your minerals and also the digestive enzymes, and we gave you a hint of that when we looked at those enzymes.

It's important for the repair of skin, hair and nails. A lot of times we'll see people that present to us that have really slow wound healing. They'll get a cut and it may be there for weeks or months because their bodies so low. Think zinc because it might possibly be zinc. In those cases, sometimes topical zinc, putting a zinc oxide cream on that could be helpful. But you do need to address the underlying.

It's important in the endocrine system by the formation of testosterone, the ratios of the estrogens because it has to do with the elimination of certain types of estrogen and DHEA. It's really important as we are looking at adrenals and we're looking at sex hormones that we look to proper amounts of zinc. I've put people on as much as ninety milligrams of zinc for short periods of time to address some serious imbalances in those areas.

Also protects the prostate. You see that a lot if you know any men who are dealing with prostate enlargement or even prostate cancer that zinc is one of the critical nutrients for prostate, along with GLA and some other herbs that work well.

It's important for the maturation of eggs. Women who are having trouble with their cycles, or difficulty getting pregnant, and their cycles are all off, could be zinc deficiency involved.

The ratio between estrogen and testosterone. There's an enzyme called aromatase and if the aromatase is overactive, we get too much conversion of testosterone to estrogen. If it's under-active, we go the opposite. Zinc tends to be an aromatase inhibitor.

It's really important for breast cancer protection in that it affects the levels of estrogens, it affects the ratios between the protective estrogens and the not-so-protective estrogens. That's a long thing to get into in terms of what those are and we have another module where we'll go into that in great detail.

It's important for antioxidant support. SOD, we've already looked at. Superoxide dismutase is a super powerful and very important antioxidant. It's an anti-inflammatory as it relates to C-reactive protein. Zinc deficiency can contribute to elevations in C-reactive protein. C-reactive protein is an inflammatory marker and in particular, it's very sensitive to cardiac inflammation, like vessel and endothelial inflammation. But it could be elevated and needed for any kind of inflammation, including infectious, acute infectious diseases.

It's neuroprotective. It protects the nerves by having action in those areas to keep it. Part of that is its affect on the phospholipids, which we just looked at with the phospholipase enzymes that it's involved with.

Let's look at zinc and insulin regulation. Zinc helps to transport insulin into the cells. If you don't have enough zinc, you can end up with Neuropathy, retinopathy, and thickening of blood vessels. It helps with the creation of insulin in the pancreas. This is especially important in Type I diabetics who are already not making enough insulin. Or in Type II diabetics who have gone through the whole realm of insulin resistance and into Type II diabetes, they're not really addressing the problem and their pancreas gets burned out of all that hyperinsulinemia. That's really important. It also affects the sensitivity of the cells to insulin. It transfers insulin into the cells, it affects the sensitivity and it is important in helping to make insulin.

Other zinc functions. It counteracts overdoses of iron. Very few people really have overdoses of iron. But it certainly can. It's been found to counteract some of those overdoses.

It chelates heavy metals out of the brain. This is pretty important. If you've got somebody who's got heavy metal toxicity, high levels of mercury or lead, which can really affect brain function, then the zinc is really important. One of the things when people are doing chelation to get rid of their heavy metals, is that they need to alternate the chelation with high dose zinc supplementation.

It affects focus and memory. Kids with ADD, you can find an affect with the zinc. They may be low in zinc. Kids tend to be low in zinc because it's hard to absorb, they have low stomach acid due to the issues they've been either born with or raised with, with food choices and they don't have enough of zinc or other minerals. It affects brain function. It affects brain function in terms of neurotransmitters and preventing depression.

You can see that there's a lot of things that zinc does in the system. Let's look at zinc absorption now. It's mostly in the proximal jejunum. Remember when we talked magnesium, it was at the distal jejunum. Proximal means, "close," so it's more close to the top of the jejunum. Right after it dumps from the duodenum, as opposed to magnesium which is more towards the end.

It's absorbed via active transport at low intakes. If we're taking the normal amounts, are very low, it's active transport. If we're taking higher amounts, it might be absorbed through diffusion. There was a little confusion in the literature. People are still working on figuring this out. Fifteen to thirty-five percent of ingested zinc is absorbed. Fifteen to thirty-five. That's not much. That's not much. That's not much. That's very little, very little and it would be much better if it was more. But that's why we need to take more than we think we need to take. When we get to supplements, some forms are not absorbed as well as others. We really need to be cognizant of that.

Let's take a closer look at zinc absorption. At the top, you've got the small intestine, the lumen, and the zinc is going to go through the villi. It's going to go into the cells that line the gut through the villi. We have low zinc, we have a little bit. We have a lot of them going in.

A higher percentage going in. Get's in here. Then the zinc goes, gets put in a vesicle and gets carried out gets put into the bloodstream. A good percentage of that is into the bloodstream.

You can see in this case, there were three zincs going in and two got in the bloodstream. That's pretty darn good. That's a sixty-six percent absorption rate. But now look. What happens? We flood it, a whole bunch of zinc going in and going into the cell. A lot of it is absorbed from the lumen into the cells, but not as much into the bloodstream. Just because you take more doesn't mean it's absorbing more. You have to make sure that the digestion is working properly.

This is another up close and personal with zinc. It gives you all the description. We're not going to go through each and every piece of this right now, but it basically shows you how active transport happens. Where the zinc gets attached to this little carrier and the carrier pops it into the cells. Then it diffuses into the bloodstream.

What kind of things affect zinc absorption? Somewhat similar to magnesium, phytates and oxalates will disrupt it. Phytates and oxalates will decrease the amount of zinc absorption. Because they are going to latch on to the zinc and carry it out of the system. Polyphenols are going to affect it, they're going to decrease it. Nonfermentable fibers and excess fiber intake are going to affect it, they'll carry the zinc out through the colon.

High calcium, high copper and high iron; these are three minerals that affect zinc. Copper in particular, we'll look at in more detail later, the mechanism for that. Copper and zinc need to be in balance. If you're taking higher levels of zinc or prescribing higher levels of zinc for someone, you need to make sure that they're also taking copper. If you're giving someone high levels of copper, or they're exposed to high levels of copper, like in copper pipes and things like that, that they get enough zinc.

High iron intake. High iron is probably in the range of fifty, sixty or more. When you're putting somebody on very high iron intake, you've got to make sure you give extra zinc to make up for that. Antibiotics and diuretics are two drugs that affect zinc absoption as well.

Things that increase zinc absorption. Citric acid. Citric acid is a lot of citric fruits. It's very helpful. We have a form of zinc that we can take called zinc citrate. That helps the absorption, so it's a better absorbed form than something like zinc oxide.

Picolinic acid. Again we have a particular form of zinc called zinc picolinate. It's combined with picolinic acid. When the zinc picolinate is used, you're going to get a much higher absoption than if you use zinc sulfate or zinc oxide.

Pancreatic secretions. If you have really good pancreatic secretions, it's going to increase the zinc absorption. What does it take to have really good pancreatic secretions? Part of that is zinc.

Then we have glutathione. If you've got good levels of glutathione, you're going to absorb more zinc. But glutathione has some dependencies on zinc as well. Then tryptases, which are types of enzymes. All of these things can affect the absorption positively.

Things that interfere with the zinc absorption. Copper excess. The medications like antacids and Tums. Here's the deal; people are taking Tums for their calcium, which is lowering their stomach acid, which is affecting the ability to absorb not only the calcium but the zinc, iodine and other minerals that rely on having good stomach acid.

Alcohol disrupts just about all of this. Birth control pills affect zinc. If you have a woman who is on birth control pills and is not ready, willing, able to get off of them, you've got to make sure you are supporting her with high zinc foods and adequate zinc nutrition.

Then, phytic acid in your grains. People are eating a lot of grains. They're on a high carb diet, they eat a lot of grains, even macrobiotics. You have to be careful that they're not getting too much phytic acid, to be messing with their zinc.

What are some of the things that deplete zinc? Gluten? Yes. Gluten affects all of it because gluten affects the gut and it affects the level of inflammation in the gut, which affects absorption. It also affects the immune system in that the antibodies that get produced can be challenging to the immune system. That's going to deplete zinc.

Any foods that are overly processed and overly cooked are going to strip minerals from the body. Alcohol, we talked about that. Herbicides and pesticides will deplete zinc. It has to do with some of the enzymes that it supports. Sugars. Any kind of sugars.

Stress depletes zinc. Zinc is very important for your adrenals. It's very important for your adrenals. Prolonged stress is going to affect that.

Antacids, we talked about that already. Low stomach acid, it's that vicious cycle; low zinc, you can't make enough stomach acid, not enough stomach acid, you can't absorb your zinc. You have to jump start the system. Sometimes you have to give people stomach acid or bitters to promote that, but you also have to give them zinc at the same time. If you look at any of my digestive support protocols, for a low stomach acid, I always talk about don't take a stomach acid unless you're also taking zinc because you want to help your body to be able to make it itself, so you're jump starting the system with both.

The unfermented soy products, those also contain a lot of phytates; the coffees, the tannins, et cetera. Then excess iron, calcium and copper. These are the things that will deplete zinc.

When you're doing your intakes with people, you want to be looking at; how good is their intake of zinc-containing foods? How much of the negative factors do they have? That'll help you guide yourself towards how you're going to start your process with them in terms of getting them in touch with a really healthy diet and zinc supportive diet.

Let's look at some of the nutrient interactions. Let's start with zinc and copper. Zinc stimulates these receptors called, "threonine." Threonine peptides have a higher affinity for copper than zinc, so the excess zinc is going to stimulate these receptors and these receptors are going to latch on to the copper. The dietary copper then becomes trapped as part of these metallothionein within the enterocyte and doesn't make it into the bloodstream. You have this extra, we saw that in the picture earlier; let me see if I can go back to that picture. This is metallothionein, over here. This is latching on to the zinc here and that's what's making a lot of the zinc not absorbable. You see?

That happens when there's too much zinc. You have all that zinc, but you also have copper. The right amount of copper. But those receptors are going to latch on and it's going to keep it from being absorbed. Yes, those receptors are not going to allow as much zinc to be absorbed. You have to increase the copper as you increase the zinc. Zinc stimulates those receptors to act more and then once they act more, because you have high levels of zinc, the copper is going to latch on to them because it has a higher affinity. You have to give higher amounts of copper; otherwise, they'd get trapped in there and you can never make it into the blood.

Let's just go back and reiterate. You've got all this zinc. Zinc is stimulating these metallothioneins, so the thionein. It's stimulating that to produce more and producing more causes it to latch on to whatever copper you have in addition to the zinc and you become copper deficient, so you need to eat a lot more copper.

How does zinc interact with vitamin A? Zinc deficiency inhibits vitamin A, so if you don't have enough zinc, you don't have enough vitamin A. It inhibits the production of it and also the activity of it. The body stores excess vitamin A and enzymes that are activated by zinc release from storage. If you're storing the vitamin A, then the zinc is going to have to be required to release it from storage. If you have a zinc deficiency, you're going to have a lot of "A" trapped in these storage sites that doesn't get out into the system.

Zinc deficiency also decreases the amount of retinol-binding protein that transports the vitamin A to the tissues throughout the body. Remember that most fat soluble things; hormones are fat soluble, vitamins, need a carrier to carry them through the blood because the blood is water soluble and the nutrients are fat soluble. You have to transport.

If you don't have enough of this transport protein to carry zinc from the storages in to the system, in to the tissues, then you're going to have vitamin A deficiencies. Vitamin A deficiencies, they come in with skin problems and immune problems and eye problems.

How much zinc do we really need? Approximately fifteen to twenty milligrams a day is the RDA. That need increases with pregnancy and nursing, changes based on your activity level, the sex and age. Also, based on what other things are happening. You're going to need a lot more zinc when you're fighting off a cold. You're going to need a lot more zinc when you're in a state of inflammation.

It's important to have enough, not too much. Fifteen to twenty is the RDA. Generally, if somebody is deficient, you're going to want to go at least twenty to thirty in a supplement to help them through that. Assuming they get some from food. If they have impaired digestion, less zinc is going to be absorbed. If they have too much of other nutrients, like iron and calcium and copper, less zinc is going to be absorbed.

The detailed list on WHFoods dot com, we give you a detailed list of foods and the nutrients and the places where you can get the zinc.

What does a zinc deficiency look like and how can you tell? Here's the thing. They took a series of rats, they took mama rats that were pregnant and they deliberately deprived her of zinc throughout the pregnancy. When they did that, they checked the babies when they were born and sure enough, they had deficiencies of zinc. What they did was, they supplemented those babies throughout their lives up until they were ready to be pregnant. They measured and they didn't have any signs of zinc deficiency. But then what happened was, they had babies and guess what? Their babies were born zinc deficient.

They did this same thing again. They took those babies, they supplemented them with zinc, they measured, they made sure that they had plenty of zinc. Those babies got pregnant and when their babies were born, guess what? They were zinc deficient. It wasn't until the fourth generation was born; they did the same thing with them, they supplemented them through life, through their pregnancy, so these babies, each generation were supplemented during the pregnancy and during their life. They still ended up with zinc deficient babies. It wasn't until the fourth generation that we had normal babies born.

How does that apply to humans? It may actually not be four generations because we don't reproduce as quickly as rats. But it might be. Here's the deal; if your mom was zinc deficient when she was pregnant with you, chances are you were born zinc deficient. If you haven't made a concerted effort throughout your life to supplement with zinc, likely you're still zinc deficient. That's the story there and it's possible that even if your grandma was zinc deficient during pregnancy, but your mom was fine, then you're going to carry the same trait. We don't know how far back it goes in humans. We know it at least goes back one generation.

I was born to a mom who was smoking. Probably drinking, too, back in the day. She was surely zinc deficient. I was born with zinc deficiencies, so no wonder that at the age of four-and-a-half or five I had to have my tonsils removed, or they took my tonsils, because I was constantly getting an upper respiratory infections. I had a lot of problems with my immune system throughout my life. I didn't know anything about this. My mom didn't know to supplement me with zinc. She just fed me a zinc deficient diet; the standard American diet, lots of white bread, lots of processed foods and I didn't get the right nutrition. That's why, I believe, my health fell apart when I was in my twenties. We know a whole lot more now. You know a lot more for yourself, you also know a whole lot more for your clients.

How do we test for zinc deficiency? You can use the zinc taste test I talked to you about, the Zinc Assay, that's great. You do follow the instructions and then you supplement. I generally recommend supplementing with an ionic zinc rather than the zinc sulfate. Although the zinc sulfate does get absorbed fairly well in liquid form. You supplement and then you regularly test.

The other way to do it ionized; Good State is a clean brand and there might be others, Trace Minerals as long as they don't have the sodium benzoate in it. You want to avoid sodium benzoate as a preservative. I know at one point, Trace Minerals had it there; last time I looked, they didn't.

You also want to look at their signs and symptoms. I'll send you back to that assessment sheet that I gave you, the three pages. You look at those and then you look at interfering factors. This is going to help you to determine what this person needs in terms of zinc.

What are some signs of zinc deficiency? We've got slow wound healing. Slow wound healing; they get a cut and three weeks later, it's still there. Brittle nails and poor nail growth and these lines; you see the white lines on the nails, here? That's a good sign of zinc deficiency. See how it's on all the nails? If those were there because this person was a carpenter and was hitting his hands with hammers, and they were hurt, usually it's one finger that gets injured. Not all of them. Look at the nails. Unhealthy hair, thin and brittle and falling out. The immune system compromised; they're getting every cold and flu that goes around, or they've got autoimmune condition, they've got some inflammation. Those are some of the overt signs of zinc deficiency.

Here's more of the same. Acne can be related to zinc deficiency. Decreased sense of taste. Like, "Hmm. I'm tasting stuff, but it just doesn't taste so good anymore." History of Crohn's disease. Over-consumption of sweets can create the zinc deficiency. Poor perception of sweet; that has to do with the taste buds. Rashes. Retarded growth and delayed sexual development in children. Slow wound healing. Smelly feet. Tendency toward infections. White spots on finger nails, puffy gums, cracked finger tips.

This is a list of questions that I usually put out to the client, to the patients, to allow them to check off, so some of these may be in less than scientific or technical terms. All of that, if they have a bunch of those symptoms and their alkaline phosphatase is low, chances are really good that they have a zinc deficiency.

Why is zinc deficiency so common? First of all, we've talked about this until we're blue in our face; we need strong stomach acid and you need zinc to make strong stomach acid. It's that vicious cycle that you've got to get in there and break. The deficiency in mom and grandma while pregnant can affect the ability to absorb. That combined with soil deficiencies and eating on the run and eating all the things and doing all the things that deplete zinc; eating a lot of grains, eating sugars and processed foods, all of that stuff adds to the mix and we create such a plethora of zinc deficiency. You're going to see it all the time. Like magnesium, it's something that you're really just thinking about in pretty much everybody.

How do we assess for zinc status in more detail? Look at the signs and symptoms, top. Blood direct; that's not often done, I rarely see anybody just testing their zinc. Indirect, low alkaline phosphatase, and there are other enzymes that can be checked; if somebody want to get into that, it's not done that often, but certainly low alkaline phosphatase is a starting point.

I don't believe that hair is a reliable source. I know a lot of people do hair analysis and swear by it. I have not had good results with looking at hair analysis and having it really match up with the clinical picture. Urine? It's often done as part of a toxic and essential elements panel; Doctor's Data does those and I'm sure some other labs do that as well. The zinc, it's decent, it's a starting point, yes, and functional. I always like functional the best; just because a level is right doesn't mean that it's functioning properly. There may be other pathways and blockages that are preventing it. Whenever you can do functional tests, that's what I like the best.

The functional tests for zinc would be the organic acid test, which tests a variety of different pathways that are zinc dependent, magnesium dependent, that are all sorts of enzyme dependent that you can assess. "Well, this pathway's blocked. It could be a zinc deficiency." When you do enough of those, you can see like, "Wow, there's a pattern here. There's like five of these that are related to zinc deficiency. Oh, and oh, by the way, they had low alkaline phosphatase and they have poor wound healing and oh, I think they might have a zinc deficiency."

Same thing with fatty acids. If you do a fatty acid test, you can tell what their levels are of the various fatty acids. If you recall that chart that I showed you, where the delta-6-desaturase enzyme is zinc deficient. If you have low fatty acids combined with some of these other clinical symptoms, it's a functional indication that zinc is probably low.

Then there's the lingual tests, the taste test, where you're tasting it; we talked about that before. Another way to look at it is in white blood cells; SpectraCell does white blood cell, they look at all the nutrients in white blood cells. Another way is feces. There are some toxic and essential elements in feces and I'm not sure that there's been enough evidence as to how or how effective that might be. Then there's the Genova, very expensive test, called NutrEval and it tests for zinc in various ways.

I've given you a list, a nice pdf about assessing zinc status. It's detailed, it goes into a lot of stuff, it's from one of the journals and you're welcome to peruse that. I highly recommend that you just take this to the next step and the next level.

Here's from WHFoods a chart of zinc sources and how they rank it; they have beef at the top with four milligrams of zinc per serving. I'd say that your total is fifteen to twenty, what you need. That's decent, it's like twenty percent. Spinach is pretty good, but that's just one cup; most of us, if we do do spinach are doing a lot more than that. One cup of spinach, if you saute it, comes down to two forkfuls; so typically, if I'm making spinach, I'm making a whole pound bucket at the same time. Asparagus is pretty good; probably a cup of asparagus is reasonable. Half a cup of shiitake mushrooms; if I'm doing shiitake mushrooms, I'm doing probably two cups, so I would get four times that. Same thing with crimini mushrooms, there's a whole cup; I don't know that I would do that many criminies.

Lamb's another one in there as a high, and then sesame seeds, pumpkin seeds, garbanzos; I don't know how this got out of order, it used to be ranked in the order that it was supposed to be, but it got out of order. Sesame seeds and pumpkin seeds are really good sources. Quarter cup, giving you almost three milligrams of zinc. Garbanzo beans and lentils and cashews and quinoa are really good, they're up there in the two's. Very good, that's ten percent in one serving.

There's turkey, which is not as good as lamb or beef. Tofu, which I'm not a big fan of, scallops, then you have the rest of it; green peas, yogurt; we gave you everything so that you could compare things. Some of them are very low, like bok choy is still considered good even though it's point-two-nine in a cup; say you eat four cups of bok choy in a sitting, you have a saute or something, that's still just about two. It's still decent, I'd probably not rate it as good, I'd probably rate it as okay.

When you add all this up it works. There's also high levels of zinc in spices. We'll have a chart that's on the page, any of them that we have lists of spices will have a special Word doc that we'll put up there that you can play around with.

What about supplementing with zinc? Let's compare the types of zinc. Chelated zinc is zinc that's been bound to an amino acid, generally. An organic molecule is given an electrical charge then it attracts the zinc and it latches on and it takes it in.

That's how it's processed in the lab and then put in the body and then it's broken apart pretty easily. Zinc picolinate is chelated to picolinic acid; remember we said earlier that picolinic acid helps to improve the absorption of zinc, so that's a good one. Zinc gluconate is bound to fermented glucose and it's very poorly used in the body. It's very poorly used. Zinc acetate is also known as zinc salt dihydrate and zinc diacetate, and it's created by adding acetic acid to the zinc and it's vinegar. It's reasonably well absorbed. Zinc oxide is the most common; it's used in topical forms and sunscreens. It's a nonchelated inorganic form. It's great topically, but it doesn't seem to work real well orally, so it's not one of the best ones. Zinc sulfate is water soluble and nonchelated, that's the form that's in the Zinc Assay tests. Then there's the ionic zinc.

They're very different, the zinc sulfate in the test versus the ionic zinc. Somebody said they were trying to use their Good State ionic zinc to do a zinc taste taste. I said, "I've never seen any research, any evidence anywhere that says you could do that." It's a specific form of zinc sulfate or the kinds of dilutions that it's done, that make the taste test work.

What else are zinc resources? Our good old textbook, "Advanced Nutrition and Human Metabolism," gives you much more details on a lot of those enzymes. I haven't looked at this, but it looked kind of interesting, I was looking at it on Amazon, it says, "Updated Factbook on Zinc," and it's from 1978; so it was probably updated from when he first wrote it. But Carl Pfeiffer is a really big orthomolecular-type MD and he works a lot on brain chemistry, so he had a book on it. I'm considering looking at that. There was an assessment study that was very good. They looked at various ways of assessing zinc. Then the Linus Pauling Institute has some good stuff.

That's the end of our zinc presentation.