Micronutrients - Vitamins: Vitamin A

Transcript

Hello and welcome to our Micronutrients module. This part is about vitamin A. We're going to learn all the things, the ins and outs of vitamin A, how it works, and how you can use it to help your clients when they need it. Again, before we begin, make sure that you know and that you let your clients know, that this is not medical advice and it's not intended to replace a one-on-one relationship. It's just sharing of knowledge and education to help people to balance, to create just a wonderful healing environment in their body, so their body can do the work. If they're under any medical care, taking any kind of medications, just make sure that you run it by your practitioner.

Good old vitamin A. It's a fat soluble vitamin. Remember we talked about vitamins that were either water soluble or fat? Vitamin A is a fat soluble vitamin. It's actually really a group of compounds, not just one. You'll get all that you need to know about what these are. There's retinol, retinal, retinoic acid, and then there is the provitamin A carotenoids. Now, some of these are not actually provitamin A. They can't be converted to, but I put them there for completeness because they're carotenoids that you know of.

Beta-carotene is the one we know of most. It's the most abundant and the most important of the carotenoids for making vitamin A. Then there is also alpha and gamma carotene. Alpha and gamma carotene, not as well known, not as abundant, not as important. Then we have got lutein, lycopene, and zeaxanthin. They all have roles that we'll look at in different pathways in the body. Basically, most of the issues with those happen in the eyes. They're mostly antioxidants. They are carotenoids, but they can't actively be converted into vitamin A.

What we're going to do is look at the chemistry behind it, look at some pathways, so you have an understanding. I want you to know you're not going to necessarily remember every single chemical. You're not going to need to remember. You just need to be able to do the research if someone presents and has issues going on. It's like you learn it. You get it. You might not be able to remember the chemical difference between retinol and retinal and retinoic acid, but you know that they exist. If you're working with somebody and they come in, and they're on some medications or they're on some supplements, then you'll be able to look up and get what's going on for them.

Let's look at the structure. The first one is retinol. Again, I don't want you to memorize this, but know that they look similar to things that we've looked out already, long chains. This has got a long chain of carbon hydrogens. The carbon and hydrogens are not repeated throughout.

The carbons are at the top. The hydrogens are at the bottom. It's just the typical nomenclature that we do in chemical structures.

I just want you to see that there are slight differences between them. When we look at some pathways, we'll see that certain things happen in the eyes and in the skin that cause the conversion from one form to the other. Do you have to memorize these? No. Do you have to know that the retinol has a CH_2OH at the end, whereas the retinal has a CHO at the end with a double bond with the O? You don't need to be able to memorize this, but just knowing that there are such subtle differences between storage forms and active forms and form in the liver, the form that's in the bloodstream, et cetera.

Retinal is sometimes called retinaldehyde. Retinoic acid has a carboxylic acid at the end, COOH. Then beta-carotene, you could see, it looks like two of the retinols, right? There are two of them, and you split it in the middle. Your body has to be able to cleave that apart. There's a particular enzyme that's required to do that. There is a particular SNP that's fairly common for that can thwart breakdown.

You may not be as efficient as you need to be at breaking the carotene into two vitamin A's. I happen to be heterozygous on that SNP. That heterozygous means I have one good gene, one bad gene from we don't know which parent, so I'm not going to necessarily be as efficient at that. Once I saw that I had that SNP, I just started to periodically take an active vitamin A supplement. Maybe I take it twice a week, and I take a few drops.

Because it's a fat soluble, it does get stored. I don't have to worry about taking it every single day. A question came up about the active ... Let's see. Let me think about the question… There's a question that came up in one of our discussions that had to do with the form to take and knowing what specific incidences, how do you know if a person needs physiologic doses versus therapeutic doses.

If a person has a SNP, so they have this problem with the breakdown of the beta-carotene, the enzyme, you're going to have to make sure that they're getting the extra just because it's an insurance policy. They may be doing it just fine, but they may not be. If they have two of those SNPs you definitely should do the supplementing. If they have the SNP plus a bunch of symptoms, like they complain about night blindness and they've got some skin issues, then for sure, you'd want to go with slightly higher doses.

With the fat soluble ones, you don't need to supplement them every single day. Some people are taking vitamin D as prescribed by their doctors, and they're taking it once a week. They're taking a very large dose. You can do that with any of the fat solubles, just so you know that.

That's the structure. What are some of the functions? Vision, super, super important, and we're going to go into details about how vitamin A works in the visual fields. Gene transcription, coding from the proteins from the DNA. Embryonic development and reproduction, that's super important. Not only the reproductive system of the mom or the dad but the embryonic development, the development of that fetus is super important. We'll look at some of that in a little bit more detail.

Hematopoeisis which is the red blood cell production, we're going to look at that in a little more detail, too, as to how the vitamin A works there. Another thing that it's important for is protein synthesis. There are a few pathways for making proteins that are vitamin A dependent. Cell differentiation, which is why it's use a lot in cancer therapies, and integrity of skin and epithelial tissue. It's also used in acne, but there are some dangers with the high doses that are used in acne. You need to be careful because what's used is synthetic forms.

In the immune system, vitamin A is an important antioxidant. It has some important immune system functions. Important in bone metabolism and also antioxidant. Let's take a look at that in more detail. This is another picture of the chemical structure. The reason I put this in here again were a few things that I wanted you to see. Beta-carotene there is at the top. If you just eat plant-based foods, the kind of vitamin A you're going to get is beta-carotene.

There is no free form vitamin A in any of the plant sources. You need to get it from animal sources. Most of us can convert it just fine, but you need to be aware that some people may not be able to. They may actually be showing signs of vitamin A deficiency that just supplementing with beta-carotene isn't going to help. It's estimated that 10% can be converted to vitamin A. If you put somebody on a supplement of beta-carotene, say it's 25,000 IUs a day, then maybe you're only getting 2500 IUs a day.

That's why the supplements of beta-carotene are going to be much, much higher. Retinol palmitate is a liver ester. It's stored in the liver. It's a form of that. It's also the form that gets carried in these little pockets called chylomicrons. Chylomicrons actually carry fat soluble vitamins and fats from the intestinal tract to the rest of the body.

These retinol palmitates get put into these chylomicrons when they cross the border from the lumen of the intestine into the bloodstream, and then they get carried around and they get delivered. They get delivered back to the liver for storage there as well. They also get put into the triglycerides, phospholipids, and they are used to make various proteins.

The chylomicrons are actually a type of phospholipid. The other thing about retinol palmitate is that it gets converted by hydrolysis reaction into what's called all-trans retinol. We think about trans fats; we think they're bad. Trans fatty acids in the form of Omega 3s can be very damaging because the body is not expecting them.

This form of retinoic acid or retinol is actually good for the body. I mean it's supposed to be all-trans. The "trans" means there's no bends up. Do you see the bends in it? It's just very straight. There's all-trans and all-trans retinal. Again, I'm just giving you this so you get an idea of the chemistry. Do you have to memorize it? No. I had to review this to really remember.

The reason I'm giving you this is because I want you to understand how it works in vision. The all-trans retinol is what's important for the retina. In the retina, it actually gets converted to this 11-cis retinol. Just so you have an understanding of the chemistry, when you have a number and then a cis, that's saying that at the 11th bond there is a bend. As an example, let's go down to the all-trans. You see that it's just straight. You've got the cycle here, and then you got the hydrogen and the carbons going across. It's straight.

When you go to this 13-cis, at the 13th carbon, you get a bend so that the carboxylic group goes down. When you look at the 11-cis, it's back a couple of places, and one, two, so it's back two more places from there. The bend is there. In the 9-cis, it's back at the 9th carbon. Make sense?

This is just a little bit of geeky chemistry. I know some of you love the geeky chemistry. Some of you don't. There's no need for you to have to memorize this. It's just … It was rough in my mind just trying to understand it, but I really wanted you to understand it because it's the, this 11 ... The conversion from the all-trans into the 11-cis that happens in the retina that actually stimulates the rods in the eyes for vision. It's a chemical called rhodopsin.

The form down here, the 9-cis, is the form that's actually useful for gene transcription. The 11-cis is the vision form of the eye, the 11-cis retinal. The 9-cis retinoic acid is for gene transcription. Then the all-trans retinol can also be converted through an enzyme called alcohol dehydrogenase to all-trans retinal. The alcohol dehydrogenase is an enzyme that also breaks down, guess what, alcohol.

The reason I'm giving you this is so that if you are researching something for someone and you're looking at vitamin A as a deficiency possibility or as a therapeutic intervention, and you're reading articles, you may get completely confused when they start to talk about all these things. Know that it's just a slight variation in the chemical structure that changes the function of the particular vitamin A version. That's all I want to say about that.

Let's look at the vitamin A in vision. Now that we've looked at the various forms, this is the reason that I wanted to show you that. You've got the all-trans retinol that's going around the bloodstream. Then it gets absorbed into the retinal pigment epithelium. That's in the eye, the retina. Then that gets converted to all-trans retinal ester to 11-cis retinol and then 11-cis retinal. That's what goes into the photo receptors.

The light shines on your eyes. Why do you see? Well because of the action of rhodopsin. Then it basically goes in, signals that, "Hey, we see this thing." The rhodopsin then gets converted to opsin, and then it's added to the all-trans retinal, and it goes back to all-trans retinol back into the bloodstream. It's actually reused to a certain extent. That's the vision.

We've also got vitamin A in gene transcription. What I wanted you to see is that the 9-cis retinoic acid goes into the receptors in the cytoplasm of the cell, and it binds onto retinoid receptors. That's what RXR is. The trans retinal goes into the retinoic acid receptors and the retinoic acid response elements then turn on the gene transcription. Vitamin A is critical for it.

Again, do you have to memorize this? Do you have to know what all this is? No. It's good to understand it so that when you're reading technical papers, you know. If somebody is having difficulties with their eyes or they say they're on a specific nutrient or medication for a specific problem, you'll at least have some familiarity and be able to go back and research this.

For lots more details, on this site in the section that says "Advanced," I'm giving you access to lots of different websites and also a book that has a lot more detail about this should you want to study it in more detail.

What I want to give you here is enough for you to be able to use therapeutically with your clients. If you want to go way more deep and you wanted to start doing some research, then I highly recommend you check out the extra sources.

How does vitamin A work with immunity? Well, retinoic acid is produced by something called antigen presenting cells, APCs. These include macrophages and dendritic cells. Now, rest assured, we will go into way more detail about these antigen presenting cells and immunity when we do our immune system module. We're trying to build up to this. Retinoic acid acts on the dendritic cells to regulate differentiation and migration.

These antigen presenting cells are basically the cells that grab on to an antigen. Antigen being the bad guy. It could be pollen, which is not necessarily bad but we perceive it as bad. It could be a particle of food, a protein from a food, or it could actually be streptococcus or something really harmful for the body. That goes into the bloodstream. We say, "Oh, antigen presenting cell grab onto it," and then present it to the macrophages and the killer cells so that it can get rid of it, but also present it to other cells to memorize it. We'll talk more about that when we do immune system.

I just want you to get the idea of where that vitamin A is important here. The retinoic acid can be produced by antigen presenting cells. It then acts on the dendritic cells to regulate the differentiation and migration, so how to say what antibodies are going to be active. What are these going to work on, and what antigens are we going to look for? It's required for the differentiation of T lymphocytes called CD4s into regulatory T lymphocytes.

The regulatory T lymphocytes keep us from going into an overactive immune system like an autoimmune, and also keep us at the right level, so we don't have an underactive autoimmune. It balances the T Helper cells and T Killer cells, basically. The all-trans retinoic acid and the retinoic acid receptors signal to promote the conversion of those CD4 lymphocytes into effective helper T cells. We will talk more about TH1 when we look at autoimmunity.

This produces pro-inflammatory cytokines. This is how the body is going to get rid of this antigen. You could see that if vitamin A is insufficient, we're not going to get these conversions going on and we're not going to get these pro-inflammatory cytokines to actually get rid of the antigens. We can get an over-production or an under-production. Vitamin A is here to regulate it. It might also have a role in autoimmunity. We'll talk more about that role at the point when we go into autoimmunity.

Let's look at embryonic development and reproduction. Embryo as you know is the little baby when it's still in mama's womb. It's important to note that vitamin A excess and deficiency can cause birth defects. It's really important if you're working with a pregnant client that you ask questions about their vitamin A intake. Really be careful if you do end up putting them on vitamin A that you're careful about how much you tell them to take.

I once had a situation where I wanted somebody to take a high dose of vitamin A for three days, because she was in an acute viral infection. High dose meaning about 100,000 IUs, whereas the recommended daily allowance is about five, and therapeutically, we may go into 10 or 20.

It's a lot of vitamin A, and I said, “Three days”. I said, "Take 20 drops." Twenty, was it? I think it was 5,000 per drop. Yes, so I said, “20 drops or 10 drops twice a day for three days.” That's what I told her to do.

She calls me up on day two or before even day three finished. "I'm not going to have enough of this to last." I was gasping, "What do you mean? There is enough in that bottle to last for three months." She said, "Well, I've been taking 10 droppers twice a day." I'm like, "Oh my god." Ten droppers is the equivalent of say 20 to 30 drops times 10. I had told her to take 10 drops twice a day. She was taking 20 to 30 times the amount that I told her to take.

That's enough to put you into a vitamin A excess. I told her to stop immediately. You have to be really careful, and make sure you write it down. Get a little sticky or actually a label that sticks to the bottle and puts the dose on it, so you don't run the risk of people getting confused. A lot of times, they get confused. They don't know. They may be thinking, “Ten droppers? OK. That seems like a lot, but I'll do it. She said it was for the cold.” You have to be careful.

Retinoic acid is critical for the development of the baby's heart, eyes, ears, limbs, lungs, and visceral organs. It's especially important in the lung maturation. When a baby is born at eight months old, they haven't had a chance to really mature their lungs. It's really important in that supplementation of that baby with the extra vitamin A so that they don't end up with chronic lung disease. Also sometimes it can be fatal, so vitamin A is super important in this particular case, like for pre-term babies.

Hematopoeisis is basically the creation of new blood cells in the maturation. We'll go through more of this when we do our immune system. I just wanted to show you the picture, that we're basically starting with what's called the stem cell. It comes from the bone marrow. They get produced into different types of precursors to the lymphocytes or neutrophils. Then they get converted down. Vitamin A is important to help with the differentiation.

This hematopoietic stem cell is just this undifferentiated blood cell, and it gets converted into red blood cells or white blood cells. Again, we'll go through more of this in detail in the blood and the immune modules.

Hematopoietic stem cell, you wanted to differentiate. If it doesn’t differentiate, you may not get the right amount of red blood cells. Maybe you have low red blood cell count. Maybe you have high blood cell count, and have an excess of red blood cells called polycythemia.

You can get that. You can have low levels, more less blood cells and less white blood cells. That can cause a problem with the immune system. The other thing that vitamin A does is it regulates programmed cell death in the red blood cells precursors. What does that mean? Well, cells are supposed to live and reproduce a certain number of times, apoptosis programmed in, dies.

If that apoptosis gets altered and it happens sooner than it should, then you’re going to have a problem because you’re killing off cells faster than you’re creating them. If it doesn’t happen when it’s supposed to, then you have these used up, worn out cells that can’t get used over and over and they’re not going to have the function they need to.

Vitamin A is super important here. If you're working with people who have immune system dysfunction or they have an anemia, vitamin A could be very important. We'll see when we look at the interactions later how important it is in the interaction with iron. It also increases hemoglobin concentration. Hemoglobin is the carrier for oxygen in the bloodstream.

When somebody is anemic, they are going to have low levels of hemoglobin. If they're low in vitamin A, they may have decreased hemoglobin concentration, which means that it can create an anemia. The other thing that the vitamin A does is it facilitates mobilization of iron from storage sites, usually those are in the liver, to the developing red blood cells so it gets incorporated into making the hemoglobin. Vitamin A is often overlooked when we're working with somebody with anemia. It's a very important thing to keep in mind.

Again, you might not remember all these mechanisms, but if I just give you facts without the mechanisms, you may not remember the facts. If I give you the facts, I give you the things that's important for and if you don't remember the mechanism, that's okay. Let that be the 90% that you forget. You can always go back, and it'll refresh your memory. You'll go, "Oh yes, I saw that before."

In summary in terms of blood cell production, vitamin A is important for the differentiation of the common stem cells into their appropriate types of blood cells. It regulates the programmed cell death in the red blood cell precursors. It increases hemoglobin concentration and facilitates the mobilization of iron from storage for incorporation into the hemoglobin. It's very important in blood cell synthesis.

Let's take a quick look at vitamin A and thyroid. Vitamin A deficiency will result in an increase in TSH. If you have a deficiency of vitamin A, it can increase the amount of TSH that you have. It also can increase the size of the thyroid gland, because it may decrease the uptake of iodine so the thyroid swells and gets larger.

Vitamin A deficiency impairs the synthesis and iodination of thyroglobulin, which is an important constituent of thyroid hormone, which we'll learn a lot more about in the thyroid module.

Vitamin A deficiency also increases the circulating concentrations of thyroid hormones, so you may end up with some very strange thyroid presentation. You see an increase in TSH but also increases in the thyroid hormones. You may think, "Oh, maybe it's pituitary problem." It could be vitamin A deficiency.

If you're looking at someone's labs, and you see some weird presentations on the thyroid, like increased TSH and high thyroid hormones instead of decreased TSH and low thyroid hormones, you might be looking at a vitamin A deficiency.

Let's look at nutrient interactions because a lot of nutrients interact with each other. There are specific considerations for not taking things together or for being sure to take things together.

Let's look at the nutrient interactions between vitamin A and zinc. Zinc deficiency results in a decreased synthesis of retinol binding protein. Retinol binding protein is a protein that transports retinol or vitamin A to the peripheral tissues.

Zinc deficiency will also lead to potential toxicity of retinol because zinc actually protects against the potential toxicity of retinol.

Zinc deficiency can result in decreased activity of retinol palmitate, the enzyme that releases the retinol from storage. When you've got the storage form in the liver and you want to release it into circulation because it's needed, if you don't have enough zinc, you can't really do that adequately. It's also required for an enzyme that converts from retinol to retinal.

You saw on that chart. There were a lot of inter-conversions from one form to the other in order for the eyes to be able to function, let alone, a lot of the others. Zinc is super important for vitamin A function. You might be looking at, "Oh, this person has vitamin A deficiency signs, and I'm giving them vitamin A but it's not going away." You may have to look at their zinc.

Similar is vitamin A and iron. Vitamin A deficiency can exacerbate iron deficiency anemia by altering the metabolism of the iron. We looked at how vitamin A was important for releasing iron from stores so they can be incorporating into hemoglobin. You also looked at how vitamin A improves iron status among children and pregnant women. When you actually look at it, people who are anemic, if you don't add the vitamin A in a lot of children and pregnant women especially, you're not going to get the iron up unless you add the vitamin A because of the interactions.

They've done studies where they gave people vitamin A alone, iron alone, or the combination together. It definitely reduces anemia symptoms and signs in the blood more effectively when they're both given together. In rats -- we haven't done this in humans yet -- but iron deficiency alters the plasma and liver levels of vitamin A. You could see that vitamin A is important for anemia.

We may not even be thinking of it in terms of anemia, but vitamin A is an important nutrient to consider when somebody says, "I've been iron deficient all my life. I've had anemia my whole life." Maybe they have a vitamin A deficiency, and it's one that's rarely uncovered. The conventional medical approach used to say, "Well, we get plenty of this stuff in our food. We don't need to take extra nutrients," when, in reality, we know that a lot of the problems that people are having can be related to vitamin and minerals deficiencies.

Let's look at some of the things that vitamin A deficiency can cause. It can cause night blindness. Night blindness is something that a lot of people have where you see fine during the day, but as soon as you go out in the dark, it's like everything blurs together and it's really hard to differentiate shapes. That has to do with the deficiency of vitamin A and the effects on the rods and the cones. It can actually lead to overt blindness and severe vitamin A deficiency because we're not getting the activity of when the light comes in to the retinas of activating the rhodopsin.

There's another condition called keratomalacia. That's basically a softening of the cornea. The cornea is the outer part of the eye which protects what's inside. When that softens and gets affected by vitamin A deficiency, you can have distortions in vision as a result.

Now, not related to eyes, there are some other things related to skin. Xerosis is another name for dry skin. Rough, dry skin can be caused by vitamin A deficiency because of the effects it has on the skin maturation.

It also can affect the sense of smell. It can affect the receptors in the nose and affects the sense of smell. Deficiency of vitamin A can lead to fatigue. For some of the reasons we already talked about, with the anemia, but for others, like affecting the thyroid function,. Vitamin A is super important for energy. When you're dealing with somebody with fatigue, make sure you assess their vitamin A status, and get them to do extra through whole foods supplementation to help with that.

It can also lead to keratinization where the skin actually becomes hard, dry and rough and scaly. It's almost like scars or scabs or healed scabs that are over a lot of parts of the body. That is an increase in keratin as a result of vitamin A deficiency. These are all the things that you'd be looking for when you're working with people.

What's the recommended dietary allowance? It's 3,000 IUs for men, 2,300 for women, 2,600 for pregnant women 19 and older, 4,300 for lactating women. It's really important for lactating women to make sure they get enough and more than the usual amount. The good news is when you supplement with vitamin A, you can get mycellized vitamin A drops that are 5,000 per one drop. It's a really easy supplement to take.

Are these the dosages for ideal health? No, not necessarily, but you've got to make sure that your person is getting at least this amount or they're under the RDA, which is minimum for survival. Some people need more than that based on what kind of vision they have, what kind of genes they have, whether they have trauma, immune, assault, et cetera.

Let's take a look at carotenoids. Carotenoids are the precursors of vitamin A, as I said before. In addition to being precursors to vitamin A, the carotenoids also have antioxidant activity of their own. They do protect the eyes. There are specific mechanisms by which the carotenoid molecules will help the eyes and especially things like zeaxanthin and lutein. Lutein is really high in kale. It's one of the vegetables that it's really high in, and it's very important for eye health.

There are two classes of carotenes. You've got the class that has the alpha carotene, the beta-carotene and the lycopene, and then you've got the xanthophylls. The carotenes have the alpha carotene, beta-carotene and lycopene, and then the xanthophylls are the beta-cryptoxanthin, lutein and zeaxanthin.

These are the various carotenoids. When you see these, you'll go, "Oh, I didn't know lutein was a carotenoid." Good, it's related to the vitamin A family, but it can't be converted there. It has some of the similar functions in the health of the eye. Lutein, lycopene, and zeaxanthin can't be converted to retinols. They don't have vitamin A activity, but they do have eye protective activity on their own.

Let's look at toxicity or excessive vitamin A. You can have excess vitamin A and it can lead to toxicity. High intake of vitamin A can accumulate in the liver, because it's fat soluble.

If you have somebody taking … Like this person was taking probably 800,000 units of vitamin A for three days, that's a lot of vitamin A. That can be stored in the liver. Had she continued that, she could easily get to a toxic load.

Children tend to be the most sensitive to overdose, so really being careful that if you're adding vitamin A to a child's regime that they don't also have vitamin A in their multivitamin. Be really careful. There was some controversial testing where they took smokers and they gave them lots of vitamin A, excessive amounts. It seemed like it caused some side effects. It's a controversial testing, but it may be just that because the smokers have some other compromises in their system that the excess vitamin A, they weren't able to handle it.

Excess vitamin A can lead to birth defects, so you really want to be careful in giving a mom who's pregnant too much vitamin A. You also don't want to give her too little vitamin A because too little vitamin A can lead to birth defects. It's really important with pregnant women that you're careful, and that you observe, and that you don't give them too high a dose of any supplement.

Some of the signs of toxicity … If you're concerned that maybe they were taking too much, you ask questions. Did they have nausea, coarse hair? Is their hair falling out?

Of course, other things can cause nausea, coarse hair, and loss of hair. Thyroid problems can cause that, too. Dry, flaky skin, fatigue, blurry vision, drowsiness, enlarged liver, headaches, bone pain. If they have bunches of these, especially if they have the enlarged liver, bone pain, things like that, you really want to be looking. Just keep it in the safe zone. Keep it in the safe zone.

I generally wouldn't give somebody more than 10 or 20,000 IUs of vitamin A for the long haul unless we were checking their levels. Here are some sources. These were taken from one of the websites and just general lists. This is the combination retinol and carotene just going from high to low. This just gives you an idea of some of the foods that have good sources and not so good.

This list is from that WH Foods site that I gave you the link to in another presentation. It's also listed in your resources section. Sweet potatoes tend to be right at the top, but that's beta-carotene. These are the vegetable sources. These are all beta-carotene. If you're looking at the animal sources, they're mixed in with the beta-carot- ... You really can't compare apples to apples.

If, say, liver has 5,000 IUs of vitamin A per serving, and peppers have 25,000, the peppers have a lot less because it's beta-carotene. It has got to be converted. The active forms of vitamin A, the already converted forms of vitamin A are going to be in the animal products. You could see livers and white fish is here, but what I want to say is maybe white fish doesn't have as much vitamin A as peppers, but you have to look at the fact that in pepper the vitamin A is in the form of beta-carotene. It's really important to take a look. You can look at these charts. The chart in the WH Foods has all of them listed with amounts. You just go to that chart.

What else? Vitamin A has been found to be super important in infectious disease control. They've given people high doses for hepatitis, like super physiologic doses for three or four days, and knocked out acute hepatitis. For more chronic hepatitis C, it would be moderate to high doses for a more extended period of time.

When you have deficiencies of vitamin A, you have increased risks of various kinds of infectious diseases. If you have somebody that gets pneumonia a lot, you may want to look to see do they have a chronic decrease, deficiency, of vitamin A. Maybe they are relying just on beta-carotene and they don't have the genetics to convert it.

Sometimes it affects the gut, so it can cause diarrhea. Vitamin A deficiency can lead to measles outbreaks. All this stuff when people talk about getting measles vaccines, what about talking about making sure vitamin A is up to snuff? It can be related to malaria and a whole lot of other infections. Vitamin A, especially in combination with vitamin C and even vitamin D, short, high level doses can be really effective for acute diseases, acute infectious diseases, and you might be using higher doses to get rid of it in short term.

Infectious disease like we just talked about, hepatitis which is an infectious disease but also chronic hepatitis and hep C, have been helped with vitamin A. If you're working with somebody with hep C, then go ahead and do the research. Find the papers and get the right dosages, and work with that person, and see if you can get some help.

It's important for leaky gut repair because vitamin A is so important for the immunoglobulins that line the gut, for the mucus that lines the gut. When that gets damaged, vitamin A needs to be addressed, also for acne. You can use vitamin A itself for acne, and get some results. There's also Accutane, which is a drug, which is very high levels of a particular type of vitamin A molecule. It can be very toxic, so you have to really be careful if somebody's on Accutane.

You might be able to get some good results combining vitamin A and maybe some zinc, and looking at their hormones, and looking at their sugar intake, their fatty acid intake. A lot of other things go in here. Vitamin A can be helpful in restoring night vision. Remember we talked about how that works with the rods and the cones, and how night vision impairment can be a problem with vitamin A. Also, beta-carotene is very helpful as itself. It doesn't have to be converted to help with the night vision.

Finally, Vitamin A has been shown to be helpful in skin issues, like eczema. There have been a lot of cases of people with eczema getting helped by high doses of A.

One of the signs you'll see in vitamin A deficiency, and also in other fat soluble vitamin and fatty acid deficiencies, is something called hyperfollicular keratosis. It's basically bumps on the back of the arms and sometimes the back of the thighs. It's bumps that look like goose bumps, but they're just there all the time. It has to do with the keratinizing of the hair follicles. They get hardened as a result of not having enough vitamin A or E or fatty acids.

Let's look at supplementation.

The synthetics are usually going to say acetate or palmitate, retinol palmitate, that sort of thing.

The natural sources are going to be animal derived. Some of the supplements are animal derived, so they'll have fish liver oil in them but they also may have some of the synthetics, like the palmitates. You'll see some combinations. You can get mycellized liquid. You can get soft gels, and you can just get a bottle of cod liver oil. That's going to have the pure vitamin A, the retinol, form of the vitamin A.

This concludes our vitamin A presentation. Be sure to check out the resources page for the list of the deficiency symptoms and for also links to more advanced resources so you can go deeper. There's a lot of more depth you can go into with this.