

Ray Peat ([00:00:05](#)):

I think it's the situation between cholecalciferol or the 25 hydroxy form and the 1,25-dihydroxy. Their relationship is very analogous to what happens when your thyroid at this level, your actual thyroid hormone, your body increases the TSH, thyroid stimulating hormone, in supposedly a reaction, but normalizes things. But in fact, that TSH itself is an irritant and produces the bad symptoms of hypothyroidism as the TSH rises. And with a progesterone deficiency, the absence of progesterone is one problem, but the fact that when progesterone is low, your body increases the luteinizing hormone and the luteinizing hormone is pro-inflammatory and creates degenerative symptoms. Any time the basic functional hormone or material is low, the body goes into an emergency reaction in which, at the same time that it's trying to correct deficiency, it's turning on sections, such as 1,25-dihydroxy D or luteinizing hormone, or thyroid stimulating hormone, which in the process of adjusting, has this lots of dangerous toxic side effects. In the case of 1,25-hydroxy D, these unwanted side effects include obesity and osteoporosis.

Speaker 1 ([00:01:29](#)):

Welcome to the WinAtLife Podcast, a place where we share everything you need to know about restoring your metabolism. So you can break free from restrictive diets and build a body and life you love.

Kitty Blomfield ([00:01:41](#)):

I'm Kitty Blomfield, co-founder of NuStrength, and your host for this episode. And today we're joined by a good friend, Kate Deering author of "How to heal your metabolism". For those who listen to the podcast, you'll know who Kate is. And if you haven't read her book, I highly recommend that you read it. I'll drop a link in the show notes with a discount code. So you can either buy it from us, or we can pretty much buy it anywhere. But today we're also joined by Dr. Ray Peat. We had such great feedback from the podcasts that we did with him a few months ago. So we thought we'd get him on again, to talk about vitamin D supplementation.

Kate Deering ([00:02:21](#)):

Yeah. So we got a series of 30 questions from everybody, that we want to talk about. And I kind of want people to think about when they're listening to this podcast, because there's such controversy between vitamin D supplements or to take them, to not to take them. It is you need to see the viewpoint of what each argument is coming from. And what we've realized is, if you're kind of an anti D supplement, you're viewing the organism as maybe calcium is bad, and that if you are highly calcified, that you need to reduce calcium, thus reduce vitamin D. Which if you're looking at through that lens, that would make sense. However, in the bio generic viewpoint or pro-metabolic view, we see calcium quite differently. And we see calcium is very metabolic. And if somebody is calcified, it's normally because they aren't getting enough calcium. And that easily parathyroid hormone (PTH), Prolactin, is increased to pull the calcium from the bone and that's creating the calcification. So we actually want more calcium from our diet, thus vitamin D would be supportive in helping us become less calcified.

Kate Deering ([00:03:29](#)):

So I think it's important to kind of think of those things as you're listening to this podcast. Again, we're not here to tell you what you should think, take everything in and decide for yourself, but ultimately I think it's a good explanation of why vitamin D supplements aren't as bad as many think.

Kitty Blomfield ([00:03:47](#)):

Awesome. Thanks, Kate. And we'll get straight into it. Hello, Dr. Ray Peat and Kate Deering. We've had Dr. Peat on the podcast previously, and I was just telling him how much awesome feedback we got from that. And it's the most downloaded podcasts we have on the WinAtLife Podcast, and everyone was saying the information was just so valuable and it was really easy to understand. Dr. Peat, thanks so much for doing that podcast.

Ray Peat ([00:04:19](#)):

Yeah. I just have trouble with my sound system. Can you hear me now?

Kitty Blomfield ([00:04:24](#)):

Yeah. We can hear you perfect. And obviously everyone knows Kate Deering. She's been on the podcast a million times. We always have a joke, it should be the kitty and Kate show. Kate Deering, author of "How to heal your metabolism". So we just wanted to do a podcast about vitamin D supplementation. Didn't we, Kate? Because I think there's just a lot of confusion out there about it.

Kate Deering ([00:04:44](#)):

Yeah. Kitty and I go back and forth and I know in the community, there's a big discussion on whether you should or should not supplement, who should supplement, when you should supplement or is there other things you could possibly do versus supplement. And so Dr. Peat was very kind to come on here to offer some clarity. And I was going to ask him 7,000 questions, I've limited to about 30. So we thought maybe a 24 hour podcast wasn't going to be a good idea. We'll do the best we can, to make it as clear and easy to understand as possible.

Kitty Blomfield ([00:05:20](#)):

Awesome. All right, let's get stuck into it. You've got the question? Or should I ask the first question?

Kate Deering ([00:05:24](#)):

Go ahead for that first one.

Kitty Blomfield ([00:05:25](#)):

Okay. All right. I'll cut the ribbon. Dr. Peat, can you please explain how vitamin D3 is utilized in the body? What is its purpose? Is it a vitamin or a hormone?

Ray Peat ([00:05:39](#)):

Those are questions that the best researchers are just now starting to ask for a hundred years. People who are treating it as just a calcium regulator, just a bone builder, tooth builder and so on. And their idea of calcium regulation was very limited. When you realize that calcium is involved in every possible cell reaction, it's everywhere, in everything living, and it's a crucial regulator. If vitamin D is mainly a calcium regulator, then that says that the field of vitamin D activity is as broad and complex as a whole life question. So what's happening now in vitamin D research, is just a few dozen people mostly, starting to realize what the real issues are.

Ray Peat ([00:06:56](#)):

So that the field is very open and expanding with really interesting stuff happening. For example, when you look at it, evolutionarily, fish don't really depend very much on vitamin D. Some experiments at a starving fish, totally for vitamin D, some of them developed spinal defects, but some didn't. Living in the ocean minerals are very rich and it happens that even though fish are generally extremely high in vitamin D content, they don't pay much attention to it. It's very hard to treat a vitamin D deficient fish, and much of the fish metabolism of vitamin D is getting rid of it. They accumulated primarily from the food they eat, the plankton, mostly the animal, Zooplankton. So it's mostly a waste product for the fish.

Ray Peat ([00:08:24](#)):

And if you think of the blind cave fish, there's no way they get sunlight, or even plankton that has been in the sun. And still, they managed somehow to have bones and to be alive and so on. Apparently caves, generally being the result of carbonic acid in water desolving away limestone, cave water is generally very rich in minerals, especially calcium. So they are an example of vitamin D free [inaudible 00:09:18] that gets along with just calcium and instead of vitamin D.

Kitty Blomfield ([00:09:27](#)):

Just real quick, are you saying that vitamin D can actually be produced in a being without sunlight? And it seems that a high mineral content would be very important to the production of vitamin D?

Ray Peat ([00:09:41](#)):

No. The cave fish seems to illustrate that the organism doesn't really need a vitamin D if it has lots of calcium and experiments with various fresh and seawater fish show that they have a very limited need for it. The abundance of calcium has made them handle the whole vitamin B issue, mostly as a waste product of eating the plankton, which the cholesterol is converted to cholecalciferol by anything exposed to the sun. And if you eat the material containing cholecalciferol, it says if you're taking a vitamin D supplement capsule, when you yourself are in the sunlight, your cholesterol is exposed. Ultraviolet light gets all the credit for the conversion of our cholesterol to cholecalciferol. But fish experiments show that Ethan incandescent bulbs can activate the conversion of cholesterol to cholecalciferol and even injecting irritants into the skin can produce the conversion of cholesterol to the Pre Vitamin D or cholecalciferol. So it looks as if the production of Pre Vitamin D or cholecalciferol is a defensive mechanism. cholecalciferol itself does a whole range of protective anti-stress, antioxidant, anti radiation, protective defensive processes.

Kitty Blomfield ([00:12:03](#)):

So just for the listener, can you basically let them know, the supplemental D is essentially cholecalciferol correct?

Ray Peat ([00:12:13](#)):

Yeah. It's Pre Vitamin D, the same stuff that fish eat and that we get out of fish. If you think of people who are in the sunlight constantly, are producing their own conversion of cholesterol to cholecalciferol. They didn't need any environment, but when you move to the north, the only way to survive more than a season or so, is to start eating some organism that still is in the sun and still producing cholecalciferol. So we either have to live on the coast and eat fish, or eat animals, which are been in the sunlight. So when you have round the year sunlight exposure, then you can be a vegetarian theoretically without the risk of a Vitamin D deficiency.

Kitty Blomfield ([00:13:37](#)):

So to conclude that, what about consuming other foods that are high in vitamin D, like dairy? Would that be also supportive?

Ray Peat ([00:13:48](#)):

Yeah. The cows were in the sunlight. So they produce the same material exactly, that fish produced by being in the sunlight or by eating the algae that was in the sunlight or show a plankton that was in the sunlight.

Kitty Blomfield ([00:14:05](#)):

Okay. So are you saying that any animal or meat or food product that is actually getting sunlight would give some sort of vitamin D to a person?

Ray Peat ([00:14:15](#)):

Yeah. Right. Except the healthy person, after that gets into your blood stream, as the cholecalciferol, this on a whole range of protective effects that your liver hydroxylates it on number 25 carbon. And that produces, what we know and measure in the blood as vitamin D. That's what some people have called the storage form of vitamin D, but that doesn't really mean much, except that the liver does bind enough of the 25 hydroxy cholecalciferol to last for a few months. Some of it is found on proteins, such as Calbindin or the calcium binding protein, and it passively dissolves in, fairly fat-soluble, it dissolves into fat tissues at moderate amount, at the same concentration that you find in the bloodstream. So the bigger you are, slightly greater amount is stored in your fat tissues at the sides in your liver. That conversion to the hydroxy cholecalciferol that happens in the liver can be blocked by a liver problem.

Ray Peat ([00:16:06](#)):

So a person with a sick liver is going to have probably enough of the plain cholecalciferol, but have a very low level of the 25 hydroxy cholecalciferol. And when you're low or very low in that form of the half activated Vitamin D, especially if your calcium intake is limited, then you will activate your kidneys. The traditional story goes that under stress at efficiency of either a 25 hydroxy cholecalciferol or calcium will cause your kidneys to produce 1-hydroxy-1,25-dihydroxy-cholecalciferol by activating a big one hydroxylase enzyme in your kidneys. But in actuality, in the inflamed or stressed tissue, has that ability to make 1,25-dihydroxy-cholecalciferol the old textbooks say that happens only in the kidneys, but actually any stress tissue seems to be able to do it. Cancer cells, for example, aren't very good at the [inaudible 00:17:51] hydroxylation, which makes these so-called active vitamin D.

Kitty Blomfield ([00:17:59](#)):

Okay. So I'm going to wind it back a second. Cause that was a lot of information, just try to summarize it so that people can understand, and because there's so much terminologies we know, in the D world, there is obviously D3 or Cholecalciferol, which is the starting supplementation form, and then it does get converted into the 25 OHD or the calcitriol or what they refer to as a stored, and maybe that we'll use that term if that's okay, cause I think that's probably easiest to understand. Doesn't mean that, that's its only form, but that's what it's kind of known in the language, and then it does convert into the active D and I think what you kind of just explained was that the store D converts into the active D under stress. It's not that that is the active form is where the active metabolites and all the good stuff is, it's that it actually converts when the tissue or when the system is under stress. Is that correct?

Ray Peat ([00:19:01](#)):

Yeah. I think it's the situation between cholecalciferol or the 25 hydroxy form and the 1,25-dihydroxy, the relationship is very analogous to what happens when your thyroid level, your actual thyroid hormone, your body increases the TSH, thyroid stimulating hormone, in supposedly a reaction, but normalize things. But in fact, the TSH itself is an irritant and produces the bad, the symptoms of hypothyroidism as the TSH rises and with a progesterone deficiency. The absence of progesterone is one problem, but the fact that when progesterone is low, your body increases the luteinizing hormone and the luteinizing hormone is pro-inflammatory and creates degenerative symptoms at any time, the basic functional hormone or material is low, the body goes into an emergency reaction, which at the same time it's trying to correct the deficiency, it's turning on a substance such as 1,25-dihydroxy D or luteinizing hormone, or thyroid stimulating hormone, which in the process of adjusting has lots of dangerous toxic side effects.

Ray Peat ([00:20:52](#)):

In the case of 1,25-hydroxy D, these unwanted side effects include obesity and osteoporosis. For example, when the conditions are stressful enough, your parathyroid hormone increases, and it's the major signal for turning on the one hydroxylase enzyme that so-called activates the vitamin D and when you're dominated by parathyroid hormone and the consequential 1,25-dihydroxy D, then you start breaking down your bones and turning off your oxidative metabolism, blocking the electron transport chain and creating the conditions for lactic acid production, spreading inflammation, degeneration, and activating the storage of fat, creating fat tissue and storing energy in it. All of the emergency things are activated by the stress or inflammation that leads to turning on the parathyroid hormone and the main two things that will keep your parathyroid hormone down and under control and stop all of those degenerative processes, the main settings are, calcium and vitamin D, the 25 hydroxy form.

Kitty Blomfield ([00:22:48](#)):

Okay. So essentially what you're saying is the 1,25 or the active form, a lot of people call it a D, is basically prone and it gives all the inflammatory. High levels of 1,25- D are not good. And that's when you get a lot of the inflammatory responses, weight gain, elevated lactic acid, and so high PTH turns that on. And so the only things that are going to parathyroid hormone, the only things that can actually directly lower the parathyroid hormone are calcium and the 25 or the store D or just taking a D supplement or sunlight or whatever. Is that correct?

Ray Peat ([00:23:26](#)):

Yeah. And Lots of supportive things like sugar, keeping your energy up and preventing fat metabolism. The stress of too much fat in your diet, suppresses the sugar metabolism and again turns on all of those pro-inflammatory processes.

Kitty Blomfield ([00:23:52](#)):

So essentially keeping the body out of stress. And so the elevated 1,25-D is just one of the many responses your body can adjust to, when under stress.

Ray Peat ([00:24:05](#)):

Right.

Kitty Blomfield ([00:24:05](#)):

And that's just the first question, so we could be here for four days. That was super awesome and helpful. And I kind of goes into this next question is, how is getting vitamin D from sunlight different from getting it from a supplementation? Are they metabolized differently or is there, at some point of time, they are at the same space and it doesn't matter where you're getting them from?

Ray Peat ([00:24:34](#)):

You get other good effects from the sunlight, but basically as far as the vitamin D is concerned, I think they function identically along with the sunlight. You're getting visible light, which is another thing that activates oxidative metabolism in support of the good kind of vitamin D.

Kitty Blomfield ([00:25:00](#)):

Got you. So obviously there's a lot of other benefits of the sunlight. I guess one of the things is that, we know that usually most people won't overdose on D by getting too much sunlight, right? Our body has an innate response that will stop deep production, once we have enough, if we're in the sun. Correct?

Ray Peat ([00:25:20](#)):

Yeah. For example, you start tending better when you have enough vitamin D. You protect yourself more efficiently by starting to produce melanin pigment, but vitamin D itself has an anti-radiation effect. And so you don't even notice, you don't sunburn, nearly as much. When you have enough of the cholecalciferol in your tissues, it's like a radiation resistance factor.

Kitty Blomfield ([00:25:55](#)):

Okay. So I definitely have people say that they no longer can tan any longer. That when they go out into the sun, they just burn. So would that be a sign that they are low D?

Ray Peat ([00:26:07](#)):

Yeah. For most of my life, I was sunburn very easily. Just driving in a closed car, through a bright landscape, my face would get bright red, and I would have a shiny red nose, or from just a few hours of exposure sideways through the windows of a car. And that isn't a very big dose of ultraviolet, but I was super sensitive to it. And after I started supplementing vitamin D, I could spend hours outside in Mexico at an altitude of seven or 8,000 feet, super intense radiation and not even get a red nose.

Kitty Blomfield ([00:26:59](#)):

And why do you think that is? Why do you think that you were not able to get the needed sun-

PART 1 OF 4 ENDS [00:27:04]

Kitty Blomfield ([00:27:03](#)):

Why do you think that is? Why do you think that you were not able to get the needed sun or the vitamin D from the sun where that would help build up the supplementation is what worked for you?

Ray Peat ([00:27:10](#)):

I just didn't apparently stay in the sun long enough, gradually enough. Once you get the protective level of vitamin D up, then it's easy to go ahead and reach a very high level, which has the full range of protective anti stress effects but once you're deficient, the fact that you sunburn so easily tends to make you avoid the sunlight.

Kitty Blomfield ([00:27:48](#)):

I see. So it's essentially like everything else in this planet that you need to build up, so it's a training mechanism to build up your vitamin D levels and your ability to withstand sunlight. If you did it slow and steady, it would work, would it be just as effective than actually having a supplementation?

Ray Peat ([00:28:07](#)):

Yeah.

Kitty Blomfield ([00:28:07](#)):

Okay. I want to go back to when you were talking about the 25 D or the Calcidol also known as the store D and I think in a lot of the other communities that talk about it, they say it is inactive form and that this inactive form just can't have any sort of response in our system, that it's only the 1, 25 D that actually has any sort of response and I know you certainly told me that the Calcidol or the store D does actually have active form, and that's the one that actually produces all the good stuff in our body. Can you give us a little more detail about that?

Ray Peat ([00:28:46](#)):

Yeah. The decisive experiments, that show that, were the receptor knockout experiments that the vitamin D receptor supposedly responds to the 1,25 dihydroxy but if you knock out that receptor, the 25 hydroxy does all of the same functions, so neither the receptor nor the 1,25 dihydroxy is essential when you have calcium and the 25 hydroxy and the knockout experiments with the one hydroxylase, two similar results.

Kitty Blomfield ([00:29:33](#)):

So, that kind of goes back to Gilbert Ling's theory, that it's not just about this receptor idea and I know they kind of talk a lot about the VDR, the vitamin D receptors in the anti-D supplement group, and essentially what you're saying is that that doesn't matter?

Ray Peat ([00:29:55](#)):

Yeah, the whole cell, the whole organism in fact, is the real receptor, because every receptor is sensitive to context and if you take out the so-called specific protein, that's named the receptor still, you have the whole context and it turns out that the receptor is just like an extra leverage point for getting the quick, easy change of the physiology, but as long as you have a living cell in a whole organism, then the specific receptors are just a part of the story, not at all the whole picture.

Kitty Blomfield ([00:30:47](#)):

So essentially the environment that the cell in has plays a huge role in how the cell reacts to certain substances?

Ray Peat ([00:30:55](#)):

Yeah, the cell is always orienting itself to its environment and when you produce an organism without the receptor or the one hydroxylase other things take over and fill in for the lack of that particular thing.

Kitty Blomfield ([00:31:18](#)):

I see, so I guess just for context, it's good to know that the cell will respond differently depending on the environment that it's in, if the body is healthier, it's going to respond differently than if the body is unhealthy and if it's under inflammation and you're not giving it enough sugar or enough other things that cell's going to react very differently, than one that is properly supported, good thyroid function and so forth.

Ray Peat ([00:31:45](#)):

Yeah. That's the high energy state of the cell, which is stable and essentially in a resting and readiness condition. If it's lower in energy then any slight disturbance can throw things off but, the cell is more oriented and ready to handle its environment when the whole system is well energized and well fed.

Kitty Blomfield ([00:32:17](#)):

Gotcha. So what about the belief that a vitamin D supplement is actually immune suppressive? So, some people report that they feel better taking a vitamin D supplement and then one theory is that, well, the reason you feel better is because it is suppressing, your immune system is what's happening, is it just suppressing the 1,25 D and that what's making you feel better?

Ray Peat ([00:32:45](#)):

Yeah. I think that's part of it. Part of the confusion is the definition of the immune system. People talk about wanting to stimulate the immune system, but I think that's the last thing we want to do. The immune system it means whatever we do to a damaging threat, some kind of injury, then we say that the immune system has been activated, but a very healthy organism, for example, with lots of calcium and vitamin D doesn't even notice it, it isn't harmed by the presence of the pathogen. So the immune system isn't activated by the really healthy organisms, for example, 98% of the really healthy people, don't mind having the COVID virus, it's a minor irritant or disturbing effect when your cells are in a stable, highly energized condition. It's only the borderline low energy, inflamed condition of old age or existing sickness that makes something like the COVID virus or a bacterium or whatever, a fungus or toxin and so on the body doesn't get damaged when it's in a healthy, energized condition.

Kitty Blomfield ([00:34:35](#)):

Right, so I'm going to take a little turn and say, there are some researchers that are utilizing a really low vitamin D status to address autoimmune issues and they're saying that if they suppress the D status to well below 12, that they're actually getting responses where people are recovering from an autoimmune issue, is there some explanation for that?

Ray Peat ([00:35:03](#)):

That would be the Trevor Marshall people.

Kitty Blomfield ([00:35:07](#)):

That would be them, correct.

Ray Peat ([00:35:17](#)):

I don't like to even call it reasoning. It's the application of an engineering metaphor of biology and an electrical engineer, for example, thinks in terms of hard wiring and switches and flow of current and so on and so the idea of receptors and the innate immune processes and all of that fits very well with an engineering orientation. A lot of, if not, all of Trevor Marshall's ideas are based on what he calls computer modeling.

Ray Peat ([00:36:10](#)):

In 2006, he referred to the Olmesartan and similar angiotensin receptor inhibitors called them antagonists of the vitamin D receptor but then in 2017, he was calling them agonists of the vitamin D receptor and saying they restored the vitamin D receptor function. What they empirically are doing with a mild dose of Minocycline and it happens to be a very effective anti-inflammatory agent, as well as an antibiotic or antibacterial, and the Sartans, Olmesartan or Losartan, those are very basic effective anti-inflammatory agents. So when you're talking about autoimmune and degenerative diseases, both anti-inflammatory agents, Minocycline and Olmesartan are going to reduce the symptoms. I don't think they have any particular, either antagonist or receptive or restorative effect on the vitamin D receptor.

Kitty Blomfield ([00:37:47](#)):

So, Trevor Marshall uses, I think it's Benicar to treat a lot of his patients, which is an angiotensin to receptor antagonist blood pressure medication but what you're saying is it may be not even the suppression of vitamin D that's making the difference. It might just be these medications are making the difference?

Ray Peat ([00:38:09](#)):

Yeah, I don't think he presents any evidence at all, that it has anything to do with the vitamin D receptor. It was originally based on so-called computer modeling, no experiments, really, and then he changed his firm antagonist to agonist. In fact, the Sartans in general are very powerful anti-inflammatory protective agents, regardless of whether it's rheumatoid arthritis that's the problem, or COVID infection. It's a general all purpose anti-inflammatory protective substance.

Kitty Blomfield ([00:39:03](#)):

Right, I remember you talking about Losartan being used in COVID and helped people get through COVID, so I would imagine that these other ones would work as well, very interesting. So flipping again, could store D status be a sign of sickness, meaning, if somebody's D is low, does that mean that they are sick or does that mean, or another argument is, does it actual need for more D or is it just a sign that they may be sick and that restoring their health would correct their D.

Ray Peat ([00:39:47](#)):

If a person is taking large amounts of a vitamin D supplement or getting sunlight and still they're circulating 25 hydroxy Cholecalciferol, if that is still low, I think that means they have a liver inflammatory problem, because the liver is a major part that creates the 25 hydroxy active form. I think most of the background of the question has to do with the Trevor Marshall doctrine, that there are occult organisms inside cells causing sickness and that his protocol is the way to eventually eliminate those occult organisms.

Kitty Blomfield ([00:40:48](#)):

So, let's say somebody was taking a decent amount of D or getting sunlight and had, like I said, low D level, still their store D was quite low. What would you at that point recommend, would you say continue to take more D or is there something else that we need to look at?

Ray Peat ([00:41:06](#)):

Yeah. The whole picture of what could be the source of inflammation and liver injury, but taking vitamin D isn't going to make the problem worse, the way the Trevor people, Marshall people say it will.

Kitty Blomfield ([00:41:25](#)):

Okay so at that pointed what about for somebody who takes a D supplement and it makes them feel absolutely horrible?

Ray Peat ([00:41:38](#)):

I've been hearing from a few people who were deteriorating rapidly, one thought she was approaching death with neurological and all kinds of other symptoms. I looked at her diet and supplements, and she was supplementing things in a base of medium chain triglycerides and when she stopped everything containing MCT, all of her symptoms went away. There's one study in animals they've found that a peanut allergy, for example, was created in the presence of MCT, it affects the immune system on the lining of the intestine in a way that destroys our ability to resist antigens and allergens and makes us susceptible to food allergy symptoms.

Kitty Blomfield ([00:42:49](#)):

That's interesting. I mean, the one supplement I usually recommend is Carlson's and that is in MCT oil so you're saying to avoid the ones in MCT oil, or, if it is creating an irritation, it could be the oil, might be okay. Are they okay to have in MCT oil? Is there one that you know of that is good, that is not in those things.

Ray Peat ([00:43:12](#)):

Lots of people get benefit from them, but I think some of the intense, bad reactions stop happening when they use a olive oil base vitamin D there are several companies that make a pure olive oil and vitamin D product either in dropped or capsules.

Kitty Blomfield ([00:43:35](#)):

Okay. Do you happen to know any offhand that we...

Ray Peat ([00:43:39](#)):

I don't remember

Kitty Blomfield ([00:43:40](#)):

...Reference?

Ray Peat ([00:43:41](#)):

No, I don't remember, just look for the price. They vary tremendously in cost.

Kitty Blomfield ([00:43:47](#)):

Okay, so a vitamin D in olive oil would be where to try if you are currently taking a D supplement and having a bad reaction, and you also...

Ray Peat ([00:43:56](#)):

I think so.

Kitty Blomfield ([00:43:57](#)):

...lead low D status. Okay. What about, lets kind of flip into maybe talking a bit about the calcium and D kind of communication and how they're all intertwined with each other. I'm going to go back real quick if somebody has low D could it also mean other things, meaning, I've certainly read some research showing that just taking magnesium can raise store D levels. So would it make sense for someone to actually explore other avenues before taking a D supplement, looking at some of the co-factors that go into a vitamin D metabolism?

Ray Peat ([00:44:50](#)):

Yeah for example, including milk and cheese in your diet is a good first step to see whether it might be a calcium, magnesium deficiency, because both of those have both an activating and a stabilizing protective potentially sedating action, a quieting effect on inflammation, for example. So a deficiency of either magnesium or calcium can lead to the inflammatory condition that activates the 1,25 dihydroxy D.

Kitty Blomfield ([00:45:40](#)):

Okay, so just being low in calcium or magnesium will initiate an inflammatory response, which will pull the 25 or the store D down and will elevate your 1,25 active D numbers. Is that correct?

Ray Peat ([00:45:55](#)):

Yeah.

Kitty Blomfield ([00:45:56](#)):

Okay so here's an interesting question are high cholesterol levels and low vitamin D status correlated since cholesterol is the precursor for D?

Ray Peat ([00:46:11](#)):

Yeah, in old people, for example the vitamin D that is active in the skin is greatly reduced and that shows that the cholesterol is a major reason that aging reduces vitamin D production. They just aren't putting the cholesterol in the position to be activated by sunlight.

Kitty Blomfield ([00:46:48](#)):

So then it would be fair to say that possibly taking a statin or any cholesterol lowering medication is certainly going to affect your vitamin D status?

Ray Peat ([00:46:58](#)):

Yeah. It affects everything including vitamin D status.

Kitty Blomfield ([00:47:03](#)):

Okay, so that would be certainly something to look at. Would it be more something if your cholesterol was high, would you first look at something like thyroid function or neural efficiency?

Ray Peat ([00:47:17](#)):

In the 1930s into the 1940s, hypothyroidism was very commonly diagnosed by elevated cholesterol and over and over experimenters within people who had their thyroid gland removed, and [inaudible 00:47:38] showed that thyroid reliably lowers cholesterol as it increases the metabolic rate, it's a very predictable event. The whole hypercholesterolemia culture grew up along with the suppression of the existing knowledge of thyroid hormone function.

Kitty Blomfield ([00:48:08](#)):

So essentially if somebody is high cholesterol, not that you need to take a thyroid, but obviously improving thyroid function, whether it's for proper diet or de-stressing that alone, without even taking a D supplement, could improve their D status?

Ray Peat ([00:48:26](#)):

Yeah, the thyroid and vitamin D and calcium are, intimately interrelated. You can't separate the thyroid from the vitamin D and calcium metabolism.

Kitty Blomfield ([00:48:43](#)):

Gotcha. What about, can we actually store enough D for the winter months, is that what the summer's all about? Essentially for those people that obviously don't have a lot of summer months, are they going to be able to get enough D during those months, so that will take care of them during the winter or, for those people is it pretty evident that they'll need to be too taking some sort of supplementation or certainly eating foods that are certainly high in vitamin D?

Ray Peat ([00:49:15](#)):

If they have really been in the sun during the summer, they will, assuming that their liver is fairly healthy. Their liver is going to store enough for several months of the darkest part of winter but it really depends on how much time they spend outside during the summer, and also how good their thyroid status is and their general metabolism but yes, the reason eating fish liver or beef liver or whatever is a good source of vitamin D is that the liver does store a considerable amount of vitamin D.

Kitty Blomfield ([00:50:04](#)):

Okay, so getting on that, would you, and I know you've gone and said kind of good and bad, would you say that Cod liver oil would be an okay way to supplement vitamin D?

Ray Peat ([00:50:21](#)):

Except that it comes with a considerable amount of fish oil.

Kitty Blomfield ([00:50:26](#)):

Yes.

Ray Peat ([00:50:28](#)):

Fish oil over time tends to accumulate with pro estrogen effects, pro inflammatory pro aging and antithyroid defects. I don't think it's the best way to get your vitamin D and vitamin A, but it is a source in an emergency, it's better to use Cod liver oils than to be deficient in vitamin D.

Kitty Blomfield ([00:50:58](#)):

Right, but something like beef liver or whole milk would be better options.

Ray Peat ([00:51:05](#)):

Much better.

Kitty Blomfield ([00:51:06](#)):

Okay, what about, milk that has been fortified with vitamin D. Is that safe?

Ray Peat ([00:51:16](#)):

The choice of emulsifiers, I'm not sure how much latitude there is, but I've heard that Polysorbate 80 and polyethylene glycol have been used as emulsifiers for the vitamin A and vitamin D. Since some people are very allergic to those polymers, you have to be watchful, if you have an allergic reaction to milk, try a milk that hasn't been supplemented, which usually means buying whole milk, which hasn't been pasteurized, then you can skim it to reduce the very high fat content of the whole milk and get an unadulterated natural milk.

Kitty Blomfield ([00:52:15](#)):

Right and that's one thing I certainly remember, over in the States, we know that all low fat milk has additives of A and D in it, I don't think there are any that don't that are or low fat. I know you consume a lower fat milk, and I usually consume a milk, like Straus, where you can actually skim the fat. Now, if I was to skim, the fat aren't I removing a lot of the A and the D that I'm trying to get?

Ray Peat ([00:52:42](#)):

Yeah, but moderate amount like one or 2% fat is all you need for the vitamins if the cows are healthy.

Kitty Blomfield ([00:52:51](#)):

Okay, I know you use a lower fat milk. Do you have a brand that you prefer that seems to do okay for you?

Ray Peat ([00:53:00](#)):

No. I just get whatever tastes good. Some of the organic milks have a really bad taste and that means their cows were eating some kind of odd wheat that I don't like, so I go by the taste.

Kitty Blomfield ([00:53:19](#)):

Okay, so does your grocery store let you taste test when you there, that would be nice, like going to a winery, you could taste your milk before you purchased it.

Ray Peat ([00:53:29](#)):

That would be nice, but I just don't buy it again when it tastes too bad.

Kitty Blomfield ([00:53:35](#)):

That's probably good advice, Katie, what do you do for your milk? Are you still there?

Kate Deering ([00:53:42](#)):

I am still here. We drink low fat milk, Craig likes skim milk. Cause he drinks...I think skim is what the equivalent, cause you guys call it different things.

Kitty Blomfield ([00:53:51](#)):

We call it low fat.

Kate Deering ([00:53:52](#)):

Yes, you've got 1% and then... He drinks the really low fat ones, so he drinks loads of milk. I drink the low fat, but we're so lucky over here. We don't...their not fortified with vitamins, which is so [Cuts mid sentence 00:54:04]

PART 2 OF 4 ENDS [00:54:04]

Speaker 2 ([00:54:03](#)):

Over here. We they're not fortified with vitamins, which is so awesome. So yeah, we just get them from our, there's just a couple of local dairies that we support that we get our milk from, which is really good. But yeah, I really feel for all our American and overseas clients, because they're always posting about how they just can't find milk, low fat milk without the added vitamins.

Kitty Blomfield ([00:54:23](#)):

Yeah. So I think the takeaway is you can either buy a milk that's full and try to skim the fat or other ones. And if they taste good and you don't have some sort of reaction to it, then it's a good milk. But some people I find when reintroducing milk, that whole seems to be the easiest route, because they seem to tolerate the best, at least in the beginning. So that's my general advice on that. Okay. Still got a bunch. So everybody put on their seatbelt. So Ray, when we measure the stored vitamin D or the Calcitriol in the blood, is this an accurate number because I always hear about there's certain things like estrogen and iron that really doesn't matter what's in the blood it's because it's in the tissue. Is this a similar case for store D because there obviously is a lot in the tissue as well?

Ray Peat ([00:55:19](#)):

No, the circulating in the blood, you have the vitamin D binding protein as well as the lipids in the blood that are carrying a large amount of it. So the fat tissues passively act as storage, but at a level, not much higher than in the blood and when it's in the muscles, nerves and so on, no one has measured the extracting those vital tissues to see how much of the 25-Hydroxy is inside the cells. It's assumed that the cells will take up according to what they need, probably very similar to blood level.

Kitty Blomfield ([00:56:30](#)):

I see. I think you once told me that if you have a good amount of body fat on you though, won't your body store more of that D in the tissue. So maybe your numbers won't be as high. And that might also be due to a liver issue?

Ray Peat ([00:56:46](#)):

The level in the fat tissue corresponds pretty closely to the concentration in the blood. So if you have a very big volume of fat tissue at that same concentration, and then yeah, that will act as a storage supplementing what's in your liver.

Kitty Blomfield ([00:57:07](#)):

I see. I see. So let's talk about the optimal number of your store D like what number, because obviously some people promote that anything above 20 doesn't make any sense. So there's no biological reason for you or advantage to be above 20. And obviously I think you promote more of a 40 to 60 number. So what would you say, obviously, that is what you would say, but why would you say the number needs to be higher? And the reasoning behind that.

Ray Peat ([00:57:40](#)):

One of the functions is to keep your 1,25 Dihydroxy D as low as possible by keeping your Parathyroid Hormone low. So having excess calcium in your diet and a generous amount of the 25-Hydroxy D that is acting as sort of a buffer against any of the irritants and inflammatory de-energized conditions that would threaten to increase your Parathyroid Hormone and 1,25 Dihydroxy.

Kitty Blomfield ([00:58:25](#)):

So you're... Go ahead.

Ray Peat ([00:58:28](#)):

The practical level, like improving sleep, for example, being resistant to sunburn and that pretty much happens above 15 nanograms per milliliter, 60 to 70 seems to be the safe range where it's acting as a buffer to reduce stress generally.

Kitty Blomfield ([00:58:57](#)):

And what about people? I mean, can you go too high, obviously you're not going to go higher than that, if you're getting natural sunlight, but if you were supplementing, I mean, what dangers are there, if you go to 80 or 90 or 100?

Ray Peat ([00:59:12](#)):

People working outdoors, for example, as a lifeguard have measured 130 nanograms per milliliter and higher, and there's no harm evident at all, but with a moderate overdose of 1,25 Dihydroxy, you can easily create Hypercalcemia, calcification of soft tissues, demineralization of your bones and other degenerative signs. So as long as your calcium intake and 25-Hydroxy are in that range, I don't know if anyone who has had 200 milligrams per milliliter, but no matter how much sun exposure you get, maybe 150 NG per ML would be an upper healthy limit, but it's the keeping the 1,25 down preventing the parathyroid hormone from treating the degenerative inflammatory processes.

Kitty Blomfield ([01:00:35](#)):

So, I mean, I've read research that will show that there are healthy people that actually have a low 25 D, store D also a low 1,25 D. And that would be a healthy person. And it's the unhealthy person that has a elevated or low 25 D but then a very elevated 1,25 D I mean, can you be healthy with a number of 20 for a store D number?

Ray Peat ([01:01:09](#)):

Temporarily, I just think the long range outlook is better when you're in the higher range, because you're having a buffer effect actually of an excess beyond what's essential of calcium and 25-Hydroxy. It gives you the opportunity to undergo some stress without tearing down your bones and calcifying your arteries.

Kitty Blomfield ([01:01:52](#)):

Okay. So for someone that maybe doesn't have a lot of stress in their life and is living inside, but not really very stressed that could totally work, but obviously in today's modern society with a good amount of stress, that would not be an ideal number to be protected for the long haul.

Ray Peat ([01:02:10](#)):

Yeah, I think so.

Kitty Blomfield ([01:02:12](#)):

Okay. So let's talk about the vitamin D kind of calcium connection. And because obviously I know you definitely, your big things that you'd like to promote are thyroid, calcium, vitamin D and how they all intertwine with each other. Can you just give me a brief synopsis of how vitamin D and calcium and thyroid all affect each other?

Ray Peat ([01:02:37](#)):

Keeping the calcium bound up so that it doesn't act as an excitant to cells, the danger when your energy is low or inflammation is high, is that calcium becomes a cell exciter, activates a breakdown of protein nucleic acids and the activation of all of the processes that lead to eventually cell death or loss of function. And the vitamin D of the right sword is functioning to activate the proteins that hold vitamin D in a safe condition. And in that condition, vitamins are calcium, is working with progesterone and thyroid as cell stabilizers, having actually a severity defect, an injection of calcium salts can act as an analgesic and as a sedative by promoting the stable, relaxed conditions.

Ray Peat ([01:04:17](#)):

Simply being low in the energy or having inflammatory signals will activate the improper functions such as calcification of your blood vessels and other soft tissues. And that's when 1,25 Dihydroxy becomes a danger. It has a brain excitatory effect, which can seem very good momentarily, but that exactly the same process that makes it a brain excitant makes it a blood vessel calcifier by destabilizing the relation between calcium and the structure of the cell.

Kitty Blomfield ([01:05:13](#)):

So I think one of the confusions about calcium is because you always hear about people are calcified and calcified arteries and blood vessels and their tissue. And so people are constantly being told you don't need any more calcium, everything's calcified. And can you kind of explain what is really happening so

that we can understand that obviously we don't want to be calcified, but is it due to the fact that somebody's eating too much calcium?

Ray Peat ([01:05:41](#)):

No, it's the same situation with kidney stones. People who don't eat enough calcium or don't get enough of the right kind of vitamin D tend to get calcium kidney stones. And the mechanism seems to be that at your Parathyroid Hormone increases at your aldosterone and whole inflammatory system increases, the angiotensin system becomes activated and the excitation goes with unopposed phosphate action. If you have too much phosphate in your diet that activates the calcification process, partly by direct solubility effects inside cells, but mostly through activating over production of Parathyroid Hormone.

Ray Peat ([01:06:56](#)):

So when you talk about getting extra protective calcium in your diet, that means relatives to somewhat lower phosphate in your diet because both of those effects will lower your Parathyroid Hormone and the angiotensin system and adrenal stress hormones, all of which protects the blood vessels and other soft tissues from calcification. Injection of the 1,25 Dihydroxy will have exactly the opposite effect or an overdose of Parathyroid Hormone activating the 1,25 Dihydroxy will pull calcium out of your bones, give you hypercalcemia and create crystals of calcium and phosphate inside your living cells, causing them to first become excited, overactive stress producing excess collagen, excess nitric oxide, and a whole process of degenerative damage leading to formation of bone fibers hardening and calcified fiber.

Kitty Blomfield ([01:08:38](#)):

So it's essentially the opposite. So it's not due to ingesting calcium that's creating the issues. It's essentially a lack of calcium and a high phosphorous diet that's triggering the Parathyroid Hormone to pull calcium from the bones and then that is what essentially is creating all this calcification.

Ray Peat ([01:09:00](#)):

Yeah, it's been known now for decades that women with the worst osteoporosis have the most calcified blood vessels.

Kitty Blomfield ([01:09:14](#)):

Gotcha. And so obviously, and this is obviously why you definitely promote a high calcium to phosphorus diet, which essentially is a high dairy diet and low grain and meat diet. Is that the primary reason?

Ray Peat ([01:09:30](#)):

Yeah. Grains, legumes, nuts, meats and fish all can create an excess of phosphate in the system activating your Parathyroid Hormone. And during the night, just the stress of the darkness of a single night, it increases your Parathyroid Hormone. And if you measure the calcium output in the urine of a person who is developing osteoporosis, most of the days, calcium loss is in the morning urine because of the elevation of Parathyroid Hormone during the night, breaking down the bones, making you relatively hypercalcemic, hardening your arteries and other tissues. And so, especially at bedtime milk and vitamin G are protective against this constant nocturnal loss of calcium.

Kitty Blomfield ([01:10:45](#)):

So just another reason to have milk and honey, before you go to bed to help with that process.

Ray Peat ([01:10:52](#)):

Mm-hmm (affirmative).

Kitty Blomfield ([01:10:54](#)):

Is that one reason why people are always so stiff in the morning?

Ray Peat ([01:11:00](#)):

Yeah, lots of inflammatory things developed during the night. If you look at all of the blood changes within about an hour or two or by the middle of the night, all of the degenerative stress hormones have increased, free fatty acids, which are toxic to all of the cells by interrupting your oxidative use of glucose, the free fatty acids rise steadily during the night, along with cortisol, serotonin, estrogen, angiotensin, Parathyroid Hormone, all of the things that take our tissues apart.

Kitty Blomfield ([01:11:58](#)):

So that's essentially why we're trained to sleep at night, right. To go into the least stressed position that we possibly can because of all of these things that are happening in our system, just based on the darkness?

Ray Peat ([01:12:12](#)):

Yeah. People have had their blood tested every 15 minutes while either awake during the night or while asleep during the night. And if you are soundly sleeping during the night, you'll have a moderate increase of the stress hormones, but when you're not sleeping, the darkness is several times more destructive. All of the stress hormones rise more quickly when you're not asleep. So sleep is obviously adaptive reaction to avoiding those stresses.

Kitty Blomfield ([01:12:58](#)):

Right. So if you're a shift worker and have to stay up at night, probably something that would help you would be milkshakes and milky drink or high calcium foods or so forth to help kind of support the system during that night time.

Ray Peat ([01:13:11](#)):

Yeah. And everything that protects against the shift to fat metabolism of free fatty acids, the 1,25 Dihydroxy vitamin D is able to turn off the oxidative metabolism, causing a shift over to the fat dependent metabolism, and the shift to the cancer metabolism producing lactic acid.

Kitty Blomfield ([01:13:48](#)):

Why do you think that the doctors do not take the 1,25 D test? I mean, do you think that would be more helpful to people to understanding their own vitamin D status if they had both 25 D and 1,25 D taken?

Ray Peat ([01:14:03](#)):

Yeah. The really useful test is the 25, the unconverted form, and some doctors measure the 1,25 Dihydroxy. And if they don't realize that that's an indicator of more of stress than a vitamin D adequacy, that can be a good indicator of vitamin D deficiency when your Parathyroid Hormone and 1,25 Dihydroxy are increased.

Kitty Blomfield ([01:14:44](#)):

Right. So, if you were really wanted to understand somebody's vitamin D status, what would be the labs that besides 25 D and 1,25 D that you would have them take to get a really good understanding of where they're at?

Ray Peat ([01:15:03](#)):

I think the 25-Hydroxy you is a good enough test for almost all purposes.

Kitty Blomfield ([01:15:11](#)):

Okay. So they wouldn't even need to get like Parathyroid hormone. Basically, if your 25 D is low, you need more vitamin D or sunlight, or you need to get out of stress or a combination of all those?

Ray Peat ([01:15:27](#)):

Yeah. There are surgical companies, websites that are adding to the confusion by saying you can't lower your Parathyroid Hormone by diet or other metabolic effects, you have to have your Parathyroid Hormone, Parathyroid Gland cut out if you have excessive Parathyroid Hormone, but there are these forces actively misinforming the public flatly saying that you cannot lower Parathyroid Hormone by eating more calcium and vitamin D, but that's absolutely not true.

Kitty Blomfield ([01:16:18](#)):

Right. Yeah. And I also saw studies that just removing phosphorus or eating a low phosphorus diet can improve Parathyroid Hormone.

Ray Peat ([01:16:27](#)):

Yeah. Well that is pretty well recognized as a cause of the increasing degenerative disease in the population as the high ratio of phosphate to calcium in the diet, in the industrial world.

Kitty Blomfield ([01:16:47](#)):

Yeah. Yes. So that's most people eating a high, meat, grain, legume, nut diet and all avoiding dairy and eating their nut milk. So that would be the perfect place to have low vitamin D status.

Ray Peat ([01:17:01](#)):

Right.

Kitty Blomfield ([01:17:04](#)):

Right. Okay. So real quick, I want to get back to just how vitamin D has metabolizes and talking about the other co-factors the other minerals or nutrients that are involved in that. Certainly, there's a lot of talk that if you were to take a vitamin D supplement, that it will deplete or use a lot of other nutrients like vitamin A or magnesium, potassium, copper. And so if somebody is already deficient in magnesium and copper and vitamin A, would it make more sense to address those issues first before putting a D supplement in?

Ray Peat ([01:17:46](#)):

I don't think so. It's actually important to work on all of them at the same time, but the vitamin D itself is part of the calming anti-inflammatory process. So the calcium and magnesium are essential and should be done immediately. But I don't think the vitamin D supplement is going to make anything worse.

Kitty Blomfield ([01:18:19](#)):

Yeah. Well, one of the conversations is if you increase vitamin D you're going to increase kind of the burn rate of A, magnesium and even vitamin A, and if you're already deficient in those, and since we know that vitamin A is very integrated in iron metabolism, that that could actually make iron get more stored in the tissue or can dysregulate iron, but also knowing that magnesium is involved in 3000 other enzymatic processes that by giving someone a lot of D and I think what you're saying is you just need to do it all together, but obviously just giving someone D and not doing all the other things you could create a problem?

Ray Peat ([01:19:00](#)):

I think that idea comes largely from 50 or 60 years ago. Some animal experiments showed that if you give very large amounts of vitamin B1 Thiamine that you you'll increase the metabolic rate and for borderline deficient in others, it will make the other deficiencies show up more quickly.

Kitty Blomfield ([01:19:30](#)):

Right.

Ray Peat ([01:19:30](#)):

But I don't know if any experiments at all, that would show that happening with vitamin D or magnesium or calcium to a great extent the body can use the boost it gets from one nutrient to reduce its need for the other nutrients, such that even adding sodium or potassium can reduce your need for magnesium or calcium. Simply the alkaline mineral iron, has a certain interactive equivalence and the vitamin A and vitamin D do work together, but you would have to be at an extreme, desperately deficient condition before you'd see one creating a deficiency of the other.

Kitty Blomfield ([01:20:49](#)):

Okay. So what you're saying is, even though vitamin A is needed in the vitamin D metabolism, it really wouldn't matter if you started supplementing even somewhat high dose of D it wouldn't throw off your other nutrients, if the other ones weren't being...

PART 3 OF 4 ENDS [01:21:04]

Kitty Blomfield ([01:21:03](#)):

[inaudible 01:21:00] it wouldn't throw off your other nutrients, if the other ones weren't being supported at the same time, unless you were extremely deficient in them.

Ray Peat ([01:21:10](#)):

Yeah. And for vitamin A and thyroid have a noticeable interaction so that if you're borderline for thyroid function and take a huge vitamin A supplement, such as a hundred thousand units, you will probably experience a dip in your thyroid activity, because a thyroid hormone and retinol travel on the same

protein. So you'll simply displace one by too much of the other. But it's noticeable only in extreme situations.

Kitty Blomfield ([01:21:57](#)):

I see. I had a thought and then it left my brain. So we'll go to the next question, which is, should people ever take a calcium supplement? Are they harmful?

Ray Peat ([01:22:16](#)):

No, they should get it from food. But for example, eggshells or powdered oyster shells, you can think of it as food. Instead of throwing away the shell of the egg, why not powder it up and add it to your omelet. It's in a form that is very [inaudible 01:22:49] by most people. So calcium carbonate, I don't think is as a problem to use as a calcium supplement. But some of the counter ions have their own activities. So you don't want to take very big doses of calcium lactate or calcium gluconate, for example, just because that counter ion can have its own metabolic action.

Kitty Blomfield ([01:23:25](#)):

Okay. So taking a food supplement like eggshell calcium, which I know, I certainly recommend, I know you recommend because it is actually a food that is safe to take. Is there any way you should take that? I've always read that calcium is better absorbed with sugar or also vitamin D. So Would it be smart to take that with something like orange juice or with food?

Ray Peat ([01:23:48](#)):

Yeah, yeah. I think with a whole meal so that you don't notice any highly purified substance that tends to disturb and irritate your stomach and then test them. And the high concentration of calcium carbonate, it can be irritating, just like too much salt or sugar in a concentrated form is irritating to the membranes.

Kitty Blomfield ([01:24:18](#)):

Okay. So anytime you're going to take a calcium supplement, hopefully food source, eat it with your entire meal so that you can get everything together because it can be an irritant.

Ray Peat ([01:24:28](#)):

Yeah. When you separate out the major nutrients, the intestine is most efficient when it has the most complex mixture of the major nutrients, the protein, fat and carbohydrate, for example. If you eat only one component at a time, your intestine doesn't recognize it as quite proper food. And so it's not as efficient at absorbing any of the ingredients. Your intestine wants a complex, natural, sort of mixture of nutrients.

Kitty Blomfield ([01:25:12](#)):

Right. I think there's always an argument that calcium carbonate isn't absorbed very well. And would you just say if you consumed it with your complete meal and with some sugar, that it would absorb much better?

Ray Peat ([01:25:25](#)):

Yeah. It becomes calcium chloride in the presence of stomach acid.

Kitty Blomfield ([01:25:28](#)):

I see. I see. Okay. Is there any issues with, obviously, I always think milk is a perfect food because it comes with all of the other co-factors like vitamin A and D and magnesium, all the supporting agents are all together. And I feel like that's kind of how mother nature meant it. And so when you do do something like a supplement, is there ever a problem to just how your body will take it in? I've always read, if you do too much calcium, you're going to lower your potassium and you'll just throw off your minerals. Is that going to happen, or will your body kind of figure it out?

Ray Peat ([01:26:08](#)):

Yeah. The receptor idea leads to a lot of those worries that are unnecessary. The cells and the intestine and the body in general are very adaptive and basically intelligent about testing what it takes in so that it isn't very easily disturbed.

Kitty Blomfield ([01:26:39](#)):

Okay. Right. Because I've heard in circles that if you ingest too much calcium that somehow it can have a thyroid suppressing effect. And I think it's because it was going to lower potassium and other minerals. And I'm hearing that that's not the case.

Ray Peat ([01:26:58](#)):

Yeah. That started, I think, with some pharmaceutical extra months in which they found that taking a thyroxine supplement at the same time that you take a calcium supplement, or drink milk, slows the absorption of the thyroxine. But a lot of pharmacists are obsessed with the idea of quick absorption. But in the case of thyroid, for example, slow absorption is what you want. And with most nutrients, slow, steady absorption is the best for your system to sort out and use properly.

Kitty Blomfield ([01:27:45](#)):

Okay, perfect. What about... You always hear about certain ratios of minerals. And one in particular that I've heard of is this calcium magnesium ratio where, you hear, "Hey, you need to have almost 10 times as much calcium to magnesium." And then I've also heard the reverse where the magnesium should be much higher than the calcium. Are you just going back to the entire, back to that receptor theory that... Does that matter? Do we need to be aware of something like that? Or should we just eat whole foods and not worry?

Ray Peat ([01:28:20](#)):

Basically, yeah. The body can sort out great ranges of proportion between calcium and magnesium. And milk has quite a lot more calcium than magnesium. But a pure milk diet, you can't become magnesium deficiency because milk has more than enough magnesium if you're getting an adequate calcium supply from it.

Kitty Blomfield ([01:28:55](#)):

Okay. And that kind of brings me to the next question that, and just so everybody knows we're almost to the finish line, which is super exciting. But I think this has been so interesting. I think a lot of people get this idea of this imbalance of minerals but it's because they're using a diagnostic test, like a hair mineral, hair tissue mineral analysis tests. And I think that you get all these ratios on this test and say, "Oh, look,

you're high in calcium," or, "You're high in this." Is that a good test to understand the minerals inside of us?

Ray Peat ([01:29:28](#)):

No, that's a good test of what you wash your hair with and just being in a dusty environment or a chemically polluted environment, you can tell where a person has been by smelling their hair, because it binds things so easily. And it will pull things out of the water. With a moderate amount of calcium in the water, your hair is going to bind a lot of calcium. But if you have softened water with lots of sodium in it, then your hair is going to experience that higher sodium, rather than calcium environment.

Experimenters, years ago, compared toenails to hair and found the toenails, by being constantly protected and a thicker material than hair, is much more representative of your actual tissue mineral levels. But still your toenails take about six months to get long enough to clip off. And so the hair is convenient and if you clip it at close to your skin, you can get hair that has only been exposed to the environment for several days. But still just one shampoo with hard water is going to fill your hair with calcium or magnesium.

Kitty Blomfield ([01:31:19](#)):

What about hair pulled? What if they pull the root? Would that make a difference?

Ray Peat ([01:31:26](#)):

Yeah. If you've made sure just the knob on the end.

Kitty Blomfield ([01:31:31](#)):

You would get more. Would it still be an accurate even? Like I said, if you were able to use the hair that hadn't been altered by water or air, would that hair be a good analysis of the minerals?

Ray Peat ([01:31:47](#)):

The water gets pretty far down the hair shaft, so it would have to just be the very knob at to end.

Kitty Blomfield ([01:31:58](#)):

Okay. Is there any good tests outside of ripping your toenail off, that sounds a little painful, of actually checking minerals in your body? I mean, is blood acceptable? Would that give you some understanding?

Ray Peat ([01:32:15](#)):

Yeah. If you include all of the blood cells, that's going to be a very accurate and repeatable, or representative of your mineral content.

Kitty Blomfield ([01:32:29](#)):

So what tests would those be specifically? Because that's obviously not a normal test that your doctor's going to do. Are you talking about the red blood cell, what's in those?

Ray Peat ([01:32:44](#)):

A chemist which just dissolves the whole thing in an acid or alkaline and just measure the mineral content in an absolute sense.

Kitty Blomfield ([01:33:01](#)):

And you're referencing the blood though?

Ray Peat ([01:33:03](#)):

Yeah.

Kitty Blomfield ([01:33:03](#)):

Measurable in the blood.

Ray Peat ([01:33:05](#)):

Yeah.

Kitty Blomfield ([01:33:06](#)):

Okay. So, but if I wanted to go to my lab and then I wanted to know all of what my minerals were, would it... I mean, because I can go get copper, or magnesium, or is it red blood cell magnesium? What would it be that I would actually buy from a lab?

Ray Peat ([01:33:21](#)):

Well, if they're separating your serum and cells, centrifuging it and then so on, then you're only going to be measuring one component of the blood. And then you have to know how that component is reflecting what's in the rest of the body. So if you have a very good standard, then any particular component is going to be altered according to the condition of the body. But if you want to know the general body status for minerals in general, I think the whole blood homogenate would be the appropriate thing to measure.

Kitty Blomfield ([01:34:18](#)):

Okay. I had a question real quick and it was coming from... What does it mean if somebody has excessively low parathyroid hormone?

Ray Peat ([01:34:29](#)):

I think that they are probably taking enough vitamin D and calcium and magnesium.

Kitty Blomfield ([01:34:40](#)):

So you're basically saying it can't really get too low?

Ray Peat ([01:34:43](#)):

Yeah.

Kitty Blomfield ([01:34:43](#)):

If they're lower than their norm number, then you're good.

Ray Peat ([01:34:50](#)):

Except when you surgically remove the parathyroid glands. If you can keep them supplied with magnesium and vitamin D, they generally are remarkably healthy, their sleep improves. And remember that aging is a constant increase in parathyroid hormone and the parathyroid hormone every night rises and accelerates the aging process. So something that gets worse the older you are and exacerbates the problem. And so the good benefits of parathyroid ectomy in people with kidney disease for example, are very impressive.

Kitty Blomfield ([01:35:49](#)):

Hmm. So basically that is the explanation, as you get old everybody, not everybody, but people are under stress, certainly you see a lot of osteopenia, osteoporosis, or kidney stones starting to occur and that's just a sign that the system is under stress. Correct?

Ray Peat ([01:36:06](#)):

I think so.

Kitty Blomfield ([01:36:09](#)):

Right. Real quick, a question about magnesium. Where would you recommend people get a source? Would you get a food source? And obviously there's a lot of people that use a lot of magnesium. Is magnesium something that most people should be taking since we're all under stress, we're losing it daily?

Ray Peat ([01:36:32](#)):

Milk is a very generous source. Coffee is a consistent source. It's a small amount, but it can help as a supplement to the milk. Orange juice contributes a moderate amount. Meat and fish and the high phosphate foods always contain a considerable amount of magnesium.

Kitty Blomfield ([01:37:00](#)):

And if people don't feel like they're getting enough, do you think they should supplement? And if they should supplement, is there a preferred magnesium source that you would tell is a better source?

Ray Peat ([01:37:12](#)):

Years and years ago, I experimented with the magnesium carbonate. I had used it in Mexico as a counteraction to reset diarrhea. And I always had the little black magnesium carbonate and a doctor friend was complaining about her horrible uterine cramps. And she normally wouldn't consider a nutritional supplement but since she was it pretty much immobilized by the discomfort at the cramp she was willing to take a chunk of magnesium carbonate and chew it up. And in just about five minutes, she looked down at her abdomen said, "I can't believe it's stopped completely." And it can have that almost instantaneous effect of working the way calcium does as a quieting influence, but it can be very quick and reliable. But the trouble is that many of the manufacturing methods for magnesium carbonate and other magnesium compounds, they involve contaminants that can be allergenic. And lots and lots of people get a headache or a queasy, allergy symptoms of a variety of types from using magnesium supplements. Magnesium glycinate, so far, I haven't heard any serious complaints from that form of it.

Kitty Blomfield ([01:39:20](#)):

Yeah. That would be the one I prefer. And I don't know, have you ever tried the magnesium bicarbonate?

Ray Peat ([01:39:26](#)):

I know people who use it and like it.

Kitty Blomfield ([01:39:30](#)):

Yeah. Those seem to be, I think that the least harsh and the ones that people don't complain. Obviously magnesium carbonate, I think to a lot of people acts as a good laxative. So I think things start moving quickly. And I don't know if it's that, is that because of the carbonate or was that just because of the additives they might have in the carbonate?

Ray Peat ([01:39:49](#)):

Magnesium itself at a certain level, it works as a laxative. If it's anti-inflammatory sometimes the bowel is being paralyzed by inflammation, and so something which is antispasmodic can let the normal [inaudible 01:40:13] takeover.

Kitty Blomfield ([01:40:16](#)):

Got you. Well, that is all the questions I have. I don't know if you have anything else to add, Ray. That was a lot of amazing information. I don't know. Do you think we hopefully covered most of it?

Ray Peat ([01:40:35](#)):

Yeah. I don't think of anything else.

Kitty Blomfield ([01:40:37](#)):

And well done in an hour and a half too. I'm surprised. I thought it might take two and a half hours.

Kitty Blomfield ([01:40:44](#)):

Well, you know what, as I was going, I started to realize we'd covered a lot of these other questions. I was like, "Okay, we've kind of covered that." And I'm like, "All right, we've covered that." Start [crosstalk 01:40:54] a little bit. Yeah. That was awesome.

Kitty Blomfield ([01:40:57](#)):

That was so, so good. And, when we did the one with Georgie, and Kayden, Matt, and Benny, I think people were just a bit confused. I think this will be much easier to understand, which is good.

Kitty Blomfield ([01:41:12](#)):

I hope so.

Kitty Blomfield ([01:41:15](#)):

Awesome. Well, thank you so much, Ray. I'm sure everyone will love this podcast just as much as the last one, so much valuable information. And thank you so much, Kate, for putting those questions to get all those thorough, super thorough questions. So I guess maybe just to finish off, Kate. So are we pro vitamin D?

Kitty Blomfield ([01:41:38](#)):

Well, I think at the end of the day, as Ray said, I mean, I think that if you are actually low vitamin D, that it would be, as you say, it's not a harmful substance to try. And I think Ray would agree. I mean, you have to take an excessive amount to really get a harmful effect. Would you agree?

Ray Peat ([01:41:59](#)):

Yeah, I've never known a person, or even a study, of the 25 hydroxy D causing harm. 5 million units continued for a period of time probably can be harmful, but I've never run across anyone of... People with rheumatoid arthritis when they feel a slight benefit from five or 10,000 units a day, some of them have gotten up to 20,000 or more units per day and not only get complete relief, but tend not to have a recurrence. So the big doses are pretty consistently therapeutic. And once you get the inflammation under control, then you don't need to keep such high doses.

Kitty Blomfield ([01:43:02](#)):

Ray, I just had a thought because I've certainly read studies that have shown that people, they've taken over time. And I can't remember the study, but it was, they gave different dosages of vitamin Ds to women. I think it was like 400 IUs, 2000 and 10,000 IUs and then follow them for a significant amount of time. And then then found at the end of this study, that the ones that were taking the highest amount of D showed more bone loss than the other ones. And do you have some explanation as to why that could occur?

Ray Peat ([01:43:38](#)):

No. I would have to see the details of the study. I hope it wasn't done by [inaudible 01:43:47].

Kitty Blomfield ([01:43:50](#)):

It might've been.

Ray Peat ([01:43:51](#)):

One of the funny things in his 2017 publication was, he was connecting, not only the [inaudible 01:44:02] the effect of vitamin angiotensin blocker on the vitamin D receptor, but he was incriminating electrosmog, which isn't a good thing, but he was incriminating that as a factor in the vitamin D receptor malfunction. And he recommended [inaudible 01:44:28] thread cap as a way to protect the brain from the electrosmog and help your vitamin D receptor. But probably there is a shielding effect from [inaudible 01:44:45] threads in the cap, but why not the whole, old fashioned aluminum hat, aluminum foil hat, which is an absolute brain shield.

Kitty Blomfield ([01:45:02](#)):

Well, maybe we'll have to get that study over. Because there are some out there that I sometimes wonder. And I'm sure there might be something in the study that would explain it and just, I didn't know. So that was awesome. And so, yeah, I think that the takeaway is if you're going to get vitamin D get someone olive oil.

Kitty Blomfield ([01:45:21](#)):

Yeah. We'll have a look. Should we? I'll have a search, see if we can find some brands, because I've never really seen any brands in olive oil.

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Kitty Blomfield ([01:45:27](#)):

No. They're mostly, I think, [inaudible 01:45:29] MCT oil and most people I know don't have an issue with that, but I'm sure as you say they could. I certainly have had people telling me they definitely have some very strong reactions with vitamin D and they just cannot take it. So it could be that MCT oil.

Kitty Blomfield ([01:45:45](#)):

Well, we can drop the link to the Carlson's and try and find some olive oil ones as well.

Kitty Blomfield ([01:45:50](#)):

Absolutely.

Kitty Blomfield ([01:45:52](#)):

Awesome. Well, thank you so much, Dr. Peat. Thank you so much cake and I'm sure we'll probably think of another awesome topic to have round again.

Kitty Blomfield ([01:46:04](#)):

I hope so. Ray, it was such a pleasure to talk to you and let me pick your brain for that long length of time. I totally appreciate it and enjoy it.

Ray Peat ([01:46:12](#)):

Yeah. Thank you. It's fun to think about the subject. It's an area that is going to get more and more interesting as more research opens up what the vitamin D is really doing.

Kitty Blomfield ([01:46:30](#)):

Yeah, you're welcome. Anytime.

Kitty Blomfield ([01:46:33](#)):

Great. Thanks so much. Have a great day guys... Or evening I should say. Bye.

Kitty Blomfield ([01:46:38](#)):

Bye.

PART 4 OF 4 ENDS [01:46:48]