

# **Understanding Your Endocrine Health: A Special Interview With Keith Littlewood**

## **By Dr. Joseph Mercola**

### **Dr. Joseph Mercola:**

Welcome, everyone. Dr. Mercola, helping you take control of your health, and today, we're going to be engaging with a Ray Peat clinician. So, his name is Keith Littlewood and he comes to us from the U.K. So welcome and thank you for joining us today, Keith.

### **Keith Littlewood:**

Thanks for having me.

### **Dr. Joseph Mercola:**

Yeah, so perhaps you can share with us your journey in the Ray Peat community and your experience and how you got involved with it. I have known about Ray for over 30 years and was disenchanted with his approach and thought he was a lunatic for three decades until I realized I became aware of the dangers of seed oils and then realized that he was probably the authentic pioneer in helping people understand this. And then I realized that, hey, if he understood seed oils three decades before anyone else or most anyone else, then he probably knows a little bit about some of the other biology things. I've been devouring his material for the last year and a half coming up on two years. But it takes a while to learn it, that's for sure. It's not something you learn in a weekend, that is for darn sure.

### **Keith Littlewood:**

No, I think I kept ... I mean, I've just reread his books multiple times so much that the pages are falling out, to be honest. And there's certainly, when I came, I think I originally found his work in 2010. I was certainly aware of your work before Ray. I remember I used to be a personal trainer in rehab and pain relief and corrective exercise, and that's what I was, personal trainer by trade to start with. And then I moved more into functional medicine testing. And it was around about the time I was studying functional medicine that I was exposed to Ray's work. I'd done some holistic nutrition work. My first degree was fitness and health. And then, I can't remember, I think it was probably in the Czech forum where people started to share some of Ray's ideas. And I looked at that and for some reason, it really resonated with me, some of the stuff, but I didn't fully understand it.

And I think even I go back now some 14 years later and there's stuff in his books that I missed after reading them 10, 15, maybe 20 times. But I think as you add layers to what he's written about, I think first and foremost, Ray kind of combined some really good ideas around biology and philosophy, brings a really good synthesis of other biologists' and scientists' work. And also ultimately is a critique of the system that can [cause] collusion between medicine and pharmacological establishments and where kind of opacity and greed comes first over many other kind of things that should be coming first within trying to get people healthier and ultimately prevent disease. So yeah, 2010, I started reading his work. I haven't engaged too much in any of the forums. I certainly emailed Ray multiple times and prior to going back, I went back

to uni to challenge some of my biases and I did a master's degree in endocrinology and a postgrad diploma in endocrinology.

And now find myself, I feel even more drawn to as well. At the moment, I'm doing a Ph.D. in endocrinology, in endocrine science. And every time I kind of get pulled down the molecular hole where we're kind of just staring at things myopically and rather [inaudible 00:03:42], I kind of come back out and his words tend to ground me. So, I'm kind of really grateful for finding his work and also inspiring me to go on it and do more work. And ultimately, over the last 15 years, I've developed a practice of working with clients around energy, metabolism, digestion, sleep [and] fertility. So that's where I'm at at the moment.

**Dr. Joseph Mercola:**

Oh, great. So, it's interesting. It seems like one of your primary focuses would be in endocrinology, certainly it's one of your passions. Otherwise, why would you get a Ph.D. in it, right?

**Keith Littlewood:**

Yeah. Well, I wanted to challenge ... It's really raised writings about what he wrote about thyroid physiology is that one, the TSH (thyroid-stimulating hormone) can be just a completely redundant test for multiple reasons. And even so more I'm looking at how endocrine disruptors can turn thyroid physiology at the molecular level, at the super molecular level and how they can disturb things either genomically or non-genomically and how even abundance of T4 can be problematic and stimulate certain pathways.

And that's really why T3 and there's quite a lot of research now to support the idea that T3 should be being looked at as opposed to TSH because stress people have generally suppressed TSH values. Chronic dieters can have suppress TSH values. There are hormone-disrupting chemicals in the environment that can suppress how thyroid function is being modulated. And I think that makes it even more complex that when a clinician would just look at TSH and T4 and go, "Well, your blood tests are completely normal, let's move on to something else or it's in your head," which is a common theme that I've seen well over a decade now with clients who've had their blood tests and just because they looked at these two markers, they're euthyroid rather than potentially hypothyroid.

**Dr. Joseph Mercola:**

So, Ray had taken the position that TSH was helpful, at least from my understanding. And you certainly have studied more than I have.

**Keith Littlewood:**

Absolutely.

**Dr. Joseph Mercola:**

But only if it's suppressed, below typically one, although I've heard him in different states, say it's below 0.5 would be more of an ideal rather than certainly below one, but as low as 0.5 or lower would be ideal.

**Keith Littlewood:**

And it can be useful, for sure, and I generally agree 0.2 to 0.5 is the range that I think is ideal. When I talk about suppression, I'm talking about suppression via other mechanisms. So cortisol, ACTH (adrenocorticotropic hormone), these things can suppress TSH production, which makes, just looking at TSH and T4 on its own, it can be very muddy water to look into. That's why the relatively crude test of temperature and pulse can be pretty useful. But again, you want other markers as well. You want cholesterol, you might want to look at prolactin, other hormone levels, you might want to look at lactate, all of these other markers that could be useful in getting you to understand what thyroid is actually doing.

**Dr. Joseph Mercola:**

Yeah. Well, let's continue to dive this down. This, I find it intriguing. So, you suggested that the T3 itself, and I'm assuming that's regular T3 or free T3 as opposed to reverse T3 would be a better marker in some cases than TSH for hyperthyroidism.

**Keith Littlewood:**

Yeah, I think total T3 and free T3 are both useful. And you can see I've just done a meta-analysis. I'm looking at this and it seems that both total and free T3 can follow the same pathway. But there's some interesting studies that show that T4 and levothyroxine, bearing in mind it's just an associational study, have potential links with certain cancers. And that can be because elevated T4 can stimulate these non-genomic pathways via certain receptors that stimulate proliferation. And T3, whilst it can be useful for proliferation, it's also very instrumental in re-differentiating cells.

And there's certainly some papers that show that when you apply T3, it can re-differentiate tumor cells. Some of the cells I'm looking at at the lab at the moment are U87 glioblastoma cells. And those cells, when you apply them with a certain amount of T3, actually re-differentiate and actually stop proliferating. So if we want to think about ... I think the most important hormone it's T3 because it's TSH and T4's role to support systemic T3 values, and when the T3 is not where it should be, that's where we see the problems. And I think Ray always talked about that and I would totally agree, TSH can be useful in certain scenarios, but again, it can also be very confusing.

**Dr. Joseph Mercola:**

Yeah. So, this is good. And for those who don't know, T4 is metabolized to T3 in the liver, and that's the active form of the thyroid hormone. T4 is a relatively inactive and doesn't really work until you convert it to T3. And if you have a challenge, you can veer it off and perform this reverse T3, which is non-functional essentially, and makes things even more confusing to evaluate. Do you find it clinically unwise or maybe even reprehensible to suggest thyroid replacement therapy? And also maybe integrate into your perception of how many people need thyroid, how many adults? It seems like the majority would benefit from it. At least that's my perception. And if they're going to take it's unwise and being kind is probably far worse than that to not take T3, it's really a poor choice to take T4 exclusively for the reasons you just stated.

**Keith Littlewood:**

Well, I think it's one of those, it depends. I've seen some people do really well on levothyroxine in the short term while they're still with my clients. I've seen a lot of people respond really, really well to T4, T3 combos. Some people do really well with NDT, some people do just really well on just plain old T3. You don't tend to see that in the kind of standard medical kind of treatments, and it tends to be your integrative physicians and clinicians that would tend to use that approach.

But I certainly think that there's a lot of research to suggest that's good. And certainly anecdotally in my practice, I've seen that substantially throughout a long period of time. I think that there's some interesting research out there as well that shows that, from mathematical modeling, that TSH and T4 will always try to support the T3 values.

And there are some other papers as well that suggesting when TSH does start to hit two, that's when you are starting to see more of the inflammatory markers. You're starting to see poor insulin responses, you're starting to see other inflammatory markers. We know TSH is kind of associated with the production of the interleukins, like interleukin-6 and other inflammatory kind of pathways. And that's what I liked about Ray is that he combined the ideas is that when the thyroid was being disrupted, which could be by multiple things in the environment, stress, inheritable traits, nutrition and all of these other things, when that combines, that's when it becomes even more confusing. And that's when we start to see even more thyroid disruption. We see the fatty acids which can push T4 off the transporters and make even more problematic. And I still think that there's a lot of people thinking about dementia and Alzheimer's and Parkinson's as just this neurological decline when thyroid hormone could be the key driving state of this and combined with all these chemicals, they do tend to find in the brain post-mortem as well.

**Dr. Joseph Mercola:**

So, in your experience, what would you suggest are the primary causes of thyroid disruption? The most common ones, I mean, you can name up probably a list of 30 or 40 of them, but in your experience, what is it? Is it low calorie diets? Is it fasting? What is the low-carb diets? What is the tip ... Stress, which obviously all of those examples contribute to stress, metabolic stress, sure. Because the ideal optimal approach is to not just supplement with thyroid hormone. You want to treat the cause. I think you're derelict in your professional duties if you fail to do that and just give a Band-Aid that is effective and without side effects that treats it but doesn't treat the underlying condition.

**Keith Littlewood:**

Sure. So I think all of those things that are relevant, I think if we look to the major kind of cohort who tend to suffer the most, it's women who are times more likely to suffer from both thyroid function and from autoimmune type issues. I think the autoimmune type issues are slightly, again, becomes muddied again slightly with what's actually going on. But estrogen will suppress thyroid function and when there's an estrogen dominance and estrogen excess, it will suppress how much thyroid hormone is being produced. Now that could be what came first, the chicken or the egg, that becomes really hard to resolve, but ultimately, this kind of state will need supplementing with thyroid hormone because thyroid hormone will help increase estrogen metabolism. Also, there are many other things that could do that. So for example, the diet becomes intricately involved with trying to resolve this. You can't just throw thyroid hormones and expect that you're going to, A, lose weight and B, resolve all those issues because if you don't have enough energy in the tank, then you're not going to be able to function at that point as well.

If you're eating foods that further suppress thyroid function, raise ideas around high brassica vegetables which are high in the thiocyanates, which would suppress thyroid function, if you are eating a lot of the beta carotenoids which are high in the carotenoids, which will also suppress liver function and liver conversion of T4 to T3, that becomes ultimately ... And I used to have a

bias towards the idea that you could throw thyroid hormone and that would be a big kind of changer. And I would always work on diet as well.

I think in some cases that certain environments can be so damaging for someone when the pollution is ... it's everywhere and become overwhelming. Now if you put that, what is the ideal kind of tipping point for that or the perfect storm is if you've got poor inheritable traits, we all know that genes don't cause disease, but you can inherit certain traits that will predispose you to the extent that your nutrition's not in good order, to the extent that you under lots of stress and you're exposing yourself to certain endocrine disruptors in whatever it might be, the food choices, certain pesticides, very polluted environments in the city, perhaps even wireless exposure.

We still don't know enough about what could be doing there. All of these things can create a perfect storm. So it becomes almost like a clinical ecology exercise to start with. What can you remove from your environment that might be damaging you? And that could be a thousand different things for a thousand different people. So that's where it becomes quite useful to do your due diligence about what somebody needs. It's a needs analysis to get people to where they want to be. There's no point in just saying, "Hey, his thyroid hormone, everything's going to work out right," because it never happens like that.

**Dr. Joseph Mercola:**

Well, what I'm trying to get from you is your clinical experience was significant, you've got 15 years nearly into this and seeking to help people improve their health with these principles. And I'm assuming thyroid is probably the single most common endocrine problem you encounter. I've mentioned low-carb diet and fasting, but there's also, of course, estrogen, which is a huge player and xenoestrogens, and you can make a pretty strong argument that seed oils are a xenoestrogen because ...

I think estrogen has three double bonds of, I'm not mistaken, and they have the same darn mechanism with respect to causing pathology intracellularly by activating calcium receptors in the cell membrane that cause the calcium to go intracellular increases the production of superoxide and nitric oxide performing peroxynitrite, which is a pretty powerful negative oxidative stress into reactive nitrogen species. So that's going on. So I'm wondering of all those things, how common do you find seed oils, once you address the seed oils, which takes a long time to address, but the seed oils and the estrogens and the plastics and the pesticides and low carbs and low calorie. I mean, if you could rank order those, what has been your experience as to be the large contributors to that?

**Keith Littlewood:**

I think it is getting the diet sorted to start with. One of the most common themes that I've found, and my practice I think is probably about 70% females overall. And so usually, it's getting enough protein in, it's getting enough calories in, it's getting enough carbohydrates in and making sure that you can utilize those carbohydrates quite well. I mean, one of the most common mistakes everybody, I don't like the idea of a metabolic diet. I think that word's kind of just a bit. It's not something I use a lot of, but the idea that what you should be able to do is utilize carbohydrates as a fuel, everybody should be able to do it. I'm probably digressing slightly, but one of my [inaudible 00:16:57] about low carbon keto carnivore doctors is they think they can cure Type 2 diabetes by removing carbohydrate as a fuel source.

**Dr. Joseph Mercola:**

No. And only in their delusional dreams they could do that.

**Keith Littlewood:**

Exactly right. And then you hear the next thing, which is, but when I try introduce recovery carbs back in, my insulin response is haywire. And it's like you haven't done anything. All you've done is remove the substrate.

**Dr. Joseph Mercola:**

Delay it, right.

**Keith Littlewood:**

Exactly. So, you can't say that.

**Dr. Joseph Mercola:**

No, they have done something, they've made it worse because they're increasing cortisol and adrenaline and glucagon, which is not good on a chronic basis at all.

**Keith Littlewood:**

Yeah. It makes your ability to utilize carbohydrate often worse, and this is something that I've seen with lots of females coming in who've gone keto, they've gone carnivore and they're experiencing more disturbed menstrual cycles, increased hair loss. You can see that they're progesterone deficient. You see that estrogen taking a hold, and this is where it becomes problematic and you start to see the sleep, the digestion, the mood, energy, all of these things that tend to go out of whack. So I would say that the diet is the base for everybody to get that right. A lot of people are unsure of some of the chemicals that are around, and they tend to become more aware of that as the process goes on. So I do think it's getting the diet right first of all. I think it's becoming aware of the things that could potentially disrupt thyroid, decrease progesterone, increase estrogen, and then you could start to look at that straight away. But it's certainly something, I often work for at least a month or two, getting the diet right before you even consider entertaining them to think about thyroid hormone.

**Dr. Joseph Mercola:**

So that's a good point. And I think the concern, at least that I had initially, and it seems to be confirming with my continued exposure to Ray Peat's materials, is the key to successfully implementing the diet is you need to understand carbohydrates. And there's a vast difference in carbohydrates. And I'm actually just finishing up my draft of my next big book, which is "Cellular Health" that is essentially extending the work of Ray Peat, but his work is the foundation for this book for sure. And what I've done is I've categorized carbohydrates in 12 different groups based on their ability to be assimilated and used by the body. Because the problem is when you are sick, as almost every one in this country is, they are metabolically challenged, they're not making optimal mitochondrial energy at all. Almost everyone is impaired. And it's because of these exposures to these metabolic mitochondrial poisons that essentially de-suck out the mitochondrial energy and you lose the ability to optimize your microbiome.

That's where the crux of the problem is. It's like almost everyone is in an inescapable black hole until they fix the microbiome, you can never, never get healthy. You just can't. You can get better, but you can't get optimally healthy. And because you have this surplus of the pathogenic

bacteria which thrive or tolerate oxygen and you remove the beneficial bacteria which are killed with oxygen, and it's that when you lose the mitochondrial energy, you can't maintain that oxygen gradient.

So, the reason is, is because those beneficial bacteria, they thrive on the healthiest carbohydrates, on the grains and the beans and the polyphenols and all the whole fruits, not fruit, just whole fruits. You can do well with that, but if you have a compromised gut, you try to take those healthy carbs and you'll take you out, you're going to make so much endotoxin, you can go into a septic shock and die. And now that's not an exaggeration. That is the most common cause of death in this country, far exceeding the deaths from heart attacks and cancer. And it's not known, hardly anyone understands that. But endotoxemia is a massive issue. So it's understanding that in integrating the carbs carefully and selectively and customizing to the person's microbiome, having some markers to understand where the status of the microbiome is and gently introducing them until they can tolerate it. Because if you put the wrong carbs in, they're going to get worse. They absolutely get worse.

**Keith Littlewood:**

Yeah, I agree to a large component of that. My experience with it is when I was doing functional medicine testing and I was doing lots of GI effects testing, you always find something wrong. Right? I think what's interesting is-

**Dr. Joseph Mercola:**

What do you mean by testing? Testing the microbiome or functional testing?

**Keith Littlewood:**

Yeah, functional medicine testing like GI effects testing. So you get a rough off idea of the bacteria that's going on, any parasites that's going on, what type of bacteria in there-

**Dr. Joseph Mercola:**

So, the microbiome analysis?

**Keith Littlewood:**

Yeah, exactly. And I stopped doing that because I found that you could relatively, you could change someone without getting to spend all that money on testing. And that's what I became really interested in is what you can do without testing. How far can you get someone without them getting to spend loads of money on testing? And I think even with the idea, sure, some of those carbs are great and some people thrive really well on beans or grains, but some people also have substantial problems with that, and they do get increased LPS. They do get increased endotoxemia, and that's why orange juice, and there are studies that show that a glass of orange juice with a high fat carbohydrate meal actually lowers endotoxin. And sometimes there can be some things that go against people with drinking lots of orange juice. They don't perhaps have enough thiamine in.

And thiamine is a great multi-contra regulator of carbohydrates as well. So, any blocks in the chain where B1, B2, and B3 could be a problem as well. I always found that we know that with hypothyroidism, for example, the constipation is a key issue. When you have reduced T3, you

have reduced gut motility, and that's where everything tends to stagnate. And again, you produce more endotoxemia, which damages the brush border enzymes in the gut even as substantially as everything else. And so, you can remove some of those kind of more problematic starchier foods and go for the simpler foods. But I think it's always worthwhile starting in moderation. I think one of the biggest mistakes that people tend to read from after reading Ray's work, and he's never said this, is they just go full on and going from a really low carbohydrate diet to a really high carbohydrate diet and they can't process the carbohydrates and they gain a bit of weight and they go ... There's a certain amount of people that gaining weight is actually reasonably beneficial for them.

There's a certain people that can't process. They kind of have a poor thyroid regulation. Carbohydrate is regulated by thyroid hormone. If you don't have enough thyroid hormone, your pancreas doesn't work efficiently. You don't produce any of the other enzymes that help to break down your foods, and ultimately you don't have a good insulin response as well. So if your T3 is off, you are hypothyroid. Throwing loads of carbs into the mix can be quite problematic. And that's why it's prudent to take this kind of slower beneficial approach of just going very slow to start with.

I remember when I first ... If you've ever come across Matt Stone who wrote some really good books, which was synthesizing some of Ray's work, I remember going, eating at a hotel behind us one night about 15 years ago, and wondering why I couldn't sleep that night because I had a high fat, high sugar meal that produced kind of load of endotoxin. I hadn't sorted out my ability to have regular bowel movements. And you're absolutely right. It's key. Digestion goes hand in hand with thyroid. It goes hand in hand with regulating thyroid, absorbing thyroid from the gut as well, and also how to regulate insulin as well. And if you can't digest your nutrients, you are always going to have a problem with supporting the thyroid as well.

**Dr. Joseph Mercola:**

Yeah. The thing is, if you have a preponderance of the pathogenic bacteria, they're going to thrive and die and secrete endotoxin. That's just what they do, and that's a problem. So, you really want to avoid the carbs that contribute to that. And that's why simple sugars, simple sugars are far superior to starch for sure, because they're absorbed higher up in the intestine and they don't need to be digested. In fact, the ultimate simple sugar is pure dextrose, which is glucose. It's a different name for glucose, and that's what they give IV.

But you can take that and it's absorbed pretty close to the stomach. It goes right in, and you almost never increase endotoxins unless for some reason there you have SIBO [small intestinal bacterial overgrowth] or something over [inaudible 00:25:16] there. But if you have a normal gut where you don't have bacterial over infection in the small intestine, that goes right in. It's amazing how that could improve cellular energy. And the other thing you mentioned about the constipation, I'm sure your experiences, but it's my understanding that when you're constipated, you tend to reabsorb the estrogen that's excreted in the stool. So, you're actually increasing estrogen levels, which is another nightmare because that's something almost as equally as bad as endotoxin.

**Keith Littlewood:**

Yeah, no, I think what's it? Enterohepatic circulation?

**Dr. Joseph Mercola:**

Yeah, Enterohepatic circulation, right.

**Keith Littlewood:**

Yeah, yeah. Yes, of course it is. And that's the thing. I think the biggest thing is that I found that 95% of clients who have low thyroid function, you can change the diet and you can get rid of the constipation, they can still be low thyroid, but if you sort the diet out nine times out of 10, unless they're really hyperthyroidism that hasn't been treated for decades and they're in a really bad way, then you can see that improve with T3 or thyroid or NDT getting two or three regular bowel movements a day is the norm. Not once a day, not once every other day, which is a lot of doctors seem to be, you said, "Oh, every two or three days is still fine." It's not. You will absorb all that.

**Dr. Joseph Mercola:**

You're right. You got it two, three, four times. I think I typically have four to five a day typically. And normally for force, I'm not talking about loose liquid stools. I'm talking about well-formed stools.

**Keith Littlewood:**

Yeah. I think that's the goal for sure.

**Dr. Joseph Mercola:**

Yeah. So, let's pivot to another hormone, which was one of Ray's favorites that, maybe his favorite. He wrote his Ph.D. in this in 1982, it was on estrogen. And this is really controversial because there's so many people out there who thinks it's the cat's meow. And they've been essentially brainwashed, if you believe Ray's perspective from the pharma industry that there's been this massive push for estrogen supplementation or ERT, estrogen replacement therapy. And then interestingly, there was a study, the Women's Health Initiative, WHI, which is published in early 2000, which tend to confirm Ray's hypothesis, but there's many, many people in natural health who take that study and just blow it up and despise it and say it was all wrong. You need bioidentical hormone replacement therapy. So I don't believe that. I believe in Ray's approach. I think estrogen is something that needs to be minimized.

It's dangerous and it's probably one of the major contributors to cancer in my view, and men and women, not just women. So, you need to be aggressive. So I'm wondering if you share a similar feeling and if you do, maybe comment on the diagnostic interventions because what contributes to the confusion on this, and I started to understand this from Georgi's perspective, Georgi Dinkov, that the confusion is generated because clinicians will do serum or urine or saliva testing of estrogens and they'll find it's really low and it should be low because it really isn't in those tissues.

It's actually in the organs. And so you have to do biopsies to measure that accurately. And that's not done. And they're assuming the serum levels are equivalent to the tissue levels and they're not. So they're getting falsely low readings when if you did it at the tissue, they're extraordinarily high, which just contributes to the confusion. So I'm wondering if you can address that and then your perspective, and then I want to talk about another simpler test that seems to be even far better and much less expensive, and it's prolactin to assess your estrogen status.

**Keith Littlewood:**

Yep. I would concur with that. I mean, where is the highest amount of T3 found? The highest amount of T3 is found intracellularly. It's not in serum. So if you apply that rationale to estradiol, for example, and maybe the other weaker estrogens like estrone and estriol, they are going to be in the tissues. Now, bear in mind, if you have any amount of adipose tissue, you are generating estrogen by default, and the amount of aromatase that's being produced will convert testosterone and other hormones also to estrogen. So looking at the serum test, I think urinary tests can be useful, but again, they have their pitfalls because they're not representative of systemic tissue status of these hormones. But I think they can be useful. But again, there are pitfalls to them. So I think the idea that of using something to test like prolactin, the pituitary hormone, bearing in mind that the pituitary adenoma or pituitary tumor is advancing as one of the most common tumors that we tend to find now.

And that's been going on for a steady rise over decades since the '40s or '50s. I think Ray cited a research called Korenchewski who talked about how the pituitary tumor is relatively rare, but they were finding them. Now we increased exposure to oral contraceptives to xenoestrogens and estrogen-mimicking chemicals. Any estrogen that's kind of excessive particularly in the brain tissue will cross over from systemic tissues in the body and it will sensitize the pituitary to growth. And this is why we tend to see first a hyperplasia and then sometimes tumors, most prolactinomas tend to be quite benign, but the bigger they get, the more problems occur like disturbed eyes, sensory issues, and these can be problems. So yes, the prolactin can be very, very useful. I think keeping prolactin round about 10 milligrams per deciliter, I think is the general idea. I think the average kind of reference range is anywhere from 20 up to a couple of hundred, I think I've seen some places.

It's like when you start to see prolactin that high, you start to infer that there're going to be some problems probably related to high estrogen. So yeah, I think those things are very, very relevant. Sometimes you can actually look at someone and tell whether they're estrogen dominant. You can certainly see it in guys drinking a lot of beer, a lot of phytoestrogens. You will tend to see a combination of weight gain that is kind of promoted by high phytoestrogen exposure. And in females, you can see that too. There are certainly estrogen-like traits with increased adiposity, certainly hormone dysregulation, which can go from dysregulated cycles to heavy clotting to dysmenorrhea, amenorrhea. It can go both ways. And there are, again, the mixing or muddying of the water tends to be conflated by the increased estradiol will suppress thyroid hormone, will suppress progesterone.

We know that estradiol, going back to your point about cancer, we know that the estradiol is the proliferative hormone. Progesterone is the anti-proliferative hormone that has that effect that stops the hyperplasia of the uterus during the menstrual cycle. So, there are plenty of studies that show that estrogen causes cancer and by way of causing disordered issues at mitochondria by kind of causing mutations, by causing hypoxia. All of these things that are relevant, they're also associated, but you can see them within the premenstrual phase, premenstrual syndrome. You can see them with issues with women who tend to miscarry within the first trimester. These are good indications of some of the things that are incidentally related to these conditions.

**Dr. Joseph Mercola:**

And they literally crush mitochondrial function and contribute to hypothyroidism, for sure. No question about it, suppress thyroid function. So, in your experience, do you think ... It seems from my perspective that the prolactinomas you refer to are almost purely the result of excess estrogen and that if you take aggressive anti-estrogen interventions that they disappear. And when I first started Ray's work, and I never measured prolactin before, I didn't understand it. So, I started measuring it. My prolactin was over 10, it was like 15 or so. Then I started taking progesterone, transmucosally, dissolved in vitamin E as Ray figured out was the best way to do it, and not that much, maybe 25 milligrams and put it on the gums. And then my prolactin levels dropped to below five.

**Keith Littlewood:**

That's good. [inaudible 00:33:44] round about four and below is great. I think keeping prolactin as low as possible is great. And yeah, I certainly think progesterone will do that. It is predominantly a female hormone, but men do need it as well. And I think the idea that-

**Dr. Joseph Mercola:**

Yeah. [inaudible 00:33:57].

**Keith Littlewood:**

Yeah, absolutely.

**Dr. Joseph Mercola:**

I think you can make an argument that almost all adults need it.

**Keith Littlewood:**

Where there's chronic stress, there's chronic progesterone depletion, there's usually chronic testosterone depletion, chronic thyroid depletion as well, so yeah, absolutely.

**Dr. Joseph Mercola:**

So how would you rank the hormone therapies? Because endocrinology is your passion. So, with respect to replacement therapy, obviously we talked about thyroid and progesterone. Would you write those as the top two? And what do you think about pregnenolone DHA and do you ever think there's a need to supplement testosterone? And certainly, I suspect we're both in agreement that virtually no one should be supplementing estrogen?

**Keith Littlewood:**

Yeah, I don't think so. I mean, I've seen probably one female client over the last decade whose life was changed with estrogen, but again, it becomes implicitly hard to measure that when there are other things going on. And that wasn't a client I saw for a long time because she was just dead set on taking estrogen forever. So, I do think that progesterone is generally essential for most females where they're menopausal or we see quite a lot of ovaries being removed for certain issues, whether it's ovarian tumors. And again, there's plenty of papers that support the effect of progesterone as the ultimate ovarian protectant. So I do think that there are cases that with regards to pregnenolone, I see some people do okay with it. And I think pregnenolone is a useful kind of base. We know it's the base hormone that converts to progesterone and then onto the other hormones.

And I do generally think, I mean, speaking from my experience, progesterone tends to have the more beneficial effects for most people with pregnenolone. I do see some people who've kind of used both pregnenolone and progesterone together. I generally don't see a need for taking both. I think pregnenolone can be useful just as a catch-all. And certainly when you're in a high levels of stress, I've seen countless clients respond to progesterone therapy, both male and female. Somebody contacted me from Germany recently [who] had some bad burns that showed that topical application of progesterone significantly reduced the damage in that. And I just hear from females all the time, eradication of premenstrual syndrome getting pregnant where they were technically infertile, calm in mood, better sleep, hair thickening reduction of many kind of menstrual related syndromes. I think you could throw not just hormones in there, things like thiamine are very, very useful.

I can't remember if it was Ray's writings, but the book series "Vitamins and Hormones," but edited by [Gerald] Litwack. But if you go back to the ones in the '40s, I think '42 it started, they talk about how thiamine and B complexes were use for resolving menstrual cycle issues. So I think it's not always just about thinking about what the hormones do, but you get some really good results with increasing thiamine levels. Now, for example, if you don't use carbohydrates very well, thiamine can be one of those things that isn't related to ...

I mean, thyroid energetics, instrumental in mitochondrial bioenergetics in the electron transport chain. But again, if you're not having enough thiamine in and you can have thiamine depletion from eating loads of shellfish, too much coffee, over consumption of carbohydrates, for example, particularly things like rice, for example, and that would deplete thiamine, and you can be taking thyroid, but if your thiamine is depleted, it will be a blockade in your phase complex, one of the electron transport chain. So it becomes not always just about throwing thiamine, it's understanding again by doing a good needs analysis where the blocking factor is for some people. And sometimes you can see that from certain symptoms and that.

**Dr. Joseph Mercola:**

Yeah, so for sure, and you emphasize the point that hormones are not the magic bullet. You really need to treat the whole process, which is looking at the diet and what else you're doing. If you're under a lot of stress and you're eating low-carb and low calorie, that's not a good strategy. And you have to address the causes in addition to providing the hormone support.

**Keith Littlewood:**

And you can throw light deficiency with that as well, inadequate vitamin D and acute red light exposure. All of these things contribute to it. Some people believe that the seasons regulate thyroid function, which I don't believe, I mean, certainly sometimes in mating animals that could be the case, but we tend to see a lot of subclinical hypothyroidism developed during winter. And sure, some people do respond to light exposure. Seasonal affective disorder has some really good results with light therapy, but there are some people that just don't do very well. As soon as they start to get cold, there's no amount of light that they actually require. And this is where thyroid hormone can be really, really useful. Again, like you say, it becomes really important to do a good needs analysis and find out what the person needs.

**Dr. Joseph Mercola:**

Yeah. So, have you ever found value supplementing testosterone? It seems like that may not be necessary.

**Keith Littlewood:**

I haven't personally. I mean, I've had some clients who've used it. It tends to be rare. It's quite a big thing. I know it's very easily ... Something that's quite easily-

**Dr. Joseph Mercola:**

Popular in the U.S.

**Keith Littlewood:**

... dispensed in the U.S., right? Yeah, that's something I've seen before. No, I haven't seen it much in my practice, but as I said, 70% of my client base is female and some clients have talked about testosterone therapy, but generally progesterone does tend to tick the box for them. I've even seen some quite anabolic responses from guys taking testosterone and also improve erectile dysfunction and libido with taking progesterone because it will convert to testosterone.

**Dr. Joseph Mercola:**

Yeah, yeah, that's good stuff. All right, so aside from the endocrinology perspective, what would you say are some of the things you've learned in the 15 years that have some universal applicability that most people would benefit from, that apply to Ray's principles?

**Keith Littlewood:**

Well, I think that there are some wonderful things. I mean, the idea about the carrot salad has probably been ... I've seen people with 20 years of chronic IBS (irritable bowel syndrome) take a carrot salad and cut out some of the other foods and bingo, it's gone. That's what I love about Ray's work. He gives some very simple solutions to end up being complex diagnostic problems when you put them into the medical system. I like the ideas that he synthesized some really great giants of science like Albert Szent-Györgyi, like Hans Selye, Mae-Wan Ho and all the ideas that they brought together. So synthesis of science and [inaudible 00:40:37] and biology and how not everything that's inherited is driven by genes as an example. We've got caught so-called up in this genetic dogma, and I think Ray pointed out that billions have been spent on the genomic database and it's created very little success as regards to magic bullets within medical therapies.

And I think having a healthy mistrust of the standard medical system is quite useful. I mean, I haven't seen a doctor now for probably seven or eight years because I think being able to become robust and analyze your own problems and work out what's going on and ultimately help people to understand where solutions are from looking at nutrition, looking at understanding the environment, looking at historical factors, how money has influenced science and biology to come up with this kind of very warped idea of what generates good biology over time. Even the ideas of Ivan Illich and his philosophical approaches to health. I don't know if you've ever read Illich's *Medical Nemesis*, which I think is an excellent book on the problem around diagnosis and the idea that you can turn a person into a patient at a single checkup and ultimately manage their health for the rest of their life while you plug them full of as many medications as possible.

So it is these ideas, I think from a philosophical perspective, that interest me just as much and the basic ideas of the tenets of good nutrition. I think a lot of people do get caught in the idea there's a Ray Peat diet and there isn't a Ray Peat diet. There's no such thing. He just came up with the idea is what are going to be the best things for a specific period of time to get you to the best place where you can be. And that's what I liked about his approach, to be honest. I think the

hormones are very important. I think metabolism is very important. One of the interesting things that really kind of got me going, I think about 2015, I was looking at Ray ideas around serotonin and histamine and I went and studied a course on the neurobiology of sleep and lo and behold, I found out that actually serotonin and histamine were [inaudible 00:42:50] neurotransmitters, so it makes complete sense to decrease the serotonin and histamine response.

And that's where I kind of got more into his work because I could see where, from a biological perspective, he was spot-on about many, many things and that's what kind of drew me to him as well. And ultimately, it's kind of formed my career path now. I never thought in a million years, I actually left school at 15 with virtually zero qualifications and in my late forties doing a master's degree and then a Ph.D. I think is enough to say that he's inspired me to kind of go and not just challenge my bias, but look for more solutions that might form better conversations for procedures and diagnosis in the future. I mean, I'm not above my station to think I'm actually going to do that, but it might contribute to the conversation that people have.

**Dr. Joseph Mercola:**

Yeah. Well, you've got more cellular energy so your brain works better and you can do things.

**Keith Littlewood:**

Well, that's the thing as well, isn't it? Is that you become more coherent and you're able to react in a normal balanced manner rather than respond to stressors with that typical fight-or-flight response that's either regressive or it's nonplus where you can't formulate the energy to respond to the scenario.

**Dr. Joseph Mercola:**

Yeah, for sure, for sure. You mentioned the serotonin issue, which is interesting. So have you modified your diet recommendations based on that in other amino acids? Because Ray was very careful about identifying specific amino acids that are problematic. Tryptophan was one of them. [inaudible 00:44:29] was another, and then cysteine and then larger concentrations, which you can get these in really large concentrations if you're just eating meat and nothing else. You're going to get a surplus of these that are counterproductive. And yes, you need animal protein, but you don't eat a lot of animal protein and it needs to be balanced with collagen, connective tissue, which is a third of our protein in our body. So I'm wondering, Ray of course, was a big fan of gelatin as opposed to ... I mean, we would recommend collagen too, but the collagen gelatin are identical molecules. Gelatin is just a little more processed. So have you integrated more collagen, gelatin, connective tissue into your program and made an effort to restrict some of these problematic amino acids?

**Keith Littlewood:**

Yeah, I think that's all very valid stuff and advice. I think certainly those things. I mean, I think Ray was kind of citing the studies for many moons ago that found that if you actually restricted tryptophan, cysteine and [inaudible 00:45:25], they actually contributed to longevity. And you also have to, when you do look at the longevity studies around fasting and calorie restriction, when you restrict lab rats their standard chow, they would tend to live longer anyway, which should make some sense that standard lab chow is actually not great food to be eating. So restricting bad food will make you live longer.

**Dr. Joseph Mercola:**

Yeah, it's not necessarily low calories, it's just restricting the bad food.

**Keith Littlewood:**

Exactly.

**Dr. Joseph Mercola:**

People get confused.

**Keith Littlewood:**

Yeah, I think the benefits of collagen and particularly glycine, which seems to be the most anti-inflammatory molecule, whether it's ... I think gelatin is probably the best form. There's some really good studies on the use of glycine for lowering oxidative stress, for improving sleep, onset sleep latency, even deep wave sleep. There's some really good studies that combine glycine and thionine together for deeper slow wave sleep. So, I think there can be, again, what the person is needing, but generally, as a rule of thumb, eating lots of meat, particularly in that tryptophan, high tryptophan format can be problematic because it can convert to more serotonin. I mean, even if you eat, let's say you eat a standard diet where you're getting meat in every meal, but you've also got a high amount of the digestive irritants. Maybe it's brains, maybe it's kind of certain emulsifiers or certain foods that would irritate the digestive tract.

This is just a recipe for increasing serotonin within those cells within the digestive tract. But when serotonin and the histamine combined, you can get a double whammy of both the digestive tract and the lungs as well. So, if you can decrease the serotonin, you will get to sleep quicker and you will also stay asleep longer. I mean, one of the reasons why you tend to wake up, in my experience, is because you have an inflamed gut, you're producing too much serotonin and also your ability to regulate blood sugar as well. So, histamine and serotonin together can dysregulate blood sugar responses as well. And one of the reasons why you wake up is because you can't regulate your blood sugar as well.

So, decreasing those, whether it's getting ... it can be a combination of increase the amount of glycine that you're getting relative to tryptophan. It can be removing the offending foods that would drive that kind of serotonergic response. That's why the carrot salad is particularly useful for lowering endotoxin inflammation, binding some of the molecules that should be going out. All of those things would have an effect. You can also consider perhaps some of the kind of soporific effects of, say, milk and the analogs that you get from milk, which can help to promote sleep. I mean, the old granny's kind of cup of milk and honey or cocoa, they seem to have worked for many people for long periods of time and there's certainly methods to that madness.

**Dr. Joseph Mercola:**

Yeah. So, have you found value to targeting the progesterone before bed, like a half hour, an hour before bed to actually increase GABA levels and suppress cortisone activation, cortisone?

**Keith Littlewood:**

Yeah, I've seen that work well with quite a few people now. I've experimented with it myself and I've certainly noticed a difference when I've used it as well. I think from a stress perspective, it can be very, very useful. So yeah, it's one of those things for females, it certainly, and guys as well, I've seen it work really, really well for progesterone and sleep.

**Dr. Joseph Mercola:**

It's like a no-brainer. You get all the ... And it appears to have universal benefit, not only for specific endogenous estrogen or exogenous that you're swallowing from pills, which you shouldn't be, but you could. But then more importantly, the pervasive influence that most of us have, which is xenoestrogens from plastics and industrial chemicals frequently stimulate the estrogen receptor. So, it doesn't matter if it's just from molecules, what matters is the receptor that you're stimulating, affecting [inaudible 00:49:26].

**Keith Littlewood:**

Yeah, and what's interesting about progesterone as well is that it doesn't always seem to work by its effect by the progesterone receptor. Again, there've been some really interesting studies within cancer cell lines. Again, [inaudible 00:49:39] glioblastoma cell lines that have shown that high doses of progesterone, they have bound to the progesterone receptor in some cases, but they haven't stimulated the response of differentiation and reducing proliferation in these cancer cells. So there's another mechanism that we're not quite sure about what's going on there, about how that actually works.

**Dr. Joseph Mercola:**

What are some of your favorite approaches with Ray Peat's work that you find particularly beneficial for most people?

**Keith Littlewood:**

They can be quite wide, like I did say the carrot salad has been particularly useful. I think the idea about eating regularly can be really, really useful for people eating four to six meals a day can be clearly quite useful. But I also think-

**Dr. Joseph Mercola:**

What do you think the ideal eating window is? Because there are a lot of people who recommend extreme intermittent fasting, which would be like the most extreme would be one meal a day. OMAD is frequently referred to, or even a four-hour eating window or two hour eating window, or ... What do you think the ideal eating window is?

**Keith Littlewood:**

I think it depends.

**Dr. Joseph Mercola:**

Okay. That's a good answer.

**Keith Littlewood:**

I think really just in general for each person. I think, and like I said, what I was going to say on top of that is that that's really good strategy to get you out of a hole to stop the body guessing. So if you've been doing that, going to four to six meals day can be really useful. It's probably not a good ... You don't need to stay on that forever. And I think even Ray talks about the ideas that some people could do really well on one or two meals a day, depending on who they are and what they're going through.

So it just depends. We tend to find now with stresses ubiquitous, these chemicals that we talked about are ubiquitous. Then sometimes we probably need to support the body a little bit more. I

actually gravitate to eating more three square meals a day, and I tend to enjoy that. I have the odd snack or something, but I'll always sometimes get clients eating like that to start with, but then some don't eat. It depends when it comes to eating strategies. My favorite thing, and I'm always looking to get people's digestion and sleep started, first of all, and usually I think you can do that within the space of a month or so by getting the right strategy. I think sometimes the sleep stuff, looking at the idea of inhibition and Ray opened up my ideas to the idea of recuperation, and this is where ideas around, I think cyproheptadine and periactin I think are particularly useful if you're getting people into deep sleep just for a short period of time.

I've seen some people go for years on it before they come to me. I don't think that's necessarily a good idea, but I do think that taking it as a strategy to get you into the next phase of healing, sleeping through the night, we know is a game changer for most people. So if you can get the serotonin and the histamine down, some people might still need a little bit of support and particularly stress. And that's where I think molecules or compounds cyproheptadine can be really, really useful. So that's been quite an interesting approach over the last few years. And again, it's not something I use with lots of clients, but I think being able to shut people down and sleep so they get into sleep, they stay asleep and they wake up refreshed within the space of a few days or a week or so, that could be quite useful.

I think what's really important to add is that a lot of people will go, again, try and add in ... It's a bit like functional medicine and some people will start adding 10 to 20 different supplements all at once, and it's like you have no idea where the benefits are and where the pitfalls are. So I always think taking something in a slow kind of exposure to certain things to find out what's working and what's not. But again, digestion and sleep, I think for most female clients, it's always great to see them happy. I get some clients who are just utterly miserable because they've been through years of hormonal health as it were, and this is where I think progesterone has been absolutely amazing. So I get quite a lot of reward. I don't do as much consulting as I used to because I'm so busy in the lab these days, but I still do it.

And I had a client this week just seeing her change and getting better sleep, seeing how troubled she was to start off with. I really enjoy that still. And I think it's a lot of raised work, as I mentioned at the start of this chat, is that very simple strategies can lead to some amazing results, and some of these things just get wrapped up in medical diagnosis over treatment, over diagnosis, and I think this is still a huge problem. And like the ideas that we talked about, what are some of the things that Ray have stuck with me? It's understanding that you don't need to go through this kind of over diagnosis and over complication.

**Dr. Joseph Mercola:**

Yeah. Have you integrated exercise programs into your strategy, getting people moving?

**Keith Littlewood:**

Yeah. Well, I used to be a rehab and trainer and therapist, so I did that a lot. I mean, I'm more about the ... I don't write exercise programs up. I haven't done that for about 10 years now, I don't think. But I encourage. I always generally start off if someone's been kind of either over exercising or hasn't been able to exercise as it's just the position with clients. Sometimes the same thing can be just to get them walking to start with, getting to walk just by breathing through

their nose and avoiding mouth breathing. That can be a great way to start. Very basic strength exercises with adequate rest periods. That can be a great way to start. It's important, I think, to get buy-in as well. There's no point in encouraging people to do things they don't want to do. Some people hate running, and I actually stopped running years ago to be honest, but I enjoy really long walks.

I enjoy training every now and then a couple of times a week, or I think it's important to get a buy-in that people really enjoy doing. So, exercise I think is key. I think that's one of the pitfalls. I think with Ray, I don't think he placed exercise as high up there as he might've done. But again, he talked about living a life that had a lot of contentment to it and doing things that were useful and interesting, rather than spending a life of over exercising and breathless exercise, which would lead to this hyperthyroid state anyway. So I think doing the right amount of exercise, it's not too much, certainly not too little, and that's, again, something you tend to see people who've been exercising five, six days a week push themselves into a hole. So yeah, adequate strength training, mobility training, moderate amount of cardiovascular exercise through regular walking I think is where most people need to be at.

**Dr. Joseph Mercola:**

Yeah, I agree. I think in my view, walking should be essential, and I'd be really ... Obviously time is a limit for most people, but if you don't have the time, it's going to be hard. But if you're going to do it, any exercise, you should do walking first and then do something on top of that because your body is designed to move, and if you don't move, your health's going to go downhill. I mean, it's lymphatics -Your body needs to move. It's just required to do that. And it doesn't need to do strength training, although it's nice. It doesn't need a [inaudible 00:57:01]. That's nice too. But you got to walk. You got to move. That's my view.

**Keith Littlewood:**

Yeah, I agree. I think walking is one of the most underrated forms of staying healthy ever. So yeah, I would totally agree with you.

**Dr. Joseph Mercola:**

Yeah, it's just simple. It doesn't cost anything. It is really, really uncommon for people to get injured walking. You can sprain your ankle or something I guess, but it's hard. It's really hard. Not many over-abuses.

**Keith Littlewood:**

And walking in nature as well. I mean, I think people-

**Dr. Joseph Mercola:**

Yeah, absolutely. Sure.

**Keith Littlewood:**

See people getting out in the city is fine and stuff, but getting out where it's less polluted. You have the colors, the vivid colors, and just being in nature I think is also substantially underrated.

**Dr. Joseph Mercola:**

So, are you still seeing patients?

**Keith Littlewood:**

Yeah, I still see people. I've cut down a little bit, so I tend to see not as many. Because my Ph.D. is part-time, but I've been in the lab 15 days out of the last 21. So I just take-

**Dr. Joseph Mercola:**

Oh boy.

**Keith Littlewood:**

I know, it's getting a challenge.

**Dr. Joseph Mercola:**

What are you doing your thesis on?

**Keith Littlewood:**

It's the effect of multiple thyroid disrupting chemicals on the thyroid axis.

**Dr. Joseph Mercola:**

Okay. So, you are working in animal models?

**Keith Littlewood:**

Yeah. Well, at the moment, we're just doing some proliferation studies in glioblastomas, but I've been using mice models for looking at brain tissue slices and molecular products within the brain. We're looking at certain mRNA, also going to be looking at some signaling as well. So yeah.

**Dr. Joseph Mercola:**

When do you get your thesis?

**Keith Littlewood:**

Well, I'm two years into six years, so I've got my ...

**Dr. Joseph Mercola:**

Oh, you're just started.

**Keith Littlewood:**

Absolutely.

**Dr. Joseph Mercola:**

That's worse than medical school.

**Keith Littlewood:**

Yeah, it's certainly a challenge, but it's interesting for someone that never studied chemistry and math, that's been the real ... where I've had to increase my capacity and looking at how to run, analyze stat tests,

which I absolutely hate. If you're in biology, you actually like to know the processes of the mechanics, not the statistics.

**Dr. Joseph Mercola:**

Sure. Absolutely. So, if people wanted to connect with you, what's the best way to do that?

**Keith Littlewood:**

I have a page on Instagram, which is @tommolittlewood or Balanced Body Mind. I'm not as prolific on there. Again, when I finish my Ph.D., I'll be putting much more stuff out. I have Balanced Body Mind website and Keith Littlewood Coaching or Consulting. So, they're generally the things that people get me.

**Dr. Joseph Mercola:**

Okay, well, this has been great. You obviously enjoy what you're doing and you've helped a lot of people and you get the benefit of reaping the rewards of being a healer and see people get better. That's so satisfying. It's really one of the primary drivers of being in primary care.

**Keith Littlewood:**

Yeah, no, it's been rewarding and to actually going back into biology at 40, late forties was really interesting, but I actually ... feel like I'm a late developer, but I've kind of found my calling later on and I'm quite happy with that.

**Dr. Joseph Mercola:**

Yeah, yeah, yeah. That's the key is to identify what you enjoy, listen to yourself, trust yourself. Don't trust others. You can listen to them and their data points, but they certainly don't want to take actions based on others' recommendations necessarily. You want to take it on what you feel is best for you and that's going to ultimately give you the most joy in life. I think that's a powerful strategy to consider.

**Keith Littlewood:**

Well, you must be feeling like you've done quite well then.

**Dr. Joseph Mercola:**

Yeah, I'm joyful most of the time actually, because we're embarking on strategies to really bring health to the large portion of the world that's been so damaged and brainwashed with misinformation and lies about health at the result of increasing these large corporations, personal profits or corporate profits. It's sad state of circumstances, but it's fixable. I'm convinced it is, and nothing will give me greater joy than see that whole thing overturned.

**Keith Littlewood:**

Well, I certainly think, especially after the last few years, what's been going on that something needs to happen that puts them in their place.

**Dr. Joseph Mercola:**

Yeah, it will. I'm going to be sure of catalyzing that one for sure.

**Keith Littlewood:**

Good stuff.

**Dr. Joseph Mercola:**

All right, well, keep up the good work, Keith. It's great to see you having such good successes.

**Keith Littlewood:**

Great, and thanks for having me on. Much appreciate it. I really enjoyed it. Thank you.

**Dr. Joseph Mercola:**

All right, you're most welcome.