Welcome to the Huberman Lab podcast where we discuss science and science-based tools for everyday life. I'm Andrew Huberman and I'm a professor of neurobiology and ophthalmology at Stanford School of Medicine. Today my guest is Dr. Kyle Gillette. Dr. Gillette is dual board certified in family medicine and obesity medicine and practices out of a clinic in Kansas and via telemedicine. He provides full spectrum medicine including hormone health, preventive medicine, obstetrics, which is the branch of medicine and surgery concerned with childbirth and the care of women giving birth and pediatrics. I first learned about Dr. Gillette from a podcast of all things and was immediately struck by the breadth and depth of his knowledge on all things hormones and hormone optimization. As you'll see very soon today, Dr. Gillette can teach you how to optimize your hormones using behavioral tools, nutrition, exercise-based tools, supplementation and hormone therapies if those are appropriate for you. There are many professionals out there including many medical doctors of course talking about hormone health. What really sets Dr. Gillette apart from the pack is his ability to understand how the different factors that I described before, nutrition, supplementation, exercise and hormone therapies, how those interact with one another and the safest and most rational ways to approach hormone optimization. During today's episode you will learn how to optimize your hormones, not just testosterone and estrogen but also prolact in other hormone pathways that impact your mood, mental health and physical health. Dr. Gillette is also an avid educator about hormones and other aspects of health. He does this on zero cost to consumer platforms such as Instagram and other social media on Instagram. He is Kyle Gillette MD. That's KYLEGILLETT at the end, MD. So Kyle Gillette MD on Instagram and he is Gillette health on all other platforms including LinkedIn, Twitter, YouTube, TikTok and Facebook. If you go to his Instagram or his other social media you will learn a lot about hormone health, about the latest science impacting obesity and metabolic health. He is a wealth of knowledge and again he's providing all that information at zero cost to you, the consumer. What you are soon to hear is a conversation between me and Dr. Gillette about all things hormones and hormone health and hormone optimization. We dive deep into mechanisms but we are clear to establish what each word or set of concepts mean. So if you have no background in biology or even if you do I'm sure that you will come away with a wealth of valuable knowledge. We also talk about specific protocols related again to lifestyle factors, nutrition, supplementation and where appropriate hormone replacement therapy. I know there's a lot of interest about these topics. Dr. Gillette is very thorough about addressing both male and female issues and addressing hormone health for people at all stages of life. I'm sure that you will come away from this episode with the same impression that I did, which is that Dr. Gillette is an extraordinarily clear communicator and that he has tremendous compassion for his patients and that he has a deep love of understanding biology and medicine in ways that can benefit you. I'm pleased to announce that I'm hosting two live events in May 2022. The first live event will take place in Seattle, Washington on May 17th. The second live event will take place in Portland, Oregon on May 18th. Both are part of a lecture series entitled The Brain Body Contract during which I will talk about science and science based tools, many of which overlap with the topics covered on the Hubertman Lab podcast, but most of which will not and will be completely new topics and tools never discussed publicly before. Both live events will also include a question and answer period during which you, the audience, can ask me questions directly about any aspect of science or science based tools and I will attempt to answer them. Tickets for the two events, again, Seattle on May 17th and Portland on May 18th are both available at HubertmanLab.com slash tour. Before we begin with today's episode, I want to emphasize that this podcast is separate from my teaching and research roles at Stanford. It is, however, part of my desire and effort to bring zero cost to consumer information about science and science related tools to the general public. And now for my discussion about hormone health and optimization with Dr. Kyle Gillette. Dr. Gillette, welcome. Thank you for having me. Well, I'm super excited to talk to you because I found out about you on a podcast and it immediately became clear that you are an encyclopedia of knowledge about hormone health for men and for women across the world. I have many, many questions. But before we dive into those questions, I'd love to just get a little bit of your background in terms of your medical training and what your particular orientation is toward treating your patients. And how do you think about this whole landscape that we call hormone health? What is a hormone? How do you envision people managing their hormones? If you could just kind of fill in a few of those blanks for us, I think a lot of people would appreciate it. Absolutely. So I'm dual board certified and family medicine and obesity medicine. I've kind of tailored my training in order to provide what I call a balanced approach to total health, which includes body, mind and soul. I recently saw a podcast with Joe Rogan and Mr. Beast. And Joe asks, Mr. Beast, how do you become such an amazing YouTuber and have all these great clickbait videos? And how did you become good at it? And it turns out he just became obsessed when he was a teenager. And that's essentially how I've tailored my education as well. I've become obsessed with optimal human performance, their body, their mind and even their spirit. So I attended med school at the University of Kansas, which is one of the few med schools that still emphasizes full spectrum care. They emphasize exercises medicine. They emphasize food is medicine, of which I was active in both of those interest groups. And residency, I was active in a lot of mindfulness curriculum and then also things like walk with a doc where you emphasize preventative medicine. That's something that we've kind of got away from and that niche led me to hormone health. It didn't really start as hormone health, but it's a very important component of health in general that many people don't emphasize. Well, this idea of preventative medicine, I think, is starting to really take hold in the general population, especially given the events of the last few years. People realize that they are showing up to health challenges at a bunch of different levels and with some people feeling very robust, other people feeling back on their heels. When someone comes to you as a patient, what are some of the first things that you want to know about them? Obviously, you want to know their blood pressure, you want to know something about their mental health and family history. But in terms of hormone health, what are the sorts of probe questions that you ask and what are you looking for? And I asked this because I'd like people to be able to ask some of these very same questions for themselves. Yeah. So when you do a physical exam and a history, you have a lot of different parts. You have your history of present illness. If they have a complaint, maybe the patient doesn't have a complaint. And that case, things like their social history and their family history are extremely important because that gives you an insight into their genetics and an insight into their hormone health. So a patient will tell me, I'm doing okay, but it helps to ask them, well, how are you now? Let's say the patient is 50. How are you now versus when you were 20? And what has changed? So I've got the question a lot. How do you get your doctor to order a better lab workup or to even include your basic hormones? And there's no magic answer to that. But what really helps is you tell them, you know, my energy is not as good as it used to be. My focus is not as good as it used to be. My athletic performance is not as good as it used to be. So you don't have to have a pathology in order for a lab to be indicated. You just need to have that pertinent symptom. I think that's going to be really helpful because for many people, the idea of getting a blood test to look at their hormone just seems like such an enormous hurdle to get over. And many doctors won't prescribe them. And would you say that it's using the approach you just described that it's equally effective for men and women? Or do you find that for one reason or another that men and women have different challenges in an advantage is in trying to access their deeper hormone data? Yeah, it's slightly different. With women, there's a lot more objective data. So if they're having menstrual irregularities or, you know, if they're going in, if they're not having a period, if they're having too heavy of periods, then those are things that they talk about very frequently, frequently with their doctor. They're men are more hesitant. So men really want to know what their testosterone is. But they, at the same time, they really don't want to tell their doctor how their libido is or how their energy is because it's almost like they feel less masculine or they feel less like a guy when they say that, even if they're just talking to their doctor about it. I think that that raises a really important point, which is that the whole discussion around hormone health is a bit of a barbed wire topic because in many ways when we hear the word hormone, we think testosterone and estrogen, we think notions of masculinity and femininity. And of course, testosterone and estrogen are present in all sexes, right? All chromosomes, all backgrounds and just a varying degrees and ratios. But it also raises all these issues about sexual health that it's kind of interesting because I surrounded by medical doctors in my lab at Stanford. And the more physicians that I surround myself with, the more open is the discussion around sexual health and reproductive health. But in the general population, I think some of these topics are a little bit taboo or again, it's kind of barbed wire. And so I think that people are seeking a lot of this information on YouTube and through communities that may or may not be very educated about the actual biology. So along those lines, we could probably assume that hormones are changing across the lifespan, certainly from childhood and puberty and onward. If you would, I'd love to just kind of take a snapshot of what you think everybody should be thinking about or doing to optimize their hormone health, male or female in their 20s. And then maybe we could migrate that to their 30s and 40s. But before that, could you just tell us what everyone should be doing for their hormone health from puberty onward? Yeah. The law of diminishing returns applies. So doing a little amount of what I call lifestyle interventions over a long period of time is going to be far more helpful or efficacious than doing a lot and then doing nothing or doing a lot and then doing nothing. So I talk about the big six pillars. The two strongest ones are likely diet and exercise. For hormone health, specifically resistance training is particularly helpful. For diet, caloric restriction can be particularly helpful, especially with the epidemic of metabolic syndrome that is continuing to on go in this country and in developed countries in general. So those are the two most powerful. So number one and number two are diet and exercise. For the last four, I have a little bit of a iteration. So there's stress and stress optimization that has to do with cortisol that has to do with your mental health that has to do with societal health and collective health of your family as well. When you're a member of a family or even a very close friend trying to achieve optimal health together is very important. It's the same thing with nicotine cessation, the same thing with hormone optimization. If you do it as a household unit, it's far more helpful. So after stress, you have sleep optimization. Sleep is extremely important, especially for mitochondrial health as well. And then you have sunlight, which encompasses anything that's outdoors. So you move more, you have cold exposure, you have heat exposure. That's sunlight. And then last one is spirit. So that's kind of the body, mind and soul. If you have all the other five in other dialed in completely, but you don't have your spiritual health, whatever you believe, then that's going to profoundly impact your body and your mind as well. We're definitely going to touch into this notion of spiritual health because I think for some people that might draw connotations of certain things that may or may not be accurate, but I know a number of academic laboratories that are focused on this and a number of not just functional medicine clinics, but research clinics and hospitals throughout the country that are achieving some really interesting data, not just in people that are quite sick, but in healthy people are trying to further optimize health. So we will definitely touch back to that. If you would be so kind as to maybe give us a little bit more detail about some of these other areas. So when people hear diet, I immediately think, okay, now we get into the the combat around vegan, plant based carnivore, et cetera. But I think that my general view of this is that most people should probably be eating as few highly processed foods, highly palatable foods as possible, which doesn't mean eating foods that don't taste good, of course. But what other sorts of things do you recommend in the realm of diet? And then I also want to know about caloric restriction because my understanding is that a caloric surplus can actually support certain hormones like testosterone. So how does one combine caloric restriction and still optimize hormones? But what would you say is it a really terrific way to think about an approach diet? Diet should be an individualized approach. So if you have a car, each car is made different and requires a different sort of fuel, whether it's a race car, whether it's a diesel truck, they have different fuels for different performance outcomes. So if you're trying to tow something or you're trying to go fast, so it's the same way with athletes, it's pretty well studied. The more intra workout carbs ultra long distance athletes take, in general, they do better. I think they've studied this in cyclists quite often. It also depends on your genetics. So you can have a genetic polymorphism and you metabolize carbs and sugar better even when they're unopposed by fiber. How does one determine whether they have such a polymorphism? I mean, I'm an omnivore. So I do eat some high quality meats, not in huge quantities, but I also eat vegetables and starches. I feel fine. I've never done an elimination diet. I think I did a very low carb diet once and all it gave me was a lot of psoriasis and poor sleep. So I backed off. I probably didn't do it correctly. But I know a lot of people that do quite well on a very low carb or zero carb diet. Yeah, particularly those who are at risk of cancer, because you have less glucose that can be easily uptaken into cells. And then also people with autoimmune diseases. They tend to do well on lower carb diets. Yeah. But yeah, as far as the, how do you know? Basically, you can use your biofeedback, how you're feeling to guess what you tolerate well, or you can just get genetic testing, which can be fairly expensive. But most of all, it requires a physician or someone who knows how to interpret the test accurately. And if someone had the means or would you say that getting regular blood testing is a good idea. And if so, what is regular blood testing? Is it every three months? Is it every six months? Of course, the backdrop of life is changing too. Stress levels, et cetera. Yeah. Every three to six months for preventative purposes. At times, you need blood tests that faster frequencies than that. And then you should also get a blood test when you're fasting and when you're not fasting. So if you're looking for damage to the beach, you want to, you don't just look at low tide. You look at high tide and you see what's happening at high tide as well. It's a great way to put it. And in terms of general recommendations around exercise, I mean, I'm of the mind based on the data that I've seen that almost everybody should, or everybody should be getting 150 to 180 minutes minimum of zone two cardio per week. That kind of could continue while having a conversation, but with if one were to exert any more effort, it would have a hard time getting the words out at least that right for cardiovascular health and general brain health and musculoskeletal health plus resistance exercise. Is that more or less the contour of what you recommend? Yeah, that's more or less the contour. The more you're doing your zone to cardiovascular exercise, the slightly less important, a long duration of cloric restriction is interesting. And that brings us to the caloric restriction. So it's very clear that caloric restriction can allow one to lose weight. Right. This is the classic Kiko CICO calories in calories out. Somehow that always has to be stated 50 times in any forum because of whatever follows people I think will anchor to and assume that we don't mean that but I know you and I both agree on calories in calories out as a fundamental law of thermodynamics. But it's clear to me that based on what I've read that when one is in a slight caloric surplus that hormones like testosterone can be optimized, but is that true for somebody who's showing up with excessive body fat? How does this all work because body fat is manufacturing enzymes that convert testosterone to estrogen? So in other words, how does someone know if they should use caloric restriction or avoid caloric restriction? Yeah, here's how to parse that out. So before I delve into the details a bit more, I should say as a board certified obesity medicine physician, obviously the laws of thermodynamics apply. And then in addition to that, there is nothing special about intermittent fasting or caloric restriction or exercise when it pertains to losing body weight in general when you do lose weight about 33% of that is lean body mass and about 10% of fat cells, you know, adipose cells are actually lean body mass as well because as proteins and water and things like that and it too. So the reason for exercise and the reason for caloric restriction in general, including intermittent fasting is health reasons that's how you increase your health span. It's not necessarily going to make the weight on the scale change, but that doesn't matter as much. It's been fairly well studied in both mice and humans is much easier to study in mice. So that's a precursor to our six types of people, the ones that care about my studies and the ones that care about human studies, but if you caloric restrict mice by 40% then they can have improved testosterone parameters, but only if they're obese to start. And it appears to be that same way in humans as well, so the easy way to think about it is if you're obese or you have metabolic syndrome caloric restriction will improve your testosterone. There has been a study and they talk about all these studies in a systematic review from the Mayo Clinic proceedings in March of last year. And they note that there is a study in young healthy men and they clorically restrict them and their testosterone does decrease. So if you're young and healthy and you don't have metabolic syndrome, then caloric restriction will likely decrease your testosterone. That clarifies a lot for me and I believe it will clarify a lot for other people as well. And I'm delighted that you pointed out this distinction about intermittent fasting not being the only way to achieve caloric restriction. There are a number of young healthy or older healthy people I know who like using intermittent fasting, even if they're not trying to lose weight for a couple of reasons. I believe that it might extend lifespan. I think there's still that still a bit of an open question. It's a bit of a hard experiment to do because the control group is it. No one wants to be in the control group as I say. It doesn't mice. Right. Exactly. Exactly. And the other feature of it that's a little bit tricky is that many people like intermittent fasting because of the mental effects, the clarity of mind that they feel during fasting, the increased pleasure in eating when they finally do eat. And here I'm referring to intermittent fasting of the sort where eating windows or anywhere from eight to 12 hours a day, not extended fast of 24 hours or more. So the question therefore is for the healthy lean enough person, right? Non obese person is intermittent fasting a bad idea in terms of hormone health is oscillating between this period of kind of feast and famine within a 24 hours. And there's a problem if one is getting sufficient calories to maintain weight. Yeah. So if they're in a chloric maintenance, then it's not going to be. It's not going to be deleterious. It's not going to be bad for the hormone health. There's a couple different hormones that we can talk about. We can talk about testosterone. We can talk about DHA, which you usually go hand in hand. And then we can also talk about growth hormone, which is not a steroid hormone, but it's a peptide hormone. So it's a chain of proteins, amino acids that are put together instead of a sterile think of sterile hormones is coming from cholesterol. So intermittent fasting you do get a little spike in growth hormone after you eat, but you also get a huge spike in growth hormone, a more significant less negligible spike overnight. And that is improved if you are intermittent fasting. So it's probably going to help your growth hormone and subsequently IGF1 levels, which will help more in older age groups than younger age groups. And I like to eat dinner. So for me, that means sometime around six or seven o'clock, sometimes eight o'clock, I confess last night, because I was working late, I ate, I ate pretty big. I just want basically my only meal today at 10 o'clock. That's a rare thing for me. Can I still achieve a high degree of growth hormone output if I let's say I avoid food in the two to three hours before going to sleep, or does one have to be very deep into a fast in order to achieve this the increase in growth hormone. There's still pretty good growth hormone output, even if you eat two or three hours before you sleep. It's just the law of diminishing returns the longer you go, you get slightly more and slightly more. And I know a number of people think of growth hormone in the context of the exogenous growth hormone and the fact that that can in some cases be associated with cancers. I've been asked many times before, can the increase in growth hormone from things like saunas or intermittent fasting cause levels of growth hormone that are so high that they cause cancers. My impulse is to say, no, that seems like it's not likely to happen, but I should probably verify that statement with you. Yeah, so quite unlikely. I think about growth hormone and especially IGF1. And there's actually an IGF1 and IGF2, but I think about it in terms of endocrine IGF1, mostly IGF1 that's synthesized in the liver and released in the liver versus IGF1 that's released classically an example of this would be. Your IGF1 levels increase after resistance training or exercise and that's more of like parachrin or autocrine and they have more local action. So that IGF1, it's pretty well studied that if you just give people IGF1, it's not going to at physiologic levels. It's not going to improve their body composition. However, that IGF1 that's autocrine and parachrin just working in those local tissues and muscles is likely part of the reason why you get a improved body composition response after exercise. I see. And just to clarify for me and for others, what can we say are the major functions of IGF1 and IGF2 that are distinct from just growth hormone? Are they just kind of the active hormone, growth hormone, the kind of the pickaxe end of the assembly line? So they have a much longer duration of action. I believe the half life of IGF1 is several days, almost a week, whereas growth hormone has an extremely fast half life of only hours. So growth hormone acts significantly on the liver to produce IGF1. So it's around in the serum in the blood long enough to where it's producing an effect pretty much all the time. Very interesting. Well, and then the other pillars, stress, we've talked a lot about stress on this podcast before in tools for managing stress. Sleep obviously is a big one. I think if nothing else, I will either put people to sleep with my podcast. Certainly not this one, but my solo episodes or hopefully convinced people that sleep is the foundation of mental and physical health and performance. Are there any aspects of hormone optimization that can improve sleep? I know sleep can improve hormone optimization, but are there any aspects of hormone optimization that can improve sleep? And for people that are suffering from this common syndrome of going to sleep and then waking up at three or four in the morning, we know that can be associated with depression. But are there any hormonal indications that might lead to that kind of situation? Yeah, there's three big ones. The first one is not super common, but it's a very direct correlation. If you have a growth hormone deficiency, a true deficiency, whether you're an adult or a child, then your sleep is likely going to be affected. And let's say you're a child with growth hormone deficiency. Once that is replaced with therapy, your sleep is going to get significantly better. The second one that's a very common scenario is if you're having what's called vasomotor symptoms of menopause or vasomotor symptoms of andropause, which are also applicable. And that's where your progesterogenic activity, so your main progesterogens are progesterone and then pregnant alone and then five alpha, three alpha progesterone, which is less manufactured in the body. So they're manufactured in a few places in men, they're manufactured some in the testes and the latex cells in women, they're manufactured in the ovaries until menopause, and then they're also manufactured in the adrenal glands. So if you're in, if you're pre-adrenal pausal, where your adrenal glands are still working fairly well, you usually still have a decent amount of progesterone around, and this can be measured too. So after menopause, women make progesterone from their adrenal glands. That progesterone crosses the blood-brain barrier, especially if it's five alpha and three alpha reduced, so it's modified a little bit. Then it is both a GABA agonist, which helps sleep just like GABA does, GEMO, immunobuteric acid, the main inhibitory neurotransmitter, of which lots of things work on alcohol, works on GABA as well. So if you have a PIN10, also works on GABA, migraine medicines, many of them work on GABA, benzodiazepines, and also non-benzoes. So an example of a benzodia, an X-an example of a non-benzo would be ambient. So those all work on GABA. So GABA is also helped by the progestogenic activity as well. That's why a lot of women in menopause feel like their sleep is much worse, is because they have lower activity of those progesterogens. And for men in so-called Andropause, low test Ostrone is that also one of the causes of poor sleep. Low test Ostrone can lead to poor sleep, but my third scenario is actually, if a man begins TRT, then they develop a poor sleep because of sleep apnea. It drastically raises the risk that somebody is going to have sleep apnea. And then a lot of people, especially when they first start in the first month or two, it puts them into this hyper sympathetic state because they have overactive antigen receptors, especially after a long time of being hypo-ganatal. Then they have a physiologic dose of TRT, and that causes the sleep issue itself. Interesting. I have a lot of questions about TRT testosterone replacement therapy. I should just mention that when you say it increases sympathetic activity, you don't mean that taking testosterone increases sympathy for others. It may, in fact, do the opposite, although it's very clear from my discussions with my colleagues on the endocrinology side and also with the great Dr. Robert Sapolsky that increasing testosterone merely exacerbates existing features of people. So the jerks become bigger jerks, kind of people become even more kind in general. So I want to get into TRT in depth. That's very interesting to me to hear that testosterone replacement therapy increases the risk of sleep apnea. And I want to make sure that I ask that is that also the case in people that are using TRT who are not hyper-ganatal because in the classic situation as somebody isn't making enough testosterone, they're below 300 nanograms per desoleter on the chart. But many people nowadays, let's be honest, are taking doses of testosterone even though they are in the sort of standard range because the range is so large because of other symptomology. Is that right? Yeah. I do love the analogy that Dr. Sapolsky had about monks taking testosterone and making them more and more generous. So that does appear to be what testosterone usually does is it exacerbates, if you will, what you're previously like. So it's not going to change you as a person. But if you're eugenadal before you start testosterone, meaning you have normal testosterone and then you start TRT or self-administered TRT, steroids would have everyone look at it, then your risk of sleep apnea still goes up in a dose-dependent fashion. So the higher the dose, the more risky. With this sympathetic and the parasympathetic nervous system, the sympathetic is the fighter flight nervous system. The parasympathetic is the rest and digest. So if you have too much fighter flight and stress can cause that too, then you're not going to rest as well at night. I want to touch on testosterone and women because there is testosterone and women. I'd like to know where that testosterone comes from, which tissues. I'd like to know whether or not testosterone replacement therapy makes sense in women. I'm hearing more and more about women using testosterone. And I'd like to know whether or not knowing a woman's testosterone for her to know her testosterone is of equal less than or more value than knowing, for instance, progesterone and estrogen levels. Because I think there are a lot of misconceptions about the roles of testosterone and women. For health optimization, testosterone is just as important to know. For pathology prevention, for example, breast cancer, osteoporosis, estrogen and progesterone are more important to know. So when you're thinking about women, women think that they have such a tiny amount of testosterone because you test it, most people test a free testosterone. So testosterone that's unbound, which is by far the smallest proportion of testosterone. Any androgen is bound by lots of different steroid binding proteins, but the ones that are most pertinent are called SHBG or sex hormone binding globulin. And that binds the androgenic steroid, for example, DHT or dihydrotestosterone. It's associated with prostate enlargement associated with male pattern baldness. And that the most strongly, and then it binds testosterone next most strongly, and then it binds things like Andersonidion or DHEA, Dhydroepiandrostron. And then it binds the estrogens, the weakest, like estradiol. So if you look at the total amount of testosterone, women actually have almost all women, not all women, but almost all of them have significantly more testosterone than estradiol. But it's because it's in different measurements. So estradiol a lot of time is, you know, pgm per mil as opposed to nanograms per desoleter. So women have more testosterone than estrogen, and significantly more DHEA than either. Interesting. Do women make dihydrotestosterone? Yeah. And where does this testosterone come from because they don't have testes? Yeah. So most testosterone and women that are pre-miniposal can come from thethecacells, THECA. So thethecacells are cells in the ovaries that can produce testosterone. And a lot of people have actually heard about hyperthycosis, not the term itself, but a lot of Olympians that are their chromosomes are X, Y, their females. And they are not taking any... They are X, Y, but they're females. Or sorry, they're X, X. So they're X, X, they're not X, Y. And they have never transitioned. They've been on any sort of hormone replacement or testosterone. But they naturally produce a huge amount of testosterone as much as many men. And some of these women, I believe they're from Botswana, were banned from competing in the Olympics in certain distances. I believe they're banned from the 400 meter and 800 meter because their natural testosterone was deemed to be too high. So they mistakenly thought that they were using steroids? They actually knew they were not using steroids. They knew it was their thecacells were just genetically gifted, I suppose. And they still made them change distances. So one or two of these athletes changed to... I believe it was a 3K or the 5K. And they still did quite well. But it was not their best event. Interesting. Yeah, that's turning out to be a very interesting and controversial area of this notion of hormone therapies and natural variation in hormones on different chromosomal backgrounds. Fasting, we should probably do a whole episode about that because it's very much over the times. So men and women both make DHT. I'd like to ask about DHT in men. So often we hear about testosterone in men and free testosterone and being the unbound form, of course. But, dihydrotestosterone, where does it come from in men? What is the cascade of events that takes testosterone to dihydrotestosterone? And what are some of the quote-unquote positive and negative effects of... Here I'm only referring to endogenous dihydrotestosterone. And in fact, I'll make it very clear whether or not I'm talking about taking something or one's own natural production. Here we're just... I think up until now we've just been talking about natural production. So tell us about DHT in men. It's such a powerful hormone during development, obviously. But what is it doing? DHT is a very androgenic hormone. So whether you're talking about DHEA, which is a mile, a weak androgen, or testosterone, which is a relatively strong androgen, or DHT, which is a very strong androgen, they bind to the androgen receptor in both men and women. So the effect of all three of those is mediated by the androgen receptor. There's a couple different beta estradiol receptors and alpha estradiol receptors, but there's only one androgen receptor. Intriguingly, it is on the X chromosome. So men get their androgen receptor gene from their mother. Women get one androgen receptor gene from their father, one from their mother. Often the one that is more sensitive to androgen, and people with PCOS, that's the one that's active. The other one is methylated and inactive. Can I just pause you once? I say it's sorry to interrupt, but I have to ask this question before I forget. And I know a number of people are probably wondering, I've heard that whether or not one develops male pattern baldness, whether or not a male develops male pattern baldness, just to be very precise. You could get some information about that by looking at your mother's father, and that would be in keeping with what you just described, that the X chromosome, which of course is handed off through the mother, is carrying the genes that encode for the number and distribution of these androgen receptors that DHT will bind to. Because of course, I think as you'll probably tell us the DHT is responsible for male pattern baldness and beard growth. Is that right? Should I look at my grandfather and my mother's side to determine what I'm likely to look like in terms of my DHTness? Is that a word? Yeah, it's the best guess that you can make purely from phenotypes. You can measure your genotype and get a better idea of that. Assuming that it's true male pattern baldness, it's related to the gene transcription of the androgen receptor. So I like to think of it as how much of this androgen receptor gene is activated by any androgen. So if you have an extremely sensitive gene, which usually means you have very few CAG repeats, which is basically just a certain CAG encodes for a certain amino acid. And if you have very few of the repeats, then your androgen receptor gene works better. Think of it as a corollary to Huntington's disease. Where if you have very few of what we call trinucleotide repeats, then it's not as severe of a disease. But after you get more and more CAG repeats, which by the way are in the population, you're getting more and more CAG repeats. So it's a natural selection of process that has been ongoing for a variety of number of reasons. But anyway, if you have more repeats, then that gene activates in the cytoplasm and moves to the nucleus and causes gene transcription more often and hair loss more often. So does that mean that we're seeing more hair loss now due to elevated levels of DHT than we were 50 years ago? Probably not. The hair loss 50 years ago, well, not 50 years ago, but 500 years ago was probably more significant. Because on average, 500 years ago, people were more sensitive to Androgens. So there's a syndrome called Androgens Incensitivity Syndrome, AIS. And that syndrome was related to when men who have the copy from their mother who was a carrier, their AR gene or Androgens receptor gene is completely insensitive. So think of it, it doesn't have it. It's not related to the CAG repeats, but think of that receptor as just not working at all. So there's a continuum. So everybody's receptor works a little bit better or a little bit worse. And the better your receptor works, the more likely you are to have male pattern baldness. So we're going to zoom out from this, but still keeping an eye on DHT. What do you like to see all women and all men do to optimize DHT? And here I'm talking about regardless of age. From this, from puberty onward phase, we haven't yet microdysected out decade by decade, which we will do. But what do you like to see people do to keep DHT in check? But before you tell us that, could you tell us what positive things DHT does when it's in the proper range? Yeah. So DHT helps a lot for the same reason why testosterone helps. It activates the energy receptor gene. It helps effort feel good. So it can be motivating. So that's how it's active in the CNS. It also is active in cardiovascular tissue. So if you look at someone that has heart failure or someone has cardiac hypertrophy, the level of DHT can matter because it's also binding to the energy receptor in the mild cardio more in the heart itself. So you think of the classic bodybuilder heart. It's an easy example to make. They have very thickened muscle. Their muscle is very strong because they're pumping blood often with high blood pressure. And that DHT and the testosterone and any DHT derivatives like masterone or oxandralone, premable and also bind to the heart. And they cause even more hypertrophy or enlargement of that muscle tissue. So then let's say the person stops and they're recovering. And they're trying to have cardiac remodeling, which is where you take a very thick heart and cardiac remodeling is important in a lot of different cardiac pathologies. But if you give them finasteride or de-tastoride, which inhibit the enzyme that converts testosterone to DHT, so making less activity at the energy receptor gene, they have cardiac remodeling and their heart health improves. So for the non-bodybuilder, the typical woman or man or younger or older, what sorts of things support DHT and thereby heart health? Presumably DHT is involved in some of the other things that testosterone is famous for in both men and women, things like libido, as you mentioned, making effort feel good, so motivation drive and vitality, I guess it's going to be the general phrase. So what sorts of things support DHT? What sorts of things create problems for DHT? There's lots of dietary changes and supplementation that you're probably doing right now that's affecting your DHT. You mean me so? Well, everybody, all of the listeners, because let's say you have a diet high in plant polyphenols. Many of those inhibit the enzyme that converts testosterone to DHT. Could you give us an example of one of those either in supplementation form or in food form? Curcuments. Certain curcuminolids, depending on the structure, will inhibit the enzyme called five alpha-aductase that converts testosterone to DHT. Tumoric. Yeah, Tumoric. Black pepper extract. So if you it's used often to increase bioavailability, it's also called bio-puring. It's also a five alpha-aductase inhibitor. So and on top of that people have different genetics too. So some people, they're five alpha-aductase enzymes, there's three of them. They're on chromosome two, three and four I believe. But some of them are active in the prostate, some of them are active in the brain, and some of them, so it depends on which tissue, their tissue specific enzymes that depend on how much DHT you convert. Do you recommend that people avoid curcumin and Tumoric for that reason? And is there any specific recommendations for men versus women? If a man or a woman, by the way, in women, a lot of times if you just ask your doctor for a DHT check, it's the same unit as in men, so it's essentially undetectable. So you have to, you know, especially if they're on oral contraceptives, which is a different topic, their DHT is very likely undetectable, especially if it's free DHT. You can measure both the DHT and the free DHT, but if someone's DHT is already low or if they have somewhat insensitive androgen receptor via genetics or via lifestyle, then I recommend they avoid bioavailable curcuminolids like bioavailable Tumoric, Black Pepper Extract, and they might be a good candidate for creatine. Creatine, like creatine monohydrate, and significantly increase the conversion of testosterone to DHT. Interesting. There's also a lot of really interesting data coming out now about the role of creatine as a brain fuel and maybe even as a cognitive enhancer over time. The data are still ongoing, but some of the studies in humans are pretty impressive, at least to me. I'm glad you mentioned this thing about curcumin and Black Pepper. I wish we'd had this conversation six years ago because I had the experience of jumping on the bandwagon or the excitement around Tumoric, and I took a Tumoric supplement. There was a couple capsules of what I thought to be, and I think was high quality, Tumoric, and I've never felt as poor as I did in the subsequent few days. Flatline of, let's just say, everything that one would want to have in life, energy, vitality, just it was a cliff. A friend somehow knew that curcumin could inhibit five alpha ductase that converts testosterone to DHT as you pointed out. I stopped taking it was the only new addition to my diet and supplementation, and things bounced back within about three, four days, but it was remarkable. I mean, I felt like garbage, and it was actually kind of frightening to experience the sharpness of that cliff. But I know that some people like Tumoric for its anti-inflammatory properties, etc. Sounds like people either need to experiment, or if they do, obviously, to approach that with caution any time you add or remove something, you need to talk to your doctor. You're a doctor, and I'm guessing that if one were to experiment, would you say that most of these effects of things like curcumin are reversible as they were in me, or is there any potential of permanent damage if people have been taking them for a long time? The effects are nearly always reversible. When you're talking about five alpha ductase inhibitions, so what Tumoric does but stronger, the most common story that we hear is regarding a supplement known as SAW, Palmetto, which a lot of older men take for their prostate health, or finasteride, which you can take for your prostate, or your heart, or your hair, or do tasteride. So if you're having side effects on these, then it's probably because of a couple different reasons. One can be your ratio of Androgens to Estrogens is off, and that needs addressed. Another one can be it's inhibiting the conversion of your progesterone to that other type of progesterone, the five alpha, three alpha that we talked about earlier that's helping with your sleep, and your brain, and your calmness. And that's definitely an effect. Another one is depending on the type of supplement or med, they inhibit different iso-inzymes of that five alpha ductase. So if they're just inhibiting one and two, then that's going to be a different effect than if they're inhibiting two and three. So finasteride does two and three, SAW Palmetto does one and two, and then do tasteride does all three. The third one is active in the brain, and do tasteride inhibits that third one a little bit weaker in vivo, but strongly in vitro. So it's really hard to parse out. You can use biofeedback and experimentation. I do think with supplements, it's safe to experiment. The time that it takes to set in is usually about three months. So the risk of, and this is anecdotally, there's been lots of research published about if post-finasteride syndrome is real or fake, and it is real, but it's one of those things that's a combination of organic and inorganic disease, almost kind of like fibromyalgia, where it's definitely real, and there's lots of things that you can do to help with it, but it's very unlikely to occur if you stop taking your supplement or medication after you have side effects. Well, I certainly feel better when I'm taking five grams of creatine monohydrate per day. I know most people take it for muscle growth and tissue repair and things of that sort, mainly I think brings water into the muscle tissue, et cetera, but I take it for the brain effects, and also because I like to think that it gives me a little bit of a DHT bump that I can actually see in my blood charts when I've done them. I know many people want to avoid the hair loss that can sometimes be associated with DHT levels going too high, and so I've been asked many times does creatine monohydrate cause hair loss? It would make sense that if creatine increases DHT and DHT, binding to the endotent receptor on the scalp can induce hair loss, that that would be the case. Is that true or is, are people just overly concerned about something that's trivial or non-existent? Each male and so yes, it can potentially add it. I don't like to say it causes it, but it can be a little bit more fuel to the fire. So just like everybody has a different sensitivity of their androgen receptor, they have a different amount of gene transcription that is going to cause death of the follicle. That's an arbitrary threshold, so you don't really know until you start losing hair. And if somebody takes a little bit of creatine to increase their DHT, maybe for the cognitive enhancing effects or for whatever reason, and they notice a little bit more hair falling out in the sink, and they stop taking it, you just said death of the follicle, which sounds very dramatic. Are those little stem cell niches that reside in the follicle, which hair grow from, are those then abolished, like there's no going back, or can you one rescue the hair? It takes months, if they're still there, the hair will come back. So the loss of the hair itself is a normal part of the hair cycle. So you have your anagen phase, your cattagen phase, your tealagen phase, and then your hair loss, and then a new follicle. Of the stem cell niche in the hair follicle. Think of it like sharks have teeth. So shark loses a tooth and they have a new one that comes through, or losing your baby tooth and you have a new one. But your hair just always keeps coming through, so it's natural for it to die and lose. That's why when you start five alpha reductase inhibitors, often you have a big shed. So what happens during that big shed is all of these cells that are unhealthy, they immediately jettison that hair, and they start making a much healthier new follicle. So all of the hairs that are at the end of their tealagen phase, then they have what's called tealagen afluvium, which also happens after pregnancy, also happens in thyroid pathologies. So you shed it, a new one comes in place, and you think that you're having a horrible hair loss caused by your finasteride or whatever you're doing, and Menoxidil does this too. But you're really just having a new healthier follicle. If you go a really long time, if you go a year, then those hairs might come back and they might not. So for simplicity's sake, if somebody is concerned about or is experiencing hair loss, male or female, what are their options of ways to offset that hair loss that are not going to negatively impact other tissue sensitive to DHT? And what I'm basically saying here is I could imagine taking a DHT inhibitor, a pill of some sort or an injection of some sort, and offsetting hair loss, maybe even stimulate more hair growth. It's clear that I'm not doing that, but I know people that do, but then experience some of the other negative effects of blunting DHT, reduced affekt, reduced libido, reduced drive, disruptions, and prostate function, or even sexual function generally. So what could can people do if they want to maintain or grow back hair, but they don't want all those other effects? What should they avoid, and what should they perhaps consider talking to their doctor about? Yeah, there's a whole host of options. I try to separate alopecia or hair loss into two different categories. Male pattern baldness or endrogenic alopecia, also known as androgenetic alopecia, versus other types of alopecia, usually telogen effluoviums. And if it's androgenetic alopecia or male pattern baldness, even if they're female, perhaps they have PCOS, something like that, then you want some sort of strategy to decrease the activity of that androgen receptor. So women can get male pattern baldness. Absolutely. Okay, I'm going to have to wrap my head around that one, but okay. So there's a lot of different things that you can do that are topical. The most promising is called deutastoride mesotherapy. Essentially what it is is it's very localized injections and areas that are prone to male pattern baldness, whether they're female or male. And it acts locally only and you repeat these injections from time to time it decreases the conversion of testosterone to DHT just in the scalp. So that can avoid prostate effects and what are some of the negative effects of blocking DHT in females in the periphery, meaning not on the scalper in the brain. But where is DHT doing its stuff? Yeah, so it's both DHT and then also that five alpha, three alpha progesterone, which is called a THP or dihydro progesterone or tetrahhydro, trihydro progesterone. So they're active in the central nervous system, but it's also just active, again, binding to the energy receptor in a female as well, causing them to have that effort feel good motivation. A lot of women that are sensitive to DHT because women can be sensitive to DHT as well feel very different when they start an oral contraceptive. Not because it alters their DHT to a huge amount, it does to some degree because the negative feedback inhibition and the pituitary and less produced in the ovaries, but it increases SHBG really high. So because their SHBGs are significantly higher, their free DHT is way lower. How does a woman know if she has PCOS, polycystic ovarian syndrome? What are the issues with polycystic ovarian syndrome? What can be done about PCOS? I confess I was naive to PCOS that wasn't supposed to rhyme, but since it does, I do confess I was completely naive to it. And I start getting a lot of questions about it in various forums. And I think that's actually the reason why I initially approached you. I know you have treated a lot of PCOS. What age women should be thinking about PCOS? What's PCOS? Teachers about PCOS, please. Yeah. So PCOS is polycystic ovarian syndrome. And this is one of those conditions which is underdiagnosed. So it's prevalence is much higher than we think it is. There's been a lot of studies and some studies say prevalence of 10%, some say 20%. It's not completely clinically penetrant. So most people don't know they have PCOS until they have infertility or subfertility. And is this is PCOS happening this frequency in 20 year old women in 30 year old women and 40 and onward? Most women find out they have PCOS in their 30s. Especially it's on a spectrum or continuum like a lot of things where you can have a weaker version or a very severe version. What are those symptoms? There's a criteria called the rot or dam criteria. And in the rot or dam criteria, there's a couple different ways that you can diagnose it. You're looking for androgen excess insulin resistance. And you can also look for polycystic ovaries. You don't actually have to have polycystic ovaries or get an ultrasound of your ovaries to be diagnosed. If you have androgen excess, for example, androgenic acne or hormonal acne, if you have hair growth like a hair growth on the chin, it's called hersotism. Or if you have, you know, like deepening of the voice at any symptom of too much male pattern baldness, fear of female, that's a symptom of PCOS as well. Then you can also have insulin resistance. So this is obesity, it's prediabetes, a high fasting insulin, a home IR over two, a fasting insulin over six. So if you have significant insulin resistance and also androgen dominance, that's a sign of an. Androgen dominance often leads to what's called oligo menoria. So if you're having more than 35 day intervals in between a period, or if you have less than nine per year, then that can be a sign that you have oligo, which means two little menoria, which means mences. A very common sign of PCOS. If you have infertility, so if you're under the age of 35 and you've been trying for more than a year, or if you're over the age of 35 and you've been trying for more than six months, then that can also be, it's a very common presenting complaint when somebody presents with PCOS. And assuming that a woman is doing all these other things is paying attention to the six pillars that we talked about earlier, diet exercise, cleric restriction in some cases, right? Not everyone needs to be cleric restricted, stress, sleep, and sunlight, spirit, assuming that they're doing all those things, what other things in the realm of diet or supplementation can help them avoid PCOS if they have subclinical PCOS, or they have not developed it, but don't want to develop it because it doesn't sound like a good thing. Yeah, so depending on where they are, if they're very strong on the insulin resistance spectrum, then optimizing their body composition, decreasing their body fat, and treating that metabolic syndrome can help. So a lot of people ask, well, does everybody that's on, like does everybody need to be on metformin that has PCOS, not necessarily, but metformin is one of the tools that can help with insulin sensitization, other tools that can help are anostatal. So my anostatal is an insulin sensitizer. It's cousin D. Cairo anostatal is a weak anti-androgen. A lot of types of anostatal have both of those in it. So depending on if you're a female or a male and you're on anostatal, the type of anostatal does matter. Yeah, this is a very important point. Just today I said, I'm trying this new supplement anostatal for its role and perhaps perhaps enhancing sleep even further. My sleep's generally pretty good. So I took it for the first time last night and I said, I thought it helped. And just subjectively, and you said, what kind of anostatal is it because anostatal is a very potent androgen inhibitor. It turns out I was taking myo and ostatal, which is not an androgen inhibitor. The type, the other type that you mentioned, which is an androgen inhibitor is D. Cairo anostatal. It's usually in a ratio of 1 to 25 or 1 to 40 in a much lower amount compared to myo and ostatal in a supplement or in the body. In a supplement to help induce ovulation. But for women who have PCOS who might want to try and reduce androgen, then they would perhaps want to take a form of anostatal that reduce the androgen receptor activity. So if you're a woman and you've ever talked to your doctor about getting on the oral contraceptive or spironal actone, which is also an antianrogen, but it happens to be a potassium sparing diuretic blood pressure medicine as well. D. Cairo anostatal might be a better option. DIM or diendomethane is another kind of a weak antianstrigen antianstrigen that a lot of women should consider as well. You mentioned oral contraception. I've done a few posts on these, let's just call them, they really are perceptual effects whereby it's been demonstrated in human several times now and what I would appear to me to be very solid studies where women that take oral contraceptives. There is both a shift in their perception of men because these studies only looked at heterosexual arrangements here where women who are on oral contraception because it blunts some of the peaks and valleys of hormone output no longer experience the same peaks and valleys in their assessment of other men's attractiveness. They are flattened their perception so to speak, they still find certain men attractive and certain men unattractive but the degree of difference is kind of mellowed out. Likewise, men perceive women's attractiveness, they still see women on oral contraceptives as attractive but a woman taking oral contraception eliminates this peak in her attractiveness that men would otherwise perceive. In other words, oral contraceptives are changing the way that we perceive each other, at least in terms of these male-female experiments. What is going on with that? Is that because oral contraceptives blunt the increase in testosterone that occurs just before ovulation or is it because of a complex cascade? What is going on? I find this fascinating. There are differences in how you are, and I wouldn't use the word change necessarily, but alter the severity or alter the peak, as you said. It is just like TRT is not going to change you as a person, an oral contraceptive will not change you as a person. It will just change your day-to-day peaks and troughs in libido and attractiveness. One of the main effects of oral contraceptives, almost all of them have a synthetic estrogen and a synthetic progesterogen in them. One common type of synthetic estrogen is ethanol esterideol. There is another new synthetic estrogen that is out there as well, but anecdotally that seems to have even more side effects. This ethanol esterideol is 100 times more potent than endogenous or bio-identical esterideol in the liver. It binds to the estrogen receptor in the liver, and it is going to increase sex hormone binding globulin, which secondarily, as you mentioned, decreases your free testosterone, and especially your free DHT. That little testosterone hump that you get when you are a female is ovulating, that is really flatlined. It is a pretty insignificant difference. It is not negligible, but it is a little bit of a hump. You have significantly less of that when you are on an oral contraceptive. Does that bluntly associated increase in libido that normally would occur from that increase in the endrogene? Yes. Interesting. What about other forms of contraception? There is copper, IUD, there is various implants, there is rings, there is a huge number of different forms of these. What we are talking about is, as I understand it, is only the effect of oral contraception that impacts hormone output. Is that correct? Yes, there is a lot of other effects as well. For example, your choice of synthetic progestin will alter how higher platelets and SHBG go. It appears to be the higher your platelets and the higher your SHBG, the higher your scope of blood clot. A lot of women know that if they are on an oral contraceptive and they are already predisposed to a blood clot or a venous thromboimbalism and they are vain, they have a blood clot and either their leg or their lung, then they can increase that chance. You can choose a synthetic progestin that is not going to have as high of a response. There is various pros and cons. Some synthetic progestins are weak anti-androgens as well. For example, there is one known as slend, which is made from spironylactone. Some women are on spironylactone and that as well, which is made from spironylactone, which probably isn't particularly necessary unless they need it for a diuretic or hypertensive effect. I'm just going to intentionally interrupt and I apologize, but specifically because I wanted to ask about there is this notion that oral contraception taken over long periods of time can disrupt fertility in ways that are independent of just the age-related of decrease in fertility. Is that true? It depends on what you mean by a long time. Six to 12 months, it's possible. Past that, it seems very unlikely. However, the persistently elevated SHBG can be present for quite some time. Wait, so if a woman takes oral contraception for six to 12 months and then stops, will she essentially be where she would have been anyway in terms of her fertility at that age? Or are you saying that it can cause permanent damage? Her fertility would be equitable as if she had never taken it, if she's certainly 12 months, but probably six months. I know of women that have taken an oral contraception for many years. In addition to the age-related decline in fertility that occurs that's inevitable. Of course, the slope is going to be different depending on the individual, but are they quickening the transition to infertility? Probably not. You could make a case that because they've been an oral contraceptive, they may have been slightly more predisposed to insulin resistance and or lower lean body mass. But that's probably going to be a negligible difference compared to their resistance training and also their caloric restriction or caloric maintenance. Of course, there are also effects of having children. On all these parameters, because it's a major lifestyle shift that obviously people contend with and have for since the beginning of human time anyway. I want to ask some questions about male hormone therapy and male hormones generally. But before I do that, I have a couple of burning questions that I get very often that I'm just going to insert now. Marijuana. I've heard that it can decrease testosterone in men and women. I've heard that it can increase testosterone. Alcohol. I think there's general consensus that high alcohol intake, high barbiturate intake, can does in fact reduce testosterone. What about modest increase of alcohol? I'm not a drinker. So I'm not asking these questions for me. I don't smoke pot and quite over. I just never really liked marijuana or alcohol. They're not my thing. But many people want to know the answer to these. And the data that I've seen are very confused and conflicting. So what about marijuana? Does it reduce testosterone to significant degree or not? Cannabinoids itself, whether it's THC or CBD, are not going to reduce testosterone by themselves. If it smokes marijuana, then it's very likely to increase your aromatase, which increases your estrogen. And that's going to, it's romanizing from testosterone. So that is going to decrease testosterone. When you have an increased estrogen, like estradiol, that's going to work on your pituitary to make less hormones that cause the release of testosterone. So you're going to have less LH and less FSH. So it's almost kind of like, you know, opiates are well known to opiate agonists. They're going to decrease LH and FSH and subsequently testosterone smoked marijuana will as well. As far as alcohol, high alcohol will decrease testosterone, as will any very potent GABA agonist, whether it's a barbiturate or benzodiazepine or a non-benzo or alcohol, they're definitely going to moderate alcohol. Alcohol, I guess it depends on what your definition of that is. I guess I'm wondering like, some people I know that don't seem to be alcoholics, at least by my, you know, assessment, will have a glass or two of wine for nights a week, which to me seems like a tremendous amount only because I don't like alcohol. I don't have a problem with other people liking alcohol, but I think many people, for many people that would be considered low or moderate intake. I would consider that low intake. The American Heart Association for men recommends between one and two drinks a day on average. They recommend it. Yeah, so around one per week. So I'm making my heart less healthy by not drinking alcohol? Yeah, they recommend a very low amount of alcohol intake for men. For women, they recommend zero to one. So that's kind of hard to interpret, zero to one. But the protective effect of alcohol, especially if it's a red wine with polyphenols in it, outweighs the deleterious effect. Interesting, because I've seen some studies at point two, the idea that even low intake of alcohol over a prolonged period of time might actually decrease brain volume or at least volume of particular brain areas. But of course, we don't know the consequence of decreasing the volume of a given brain area either. I mean, one can imagine it's decreasing the size of ones of MIGDLA and making them less stressed. Although there's no evidence to support that. I've been told that I need to drink many, many times, but I always reply that I don't need to drink anything in order to speak my mind. So, again, individual differences. Very interesting. So it sounds like smoked marijuana may in fact reduce testosterone or at least increase the conversion of testosterone to estrogen. And with alcohol and GABA agonist, it's important to remember that it shouldn't be daily. So one drink of alcohol a day is actually very mildly immunosuppressive. So it's better to have two drinks of alcohol one day of the week and then two more drinks of alcohol another day of the week and then no alcohol the rest of the time. The same could be said, even for supplements that have GABA in them. A lot of sleep supplements have gamutemetobuteric acid, which is a gaseous. I occasionally take 100 to 200 milligrams of GABA in order to enhance sleep, but I do it maybe every third or four nights, no more than three or four nights a week. Yeah. That's perfect. So there's a lot of sleep supplements that should not be taken daily. And GABA is one of them. Another one of them is trasodone. And melatonin is kind of arguable and it depends on the situation. But in general, if you're taking a sleep supplement, it should not be taken every night. The sleep supplements that I understand are okay to take every night or nearly every night are things like magnesium three and eight. Apigenin. If that's not true, correct me. I certainly take them every night unless I forget them in back home and I'm traveling. Magnesium is one of the exceptions. L-thienine is also another exception. Great. Well, then at least I haven't put anything into the world. That's wrong in that category yet. And hopefully I won't. But if I do, I'll correct myself. So let's talk about testosterone in males. See these headlines all the times now that testosterone levels are dropping. Spurm counts are dropping. Phenotypes of men are changing over time. And I can't quite follow the literature on that because obviously those are hard controlled experiments to do because techniques change over time and sensitivity of techniques change over time. But regardless, I'm aware that a lot of people are considering increasing their testosterone by taking testosterone. A few years ago, that was considered steroid use and it was really extreme kind of stance. Nowadays it seems like there's more discussion about it. First off, I'd like to know, does testosterone supplementation, and here I'm talking about prescription from a doctor, does it make one more prone to prostate cancer? That seems to always be the first question that comes out. Yeah, and there is a huge amount of misinformation about this too. So testosterone is not going to cause a prostate cancer. However, normal aging causes prostate cancer and testosterone will grow your prostate cancer. So if you're an 80 year old male and you have an autopsy and there's at least a 50% chance that you have a prostate cancer, if you're 90 or 100 years old, there's at least a 90% chance. So for humans with a prostate, it's only a matter of time until you get a prostate cancer. If it begs the question, do you want to take something that's going to grow it? For sure, once you have it. So it's an individual assessment and it's important to follow things like PSAs as well. So a PSA of four or less, I mean, ideally you wouldn't be at four because that's kind of the upper threshold, is the simplest readout of whether or not there's excessive prostate growth. There's benign prostate hyperplasia where the prostate is growing, but it's non-cancerous, correct. And then of course there are the symptomologies like people have challenges of urination, they have sexual difficulties, etc. I'm always struck by the correlation that people draw between testosterone and prostate health. And the fact that or that I should say the claim that testosterone makes prostate health worse because if you think about it, young males have high testosterone often, if not always. Certainly often. And you don't see a lot of prostate overgrowth and cancer in young males. So something's going on here. How should we conceptualize this? So if you have a PSA of 3.9 and your 25 year old male versus a 75 year old male and you have a PSA of 5.9, the 3.9 PSA is significantly more concerning. So think of your prostate as taking cumulative damage from not only testosterone, but also estrogen and also growth hormone. So that's why obese individuals have higher incidences of prostate cancer as well. It's because they don't have those cell checkpoints where your immune system takes a second and says, all right, stop replicating this fast prostate cells. Let's see if there's any atypical ones and then it finds those. And it prevents them from reproducing. That's why immunotherapy and cancer is so promising is because they can target these certain things. So the older male is going to have that cumulative damage happen already. And arguably prostate cancer is a normal, you know, with aging, you know, fast aging is abnormal. Very slow aging is normal. There's a fine line to walk between those two. But there's a lot of things that can be done to decrease the turnover, decrease the inflammation and decrease the congestion of the prostate over time. There's also a lot more than just PSAs that can be done. There's prostate MRIs and things like that that can look at the structure and the function of the prostate. So what should every male do to maintain the health of their prostate? And I realize that younger males probably aren't thinking about it all. Although it seems like nowadays, I get these kind of what I call cryptic questions. I think women are more comfortable talking about their hormone and sexual health because of the cycle, because of menstrual cycles, they're used to fluctuations that sort of give them the experience of what it's like to have different levels of progesterone estrogen, testosterone, et cetera. I get these kind of cryptic questions, often in my direct messages, where what I think people are asking is, you know, what is there something wrong with my prostate? What should I do for my prostate? These are often indirect questions for other aspects of their life where they're suffering. But and I don't say that in just I think more direct discussion would be great. So what should all males do to maintain prostate health throughout the lifespan? Maintaining prostate health can be looked at similarly how you can maintain a good natural optimal testosterone. So you look for things that can hurt it. You don't necessarily look for one thing that can improve it or boost it. So for young males, those are prostititis. So it goes hand in hand with epidid amitis. So different infections of the prostate. The younger the male is, the more likely it is related to something that could be sexually transmitted. But another very common cause is what we call gram negative and anaerobic bacteria. The prostate is right by the end of the colon. So if you have chronic constipation or if you have colitis or if you have, you know, even just an E coli overgrowth in the colon is very likely to cause an infection. To cause an infection of the prostate as well. What should males do to prevent that? Have a diet that has good healthy prebiotic fiber, probiotics as well. Make sure that they're having regular bowel movements that they don't have chronic constipation have good sources of dietary fiber, which is also a soluble fiber and enough insoluble fiber. For most people get enough insoluble or non dietary fiber. So that can help prevent the chance of diverticulitis, which is another type of infection. It can also decrease the chance of colitis and decrease the chance of prostate infections as well. Are there any foods and or supplements that should take or avoid? What about you hear about salt, palmetto? Yeah, supplements for or supplements that support or cause issues for the prostate. Yeah. If there's a strong genetic predisposition to enlarged prostates or even just really early prostate cancers that grow fast, then they consider taking salt, palmetto or even curcumin as an anti-androgen as long as they're able to tolerate it. It's an individualized basis and depends on their history. As far as making sure that their prostate is not congested, there's an interesting correlation between having girls and having prostate cancer. So if you're offspring or females, then you're slightly more likely to have prostate cancer. There is some there's hypotheses that link estrogen to prostate cancer rather than testosterone. So if you have hyperestrogenism, your prostate has more atypical cells. In general, the higher your C reactive protein, which is the general marker of inflammation in your body, we call it CRP and the test order is HSCRP or high sensitivity CRP. If your CRP raises up very high, if you have an autoimmune disease, like if you have a crones flare, or if you have lupus or an infection or a sexually transmitted infection, or even colitis or even the flu, your CRP is going to raise significantly. That you would detect in a blood test. Correct. So you want to get a baseline CRP when you haven't had any of those things recently. And if your CRP is higher, you also have more female offspring. If your CRP is higher, then your reactive oxygen species, which are causing mutations and atypical cell turnover in the prostate, are also likely higher. So you want to keep it very low CRP. Interesting. And what about blood flow and pelvic floor in general? We should probably do a whole episode on pelvic floor. There's so much interesting data coming out of the fields of clinical and research urology. I realize it's kind of the Netherlands of biology and medicine. People probably aren't thinking so much about this. But pelvic floor is obviously a confluence of a ton of vascular of nerves. And of course the prostate resides there, and of course the genitals reside there as well. So I would imagine that the one of the six pillars, you know, exercise, being able to maintain adequate blood flow to those regions is key. What about just postural things? People sitting too much, not hydrating well enough. You mentioned avoiding constipation. What are some other things, including medications that can serve to support the prostate over time, and maybe even support pelvic floor in general, both in males and females over time? Absolutely. And this is something that's rightfully getting more and more attention. The way I explained the pelvic floor is your abdominal cavity, which includes your peritoneum or where most of your organs are, your retroperitoneum, your pelvic space. Think of it as a box, and your abs are the front of the box. Your back muscles are the back. Your diaphragm is the top of the box, and your pelvic floor, that's where your port is to the outside world. Especially important, it has muscles as well, and you can do exercises. Pelvic floor, physical therapists are becoming more and more utilized, especially after childbirth, but in other situations as well, including by men getting care from your oligists. So you want to both strengthen that pelvic floor and make sure that the tubes that are docked to the outside world are working well enough, but they're not too loose, they're not working too well. So there's a lot of medications that can be positives or negatives for your pelvic floor. We kind of talked about your gut and colon health in general, as far as your prostate health, and as far as your bladder and urinary system health, you think about a couple of different classes. So you have your phosphodastasis, you have your tidalofil. Basically, this is going to help decrease congestion in the prostate. A lot of people take it for ED, but it can actually help you decrease your... You define that. A lot of men take tidalofil, it's generic as siallus, has a much longer half-life than viagra, or levietra. It's half-life is almost a day. So you can take a very low dose of it, instead of taking 20 milligrams, you take two or two and a half milligrams. So you're saying that a lot of men take it for erectile dysfunction, but that at lower doses it may have served purposes for prostate health independent of erection. Correct. The most common scenario is if a male is waking up twice at night to pee, on average it'll cut that down to once. So if they're waking up at four times at night, then it can cut that down to twice at night. Just because you have easier blood flow, we used to use other medications like FlowMax, which is Tamsulocin. That's an alpha antagonist, so it basically binds to a receptor in smooth muscle, and it helps relax that. There's several other alpha antagonists. And then you also have your medications that are hormonal, like finasteride, that a lot of people take for prostate health to decrease the enlargement of the prostate. The periorethral area or periorethral lobe, there's several lobes of the prostate. That tends to be especially enlarged in cases of BPH and BPH. Prostate hyperplasia or in enlarged prostate. And if you are able to shrink that area, then at that point it's just a plumbing problem. And the urine is able to get by easier. My understanding is that now there's a growing, I don't say a movement, but the idea of taking very low dose, like 2.5 milligram or 5 milligram to Dallophil, even daily, is becoming pretty common for many men who do not have erectile dysfunction. Simply to either maintain or enhance prostate health. Is that correct? Yeah, that's correct. And do you see any negative effects of doing that? There can be negative effects. It can lower blood pressure. So theoretically it can increase your chance of vasal vagal syncope. A lot of people take it as an alternative to pump because it kind of works similarly to citralline or different pump products and pre-workout. And it can certainly help with that. But if you're about to go do a deadlift where you might pass that anyway, it can certainly increase the chance that that happens. Because you don't have that compensatory exercise hypertension response. Could someone just take it away from exercise? They could. If you took to Dallophil, then that's going to be, has a long half life. Whereas Viagra and Levitra is just a few hours to Dallophil is almost today. Some interesting studies on Viagra have been done as well. It can potentially alter your rays and cones in your eye. So the usual recommendation for pilots that need to have red, green discrimination from very long distances with very small indicator lights is to not take Viagra. So I usually say if you're if you're a pilot, that's your profession, perhaps hold off from that for a while. There's also studies with Viagra that significantly, which is also not a still deadlift fill as the generic now. And then increase eyebrow hair growth. So potentially what it does is it helps vasodialy and relax the veins, especially in older men. And when those veins are relaxed, you have better blood flow. That's one of the proposals or theories behind why older men get the androgenetic alopecia more. You're having less blood flow in the scalp. So theoretically, it can also help prevent that. And then the theory increasing blood, because it increases blood flow systemically throughout the body, not just in specific tissues. Well, I find it incredibly interesting that either these online forums building up now around low dose to Dallophil daily use of low dose to Dallophil. Again, not for sexual erectile dysfunction, but for sake of long term prostate health. Is there any reason why women might want to take low dose to Dallophil? To Dallophil is also a weak androgen receptor sensitizer, kind of like alkanitine, where the density of the available androgen receptors to bind increases slightly. So there could potentially be a benefit from that. But most of the time it's used in men. Very interesting. We haven't really talked about testosterone and optimizing testosterone in males. Assuming someone is paying attention to the six pillars, there's a kind of a gap as I see it between doing all those things and TRT hormone replacement therapy. And then again, the R, the replacement in TRT is a little bit of a, in quotes nowadays, because a lot of people who have testosterone in that 300 to 900 nanogram, predestine layer range opt to take low dose testosterone anyway. My understanding is that there have been some new kind of movements in this area toward, for instance, not doing big, large doses injected infrequently, but rather low doses quite frequently. Obviously prescribed by a doctor, monitor by a doctor, etc. Is that generally what you like to see in your patients if they're going to take this route? If they're a hypo-gonatal patient who's benefits outweigh risks of TRT, then you want to have a nice even steady state. It's not going to be exactly the same as producing pulsatile testosterone release endogenously from your own body. When you have a steady state, you don't have a peak or a trough, and when you have a peak, that's when the energy receptor gene is overactive. It's when you get more erythropoidcin or eporelease, and that leads to a lot of the side effects of thick blood, so higher hemoglobin and hematocryts. And then when you have a crash, you don't feel good. So it's definitely not optimal. There's a lot of ways to get around this. So when you're doing testosterone replacement, if you're someone that needs it, you can have different types of esters, or you could do topical testosterone. So the ester is basically something that's attached to increase the biological half-life. Most common ones are SIPI-N-A, and ANTHA, there's also a very short-acting propria-N-A, which has almost no clinical relevance. And there's also very long-acting ones to canowate and undecanowate, and different mixtures of all those. So if you're someone who has a very, very low SHBG, you're going to have trouble regulating your serum testosterone in the long run. If you do it topically, then the testosterone is absorbed, hopefully bound to SHBG, and then a lot of times you reapply twice daily or once daily. But you have lots of variations. So for most people, especially for people who can't absorb it well, that's not going to be a great option. So injections would be perfect. Most people end up injecting because they have either side effects from too high, too low, or just too much of a very dose when they do topical. There's also a capsule with a special lymphatic absorption. So it's not being absorbed through the liver. It's not epatically metabolized, but it's absorbed through the lymph. And it's essentially a testosterone undecanowate, and then put into a capsule. So, and that's taken twice daily. It has fairly steady half-lives, but you have to take it at specific times of the day. So that being said, and it's new enough to where there is a huge amount of data on it, but it is FDA approved. So it is brand name now. It's called Jitanzo. But the injectables, in general, the lower your SHBG, the longer of an ester you want. Because when you inject it, whether it's intramuscular or subcutaneous, just talk to your doctor about the risks and the benefits of those subcutaneous has slightly longer active half-life. Because the esterases take longer to reach that supinate or an anti-esteroid cleave. So, most men, a lot of people ask me about what a usual dose is. For most people, it would be a total of about 100 to 120 per week for an actual replacement dose. Milligrams. So, 120 to 100 milligrams per week administered two to three times per week. And you're not, so you're saying dividing that into two or three, right? So, I'm sure there's a bunch of people out there thinking, oh yeah, 103 times a week, which is actually quite high dose. Yeah, there really does seem to be a shift in toward spreading these dosages out into, you know, dividing them into two or three smaller doses. And then, along those lines, five to ten years ago, it was common to hear about inhibiting estrogen through aromatase inhibitors. Nowadays, you hear, and I think it's true, at least by my read of the literature, that inhibiting estrogen can disrupt brain function, can cause connective tissue issues. And even can cause reductions in libido. So, a lot of people think that estrogen, if you crash estrogen, that basically libido goes up, but actually the opposite is often true. You don't want estrogen too high or too low. Is that correct? And for that reason, do you shy away from people taking aromatase inhibitors? Yeah. Very few people truly need aromatase inhibitor. There's almost always lifestyle interventions. It can just depend on which gene, how active your aromatase gene is. Some people's aromatase gene is very active. A lot of times, these individuals have pubertal gynecomastia, which is breast tissue growth in males, even despite no other risk factor. Even if they're lean? Some people get it if they're lean. I remember growing up. There were a few kids that got mild cases of gynecomastia that were transient. They developed gynecomastia and then it went away. Often it's unilateral on one side too. So, growth hormone, a lot of times, is the fuel to that fire. Oh, interesting. Yeah, there were a couple of kids. They took some teasing because back then, there wasn't online discussions about hormones and things like that, but then it seemed transient. And people I'm thinking of were actually lean individuals, so they weren't overweight, which of course can cause gynecomastia because adipose fat tissue can convert testosterone into estrogen. So, it sounds like an acceptance special case is that avoiding aromatase inhibitors is probably going to be a good idea. There's several other ways that you can control your estrogen and keep it at a healthy level. Which you do have to check, there's a lot of patients who assure me that their estrogen is going to be sky high and it's actually very low and vice versa. But calcium deglucrate is a supplement that can help with estrogen control. What's a typical dosage of calcium deglucrate? 500 to 1000 milligrams. But is there the risk that if someone's estrogen is in normal range and they take the supplement that their estrogen will go too low? Is it that potent? It's not that potent. It's not near as potent as an aromatase inhibitor, so it helps with excretion and also the sensitivity of the estrogen receptor itself. It kind of helps out-compete it. Some people also take dim or different cruciferous vegetables, they get them from cruciferous vegetables like kale or broccoli. And that is both an anti-estrogen and an anti-androgen. So if you're on TRT and you're on that, then you're probably just on too much TRT. I remember a few years ago I had a friend and it's truly this is every time I have a friend saying, because I'm very cautious about which supplements I take. I think people might get the impression that I'm very cavalier about this, but I'm not. I always alter one thing at a time. I talk to physicians. What I suggest other people do, I actually do and have done for a long period of time. And I recall wanting to take dim because I thought, well, back then you're here, okay, reduce estrogen. My estrogen levels weren't out of range, so they were fine. But I thought, well, what would the experience be of bringing those down? But someone I know is quite informed in this area. I said, yeah, exactly what you said, which is that dim can reduce estrogen, but also testosterone. So I just never opted to try and take it. I do want, we're sort of airing in this direction, but we went straight from the six pillars to TRT or to what some people now call sports TRT, which is basically code language for saying taking exogenous testosterone, even though one doesn't need it to get into a semi-super physiological range or a high-end, like 900 to 1000 nanogram per deciliter range. And people always point out, I should mention that, oh, well, in certain countries, the high-end range is 1200 nanograms per deciliter in the US. It's 900. And so if you're 1200, are you really super physiological? All that aside, I neglected to ask about that gap in between where individuals could think about supplementation, meaning non-prescription approaches to increasing testosterone. And here we should probably also talk about things like, is it true that ice baths increase testosterone or not? Lifestyle factors that go beyond the six pillars for increasing testosterone. If you could comment on those, that would be terrific, supplements that are useful, and it'd be wonderful if you could mention where some of these same practices and supplements might be useful for women, as well as men, to increase testosterone for all the reasons we talked about earlier. Yeah. So this is where a true individualized approach comes in. When you're talking about what dose of TRT you should be on, one thing to keep in mind is the law of diminishing returns. Quality of life is a subjective thing, and it's different for each person. So some people are more willing to give up a little bit of athleticism or body composition. Some people are more willing to give up, or not willing to give up, libido or sexual health. And as we mentioned earlier, everybody's Androgen receptor is less or more sensitive. So you can make a case that if somebody's Androgen receptor is half as sensitive as somebody else, the person with the less sensitive receptor does need a level of 1,000 or 1,200. There's no great way to know that. And you can alter the sensitivity of your Androgen receptor with things like Elkharnitine and Tidalophilus mentioned. We'll definitely come back to Elkharnitine because I'm really intrigued by the data on Elkharnitine both for women and men in terms of egg quality, sperm quality, fertility and a bunch of other interesting effects. So we'll come back to Elkharnitine. But a lot of how you feel the biofeedback or subjective, I feel like this comes from the ratio of your Androgens to your Estrogens. And a lot of that is lifestyle. So if someone's also on HCG that could upregulate aromatase as well. And HCG, you might want to just human, Chorionic, Ganatotropin found used to be found in pregnant, it's still found in pregnant women's urine. Still found in pregnant women's urine. But used to be a believer or not, there was a black market for pregnant women's urine before it was, this stuff was developed synthetically. So in other words, what we're saying is men typically would buy pregnant women's urine through black markets in order to get the HCG in order to get the testosterone enhancing effects of HCG. So in other words, men were using pregnant women's urine for HCG. I do not want to know how they got into their body. Let's just skip to what you were going to say next instead. Yeah. So that's HCG. There's a lot of other things that upregulate estrogen alcohol significantly increases aromatase. So if you're very sensitive to estrogen, then you probably shouldn't even consume the two glasses three times a week. High fat meals also upregulate aromatase. So if you're on a ketogenic diet, but you have hyper estrogenism, then you should take care of that as well. All kinds of fats are just saturated fats. I'm not sure if it's just saturated fats, but fat definitely increases both fat in your body and consumption of a high amount of calories increases aromatase. So it's the ratio of testosterone to estrogen. I don't want to break your flow, but since we're talking about fat, I have to ask since estrogen and testosterone are both synthesized from the cholesterol molecule, I've heard that ingesting some amount of saturated fat can be useful because of the way that cholesterol can serve as a precursor to these molecules. Now, I once said on a podcast that I like butter so much that I occasionally eat parts of butter. Somehow that misinterpreted to mean that I eat entire many parts of butter. I'm saying like one or two parts of butter here and there and I have no guilt or shame about my blood lipids are in great shape. Also, so I'm feel good. But is it possible that people who are ingesting too little of saturated fats could directly or indirectly reduce or somehow disrupt the proper ratio of testosterone to estrogen in men and women? It's theoretically possible, but it probably doesn't happen in developed countries just like it's theoretically possible to have not enough omega six fatty acids, but that probably does not happen in developed countries. So I don't need the butter pets, but I'm going to do it anyway. I'm just curious. Grass fed butter has good omega three content as well. Grass fed foods in general, it's not the end all be all and everybody doesn't need grass fed foods, but they are one of the only sources of healthy trans fat. So a naturally occurring trans fat comes from ruminants. So ruminants that I think of like cows and the rumination in the different stomachs can change your omega three and omega six to trans linolytic and trans linoleic fatty acids. Which are healthy for us. So it's actually omega three's and omega six is that just happened to have a trans instead of a cis isomer. So and these healthy trans fats would be found in ruminant cheese and milk and butter from ruminants and more the meats and the meats. For people who are following a purely plant based diet or mostly plant based diet, are they at risk of not getting enough of certain types of fats or other nutrients to maintain that healthy ratio of testosterone to estrogen or not. If they're vegetarian, they're probably not at risk. If they're a vegan, they very well could be at risk. Most vegans are aware of this very acutely and they'll supplement with algae or they'll supplement with other sources of healthy fats. So the takeaway that I'm drawing from this is that less so than getting saturated fat, it's key to get these healthy trans fats from ruminants or the food products of those ruminants as well as to get proper amounts of omega three. And to be clear, you don't need any trans fats. It just happens that those omega three's and omega sixes are in a trans isomer. I see. Okay. So that's nutrition. What other supplements can support healthy testosterone to estrogen ratios? Anything that alters aroma tastes can support healthy testosterone to estrogen. And your testosterone to estrogen ratio, think about it as how much estrogen activity do you have at the beta ester dial receptor and your alpha ester dial receptor? How would I know that? So it's hard to tell, but depending on what you're eating, if you have a lot of plant based diets or polyphenols, many of these are beta ester dial receptors. People know about terchestrone and also beta ectosterone, which are two ectosteroids that are beta ester dial receptor agonist. So they activate the beta ester dial receptor. So if you have a very low amount of estrogen naturally, you're probably a better candidate for it. For taking to terchestrone or ectosterone. I've never tried them, but I know my understanding is that they work tremendously well for some people and not at all for others. And so one just simply has to try. But in promoting the activity of this estrogen receptor, is there a risk that terchestrone or ectosterone could cause some of the, quote unquote, problems associated with increasing estrogen activity like reduced libido, water retention, water, water retention. Yes. Reduced libido, probably not closing growth plates in the bone. No, because that's the alpha ester dial receptor. I've talked before on a couple of podcasts about Tonga Ali, which is this Indonesian herb. I guess it's also made and found in Malaysia, but it seems to be the Indonesian variety of Tonga Ali that's most effective or potentially for reducing sex hormone and binding globulin in there by freeing up testosterone. Whether or not the effects are through that pathway through another pathway, a lot of people report improvements in things like libido and maybe. Androgen like phenotypes, right, feeling more vital, et cetera. And of course, some of that could be placebo, correct. But what are your thoughts on Tonga Ali and please challenge my statements about Tonga Ali if they're incorrect. I'm not looking for validation here. I just really want to know what your thoughts are on it. Do you ever recommend it to patients when men, women, one or the other? Yeah. So Tonga Ali or Long Jack has multiple mechanisms of action and there have been several placebo controlled studies on it. Some of them show decrease in SHBG, at least one of them did not show any change in SHBG. However, it is, it does act on aromatase very weekly, probably not so strongly that you would have to be concerned of hyposurginism. So it reduces aromatase and thereby can reduce estrogen. Correct. And also a week, it's not a serum, so it's not a selective estrogen receptor modifier, but it's probably a week, it's probably an arm as well or a non selective estrogen receptor modifier. And that should help with decreasing negative feedback inhibition of estradiol in various locations and also increasing testosterone. Interesting. Yeah. The dosage that I've been using for years now is, it's 400 milligrams taken once a day. Typically early in the day because it can kind of have a mild stimulant effect, very mild. And I know that some of the products out there recommend dosages that are much higher. Anytime I've taken more than 400, I don't feel very good. I don't know how to describe it other than it's just a little over, like stimulatory in terms of, thanks me kind of, it's like drinking too much coffee. Yeah. So that's interesting. And so, would women ever want to take Tonga Ali for any reason? Yeah. Absolutely. So there's a lot of women that have hyperestrogenism. And unlike adrenal fatigue or andropause, there's actually ICD-10 codes for hyperestrogenism. ICD-10 codes. That's doctor's speak. There's codes to where your doctor can actually diagnose you with something. So if you go to your doctor and you say, I have adrenal fatigue, they can't diagnose you with that. Or if you say I have andropause, they also can't diagnose you with that. But if you say you have hyperestrogenism, the most common complaint that comes with it is endometriosis, which is overgrowth of the lining of the uterus. And those people could potentially, I think that's one area where we might see Tonga Cats supplementation more and more, because not only does it decrease aromatase, like we mentioned, testosterone and females is higher than estrogen and females. So a lot of females get estrogen from aromatization as well, peripheral estrogen is sometimes what we call it, because it's not directly produced in the ovaries. But they could be good candidates for Tonga Cats if that's the case. Very interesting. And my understanding is that people should be looking for sources of Indonesian Tonga Ali in particular. Correct. Another interesting application is essentially a, I'll call it a PCT, but essentially what that means is PCT means how the finest post cycle therapy physicians love acronyms scientists love acronyms, military love acronyms where we do. Yeah, the PCT post cycle therapy. So this is people coming off hormone therapy or steroids. This would actually be for women that are coming off of their birth control pill, because perhaps they can help lower that SHBG back to normal, which is sometimes persistently elevated. And then it can help prevent the subsequent hyper estrogenism that happens. Does Tonga Ali need to be psyched? When I first started taking it, I would cycle it. I would do a few, the three, four months and I would take some time off. Now I've just been taking it continuously for years. And I should say I do blood work to check my liver enzymes and everything else. And I don't see any reason for me to see staking it. Yeah, probably not. There's been human studies on both Tonga and Fadoja. And full disclosure, I did help design Derek's new testosterone optimization supplement, which has both Fadoja arrestress and also Tonga Ali in it. Yeah, let's talk about Fadoja separately in a moment. But if let's say someone is only taking Tonga Ali for whatever reason, but do they need to cycle off? Likely not, but I would just to be safe because it does both affect your rheumatase and it's an estrogen receptor modifier. And what would be a reasonable cycle off? So how long to take and how long to stop before taking it again? Yeah. There's a couple different protocols that you can do. But 11 months on, one month off for Tonga Ali is pretty reasonable. Now, this is, I guess this is, we'll talk about this later too. But if it's combined with Fadoja, the protocol that I would do is three weeks on one week off. So that's Tonga Ali. But I'm curious what your thoughts are on Fadoja agressis, this Nigerian shrub or this extract from Nigerian shrubs that at least in my experience in my read of the literature has the potential to increase testosterone and probably other hormones as well by way of increasing luteinizing hormones. Something that we haven't really talked about much up until now. What are your thoughts about Fadoja agressis? What are your ideas about the proposed mechanism or mechanisms? And where might this be useful for people on or off hormone replacement therapy? Yeah. Fadoja agressis has just reached a point where we have enough evidence to we know it probably helps both with luteinizing hormone release, which stimulates latex cells in the testes to produce more testosterone and probably with LH receptor sensitivity as well, which is a good combination of the two. It does come from the Nigerian shrub, but there is not quite enough evidence for me to be able to say that safe for someone to take this all the time, which again, full disclosure, that's why I recommended that we recommended for people to cycle this supplement. So three weeks on, one week off, that's likely safe. The only toxicity studies in general are enrats and in humans it looks quite safe. My understanding is that the toxicity studies enrats showed toxicity to the testicular cells, so that's certainly concerning, but that the dosages that were used or translating the dosages used to humans would lead to a situation where the dosages that humans would have to take would be very, very long. So the amount of, I no longer take Phadogia, but I took it at 600 milligrams per day for a long time and I ceased taking it because I was experimenting with other things and I didn't want to confound those things, not because I had any negative side effects. In fact, I was monitoring blood work and other biological parameters that would have told me if there was just a particular toxicity and there wasn't. Let's put it that way. Yeah, I think it's extremely safe and I'm just not convinced that there's enough overwhelming evidence for a long term consistent administration. So do you recommend this to people who are not taking TRT and do you recommend to men and women? So if you have a really high LH, then there's probably a gonadal issue, whether it's heat damage to the testes of varicoseal, a history of testicular cancer, where your LH is going to be higher. So if your LH is already very high, increasing it even more is probably not going to help. However, if your LH is low, then obviously try to find out if it is low. Is it deficient or is it just a little bit low? If it's low and you don't have an issue with prolactin, you don't have an issue with opioid receptor antagonism, the Naltrexone can actually potentially help antagonize that to increase LH as well, especially in people recovering from opiates or likely even alcohol. So you're looking for a subclinical secondary hypogonidism, which is essentially just think of that as low LH. So in people with that lower LH and their estrogen is fine and their prolactin is fine, then Fedosia is a particularly good option. Interesting. So three weeks on, one week off for 600 milligrams Fedosia, 400 milligrams Tonga Ali Indonesian Tonga Ali, could potentially be good. Of course, everyone should always check with their physician, clear this, do blood work, etc. I would say we don't just say that to protect us. We say that to protect you, meaning that the consumer is very, very important. You don't want to get, you don't want to fly blind with any of this stuff. You want to do blood work, right? That's the Keshe 22 supplements. Is most of them are safer than medications, but the only difference between them and a medication is ones prescribed and ones not. And oftentimes with supplements, it's unclear whether or not what's listed on the bottle is actually what's in the bottle. But I think there are a number of reputable brands now. The other supplement I want to talk about in terms of testosterone augmentation is boron. What is boron thought to do? Does it actually do that? And do you ever recommend boron? Yeah. So boron is actually an element and you can find it on the periodic table. It's more plentiful and rich soils. So frequent farming can deplete the soils of boron. It's very plentiful in the Mediterranean area like Greece and Turkey. So a lot of people will just eat dates or raisins that are grown there. I thought you were going to tell me people eat dirt. Well, there are people who eat dirt. There are people who eat dirt. There's a phenomenon called paika, right? Where people in a, and that's not a good thing. They often assign an iron deficiency. But they're eating grapes and dates that were grown in soil that has high amounts of boron. So boron can help regulate SHBG, but its effect is mostly acute. So it's unlikely to have a bad effect. So a lot of people take boron because it's probably not going to hurt. And it will lower SHBG even if it is for a short period of time. So I guess you can make a case that maybe cycling boron can help too. What sorts of dosages are useful for boron supplementation? Three to six milligrams wants to twice a day. Oh, interesting. So that's higher than the amounts that I've taken. I've had long been doing this cocktail of Tonga Ali. Again, I stopped taking Fidogia. But for a long time with Fidogia and boron, I think it was two to four milligrams per day. But maybe that could afford to go higher. Although my blood work is where I wanted to. Thankfully, sort of circling back to Fidogia. Fidogia was attractive to me as a supplement because I saw increases in LH testosterone and free testosterone. My estrogen stayed in check. But I also did not see a down regulation of LH when I would cycle off. Whereas with HCG, human cortionic canadrin, which does now arrive in forms not from pregnant women's urine only. But this synthetic forms that people inject, that as I understand it can actually suppress endogenous hormone output if one takes it for a long period of time. So why would a man or woman want to take HCG and what are the potential risks and benefits of taking HCG? HCG or human-chorionic canadrin is actually very similar to TSH. So when a woman is pregnant, she produces more HCG, especially in the first trimester. When you take a pregnancy test, whether it's qualitative or quantitative, you see the HCG rise. And it actually doubles every 48 hours. So if you're five weeks pregnant, you can get a HCG level. And then two days later, five weeks and two days, you can see your HCG and maybe it went from 500 to 1000. So it precipitously increases. It does a few things. One thing is it prevents hypothyroidism or hypothyroxenemia of pregnancy, which is one of the most common causes of miscarriage. It's also why if you have hypothyroidism and you get pregnant in the first trimester, you want to increase your dose from 25 to 40% to keep your free T4 high as much as possible. And the reason why you have to do that, as opposed to somebody who does not have hypothyroidism, is if you have hypothyroidism, then likely your thyroid will not respond to either TSH or HCG. So the increased HCG does not compensate for that. So if you take HCG, then it can potentially improve your thyroid function. So that along with selenium are likely the two best things that you can do for thyroid health. HCG and selenium? Yeah. I definitely make sure I get enough selenium by eating three to five Brazil nuts per day, which I very much enjoy the taste of also. Who should take HCG and can HCG suppress one's normal luteinizing hormone output? Yeah. It suppresses LH in a dose-dependent manner. So the higher the dose of HCG you take, the more it suppresses LH. A common dose for fertility is usually why HCG is prescribed. In men or women? In both. Is 10,000 IUs all at one time, which is quite a bit. That's a tremendous dose. In fact, some formulation, some brand names of HCG come in auto-injector pins to where you cannot even dose slower than 5,000 units at a time. Wow. But I know a number of people who take HCG to maintain a particular function while on testosterone therapy or augmentation of some sort. Does it work to do that? Yeah. Some people are on HCG model therapy. It can be slightly better on your lipids than being on TRT. So people are using HCG alone as a kind of neither sort of a hormone augmentation. Yeah. Some clinics advertise it as a non-suppressive alternative to TRT, but it is suppressive of LH. But it could also increase estrogen pretty potently. Yeah. And is it true that increasing LH and or HCG can improve sensitivity of the genitals? And is that true for men and women? I've heard this anecdotally. People say HCG makes sexual activity more pleasurable for people because of some of the patients who are in the same state. Does it have some, is it a direct effect on some of the nerve cells in the genitals? Yeah. So LH is also an agonist in the prostate and in genital tissue in general. So it's a very common treatment for post-fenasterides syndrome or post-5-outward ductase. When you've blocked the conversion of DHT for a long time, it helps re-upregulate DHT. So someone who's been taking finasteride to prevent hair loss comes off it feels maybe because they felt lousy, but then feels even lousier for reasons you talked about earlier. And then they might use HCG as a transition treatment to transition back to normal hormone health. Is that right? It's extremely helpful in many cases. Now when you come off the HCG, then you need to have a strategy of how to return to your normal as fast as possible as well. But it will upregulate those five alpha-adductase enzymes. You have, in your genital skin, both the scretal skin and penile skin and perineum in general, you have, I believe it's called stratum lusitum. It's a skin layer that is very, very thin, but it has the highest concentration of five alpha-adductase. So you have a lot of activity and after you've been on something that inhibits the enzyme, the five AR enzymes in those tissues, then you do something else to upregulate those enzymes. Whether it's weighting and taking time, whether it's trying to dallophil, whether it's trying to create even, or whether it's trying to HCG, a lot of times those are the go-to's for post-finasteride syndrome. Any risks for women taking HCG on their ability to get pregnant or risk generally? Yeah, obviously it'll make any pregnancy test positive. So that's a risk that some women don't know. So one could, in theory, fake a pregnancy test by injecting HCG? Absolutely. Interesting. I have no motivation to do that. I was just curious. Yeah. What about prolactin? You know, the simple version of this that I was taught, because I was taught mainly from the neuroendocrine perspective, was dopamine is a kind of close cousin of testosterone, and also estrogen for that matter, drives upeditive behaviors, including pursuit of sexual partner sex itself, motivated behaviors generally, then post-copyletory, post-organic states are accompanied by a prolactin increase, sets the refractory period for mating in males, and maybe even in females as well, involved in milk, glectown, etc. What are sort of the general contours of syndromes or things that people could be on the lookout for of having too much prolactin or too little prolactin? And I'm aware of a number of people who take dopamine agonist, altiracine, capporgoline, things like that to really boost their dopamine levels, and that isn't always a good thing as it turns out. Oftentimes people become kind of hyperdopaminurgic, and so they have the drive to do all these repetitive things, you know, fill in the blanks, but they don't always have the ability because it seems just as testosterone and estrogen need to be in the proper ratios, dopamine and prolactin need to be in the appropriate ratios. So how should we think about and perhaps act on our prolactin systems? Absolutely. The way I describe it is the dopamine wave pool. So if you're increasing your dopamine too much, you're going to overflow, and then you're going to have that wave crash too much. So you want to have nice even waves that are not going too far above the pool of dopamine, and prolactin will follow. So prolactin and estrogen are quite close cousins. Estrogen upregulates a gene called the PRL gene, or prolactin gene, that directly increases prolactin synthesis. So prolactin is going to also inhibit the release of testosterone from the pituitary. So if you're using a dopamine agonist, then you're going to help decrease the prolactin producing cells, including if you have a prolactin producing micro adenoma in the pituitary. How common are those? I mean, I hear a lot about these, you know, hypogonatism, and of course that can be due to an issue at the testicles, or hypergonatism could also be, of course, in like, overarion syndromes. And then there's, of course, the brain side of it, where the signals aren't coming from the brain. You're not enough gonadotropin, not enough luteinizing hormone. And there are ways of teasing this apart through with an endocrinologist that are quite elegant, in fact, right, using stimulating hormones too much to dive into here. But how often does one actually have one of these pituitary tumors? I have heard that people that play a lot of high contact sports. So boxing, football, people that headed the soccer ball quite a lot. Sadly, people whose jobs forced them to take head blows for, you know, could be military, and so they were firing, you know, 50 caliber guns, and the kind of woodpeckering of the brain inside of the skull. And construction workers, or just a concussion, can cause the pituitary to go malfunctional. Is that really common, or is this something that, you know, is a rare, like, 1 percent? Yeah, it's extremely common. It's another one of those conditions where a lot of people never know they have it. They just feel a little bit more fatigue. They have that high prolactin feeling all the time. But two-itary micro adenomas can be non-producing as well. So your prolactin can be totally normal. Your growth hormone and IGF1 can be totally normal. That's the second most common producing micro adenomas, growth hormone, causing either acromagally, which is growth of cartilage or gigantosum. This is the big brow. So those are fairly common causes of adenomas. But a lot of people that have a very small adenoma, you know, much less than 1 centimeter. It's hard to see on imaging, even if you have a contrast that specifically looks at the pituitary. And many people aren't symptomatic. So it's one of those things, along with PCOS and pre-diabetes, that are much more frequent when it comes to prevalence, which is the percentage of people that haven't in the general population. I'm glad you mentioned the dopamine wave. Well, I know nowadays there's a lot of interest in augmenting dopamine. I know a number of people that do this through prescription drugs, Adderall, Ritalin, Modaphanil. And those drugs, of course, hit many transmitter systems. But dopamine is certainly involved. People taking antidepressants like, well, butrin tap into that system. And of course, people are trying to inhibit prolactin and promote serotonin or reduce serotonin. To me, it all seems like a very delicate dance, right? I mean, to just imagine the arousal arc of for mating behavior, for sexual reproduction, is such an elaborate dance between sympathetic drive and parasympathetic drive, even with across the span of minutes, right? I mean, I've talked about this before in the podcast that the arousal is kind of more parasympathetic, orgasm in itself is a sympathetic response, a completely different set of neurons. And so, where do you see people getting into trouble just trying to hit the gas pedal on dopamine? And where do you think there is a place for people who perhaps are experiencing low drive and motivation, not just sexual, but in general, to increase the amount of dopamine circulating in their brain and body? How do you think about that given this wave pool analogy? Yeah, so it's important to parse it out and start with the least powerful interventions. So, if someone's concerned about dopamine or maybe they have a slightly higher prolactin, then they eliminate things that could be increasing that prolactin, such as a casean or gluten, which are mu opioid receptor agonists, or any mu opioid receptor agonist in the gut. It's a casean, so milk protein. Correct. Can increase prolactin. Correct. Interesting. In addition to that, they should, if they need a pituitary MRI, and they should get a pituitary MRI, if they don't have an adenoma, or if they don't have a high enough prolactin level to where they need an MRI, if they're having visual symptoms, or if they're having all factory symptoms with the nose, then it's more likely that they do, that they do. But if they don't, a lot of times, a prolactin under about 40 is not too big of a deal. They can take dopamine agonist, that agonize that D2 receptor, like P5P, which is essentially vitamin B6. It's a puridoxine, five pyrophosphate, and puridoxine is vitamin B6. So that can help 50 milligrams once to twice a day. Vitamin E can also help, especially if it's mixed to co-ferals. A lot of people have the high levels of vitamin E, but low levels of the gamma form of vitamin E, so that can also help. I'm so glad you mentioned vitamin B6 and P5P. I have heard that one can shorten the refractory period after orgasm, essentially to be able to have sex again, to be quite direct about it, by way of vitamin B6, blunting of the prolactin response, which turns out to be quite potent. But I've also heard that vitamin B6 can be neurotoxic, especially in the periphery that it can cause peripheral neuropathies if it's taken in high doses. But that P5P is the safer form. Is that true? It's pre-activated, so it does not build up. Think of it as an allegory to how folate can build up. It's not methyl folate, but it builds up, and it can increase levels of homocysteine. Or if you have too much vitamin B12, another water soluble B-vitamin, you can have too much methylmolonic acid or MMA. So depending on what your enzymatic conversion is to the active form of the enzyme, often it's just safer to take the active form of the enzyme. Very interesting. Okay, well, at risk of going down every hormonal pathway and talking about supplementation, lifestyle factors, I think touching on as we have testosterone and estrogen and prolactin, I'd love to chat a little bit about alkanitine. We talked about this earlier, but I want to raise this discussion about alkanitine, not in the context of alkanitine itself, but in the context of fertility. Because my read of the literature is that alkanitine can be very beneficial for enhancing sperm quality and egg quality, and even rates of conception. What forms does alkanitine come in that people can reasonably consider? What is it doing? And do we know how it's doing it? And do you often use this in your patients? Yeah. So the way I think about alkanitine, and I'll try to tie this in with creatine and other things as well, is if your cell is an energy factory or a car, then alkanitine is the shuttle that helps get the fuel into the motor to use the motor. The motor is mostly due to lifestyle factors, so like you know, your diet and your exercise. And the type of fuel itself is NAD plus. We don't need to get into NAD precursors or NMN or NR or anything. And then the accessory fuel tank is your creatine phosphate. So creatine is your accessory fuel tank, your NAD status, which is largely determined by your REM sleep and quality sleep and exercise, along with supplementation as the fuel. The carinitine shuttle is carinitine palmitil coenzyme, and that takes medium-chain fatty acids. It takes different molecules of fat. You have two main energy sources, other than ketones. You have your glucose or carbs. You have your fat or fatty acids. And that takes it across the layer of the mitochondria so that it can be utilized. So it upregulates that. That's why things that have flagella in general, the flagella are going to work better. Like sperm. Flagella being anything sort of the wavy little tendrils on cell types. Of which way they're everywhere right in the gut too. Yeah. So those are going to work significantly better. And in general, your mitochondria are going to work better. So the worst your mitochondria are off the bat, the better they're going to be helped by the shuttle that shuttles them across. It also slightly increases the density of the hydrogen receptor as well. Is that a local effect? So if an alkane is injected into a particular muscle, will it increase the density of hydrogen receptors in that muscle? Likely so. So how are people taking alkanitine? They're capsule forms and they're injectable forms. Most people are going to be taking the capsule forms because that's all they're going to have access to. And then we shall also ask, can you get alkanitine from food? Yeah. So alkanitine is just a combination of, it's actually a very small peptide. So glutathione is just three amino acids. Elkanitine is the smallest peptide too. So peptide is just a protein that has amino acids between two and about 200. And alkanitine is just two amino acids. Amazing. So it's like a micro peptide. Yeah. So your body synthesizes enough. It likes to absorb the amino acids by themselves. And then if it puts them together, there makes alkanitine. It's not very bioavailable if you take it. A lot of people will take alkanitine, alchar trait, or acyl alkanitine. And that's about 10% bioavailable. So if you want one gram or a thousand milligrams of alkanitine, you can take 10 grams of oral alkanitine. Is it the one gram, the typical dose you recommend, one gram per day? Four fertility and anandrogen receptor upregulation. So that means taking 10 grams of the capsule form. Yeah. So it's about 15 to 20 capsules, which is a lot. And that is a lot. It can also potentially increase TMAO. Yeah, I wanted to ask about that because TMAO on your blood chart is, you know, that's, when that's elevated, that's going to cause some concern. You taught me a trick, however, that one can take 600 milligrams of garlic capsule for the allyson, is that what's cool? Allyson, isn't it? It's like the name allyson, but with two Ls. Yeah. Okay. And that had a remarkable effect in reducing TMAO. So that's quite potent. And also, and they, was it just coincidence that it really brought my LDL down as well? I'm not sure if the LDL is a coincidence, but depending on your gut microbiome or your microbiota, some microbiome beneficial bacteria will convert carnitine and also coldine. And then, if you're a coldine precursor like alpha GPC or phosphatidyl serine, it will convert them more or less to TMAO. So TMAO is something that you can get measured in a blood test and see if it's high or low. Some people might not even need allyson. Interesting. Some people do benefit from it. Interesting. Although, I think it was you that also told me that allyson and garlic can have positive effects on cardiovascular tone and blood flow generally. Is that right? Yeah. Okay. So is 600 milligrams garlic an excessive amount or can I just eat garlic? You can. I see. I mean, I like eating garlic. Yeah. Yeah. So, okay. So one could also just eat garlic. If one we're going to take alkanthin in injectable form, how much of that is bioavailable? A hundred percent. A few inject it. So it is in a queous solution. So it's a bacteriostatic water essentially. So it's not in a carrier oil. So it's really, it's going to burn a lot if you inject it subcutaneousily. So it's going to be absorbed faster and more evenly and also just heart all less if you inject it into a muscle. But one could then just take one gram per day injected or divide it up into a couple doses. Yeah. Or 500. The minimally efficacious dose for injectables probably around 200 when it comes to sperm motility and androgen receptor upregulation. So it really depends on why you're taking it. In terms of fertility and in terms of blood test generally, I always say that if possible either by way of insurance or by way of some other way, affording it, it would be great for people to have blood tests to know what their hormone levels and other levels of other things like metabolic markers and lipids were in their 20s. Also in their 30s, also in their 40s. I think there's this idea that you only take a blood test when you have a problem. But then of course you one can't actually do the comparison that you mentioned earlier or state the comparison to one's physician that things are changing over time. And it seems to me that basically everyone should get at least a once a year blood test. Is there the hope that insurance will someday just cover it for everybody this will be standard care? Everybody should know what sorts of things are floating around in their bloodstream and what they need more of and less of in life. I doubt it will ever be covered by insurance. In many cases you could make an argument that it's indicated as insurance begins to cover more of the population for pathologies. The things like FSAs or HSAs or care credit will likely cover this advanced testing which continues to come down and down in price. So it'll be affordable but it won't be free. I'd like to shift gears slightly and talk about social interactions and relational effects on hormones. It's something I just find fascinating. We touched on this a little bit earlier in terms of oral contraception but now that we have the backdrop of what these various hormones do, some involvement in neurotransmitter systems like dopamine and prolactin associated pathways, prolactin course being a hormone non neurotransmitter. There's a phenomenon in human beings where people get very excited about a new partner and that excitement no doubt is related to the dopamine system among other systems. That excitement can be maintained or can wane over time. Here I'm talking about attraction but I'm also talking about general excitement in the sense of novelty because that's what dopamine is associated with. Given that you work with human beings and they have lives and relationships and lifestyles and they have hormones and all these things interact, what are some of the ways that we could think about adjusting our relationships in order to optimize hormones as opposed to just thinking about how to optimize hormones for sake of our relationship because it's bidirectional of course. And this assumes I should say that one is already paying attention to the six pillars talked about earlier is doing that people are doing most things right. How should we think about relationships and hormones, friendships, romantic relationships, new partners, long term partners. How do you think about this kind of stuff? Yeah, so if you have a new partner, then it is largely regulated by the dopamine energy system, which changes over time. So people may have heard the saying that you have to go through a full calendar year with someone that you're in a relationship so that you're a very good advice by the way. You really know what to do and what not to do, but because they, you know, you experience both of your families and the holidays and all the different situations, but I would argue until you have moved in together, had a baby and then erased that baby preferably breastfeeding because that's when you get the prolact and spikes, you don't really gone through every stage in life yet. Now you can't really do that with every person that you're considering well, some people do, but it can be quite costly in terms of time and finances and emotionally costly. And then here I'm definitely not referring to any personal experience of having done all that many times over, but what would you suggest people do or think about as they enter relationship or for people that are in long term relationships where they feel like something has shifted. And indeed, those shifts may reflect the output of different hormone systems and neurotransmitter systems. It almost certainly has to be the case, right? Yeah. So just like women who spend a lot of time together, whether they're co-workers or whatever, a lot of times they're menstrual cycles will align. There is a lot of pheromonal and hormonal crosstalk, including prolactin between men and women. So spending 100% of the time together, this is why people think it's so hard to work together and live together. There are around each other 24-7. You don't have the reprieve where you let that dopamine settle down and then you're excited when you see them again. A lot of guys know that if they've gone on a hunting trip or if they've gone on a trip for a long time, they come back and they see their partner and it's like a new, not quite like a new relationship, but almost like a new relationship. They have that excitement again. And purposely building that into every relationship can help significantly, especially if you choose to have a child or get pregnant or be breastfeeding because you just plan ahead for both of your prolactants to be high and both of your dopamine's to be low and both of your testosterone's to be low. So there's a lot of planning that you can do. Essentially every relationship goes through a crisis. And that crisis is personal between the two of you and you can plan ahead and figure out a way. Maybe it's not supplementation. Maybe it's not even the amount of time you spend away from each other. But plan ahead to have good times if you know you're about to go into a crisis. And so it sounds like time apart and time together, which is actually built into a number of cultures where men and women will will purposefully avoid each other for some period of time, avoid physical touch and maybe in proximity and then will reconvene. And yet those are very stable relationships over time often is the inverse also true. For instance, for people that are in long distance relationships where they're only seeing each other three or four days a week or two days a week. Does this explain the fact that some of those relationships can go on for a very long period of time without ever actually entering the what's called the hyper prolactin phase of actually moving in together and et cetera, et cetera. Like in other words, is that a way in which people are spiking and troughing dopamine that keeps them attached this kind of elusive. This sort of what is it called I think it's called like cat string like if you play with a cat and you move the string away they'll keep reaching but you throw the string on the ground they're like they're totally uninterested in it. Is that what's going on because that's a dopamine urgent phenomenon the cat string example we know this experimentally in those cases the relationship hasn't really progressed in many of those times. And so that's what I think is the progress in many of those cases past the dopamine spike the fun initial stage honey mood stage whatever you want to call it so it's almost kind of like a roommate. If you're looking for a roommate if it was for college or after college or whatever you know you can fill out forms and look for common interest but until you're actually together a significant proportion of the time you're not really going to know if you're going to be compatible or not. Is there evidence that the appearance of an infant changes obviously that they're going to be hormonal shifts we know actually that for in both women and in men there's a prolactin increase when one when couples are expecting a child. This is the it's almost like a brooding phenomenon you see this in birds where it's called actually calls called brooding and it's caused by prolactin increase but turns out this also occurs in humans and some people would argue this causes the dad bought phenomenon because it actually prolactin is involved in laying down a body fat preparing for sleepless nights and presumably that spike in prolactin is there also to suppress sexual activity because there are periods of time immediately near childbirth where sexual activity is not advantageous. Yeah, you see a prolactin spike right after breastfeeding so if you think about it often when you have an infant. You'll breastfeed put the infant to bed and then immediately go to bed with your partner which is not particularly conducive it's almost like trying to have intercourse back to back and it's very difficult because of the in the prolactin sense yeah low dopamine high prolactin oxytocin is also increased significantly to help with milk clad down as well so yeah as far as brooding there's definitely a human equivalent of brooding some humans call it nesting instinct which is both helpful but it's a it's not necessarily a bad change in in relationship it's just a change and as long as you know that it's coming you're going to do better with it just like any medication if you are aware of the side effect and then it might happen then when it happens it's not only less severe it also happens less often very interest you television was a neuroscientist you know I come from the framework that you know of course hormones impact perception and behavior but perception behavior also impact hormones I found this fascinating I also really like the example you gave of people taking time apart but also these affiliative bonds that are non-romantic bonds can serve as kind of a reservoir to replenish dopamine that is then released upon experience going back to one's partner or some sort of regular feature of home very interesting and of course this should exist on both sides I'm guessing that from both the male side and female side there's an interest in kind of separation and reunion as the theme and I guess the frequency will vary for different different couples in different situations yeah and I don't want to make it seem like prolactin is all bad so prolactin does help with the nesting instinct it helps with breastfeeding as well a lot of women are diagnosed with with luteal phase defects which is basically the phase after ovulation but before a period or giving birth the pregnancy is kind of a prolonged luteal phase and a lot of them will go on progesterone for this progesterone can also decrease prolactin and prolactin is also helpful for them maturity of lungs and infants so it helps the swing of myelin to let you know that it's a lot of the same thing as the other side of the body and the other side of the body is a lot of the same thing as the other side of the body so it can decrease if you're if you're prolactin is too low through pregnancy it spikes up very high during pregnancy then it can lead to increased risk of a respiratory distress of the newborn. It's so vital I realize that earlier I raised the question about whether or not cold exposure could modify hormone output in particular whether or not ice baths or I supplied to specific tissues of the body as people are doing when we're the other can change testosterone levels estrogen levels in other words taking ice baths and cold showers increased testosterone and or estrogen yeah so taking a ice bath or a cold shower or cold exposure in general it's not going to correct divide them indeed efficiency or metabolic syndrome so there's a lot of things that it will not correct that are causes of hypogunitism or low or low testosterone but it will help acutely specifically the application of cold to testes that are too warm so if you have a varicoseal or if you have a little bit of a primary hypogunitism which is where testosterone is not released by the testes but your LH and FSH signals are sufficiently high then you'll likely respond to cold exposure better and there's actually undergarments that are designed specifically to help with fertility and there's probably going to be more and more than the future you just need to be careful not to get frost by because it's a particularly bad spot to get frost by noted could you define varicoseal you mentioned it a few times is that's a varicose vein yeah so it's essentially a varicose vein it brings warm blood and the venous flow or the flow back to the heart is not as good just like in the legs it can happen in the scrotum usually about 20 to 25% of people have one great varicoseal there's grades one through four one through five and most people just have a very mild one usually on the left side because the blood has to go through further to get back to the heart and it raises the temperature of the testes temperature is the enemy of testes so they like to be five to 10 degrees cooler than the rest of the body so our son is particularly bad for sperm production they can be what when you say can be a how long could one safely be in the sauna or would you want to go back and forth between the cold and sauna is there any are there any data if someone is having infertility then I tell them to avoid all saunas empirically if someone has if they're not infertile but they have a low sperm count I also tell them to avoid however it's mostly a warmed water that can raise the temperature of the testes faster than the sauna so hot so and things that's yeah so hot tub and a jacuzzi those are enemies number one and number two of sperm what about ice baths and cold showers for women any evidence that it can shift hormone output in women yeah it can it increases the activity of the beta adrenergic receptors so even in the central nervous system and the astrocytes as well so it can do a few things it can slightly decrease the drive for food which astrocytes and beta adrenergic receptors have some medications that are way lost medicines also do similar things but it can be beneficial in women do but no evidence that it changes estrogen output in women correct nothing I know of me either peptides a lot of discussion these days about peptides peptides of course just being strings of amino acids as you mentioned very small ones like two amino acids like alchornitine all the way up to poly peptides which just mean many many amino acids there's so many peptides that there's we should probably just do an entire episode about peptides but I think one of the reasons I'm hearing so much about peptides these days is that they are not called steroids you know the name steroids I think has been has come to be associated with anabolic steroids in the context of you know acne testosterone rage etc but of course testosterone excuse me estrogen is a steroid hormone right there are other steroid hormones as we both know but peptides are gaining increasing popularity I'm willing to go on record saying that you can be sure that many of the incredible transformations that you see in Hollywood are the consequence of peptide use and I put my my name behind that because I'm well aware of people that uses to prepare for roles but athletes use them and then every day people are using them to for instance um sirmoreland testimony and ipamorland to stimulate uh the release of growth hormone rather than taking growth hormone BPC157 which is essentially a synthetic gastric juice that normally repairs the gut they're being used to treat injuries and there are other ones as well what can we say generally about peptides are they safe are they not safe what about sourcing and are there any peptides that you think could be a particular use for people and we should probably also touch on peptides that people shouldn't go anywhere near with a 10 foot pole yeah definitely so peptides are very heterogeneous there's very dangerous ones and very safe ones my favorite peptide is the original peptide which is insulin so insulin is a peptide and you know less than a hundred years ago there was a scientist studying insulin and at some point they saw that an animal had its diabetes cured by insulin inject cured by insulin injection less than a year later they were injecting insulin into every type one diabetic because it was saving their lives and yet insulin can kill you if you take it at the incorrect dose yeah so just like insulin should be prescribed by a doctor there is over the counter insulin rely on our nph but ideally your insulin is prescribed by your doctor for your diabetes as it's life saving peptides should be prescribed by doctors as well and there's several that are FDA approved so you mentioned a lot of different ones let's start with tesimorland so tesimorland was recently FDA approved for something called lipodistrophy and it happens where body fat is displaced into abnormal areas often as part of AIDS or severe burns things like that and it helps redistribute this body fat and give people their quality of life back tesimorland is a GHRH which I kind of loop into the category of GHRPs so growth hormone releasing peptides so it's only a couple amino acids different from endogenously produced growth hormone releasing hormone so growth hormone itself is also a peptide it's a peptide hormone not a steroid hormone so you have different somatotrophs which are very similar to growth hormone another fun fact is that HPL which is human placental lactogen we love acronyms right human placental lactogen is nearly identical to growth hormone the growth hormone in pregnancy is not what causes the sugar spike and gestational diabetes it's the human placental lactogen so if you look at twin pregnancies if they have two placentas or more placental tissue making more human placental lactogen the risk of gestational diabetes is exponentially higher so this HPL is only a couple molecules different from growth hormone it is interesting that these different GHRHs and GHRPs actually have pretty different mechanisms of action ghrelin is also a hormone that's released when you're hungry this is probably one of the reasons why you have more growth hormone release overnight and there's a lot of peptides that are very similar to ghrelin so these peptides are not bioidentical peptides but they just have a couple different amino acids changed so they're almost identical and they're probably going to be used in the future for growth hormone deficiencies including kids they've been studied so if somebody wants to increase their growth hormone output in addition to not eating within two hours of sleep getting good deep sleep doing all the other things in the six pillars that you mentioned earlier especially resistance exercise at some point earlier in the day what are the risks and benefits of taking a growth hormone releasing hormone peptide like sormoralin prescribed by a doctor of course what should one be concerned about how long could one take these I've even heard that they can modify gene expression so that they really are changing your hypothalamus in very long lasting ways yeah there's definitely a lot of risk tumor growth and cancer so you look at a type one diabetic they have very high incidences of various types of cancer they have very high growth hormone but low IGF1 paradoxically so they would likely give you a similar cancer risk to a type one diabetic that has very high growth hormone however there are the benefits of it you think of liposis decreased body fat increased lean body mass a lot of those can you can use other things to get those benefits so then you know you don't need growth hormone for those benefits it just leaves cosmetic benefit to which you can usually use topicals to get you know your hair and your skin and your nails and a lot of other things that you can do other than growth hormone so a lot of people just don't need these GHRPs if they don't have lipodistrophy or if they don't have growth hormone deficiency there is other uses of them specifically in injuries so I know that they've been studied not sure if it's in the military we mentioned the woodpecker or the coup contra coup injury so that can always holding back and forth the brain basically slamming up against the skull of heading the ball in soccer definitely people who use the 50 caliber and military that's a fairly small population and I think anyone that's hit their head hard more than once yeah we can talk about BPC 157 for a bit GHK copper peptide for a bit TB 500 or a thymusin beta 4 analog and then we can also talk about bramilano tide which is Milano 10 3 they have Milano 10 1 and 2 and then they also have Milano 10 3 and 4 yeah let's talk about BPC 157 and Milano 10 because I think those are the ones that most people are I so to speak yeah so BPC 157 is body protective compound 157 it's identical or bio identical to gastric protective compound 157 that's produced in the stomach so as you age you get atrophic gastritis very often that's why you have less intrinsic factor which is kind of another peptide that binds to vitamin B 12 that's why you can get age related B 12 deficiencies so that's one reason why you have more colitis more diverticulitis as you age you don't have that gastric protective compound it's it increases veg F vascular endothelial growth factor which basically makes your blood vessels grow more so that's what causes your body to form a blood vessel so another medication known as Avastin it's on the WHO's list of essential medications for cancer so many different types of cancer including colon cancer you treat it with Avastin which is a VEDGEF inhibitor so if you have cancer or a high cancer risk you probably don't want to be taking a medication that's the exact opposite mechanism of action as your essential anti cancer med in other words if you have cancer you're at risk of cancer avoid BPC 157 correct a lot of people prescribe it for six weeks and BPC 157 so brimmelano tide that is FDA approved for a hypoactive sexual disorder Tessa Morlin that's also approved for lipodistrophy interestingly another one of the melano tans is also approved for lipodistrophy and also deficiency in the melanochoric receptor so the receptor that receives the alpha melano site stimulating hormone it's a very rare condition it's also approved for that because if you don't take it then you get obesity but BPC 157 is not FDA approved but it is essentially standard of care at this point I would say it's you know if you're not counting insulin or growth hormone as peptides it's one of the most commonly used peptides and anecdotally and in some clinical literature it's fairly well tolerated for short periods of time I'm not in the camp that everybody needs to do it two to three times a week or even daily for six weeks no matter what the major benefit is when you're going to take it early on because it's going to allow your body to increase blood flow to the injured area and the less blood flow has for example cartilage ligaments have horrible blood flow especially as people age it's going to make a significant difference so I would wager that that Russian gymnast that Achilles healed in one month completely from a full rupture was likely taking BPC 157 or something very similar I'm willing to wager on that as well a remarkable recovery and so because it is prescription there are non prescription forms my understanding of the non prescription forms and the danger of going after non prescription forms is that oftentimes they will contain what they claim they contain BPC 157 in this case but they are not adequately cleaning out the LPS the lipopolis saccharide which can cause inflammation in fact in the laboratory we use LPS to deliberately induce fever and inflammation to study systemic inflammation so this is a warning to people if you're interested in peptides you absolutely need to work with a physician in my opinion get it from a really good compounding pharmacy who will clean out that cleans out the LPS because if you're buying it through a source that you know a lot of people I don't want to name sources but they're these common sources on the internet that everyone knows about they're buying these sources they'll ship it to anyone essentially but then the LPS is really causing inflammation and many people experience a kind of mild fever tingling from that when they inject it and I go I can feel it working that's probably LPS action which is not good for the brain I don't know about the on other peripheral tissues I haven't heard of people dropping dead from this stuff yet but I certainly wouldn't want to be ingesting any LPS unnecessarily so would you agree that you should work with a doctor after all you are a doctor yeah definitely talk to your doctor about this and talk to them about the dosing regimen as well so if they have you doing it for six weeks ask him why am I doing it for six weeks why not two weeks or why not as soon as I feel better can I just stop it yeah there's a lot of good questions like that that you should ask your doctor and if somebody's trying to prescribe you a bunch of different things then see is this what they prescribe everybody or is this individualized for me there are peptides like GHK copper peptide which is produced and dodgingously in the liver more at younger ages that's why the liver can regenerate fully is this the GHK copper peptide helps and if you're copper deficient which not a whole lot of people are but a lot of people that have had bariatric surgery are copper deficient GHK copper peptide can help significantly with your nervous system and it's also synergistic so any growth agonist like thymus and beta four made in kids in the thymus which shrinks that's another reason why kids heal really well that in GHK is somewhat synergistic with BPC but if you don't need all three you don't want them and if you don't need it for more than a week you don't want it for more than a week I really appreciate you saying that I often say that sometimes the best dose of something to take is zero it's often the case that the best dosage is zero you mentioned melanetan there are several kinds of melanetan I find it a little bit of a funny conversation because I first learned about melanetan from reading about peptides and discovering that people were taking injecting melanetan to get tan because it's in the melanin synthesis pathway they also discovered this isn't an individual this is reading about this in various manuscripts and peer reviewed papers that it could cause things like pre-opism like like sustained direction that might be the last one that anyone would ever have because of damage to the to the of ask you to also women taking melanetan as a way to get tan and lose body fat so this sounds all very recreational are there any clinical usage of melanetan so separate from the kind of extreme biohacking cosmetic world which is really not the main focus of this podcast ever what more in terms of you know health pursuing health optimization yeah there's actually three FDA approved indications believe it or not not many people know about this but there's three well accepted indications one of them is the hyperactive sexual disorder and more in women that's for brim melanotide so those are women that have essentially no libido whatsoever yeah but other hormones are seen are in check yeah classically it's before minipause so those hormonal issues are not contributing and when you give them this peptide it's also known as PT141 it helps significantly a lot of times use it in nasal spray it goes straight into the central nervous system and accentually you can also inject it and you can also take it via trokey men and women take it correct it's approved for women but it can also help men and it's relatively safe the only relative contraindication that I tell people and a lot of people say oh there's no side effects that I know of but if you have a family history of melanoma or potentially have a melanoma and don't know about it that's why I'm a big advocate of dromoscopy as well and regular skin checks then theoretically it's going to increase that alpha melanocyte stimulating hormone and it can grow that so that's the most important thing is that you can grow that so that's the most important thing is that you can grow that so that's definitely not a good thing so be very careful about long term administration of it it's also approved for lipidistrophy which is the same exact thing as testamoral and which I believe is also known as evista or agryfta and then it's also approved for the rare genetic condition where your receptors or your melanocytes don't proliferate as well so you usually have hypopigmentation it's not true albinism but it's associated with the most important thing is that it's not true but it's associated with morbid morbid obesity and very bad poor outcomes from that in childhood so it's used in kids actually interesting well peptides are a fascinating landscape but thank you for that deep dive into several of them we will probably return to you to talk about peptides again in the near future because I know there's a lot more there and a lot of interest I want to talk about the sixth pillar so just to remind people you said exercise where appropriate caloric restriction managing stress sleep and sunlight are critical for everyone at all ages to manage and optimize hormone health then you have this sixth category which is a really intriguing one which is spirit which is it kind of unusual thing to hear coming from a medical doctor except that I have many colleagues and indeed our former director of the national institutes of health Francis Collins has talked about this notion of spirit we've talked about belief effects on this podcast before with Ali Krum how one's understanding of the things that they do and their world in general really creates an important effect on everything at the level of physiology not just psychology so as a physician how do you conceptualize the spiritual aspect and how do you talk to patients about this given that people walking into your clinic presumably have a bunch of different religious and not a religious background some sure some are atheist some are probably strong believers how do you deal with that and how should people think about this yeah I believe it's it is surprisingly well received you wouldn't think at first glance that a patient really wants to talk about their spiritual health with their doctor but the way I think about it and the way that it really is is it's like a venn diagram and you have a body and a mind and a soul and you can't have one healthy without the other healthy even if your mental health is phenomenal and even if your physical health is phenomenal the mental aspect of spirituality if that piece is not there then that's going to affect your body physiologically as well and Ali Krum has done some excellent work there's also been a lot of other studies regarding prayer and I'm a Christian I believe in God and that gives me a lot of that resilience and motivation it gives me the cornerstone or the groundwork how I can interact with life and regardless of someone's an atheist or regardless of regardless of what someone believes as far as religion or the origin of the species they can know that their spirituality is going to have a profound effect on their mental and physical health as well people like to compartmentalize it so they like to talk to their doctor only about the physical health because it's comfortable to do that they only talk to their pastor or a mom or you know reek either for their spiritual health and they just talk to their therapist or psychiatrist about their mental health but you need to bring all three of those things together it's well known that interdisciplinary clinics lead to improved patient outcomes and that's just disciplines within medicine so that's just doctors that are specializing in this or this so this takes a step back and upper in the upper part of that tree before you reach those dichotomies or the split-offs you have your your body and your mind and your soul so your spiritual health and your mental health and your physical health so if you're in line and all three of those things that builds the cornerstone for the rest of your health and the rest of your life so if someone comes into your clinic and they say they're feeling one way in their body they're feeling one way in their emotional life you run their charts you get their blood work and they're an atheist or they're agnostic what are some of the six pillar practices that they can consider that are in keeping with their atheism or agnosticism because I have to assume that people who are in participate or feel that they belong to you know particular religious sect will have particular prescriptives from those religious sects that will direct them towards particular types of prayer but how would somebody who doesn't have a prescriptive coming to them from some other source what would they what could they do or would they do yeah so I certainly don't force prayer on anybody or anything like that but it's my belief that being especially being an agnostic it's almost the hardest thing because if you're an atheist then you have some groundwork and you have some spirituality even if it has to do with the human spirits interaction with the environment things that can't be physically explained well phenomenon like the work that Ali Krum does but if you're agnostic you're still trying to find that so I hope that everybody does find what they truly believe in as far as their own spirituality but yeah that's a personal journey from a physician standpoint and even if I'm friends with him as well from a friend's standpoint I don't like to push anybody in any specific direction so I don't think that everybody should believe what I believe and I don't feel like there should be any pressure for them to believe something different so I think that there can be excellent physician patient rapport regardless of what we believe and what our backgrounds are yeah that's wonderful to hear I can say without revealing any names that I have close colleagues that in every bin of this spectrum like hardcore atheists hardcore religious in different domains different religions I don't know if I know many I'm agnostic as to whether or not I know any agnostic I should say it's not something that people commonly discuss but in the context of science and medicine but it's starting to happen more and more certainly this issue of spirituality is one of the areas in which neuroscience is asking a lot of questions like what spiritual experiences really are in terms of how they're grounded in the brain or not grounded in the brain I think it's a really interesting area for discovery and I appreciate that you bring it up and you bring it up in the non pressured way that you do I think that it will stimulate a lot of thinking which is ultimately the goal of this podcast well I have one final question that I listen or insisted I ask and it's a very straightforward one it's not at all a curve ball and not at all related to what we were just talking about but it was the most common question when I told people that I was going to be talking to you which is is caffeine problematic for hormones is amazing I received hundreds of the same question about caffeine and since it's probably the most commonly used drug on the planet I know it's taking us back into the very practical but in closing we're not quite there but in closing is caffeine having an effect one way or the other on testosterone, estrogen or other hormones that is positive negative or neutral only if it affects your sleep so it works on a dynosine and it can actually slightly improve allergies as well but negligible effect otherwise great well sorry to end on such a practical brass tax type of type of question but I did promise to the listeners that I would ask that question listen I want it sincerely thank you we covered basically at an endocrinology textbook a neuroendocrinology textbooks worth of information a ton of practical tips in there where can people find out more about you we will certainly provide links and I guess the other question is are you taking patients I'm sure you'll hear that in the various venues where people can contact you but where are you active in terms of public facing work I'm active on Instagram Kyle Gillette MD I'm also active on the social medias of my brand new clinic which is Gillette health that's at Gillette health on Instagram or Gillette health dot com great we'll provide links to those and I should say that your the content you've been putting out on Instagram is terrific because you actually point to specific studies and you put things into actionable context which is very meaningful for me Kyle doctor Gillette I should say thanks so much for your time I really appreciate it I know the listeners will too thank you my pleasure thank you for joining me for my discussion about hormone health and optimization with doctor Kyle Gillette as you just heard he is a treasure trove of actionable clear information and again you can find him teaching more about hormones and other aspects of health on Instagram at Kyle Gillette that's Gillette with two T's and two else but no eat Kyle Gillette MD on Instagram and Gillette health on all other platforms and if you would like more information about his practice you can find that at Gillette health dot com if you're learning from and or enjoying this podcast please subscribe to us on YouTube that's a terrific zero cost way to support the podcast in addition please subscribe to the podcast on Spotify and Apple and on Apple you have the opportunity to leave us up to a five star review if you have questions or comments about this or any episode of the human lab podcast or if you'd like to suggest topics that you'd like us to cover or guess that you would like me to talk to please put that in the comment section on YouTube in addition please check out the sponsors mentioned at the beginning of today's episode that is the best way to support the podcast we also have a patreon it's patreon dot com slash Andrew Huberman and there you can support the podcast at any level that you like during today's episode and on many previous episodes of the human lab podcast we discuss supplements while supplements certainly aren't necessary for everybody many people drive tremendous benefit from them for things like optimizing sleep and focus and indeed hormone health anytime you're considering taking a supplement you want to make sure that the supplements are of the very highest quality for that reason we've partnered with Thorn THORN E because Thorn supplements are known to have the highest levels of stringency in terms of the quality of their ingredients and precision about the amounts of the ingredients that they put in each bottle meaning what is listed on the packaging is actually what's contained in those supplements which is not true for many supplement companies out there if you'd like to see the Thorn supplements that I take you can go to Thorn that THORN E dot com slash the letter U slash Huberman and you can get 20% off any of those supplements also if you navigate deeper into the Thorn site so go to Thorn dot com slash U slash Huberman but then pass into Thorn dot com you can also get 20% off any of the other supplements in the Thorn catalog if you're not already following us on Instagram and Twitter please do so it's Huberman lab on both Instagram and Twitter and there I cover science and science based tools some of which overlap with the contents of the Huberman lab podcast but much of which is distinct from the contents of the Huberman lab podcast and again we are hosting two live events one in Seattle on May 17th another in Portland on May 18th that series is called the Brain Body Contract where I'll talk about science and science based tools some of which I have never talked about in a public forum before and there will be an open question and answer format for you to ask me your questions and I will do my best to answer them in real time thank you once again for joining me for today's discussion with Dr. Kyle Gillette and as always thank you for your interest in science