Testosterone Explained (Low T, Muscle Growth, Aging & TRT) | Dr. Ben House

Perform with Dr. Andy Galpin · Episode 34 · September 30, 2026 · Transcript

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Dr. Ben House
People are not getting informed consent. And that's why the TRT discontinuation rates are also bananas, because they aren't being sold the true story. This can be done really, really well. Testosterone can be life-changing if it's needed. It can be absolutely huge. But it can also be done really, really poorly, just like anything else. And in those cases, people are not being told the true story. And really, if testosterone is ever your first line, just from a low testosterone draw, if testosterone is the answer there, I'm walking to the door.

Dr. Andy Galpin
Yeah.

Dr. Ben House
It's not as simple as low testosterone, testosterone. There's 120 things that can cause low testosterone. You should be asking, "Why is this low?"

Dr. Andy Galpin
The science and practice of enhancing human performance for sport, play, and life. Welcome to Perform. I'm Dr. Andy Galpin. I'm a professor and scientist of human performance. And today, I'm talking with Dr. Ben House. Ben is a PhD in nutritional sciences and has spent the last 20 years or so working with high-level performers, almost especially, but not exclusively, in professional sports. He has been one of my absolute top and go-to resources for nutrition and physiology for the better part of two decades now. He brings an unbelievable depth and understanding of both the literature, as well as the practical relevance to that. In this conversation, you're going to learn a ton about testosterone. Everything from what testosterone really is, how it's impacted by aging, how it's impacted by nutrition and other relevant factors. You're going to also learn a ton about some misconceptions and some of the things that are being purported commonly in media and other avenues about what's really going on with testosterone and how we should be thinking about it across our culture.

Dr. Andy Galpin
So that said, I hope you enjoy our long and detailed conversation with Dr. Ben House. Dr. Ben House, welcome in.

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Dr. Ben House
Thanks for having me.

Dr. Andy Galpin
So beyond excited to have you here. A lot of areas I want to go into today. You've been in pro sports for a long time. You've been in this entire world of performance and nutrition and science for as long as anybody I know. But I want to start with testosterone. I know you've done a bunch of work lately. You've got a bunch of papers that you've authored and published, and a whole bunch of stuff going on. So if you wouldn't mind, can you just give us everything there ever is to know about testosterone and keep it in 30 seconds?

Dr. Ben House
Sure. Yeah. It's a male hormone.

Dr. Ben House
I think the internet thinks it's more important than it probably is. That's not to say that it's not important and that it can't change physiology, but I think we give it, inside of the normal range, we give it a lot more credit than it's probably due. With an asterisk there that I think you and I both appreciate, that there are some things that we don't know about it, like how important is the peak? Does dropping from 800 to 500, is that bad? We know 300's really bad.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But what's the delta there?

Dr. Andy Galpin
So a handful of ways I want to tackle this topic because it is so big, and one of the things that I appreciate about you so much and over your career is you're one of the very few people I can look to that can look at the same exact problem as everybody else and just see a little bit differently. What is the primary thing for someone who's in a high-performance mindset and they want to be the best they possibly can? We'll go into the disease and medicine at some other point. That's not really what you and I do for the most part. So a performance mindset person, just off the top of your head, what are the things they should be thinking about with testosterone?

Dr. Ben House
I can give you the wish list.

Dr. Andy Galpin
Great.

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Dr. Ben House
I think that's maybe the most important part. The wish list is, for most of us, is probably to go back in time, and to get testosterone probably in our late teens, and to track it over time. Testosterone total, and I'll throw free in there, and then also sex hormone binding globulin. Tracking those longitudinally, I think, for the individual, that's where the money is. And really looking at not just one time point, but how does it relate to all these other time points? And the analogy that we sometimes use is shoe size, right? Say you're a size 10 and that's your norm, right? But then all of a sudden at 40, they're trying to fit you into a size five shoe. That's probably not going to go very well. So you want to know your peak so that you can kind of maintain it, hopefully, throughout the life course.

Dr. Andy Galpin
Why wouldn't I want it just red-lined? Why wouldn't I want testosterone just as high as possible all the time?

Dr. Ben House
Left ventricular hypertrophy is a reason not to redline it. Combine that with some sludgy blood or erythrocytosis, if I'm speaking gobbledygook to you. Testosterone upregulates EPO, which is going to tell your body to make more red blood cells. So if you have more red blood cells, then your blood will get more viscous, so now you're not pumping blood, you're pumping oil. So that's a double whammy on your heart in that you have a bunch of back pressure, so you have a bunch of muscle that all of a sudden your heart has to pump against, and it's pumping ketchup. I'm fairly certain that's a bad idea. You don't want to run that for decades if you get decades.

Dr. Andy Galpin
So just starting, let's assume we'll get to exogenous testosterone kind of later, but let's stay within the not on it yet or-

Dr. Ben House
Yeah

Dr. Andy Galpin
... come off it, in that sort of range. Maybe just start us with what is the actual normal range? And if you wouldn't mind, give us units one time and what a normal range means, then we'll start getting into manipulation.

Dr. Ben House
So the normal range for a male of testosterone is debated. Let's call the low anywhere from 264 to 300 nanograms per deciliter. High end- I've seen outside a lab range, can't measure it naturally. This is legit. I have seen that. I think you and I have both seen enough people-

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Dr. Andy Galpin
Yeah

Dr. Ben House
... in this space, thousands of blood labs, that those people do exist. Those people are fairly big, I'm not going to lie to you, when I have found those people.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But I've also found people who are just as big at 400 nanograms per deciliter. Some of the biggest people I know have very normal testosterone. Females are going to be a lot lower than that. The low for females is debated. It's hard to measure because we're talking about very minuscule amounts, but 20 might be 20 nanograms per deciliter. You can see it 60, somewhere in that range, so a lot lower. 10%, they have 10% of the testosterone as males, gets thrown a lot. Depends on, I don't know that that's super helpful.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Knowing the range is probably more helpful.

Dr. Andy Galpin
You said higher than labs will measure. What's that number?

Dr. Ben House
For the lab, like 1,200 nanograms per deciliter. We hear a lot about in your bloodstream, we were talking about this five, 10 years ago, now it's kind of mainstream. You have, what, five grams of blood sugar in your entire bloodstream at any one time. Diabetes is seven grams or nine grams. This is infinitesimally less than that. So what I always tell people is to have an idea of how much testosterone in your blood, if you take the average backyard pool, you're looking at a male is half a paperclip. So take half a paperclip or a paperclip, whatever, it doesn't matter.

Dr. Andy Galpin
Take the whole thing.

Dr. Ben House
Take the whole thing. Take a couple paperclips of salt and dissolve it in your pool, and then we're going to go find that with science. It just boggles my mind. And then, in general, we're going to have a 6% error on that, which is crazy. Now, free test, you're talking about milligrams, like five milligrams into a pool, and then we're going to go find that with science. And right now, we have

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a 12 to 15% error on that, which is pretty crazy. I don't know, sometimes we don't give science enough respect, but that is a crazy thing that we've been able to do.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And inside of that same pool, just to kind of bring you back to this blood glucose analogy, so you have five grams of glucose. You have nanograms per deciliter. Nanograms. You're talking about 10 to the negative ninth in terms of testosterone. When you look at that same pool, you got 150 pounds of glucose. Wheelbarrows full of glucose.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Hematocrit, you're talking ton to ton.

Dr. Andy Galpin
Oh, yeah, half the pool.

Dr. Ben House
Half the pool is hematocrit.

Dr. Andy Galpin
Literally half the pool, yeah, is red blood cells.

Dr. Ben House
So that maybe helps people get a perception about not only how little of this hormone and solute is around, but also its action inside of minuscule amounts. Throw another paperclip on there and you're Ronnie Coleman.

Dr. Andy Galpin
Yeah. Yeah.

Dr. Ben House
That's-

Dr. Andy Galpin
Right.

Dr. Ben House
It's crazy.

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Dr. Andy Galpin
So you said a very specific number. You said 264 versus 300.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Yeah. Why 264?

Dr. Ben House
Again, I've been after this question for, phew, 15 years to been in the space for pushing 20. And I've been doing this a long time, but I think it's good to give... I haven't been in the game as long as Bhasin and Kramer.

Dr. Andy Galpin
Yeah.

Dr. Ben House
People were doing this research in the '90s when I was, whatever, playing video games, and they're still at it.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And so we had 300 nanograms per deciliter was kind of this line in the sand forever. And then Bhasin did some harmonized, we have this bell curve, and so the 2.5% of the population would be below 264. And then 300, it's like 306 or something, is where 5% of the population. So a lot of these are, and this is maybe something to anchor us throughout, are population-based norms, and that's where I think, on the individual level, much more important to you, where your peak is. Same with bone mass. And that's one of the big things we don't know is, does peak testosterone correlate with peak bone mass? Does that set your skeleton up, and now all of a sudden, you're riding that the rest of your life? These are the questions that we don't have answers to.

Dr. Andy Galpin
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Dr. Andy Galpin
I personally simply mix a scoop of their cinnamon flavor in some water every night, and by doing so, I make sure I'm covering any gaps I might have in my daily fiber intake that I try to get through eating a balanced whole food diet. If you'd like to try Fiber+ or any of Momentous's best-in-class supplements, just go to livemomentous.com/galpin and use the code GALPIN for up to 35% off your first order. Again, that's livemomentous.com/galpin and use the code GALPIN for up to 35% off your first order. So I think it's fair to say that at this point, we have a reasonable understanding of what testosterone is.

Dr. Andy Galpin
What total testosterone, free testosterone, and maybe you could quickly share that and why that free thing is. You kind of diminished earlier. A lot of people are like, "I thought free testosterone matters the most." So I'll actually just stop. Maybe just answer that question.

Dr. Ben House
It's good to honor that in 2026, this debate has been running.

Dr. Andy Galpin
Yeah.

Dr. Ben House
It's been running hot since the '80s.

Dr. Andy Galpin
Yeah.

Dr. Ben House
We've been trying to figure this out, and this debate is still running hot. We're talking about journal, Endocrine Society is still having debates on this. And the reason that I think they're feeling debates is because free testosterone is probably where the money is, but it is inherently harder to measure because it has such a low concentration.

Dr. Andy Galpin
What percentage of testosterone is free versus non-free?

Dr. Ben House
2%. And then you're at 45% is bound to sex hormone binding globulin, which we think of sex hormone binding globulin as like, all right, this is unavailable to tissues. That is untrue. And it's more of the best analogy that I ever heard for this is like, all right, you have this globular protein

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and albumin is the other carrier, and these are globular proteins, and they're grabbing testosterone, right? And it's how strong the grip is. Sex hormone binding globulin has a much stronger grip than albumin. But it still can be unlocked, it can be released. And then the other part that this is maybe like testosterone's cool, it sounds cool. There's a lot of words that sound cool, like you have aromatase, you have like, there's so many cool sounding words, but maybe my favorite is meglitin. What meglitin does is it eats, endocytosizes the sex hormone binding globulin and testosterone complex and brings it into the cell.

Dr. Ben House
And so meglitin's very probably not expressed in muscular tissues, unfortunately, as much as that would be cool. It's probably mostly limited to the kidney and the reproductive tract.

Dr. Andy Galpin
Yeah, places that have to get it.

Dr. Ben House
Have to get it. And so that's interesting in and of itself, but the free fraction and the albumin fraction are probably what's available to most tissues.

Dr. Andy Galpin
Got it. So what you're saying is, I'll put a number on it. I could use a real number, but a fake one will be easier. Let's just say we had 100 testosterone total, right? So in our pool, we got a giant pool, we got 100 out there. Of those 100, how many of those would be free?

Dr. Ben House
Two.

Dr. Andy Galpin
Two.

Dr. Ben House
They're spread there, like one to three.

Dr. Andy Galpin
Free meaning I can go into the cell and be used immediately.

Dr. Ben House
Yes. And this is maybe my ultimate gripe with how this science has kind of hit the internet. I think that is true, but it's also not true because the binding and dissociation kinetics of this are so fast.

Dr. Andy Galpin
Mm.

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Dr. Ben House
That's the other thing about biology that we can't fathom is things are operating on millisecond timelines, and we're measuring this once a day at luckily at 7:00 a.m., right? And testosterone's disassociating, it's moving, it's going across the membranes all the time. So yes, I think for us to think about this, 2% is available to the cells, and then that albumin-bound testosterone can come off quite quickly so that is available as well to the cells. So at any given time, maybe 52% of that is available, and then 48% is bound to sex hormone binding globulin, not coming off from-

Dr. Andy Galpin
All right. Let me stay on free testosterone for a quick second. This is one of those issues where I think the nomenclature does all the success and causes all the damage.

Dr. Andy Galpin
I think that if I were to hear the word free testosterone, and then non-free testosterone, I'd probably be like, "I want the free stuff."

Dr. Ben House
Mm.

Dr. Andy Galpin
You keep saying 2%. What's the normal-ish range? Is that always 2%? Is it 1 to 5%? Like what would it be a typical ballpark for people to see for free?

Dr. Ben House
I think absolute numbers is the play here.

Dr. Ben House
This is very pertinent right now because it looks to be like 66, I think it's picograms per milliliter.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And this is going to be different if you're in Europe, but that absolute number is the low. And I don't really know what to do on the high side of that. I'm like, "Great." That's kind of my answer. Okay. To me, it's relative, like, "All right, where is this normally for you, and then where does it go out to?" But free testosterone, if we look at the literature, where free testosterone is used is in edge cases. That's, I think, really, really important. So how it's been used in kind of optimizing culture is not how it's necessarily used clinically. Like this is an edge case, it's like, all right, testosterone's low, borderline low, and there's symptomatology, let's go to free testosterone. That's how it's predominantly used.

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Dr. Andy Galpin
Why isn't free testosterone always measured?

Dr. Ben House
The concentration is so low, and it has a lot of error. You're talking about analytical error of 12 to 15%, and then you and I talk about compounding error all the time, because you just can't get away from it. And we look at labs, I think, a lot differently than normal people look at labs. You look at the Endocrine Society, how this low testosterone's even diagnosed. You need to have two draws, two fasting draws that are lower than whatever the threshold is. That's good because you can have all the lab error, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
Or you might have caught you in a bad state. And now the military just put in a really cool asterisk, which I really like, is that now you can't have undergone a severe deficit, severe sleep restriction for 30 days before, which I would love for all the TRT clinics to adopt the new guidelines. That'd be great.

Dr. Andy Galpin
You'd be seeing a lot of bankruptcy statements come through if that happened.

Dr. Ben House
For sure.

Dr. Andy Galpin
Yeah. No, I want to go through actually all that in detail, but I want to keep going on free testosterone. because I know it took me a long time. You've said this now several times, so slight detour on top of the detour here, but really interesting. What do you mean when you say analytical variability?

Dr. Ben House
So there's intra-assay variability. So if I grab your blood, let's just say it's the same vial, and I just throw it through the same process. This is if we just run the same lab, everything, you'll get 12 to 15% error intra-asset.

Dr. Andy Galpin
Same person, same sample, you just take the same, put it through the machine once, put it through the machine a second time, and you'll get a 10 to 12% difference in that number.

Dr. Ben House
Yeah, because you're trying to find grains of salt in a pool.

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Dr. Andy Galpin
In a pool. ... super difficult. Why does that matter?

Dr. Ben House
This comes back to, and we've talked some about this even before the show, is just separating signal from noise, that is the job to be done in pro sports and data science. You do not want to be reacting and causing unneedless stress because of noise. You want to be reacting to signal. And that's why we want to model this. I want to know if this value, on the individual level, is this statistically significant? Is this inside a lab error? Am I reacting to noise, or is there an actual signal here? And that's why it's really, really important to know this, and that's why I wish that labs would have to publish, it'll probably always be best-case scenario, but it's not the lab tech coming a little bit hungover the next day.

Dr. Andy Galpin
Yeah.

Dr. Ben House
This is their best. Throw the best person at it. And this is their error.

Dr. Andy Galpin
Is free testosterone measured the same on all the big labs?

Dr. Ben House
That's a good point. For the end user here, I only want to see free testosterone through equilibrium dialysis. That's the gold standard. I'm not really interested in calculated free testosterone. That might be useful at the population, but I don't care about that personally. And the same thing with testosterone.

Dr. Ben House
Yeah, these exist. You wouldn't want an immunoassay. You want that to be LC-MS or mass spec, liquid chromatography mass spec. You also want ultrasensitive estradiol. Estradiol is in that very low range, especially in men, where it's very hard to pick up. I'm quite bullish on that. You fictiously are going to get high values, and then everybody freaks out about high estrogen when they should be freaking out about low estrogen.

Dr. Andy Galpin
I want to go through this spin cycle one more time on exactly what you said.

Dr. Ben House
Okay.

Dr. Andy Galpin
I think that was really, really valuable. I wasn't planning to go here at all, but this is great. This is

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guidelines. If you want to pay attention to your free testosterone, you said two things there. One, there's a difference between direct and calculated.

Dr. Ben House
Correct.

Dr. Andy Galpin
Give me more on that, and then what was the thing that people should be looking for? You s-

Dr. Ben House
Equilibrium dialysis is the gold standard measurement for free testosterone.

Dr. Andy Galpin
That doesn't come on a normal blood test.

Dr. Ben House
No, you have to select it. And they're in batches now. The gold standard testosterone is in a batch of, all right, I'm going to get LC-MS total testosterone, then I'm going to get equilibrium dialysis free testosterone.

Dr. Andy Galpin
That's not on your basic panel. And if they were to not select that and they see free testosterone on the report...

Dr. Ben House
Could be a Vermulien calculation, something like that, which is calculated from sex hormone binding globulin concentrations, albumin-

Dr. Andy Galpin
Albumin

Dr. Ben House
... concentrations, which can fluctuate based on hydration status. That's the other part about this, is that there's a lot of acute things that move testosterone, like plasma volume being one of them. If you're doing this yourself, you want to standardize the time and the hydration status as much as you can to limit your own volatility, because you start stacking errors here, and you're going to be in the realm of 20% to 30% real fast. And you guys can do the back of the envelope math. If your testosterone is 600, that means your spread just from noise is 120. That's pretty crazy.

Dr. Andy Galpin
So, if you went from 600 to 700, you didn't know if that's real.

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Dr. Ben House
Noise. You don't even know it's real.

Dr. Andy Galpin
It just could be because you're more hydrated one day, less hydrated another day, or the lab variability, or any of those things.

Dr. Ben House
Or the time of day, like when you woke up. So, your testosterone peaks at slow-wave sleep, and then it stays elevated through the rest of the night through the REM cycles, and then when you wake up, it's slow burn. And so if you woke up at 5:00 a.m. for your draw last time, and you got it drawn at 9:00 a.m., that's four hours awake. You might have dropped, the average person is you're going to, you look at the literature, it's 43%, so from their peak to their nadir. So, you might have dropped already 20%, whereas the last time you woke up at 7:00, you got it at 8:00. That's a completely different draw pattern.

Dr. Andy Galpin
The reason why I find this so fascinating, interesting is if you're going to make a decision, especially about pharmacology or anything, your sleep, or when you're going to work out, or is your new exercise routine help, like anything that you're trying to figure out here, if you're not taking this much care into your testing, you actually don't even know if this stuff's working, or conversely, you might actually be going the opposite direction. So, if you don't mind, can you just give me some fictitious numbers here? What's the average testosterone for 40 to 50-year-old male?

Dr. Ben House
550, somewhere in there. Depends on the population that's sampled, where they are. I think like-

Dr. Andy Galpin
The UK, that's 300.

Dr. Ben House
Yeah. The UK Biobank has some, again, but this is because of sampling. They sampled in a 10-hour window. They didn't have to be fasting. Eating, fasting is 19%. So, that's what I'm saying. You just start stacking errors on this thing, and you do not have signal. That's why knowing where the noise is can set you free on your own individual data, and you want to keep it as standardized as you can.

Dr. Andy Galpin
So, the absolute amount of difference in a given day of testosterone for you, me, you personally, right? How much would my testosterone change in amount given in one single day?

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Dr. Ben House
Yeah. This is Diver et al. 2003 we've known this. They looked at young men, fit older men, and then older men, and this is the diurnal rhythm-

Dr. Andy Galpin
Yeah

Dr. Ben House
... of testosterone, which you're after. Say your peak is 650, and then-

Dr. Andy Galpin
And this happens when you're sleeping.

Dr. Ben House
Yes. And then it drops, and usually late afternoon, evening is the lowest it gets. And that is going to be 30% to 40% of that morning high. So, you're talking about dropping 200, 250 nanograms per deciliter from your peak. So, your low could be 400. Now, let's say your peak is at 500. All of a sudden, you get your low, it's 350. Someone's freaking out.

Dr. Andy Galpin
Or let me make it more tragic. You're 450. Like you're in a... Most of us would say that's probably a pretty good spot, and then you get it at the wrong time. You wake up at 5:00 a.m., and you actually don't get your blood draw till 9:00, but you fasted, you rested, but you're still four hours into your day. You could easily be in a sub 300.

Dr. Ben House
Yeah, I think this is why, like, it's some crazy number, like 42% of people on repeat draws are not hypogonadal. Like, the numbers are so bad, they almost can't be real in that 4% of people who get on TRT in certain scenarios have gotten two draws.

Dr. Ben House
Like, that's just crazy to me. Like, 4% of people who've gone on TRT in some data sets have actually done the thing that they should have done.

Dr. Andy Galpin
As in 96% did not.

Dr. Ben House
As 96% are on TRT and did not follow protocol.

Dr. Andy Galpin
So the protocol meaning, and you said this kind of quickly earlier, but most organizations, whether these are sporting organizations, which you can't give up, but endocrine societies are

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going to require or strongly recommend at least two testosterone draws before going on TRT.

Dr. Ben House
Like, health insurances will require this.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Rightfully so. And you need two draws, and you need symptomatology. Like, that's the other part about this is, like, we've toyed around with this number of 100. It's like, all right, let's play with that. Like, we grab 100 just random dudes off the street for some reason, and we're just going to survey. Hopefully, we're not doing it at 2:00 in the afternoon. We're going to do it at 7:00 a.m.

Dr. Andy Galpin
Or you are because you want to make a point.

Dr. Ben House
Oh, yeah, or you are because you want to show the world that everyone's low, which is what some people want for monetary reasons or just because it fits their narrative. Whatever. No beef. Uh, kind of beef. And so-

Dr. Andy Galpin
A lot of beef, but yeah.

Dr. Ben House
A lot of beef. So, like, say you did it right at like 7:00 a.m. Everybody woke up at 6:50. You're right there ready to take their blood. Out of those individuals, if we're just smattering, not worried about age, you're looking at like 25% are going to have low testosterone.

Dr. Andy Galpin
As defined as sub 300.

Dr. Ben House
Sub 300. If they're normal weight, that drops to 11%. So, like, just to give people, like, finding the needle in the haystack gets harder. Now, let's play this out. So even at that 25%, only around 5% to 6% of those people have symptomatology. So, like, already you're like, all right, worst case scenario, we're at, like, okay, yeah, that's bad. I'm not going to sugarcoat it. Like, 25% of the US population having low testosterone, that's not good. But only 5% to 6% of them have low testosterone plus symptomatology. So that's a criteria for getting on TRT. And then the edge cases where free testosterone would be used would be, like, total testosterone, kind of on the fence, maybe like nebulous symptoms like fatigue, which could come from anything. I'm not willing to chalk that up to testosterone. And their free testosterone is also low. But the free

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testosterone has kind of been used to this, like, it's not used that way.

Dr. Ben House
It's used as, like, I'm going to find a way to put you on it. Like, let me go find it for something I want to find.

Dr. Andy Galpin
Here's the lie I've seen. "Oh, we looked at your total testosterone. You're 450."

Dr. Ben House
Mm.

Dr. Andy Galpin
"Eh, it's kind of a little bit low. We'd like to see it 800, but like," "... okay, not too bad, right? But your free testosterone is at 45."

Dr. Ben House
Yeah.

Dr. Andy Galpin
You're buying this story?

Dr. Ben House
You want to be a man or not?

Dr. Andy Galpin
100%, right?

Dr. Ben House
Yeah, this is crazy.

Dr. Andy Galpin
You're like, whoa, whoa, whoa.

Dr. Ben House
It's crazy.

Dr. Andy Galpin
I completely understand why this happens to everyone, right? Because you've got sex hormone binding globulin as a part of the story. Maybe I'll go back really quickly and come right back to here. When we talked about 2% of testosterone in your body is free. A la 98% is not. And then you gave us numbers, but of that 98%, it's kind of a lie. It's kind of a lie in the sense that 90... This is being sold to you as 98% of it therefore is inactive.

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Dr. Ben House
Which is untrue. Yeah, that-

Dr. Andy Galpin
Untrue

Dr. Ben House
... that's untrue.

Dr. Andy Galpin
So give-

Dr. Ben House
Some of it's weakly bound

Dr. Andy Galpin
... me that breakdown. You did it one more time or once earlier, but...

Dr. Ben House
45% to 55% is bound to sex hormone binding globulin. The rest is bound to albumin, which is weakly bound but available inside of the capillary beds where it would dissociate and bind to the androgen receptor.

Dr. Andy Galpin
So if we wanted to give really quick math here, basically what you're saying is 98% versus 2%, however, of that 98%, I don't know, close to half of that is actually available.

Dr. Ben House
Yeah.

Dr. Andy Galpin
It's being bound to albumin.

Dr. Ben House
Yeah.

Dr. Andy Galpin
But you can get it off of there, particularly probably when you're exercising-

Dr. Ben House
Yeah

Dr. Andy Galpin
... or doing other things like that that makes it want to give it up. So if you're making your entire decision on something as serious as TRT, only based on that number of 2% and not regarding

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total or symptoms or other things, up to you is what you and I would think. But you're not being given-

Dr. Ben House
I'll paint the numbers even-

Dr. Andy Galpin
Please.

Dr. Ben House
So you were like 450, 45.

Dr. Andy Galpin
Yeah, yeah.

Dr. Ben House
I'll paint this, like, way more real. So 650, hot, like, oh my gosh, your testosterone is at 650. That's okay. I'm willing to say that's pretty good. That's higher than the average person, right?

Dr. Andy Galpin
Yep, yep.

Dr. Ben House
But your sex hormone binding globulin, ooh, that's 53. That's lab high.

Dr. Ben House
Yeah, because sex hormone binding globulin, the lab range is built off a metabolically deranged population, so it's fictitiously low. So now all of a sudden, your free testosterone's borderline. That person has no business being... Like, I'm bullish in, like, 650 plus a borderline high sex hormone binding globulin. No, no, no.

Dr. Andy Galpin
I don't even care if it's borderline high. If it's ripping high, like, how do you answer that, right? I'm 600 plus, I'm 500 plus, and I'm way sex hormone binding globulin high.

Dr. Ben House
I'm not reaching for the needle, brother.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Once you've looked at all these military studies and you realize, all right, this is a scenario where the body probably wants this way some. The body is going to get what it wants somewhere,

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somehow. And so sex hormone binding globulin is driven down through Hepatic fat or liver fat. And so that's the primary reason that obesity drives low testosterone, is through a sex hormone binding globulin mechanism. You also have leptin resistance in the brain, which we can talk, now we're jumping ship. But I think it's important because sex hormone binding globulin, if you're healthy, will most likely, it scales with age, yes, but it scales, like this is metabolically deranged population, sex hormone binding globulin's going from 20 to 30 throughout the life course. This is metabolically healthy people going from 40 to 60 throughout the life course. Our normal range is built on an unhealthy population.

Dr. Ben House
Tommy and I have been looking at this for 10 years, and we had a convenience sample of just jacked and very healthy individuals, and I think the average sex hormone binding globulin was 45.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's what drives me bananas is we don't appreciate the athlete lifestyle, so then we're not even going to try the things that could potentially lower this from a performance standpoint.

Dr. Andy Galpin
Yeah.

Dr. Ben House
We'll just be like, "Oh, supplement."

Dr. Andy Galpin
I am going to pin you down on solutions for all this stuff, because there's a lot of ways to get here, but I'm so interested in just this part of the equation because I care so much about this particular topic because, and I know you feel the same, first and foremost, I want to protect people. You have the right information, do whatever you want.

Dr. Ben House
Informed consent. You want to go to 3% body fat, I'm here for the ride, brother.

Dr. Andy Galpin
You've been there.

Dr. Ben House
I've been there. I'm willing to take you to the edges of what's possible, but I'm also going to tell you what you're in for.

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Dr. Andy Galpin
Yeah.

Dr. Ben House
And then you can decide or not. People are not getting informed consent, and that's why the TRT discontinuation rates are also bananas, because they aren't being sold the true story. We're really talking about this from a negative angle. This can be done really, really well. Testosterone can be life-changing if it's needed. It can be absolutely huge. But it can also be done really, really poorly, just like anything else. And in those cases, people are not being told the true story. And really, if testosterone is ever your first line, just from a low testosterone draw, if testosterone is the answer there, I'm walking to the door.

Dr. Andy Galpin
Yeah.

Dr. Ben House
It's not as simple as low testosterone, testosterone. There's 120 things that can cause low testosterone. You should be asking, "Why is this low?" And if no one's answering that question for you, you need to find someone else.

Dr. Andy Galpin
Is it low because I'm just getting older? Is it low because I am not sleeping enough? Is it low because I'm not eating enough? Is it low because I'm eating too much? Are all those-

Dr. Ben House
Oh

Dr. Andy Galpin
... or should we go through them one by one?

Dr. Ben House
Three out of four, yes. One of them's a no.

Dr. Andy Galpin
One of them's a no. Okay. Hang tight on that. Steel man me this.

Dr. Andy Galpin
50 years old, I'm into my health, but I have a full-time job in a different sphere, all the things. I feel like trash.

Dr. Andy Galpin
Whatever, I eat pretty good. I'm doing all the things. I try to sleep, but I got a hard job, and I got... You know where I'm going with this steel man, right?

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Dr. Ben House
Mm-hmm.

Dr. Andy Galpin
I understand the urge to go, "I'll take a little bit of TRT, my doctor's going to pay attention, and I feel a lot better." What's wrong with that?

Dr. Ben House
I have no problem with that if someone's lipids are washed, if their hematocrit is washed, if they have informed consent.

Dr. Andy Galpin
I didn't say any of those things.

Dr. Ben House
Yeah. I'm going to add caveats to that.

Dr. Andy Galpin
Yeah.

Dr. Ben House
If it's just like, "I want to feel better and I'm going to pop my testosterone to 1,200."

Dr. Andy Galpin
Yeah. Maybe I'll ask it this way. If I'm that person, then, you kind of just answered it, but I'm not going to do all the things, whatever.

Dr. Andy Galpin
I'm going to rip the test, though. I don't care. I'm going to rip it.

Dr. Ben House
I'm going to take gear.

Dr. Andy Galpin
I need to go-

Dr. Ben House
I'm taking TRT plus

Dr. Andy Galpin
... what should I watch out for? Because you actually kind of backward answered it, but-

Dr. Ben House
Again, there's ways to do this well, and there's ways to do it poorly.

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Dr. Andy Galpin
Yeah, I'm self-managing, basically.

Dr. Ben House
I'm self-managing. You want to make sure-

Dr. Andy Galpin
I'm going to a clinic, or my buddy's just going to sign off the thing on the whatever. I'm really the one paying attention.

Dr. Ben House
All right. This is like, "I'm going to do this thing. I feel better on this thing. I want to do this as well as possible."

Dr. Andy Galpin
Yeah.

Dr. Ben House
You definitely don't want to have a hematocrit above 52. You definitely do not want to have a hematocrit of 54 or higher.

Dr. Andy Galpin
That's a red flag, stop right now.

Dr. Ben House
Yeah, you are playing with fire from a lot of different angles. You are hitting the-

Dr. Andy Galpin
Like wake up dead.

Dr. Ben House
For sure, yeah.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Major cardiac event type scenario.

Dr. Andy Galpin
Yeah.

Dr. Ben House
In that you are, especially this person's going to be training, right? So the odds that they have left ventricular hypertrophy is quite high. And that-

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Dr. Andy Galpin
We can speak to this one, too, because you and I have seen this game. I've seen this one.

Dr. Ben House
I've seen this ton, and it makes me so angry.

Dr. Andy Galpin
Yeah.

Dr. Ben House
This is guidelines 101. Erythrocytosis needs to be managed either through blood donations or a change in formulation. This has to be done. This is not like, "Oh, we'll maybe do this." No, you have to do this.

Dr. Andy Galpin
If you're going to self-manage, I don't want to pay attention to all this stuff, I'm just going to go on this because I can get it from the clinic or tell it whatever. Number one measure, hematocrit.

Dr. Ben House
CBC differential right now, I think $5.50.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You don't even have to be fasted. Be hydrated.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But you got to get this. You got to track this in yourself. To bring it back to professional sports, like doping, EPO, if you've been following Tour de France, you know back in the day, this was a big deal. You're talking about people waking up in the middle of the night because their hematocrit is so high that they're doing air squats because otherwise they will die.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And you got people just running this by themselves, just playing Whac-A-Mole with TRT.

Dr. Andy Galpin
And 100 other things that they're doing to increase cardiovascular risk

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Dr. Ben House
Yeah.

Dr. Andy Galpin
Stimulants, to say the least. What else should I be paying attention to, high-level stuff besides somatic? I kind of cut you off. Well, I definitely cut you off, but what other would be high things on your list? Warning signs.

Dr. Ben House
For running TRT, the-

Dr. Andy Galpin
Yeah

Dr. Ben House
... somatic is the biggest one. PSA, you want to have tracked because this gets to the anabolic versus the androgenic effects of testosterone. And so you're going to get, the anabolic effects is kind of mostly what we're after. We're after some of the androgenic effects, but that's a Goldilocks. You don't want all of them.

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
All of them is hair loss, acne, things like that. And they come along for the ride in different ratios. Some people go on TRT, immediately bald, and cystic acne. Some people never get it. So, maybe you're a high DHT converter, dihydrotestosterone is converted through 5-alpha reductase. That's where, it's a more potent androgen, but it also has some of the more androgenic side effects. In the drug world, that's why you have so many derivatives of these things.

Dr. Andy Galpin
Yeah.

Dr. Ben House
It's because people are trying to get the anabolic effects without the androgenic effects or some version of that. That's the other thing that you want to make sure of. You also have the lipid component. Testosterone can just absolutely tank your HDLs. You probably get that up with fish oil, smarter things. Those are the main ones. Estradiol is the other one that, it's gotten a really bad rap. For males, we want estradiol. I would bet that you will feel worse at low estrogen and high testosterone than you would at low range testosterone. Because estrogen is really, really important for sexual desire. It's really, really important for bone. It's really, really important just for

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your brain and a ton of different tissues. You do not want to jam that thing into the floor. Even though estrogen's a brake at the hypothalamus and the pituitary, and if you run Arimidex, you can drive testosterone up, but the price of that is low estrogen, and that's not a price that anybody wants to pay.

Dr. Ben House
So, testosterone is generally a ratio with estrogen. You want to have a good amount of coverage there, and the bodybuilders have known that for a long time. They've run those experiments.

Dr. Andy Galpin
Yeah. You mentioned it before, but estrogen measurement. You said something about what to pay attention for that.

Dr. Ben House
Ultrasensitive. It's, yeah, it's that LC-MS measurement.

Dr. Andy Galpin
Have to buy it.

Dr. Ben House
You have to get ultrasensitive estradiol.

Dr. Andy Galpin
We ran this into the ground.

Dr. Ben House
I-

Dr. Andy Galpin
And I wanted to vomit

Dr. Ben House
... I have gone to war for this. It's so bad. It's so bad to not get, you're just reacting to air, and it's going to be high because the amino acids, they're going to pick up other compounds. There's three different estrogens in the body. It's going to pick up some of those other ones, so it's going to be high, and then everybody's going to freak out. So, you definitely don't want to get that measurement.

Dr. Andy Galpin
So, this is, if you're getting a lab, buying a lab, or happen to look at your lab work, if you got estrogen and it just says estrogen on it-

Dr. Ben House
It's not ultrasensitive, most likely

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Dr. Andy Galpin
... this is, what was your numbers? 20 to 30% error rates, sometimes 40?

Dr. Ben House
Oh, dude. Yeah. It's bad. On the amino acid?

Dr. Andy Galpin
Yeah.

Dr. Ben House
Bad. Bad.

Dr. Andy Galpin
You don't even know what that number means anymore. Especially-

Dr. Ben House
And that's the published number.

Dr. Andy Galpin
Correct.

Dr. Ben House
That's the best-case scenario number. That's not the lab tech is hungover number.

Dr. Andy Galpin
Yeah. So, make sure it says or you're asking for ultrasensitive on that. And then that still was like a 15%, 18% error or something like that number?

Dr. Ben House
Yeah. Somewhere in that range.

Dr. Andy Galpin
The quantities are just so small. It's really difficult to pay attention to. So, don't over or under-react to those numbers if you didn't get it appropriately. And it's a significant difference in cost.

Dr. Ben House
That's one of the other problems, is people don't know this, so they buy just clump panels. And those clump panels are generally not going to have your gold standard markers. None of them have gold standard T3, which is another whole podcast, which we've actually paid for on-

Dr. Andy Galpin
Yeah

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Dr. Ben House
... a number of people, and it does align, which is cool. But it aligns in the normal range.

Dr. Andy Galpin
Uh-oh.

Dr. Ben House
Some of these markers function pretty well in normal ranges, but once you get into the low end, their quality just tanks, just hammers.

Dr. Andy Galpin
Which is the part that you care about.

Dr. Ben House
Correct.

Dr. Andy Galpin
You don't care if it's normal.

Dr. Ben House
Exactly. It falls apart at the part where you care about it.

Dr. Andy Galpin
Yeah. No good. Okay. We'll spin backwards then. You were going on here about total testosterone, so okay, great. We learned a lot about it. Hopefully, now you've learned a little bit about paying attention to free. You buy any blood test, you're going to get albumin, you're going to get sex hormone binding globulin if you put that on there. Anything to say about SHBG measurement like we had with-

Dr. Ben House
SHBG, we're talking about a lot more of it around.

Dr. Andy Galpin
It's big, too.

Dr. Ben House
Yeah, it's a big molecule. And that's in molar amounts, so less worried about the error rates in that one.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's like albumin or any of these other globulin.

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Dr. Andy Galpin
Yeah. Big proteins.

Dr. Ben House
So, I think if we're talking about this shoot-from-the-hip TRT person, you got estradiol, erythrocytosis, the lipids, the kind of DHT androgenic symptomatology that they're going to want to watch out for. Those are the big ones, I think, of doing this really, really well. I would also say that another thing that I've become a little bit more bullish on is getting, and this is crazy that we have to say this, but I've been in the gym industry for 20 years, and I can't name a single person in my life who has gone and got a cardiac stress test before they've started training. These are all on the sheets that you got to sign.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Everybody signs the thing like

Dr. Andy Galpin
Yeah.

Dr. Ben House
"Did it." Do that.

Dr. Andy Galpin
Yeah.

Dr. Ben House
We should do the things that we're supposed to do. Go get an ECG. Make sure you don't have AFib because the other thing you're playing with, and this you can't pick it up with labs, is with TRT, you are ... playing, and this is atrial fibrillation. It's like a flutter in your heart. Again, you start stacking all these risk factors. Catch-up blood, large left ventricle, which is the main pump, a lot of back pressure, high blood pressure, atrial fibrillation.

Dr. Ben House
It's not a gamble you want to make. Maybe it is. Maybe you want to live large and leave a giant coffin. I've been there, 100%. I understand that philosophy. Maybe that's still where you're at, and go at it. Whatever. But at least now you're making an informed decision. I think a lot of people operating and they have no idea, they're just hoping. They're just like, "Fingers crossed."

Dr. Andy Galpin
Last question in my TRT run and gunner. Is there any physical symptoms that you would pay attention to where it's like, "Hey, you should go talk to somebody, maybe something's going on?"

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Dr. Ben House
Physical symptoms are, this is another one that I think the run and gunners don't realize, whenever you take this substance exogenously, you are going to kill your endogenous production. And just to put that in values, your boys are going to produce anywhere from six-ish to 10 milligrams of testosterone a day. That's how much your Leydig cells in your testicles are pumping out per day. So you can do the math there. That's 43 milligrams-ish per week, right? So that's 43 milligrams. I think testosterone cypionate is like 70% test. So 100 mgs is not physiological, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
It's high. So that's the other part of this, is that your body's making, let's call it 50 to 60 milligrams per week. And so-

Dr. Andy Galpin
And you're going to double that

Dr. Ben House
... we'll talk about the TRT plus route. You're not doing TRT. That's the other, let's pin that, but we have to talk about it. The thing that I'm getting at here is your boys are going to shrivel up, and that's not something that most people know. Their testicular volume is going to raisin ice. You're going to get atrophy. And this is the other part of this. So you get the run and gunner. This is my biggest beef with informed consent. You get the run and gunner who's like, "All right, TRT with a doctor, whatever. I got low free test. I'm going to go on TRT." And they go on TRT, and they get some symptomatology, and they're like, "Yeah, I don't like this." And then they go cold turkey off.

Dr. Andy Galpin
Yo. Oh.

Dr. Ben House
You rip testosterone away, look at the literature. Psychosis. This is, you get-

Dr. Andy Galpin
Yeah, not mood disorder, not erectile dysfunction, all the way to the end

Dr. Ben House
... suicidal risk.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
In the literature, you can find that. So this is not something that you want to do. This is why this needs to be managed by someone who's very good at this.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So you don't want to go from zero to hero. I'd rather you go from zero to hero than hero to zero. If you're playing this game by yourself, you have to become highly educated on your blind spots or find an MD, DO, who really knows this game, and their first hammer is probably not TRT, so they're probably not a TRT clinic.

Dr. Andy Galpin
Today's episode is sponsored by David. David makes protein bars unlike any I have ever encountered. They have an amazing 28 grams of protein, only 150 calories, and zero grams of sugar. That's right, 28 grams of protein and 75% of its calories come from that protein. This is 50% higher than the next closest protein bar. Honestly, it's the best-tasting bar I've ever had in my life by a mile. And their newest bar, the David Bronze bar, tastes incredible as well. While I often talk about the importance of getting one gram of protein per pound of body weight for things like muscle health and recovery and the promotion of lean body mass and satiety, the reality of that is, for most people, getting that one gram of protein per pound of body weight is really challenging. However, David makes that easy. Their bars taste incredible. The Gold bar is packed with 28 grams of protein with just 150 calories, and the Bronze bar has 20 grams of protein, also with just 150 calories.

Dr. Andy Galpin
I eat one almost every single day and always have two or three with me in my backpack when I'm traveling, and I literally mean always. It probably sounds funny, but I eat them as dessert all the time. When you try them, you'll know exactly what I mean. If you're interested in trying these bars for yourself, you can go to davidprotein.com/perform. Again, that's davidprotein.com/perform. People will maybe not realize this, but there have been several studies that I know of, at least two, you'll probably know many more, that have legitimately, effectively, chemically castrated people.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Fill me in here. People that start off at total T in the 4 to 500s, and they bring them into the 30s?

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Dr. Ben House
Yeah. This is Kavounian et al., 2006. I don't know how to say the other one.

Dr. Andy Galpin
Just-

Dr. Ben House
Gondal-Har or something. I don't know. Apologies.

Dr. Andy Galpin
That was many later. Many years later

Dr. Ben House
Yeah. Apologies for the author, not being able to say the name right. It's a very long author last name. The studies, though, are very eloquent. And Kavounian's the worst. I don't know how they get these things through IRB. I don't know how people sign up for them.

Dr. Andy Galpin
The sign-up thing throws me.

Dr. Ben House
This is a part of this, we haven't really double-clicked on the axis a lot. So you have the hypothalamus in the brain, which is your air traffic control tower, and then you have the pituitary gland. And so the hypothalamus produces, so this HPG axis is very important. And so you have GnRH coming off the hypothalamus, which we're not going to measure. This is in the brain, extremely short half-life. Then you have LH, which comes off the pituitary gland, which we do measure, which we haven't talked about a lot. You need to measure FSH and LH as well. This is coming off the brain, but this is very pulsatile. It's hard to nail down. So this is luteinizing hormone. So that comes off the pituitary gland. And so When we're thinking about these things, we have to understand the axis and the feedback loops and how we're measuring them, because LH is going to tell your testicles to produce testosterone.

Dr. Ben House
FSH is going to tell your Sertoli cells to produce sperm. People say these things all kinds of different ways, so let's not get involved in the pronunciation of it. But you have testosterone's going to be produced from the LH spike. The LH and the FSH are important because I think a lot of times, we forget about the thermostat-

Dr. Andy Galpin
Yep

Dr. Ben House
... of this, and we just think about the apparatus. We think about the output. But the thermostat is

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much more important to me and much more likely to be dysregulated. And I say dysregulated with an asterisk there, because a lot of times it's regulated-

Dr. Andy Galpin
Mm

Dr. Ben House
... in a way that the body wants it to be.

Dr. Andy Galpin
Yeah. You're putting the negative connotation on it.

Dr. Ben House
Mm-hmm.

Dr. Andy Galpin
It's doing exactly what it wants to do.

Dr. Ben House
It's doing exactly what it wants to do for the body.

Dr. Andy Galpin
It's not misfunctioning.

Dr. Ben House
Yeah. You don't have enough energy, so it's turning the lights down on reproduction. And the reason this is important is because, let's contrast Hammersland and Friedl, which are military studies, which are crazy. So like, how do you get down, as a male, how do you get down to 30 or 60 nanograms per deciliter? You should know that we've talked about 600. You're going to drop yourself into feminizing levels of testosterone.

Dr. Andy Galpin
Yeah. This is like you are literally post-menopausal woman.

Dr. Ben House
Correct. You can do this pharmacologically with Goserelin or Zoladex, which is a GnRH agonist.

Dr. Andy Galpin
Yep.

Dr. Ben House
Which is like what? Why is that happening? And the analogy for this is like, it's a trombone, so all of these are pulsatile hormones in the level of the brain. So you can also knock it out. It goes up first, and then it goes down. But you knock it out because you kill the pulsatile nature of the

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hormone-

Dr. Andy Galpin
Ah

Dr. Ben House
... at the level of the brain.

Dr. Andy Galpin
Yep.

Dr. Ben House
And so that's how Kvorning and these two studies that knocked men down in the 30s-

Dr. Andy Galpin
Yeah

Dr. Ben House
... and then had them resistance train, that's what they did. They gave them injections of this GnR, of Goserelin, and then their testosterone absolutely tanked. And-

Dr. Andy Galpin
Do you remember how long it... Those are 20-week studies or something?

Dr. Ben House
Oh, not that. No.

Dr. Andy Galpin
How long was it?

Dr. Ben House
The 2022 one was only one shot of Goserelin, thankfully for them. I look at these study designs and I'm cringing. It's hard for me. These are college kids who are just getting absolutely-

Dr. Andy Galpin
I mean, you're flooring somebody in a few weeks.

Dr. Ben House
Yeah. For sure. And they had, Kvorning was worse. I think it's like an eight-week study they were on it, so they were at 30 nanograms per deciliter for eight weeks.

Dr. Andy Galpin
Oh, if I remember correctly, they're like 20-week studies, but they put them on that dosage for 10 weeks.

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Dr. Ben House
Yeah, you have to put them, you have to wait for like, Kvorning, the second one didn't do that. They just gave them the dose.

Dr. Andy Galpin
Yeah.

Dr. Ben House
The second one was actually more, you look at area under the curve, it was more testosterone. The first one from 2006 was, they were tanked out in testosterone the entire time, and they didn't have, I don't think, they might've had one withdrawal, but that's the other part that-

Dr. Andy Galpin
Yeah

Dr. Ben House
... that's the other part, I'm looking for how many people, how did they keep these dudes in the study? Yeah.

Dr. Andy Galpin
Nobody quit the study.

Dr. Ben House
Nobody quit the study.

Dr. Andy Galpin
We get more people quitting a stretching study.

Dr. Ben House
They stayed in the game. I'm not, the other part-

Dr. Andy Galpin
These drugs exist, for the record, for a good reason. Sometimes you have to do this with the testosterone for cancer management and some other things. But nonetheless, if you're wondering, like, "Why the hell would that actually..." That's why, but.

Dr. Ben House
And some of these are fertility drugs.

Dr. Andy Galpin
Yep.

Dr. Ben House
These are off-use, I don't think Goserelin is. It might be, I don't know what its use case is. It

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might be a prostate cancer drug. I'm not actually sure on that one. But the point of these studies, I don't know how they got IRB approval, but they got IRB approval twice. I'm sure they'll get IRB approval again. They did watch them, and the system came back online. That's the other part about this is it looks like if you knock this axis out for weeks, and it rebounds on the level of weeks and months. Some people, it does take like nine months to come back online. But it does look like it comes back online. We don't know if you do years of this, though.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Like atrophy, in general, the dose and duration here is probably important. You shut down the apparatus for years, and this is the argument for HCG underneath. HCG is an LH analog, so if you're following that HPG axis-

Dr. Andy Galpin
Mm

Dr. Ben House
... so LH will tell the leydig cells to keep secreting some level of testosterone, and then that'll maintain testicular volume, maintain the actual testes working. And so the big finding with Kvorning and GandolPHAR from 2022 is that they had these people resistance train and in as low as you could imagine testosterone being for a male, and they still gained lean body mass. It was blunted compared to the placebo, like 43% to 73%, but they still gained muscle on castrate levels of testosterone.

Dr. Andy Galpin
You're talking, I spent two months with a sub 50 total testosterone.

Dr. Ben House
Kvorning, yeah.

Dr. Andy Galpin
And I still gained muscle in those two months.

Dr. Ben House
Still gained 43% of the muscle that the other group gained, 43% less than the placebo.

Dr. Andy Galpin
Do you remember the total volumes here? Total-

Dr. Ben House
Ooh.

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Dr. Andy Galpin
This was like-

Dr. Ben House
I think it's like, this is good. So Bonito et al is a meta-analysis for hypertrophy and just normal, just I don't know, 150 studies or something, and the average was 1.5 kilos of lean body mass over 10 weeks, so that's your average gain. I think that's a fair, I don't think anybody's scoffing at that. This is like an untrained individual starting on hypertrophy training. The average person is going to gain three-ish pounds of lean body mass in 10 to 12 weeks. I think that's pretty normal. I think they gained 1.1. Yeah, I think it was 1.2 and 2.1. I think those are the numbers.

Dr. Andy Galpin
So, let's call this out. You're talking about a group that has presumably the control group Four to five, four to 600?

Dr. Ben House
I think they were, yeah, I think they were in the 600 range, somewhere in there.

Dr. Andy Galpin
600 range.

Dr. Ben House
Yeah.

Dr. Andy Galpin
So a group that has total testosterone of 600, a group that has a tenth of that.

Dr. Ben House
Yeah.

Dr. Andy Galpin
They do the same training, and you're talking about one group gained three pounds, and the other group gained four and a half?

Dr. Ben House
Yeah. It gets worse than that. I'm going to pull out Longenecker et al. 2016. It's not the best. We have some police studies that are a little bit better than this, but the recomp is bananas in that in four weeks, I think they lost 11 pounds of fat and gained somewhere between two and three pounds of muscle. This is-

Dr. Andy Galpin
Pretty good

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Dr. Ben House
... pretty good. In four weeks on a 4C body comp. And so these-

Dr. Andy Galpin
High resolution, real high accuracy.

Dr. Ben House
Full compartments. Yeah.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So DEXA with a Bod Pod, with a total body water measurement.

Dr. Andy Galpin
Like the best possible, most accurate way you can measure body composition. It's still not perfect, but it's not just like a tape measure or-

Dr. Ben House
Yeah, this is just not you going to your InBody. Like this-

Dr. Andy Galpin
Yeah.

Dr. Ben House
This is not going to-

Dr. Andy Galpin
Not a scale at home.

Dr. Ben House
Correct.

Dr. Andy Galpin
So continue on with your-

Dr. Ben House
Their testosterone, they were overweight. So one of the best trade force studies, these people lost body fat and at this, a lot of it, so significant deficit, and they also gained muscle at the same time. And for those of you who understand body composition, fat, adipose tissue is not just fat. It is by volume seven to 9% also protein. This is a DEXA measurement, so take that number and actually make it higher-

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Dr. Andy Galpin
For real

Dr. Ben House
... because they're losing protein from fat while simultaneously gaining it from muscle, so bananas results. Their testosterone went from 500 to 110.

Dr. Andy Galpin
What?

Dr. Ben House
Yeah. One of the best recomp studies that we have, sex hormone binding globulin went up 30%, and they almost did it to themselves, right? They weren't at castrate levels, but they were tanked, absolutely tanked.

Dr. Andy Galpin
So these people must have been pretty lean to start.

Dr. Ben House
No. 23% body fat, BMI of 29.

Dr. Andy Galpin
Explain that to me.

Dr. Ben House
It is kind of a black swan finding, but it's at the group level. The reason for it might be how good it was.

Dr. Andy Galpin
No.

Dr. Ben House
In that these guys-

Dr. Andy Galpin
Yeah

Dr. Ben House
... were running 12,000 steps-

Dr. Andy Galpin
Yeah

Dr. Ben House
... six workouts a week. They were doing, they absolutely nailed it. And by nailing it, they

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crashed their testosterone, in a lab-based setting, which is quite rare to do this. Their energy availability was on paper at like 33 kcals per kilogram lean body mass, so if you know that number intuitively, that's not bad.

Dr. Andy Galpin
That's pretty good.

Dr. Ben House
It's pretty good, pretty not, but I would think it was this conglomeration of going from zero exercise, which we do see, to a lot of exercise plus a deficit that did it.

Dr. Andy Galpin
So much interesting stuff right there. We have to go backwards now. We just got to start picking these things off one by one. I've already learned a ton. A lot of the stuff I'm aware of. I've read these papers. I've read your stuff. I mentioned at the very beginning, you have a bunch of research papers that you have published recently, you have in publication. You have a bunch that you're releasing for the average person out there, so anyone can go read all these things from you. We'll put links in the show notes to all your stuff. You've got all kinds of things out there. I got to go back to the very beginning. Let's just stick with total testosterone for now, and you can pop in LH, SHBG, and free as pertinent. But if we keep the main story on total testosterone, you just gave me an example of that going down and body composition changing significantly.

Dr. Ben House
Can I contrast it with a study, which I think-

Dr. Andy Galpin
Please

Dr. Ben House
... is really interesting?

Dr. Andy Galpin
Okay, please.

Dr. Ben House
So you have Longenecker et al.-

Dr. Andy Galpin
I don't stammer much on this show, and I'm stammering because I'm like, "Oh, God, this is wild."

Dr. Ben House
Yeah, Longenecker is a wild study. I bring it up a lot because I think it boggles people's minds,

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and it definitely boggled mine. I had to read it a ton of times. I bring it up a lot. Vinnick is another study, which is a keto study, so there's people that love keto-

Dr. Andy Galpin
Oh

Dr. Ben House
... so let's play this out.

Dr. Andy Galpin
Oh, boy.

Dr. Ben House
It's a study where moderate weight loss, keto versus non-keto, both of the arms were very, very high fat, low carb with resistance training. So Longenecker's kind of a black swan finding one direction. Vinnick is not like a black swan finding. This is known in the high-fat literature that you can-

Dr. Andy Galpin
Yeah

Dr. Ben House
... bump testosterone up by 20-ish percent, somewhere in there. And that's what happened here. They went from like 600 to 800 in, I think, 10 weeks, somewhere in there.

Dr. Andy Galpin
That's significant movement.

Dr. Ben House
Correct. They did not gain muscle, and they did not gain strength.

Dr. Andy Galpin
All right.

Dr. Ben House
So that's the contrast of this is that, whoa, you just told me that someone gained 200 nanograms per deciliter, and you have the backdrop of no carbohydrates. I'm willing to say-

Dr. Andy Galpin
Yeah

Dr. Ben House
... that influences DEXA, but the no strength-

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Dr. Andy Galpin
Measurement, right

Dr. Ben House
... the no strength, that's a wild one.

Dr. Ben House
We can see strength gains that are equal, Kvorning.

Dr. Andy Galpin
So if I'm teeter-tottering this, you just told me a scenario in which testosterone tanked, and I gained a little bit of muscle while losing a lot of fat.

Dr. Ben House
A lot.

Dr. Andy Galpin
And then you contrasted that with another study who had a very significant increase in testosterone when already at a high level, which is presumably really fucking-

Dr. Ben House
In a minimal deficit, and so the minimal-ish deficit.

Dr. Andy Galpin
But yet they didn't get any stronger or gain any muscle. That could be explained by a number of things. Maybe let's just say that it was a bad training program. They didn't lift as hard. Okay, a thousand things could be going on there. But on its surface, you're talking about a 600, 700 point swing between the people that got down to 150 and got pretty ripped.

Dr. Ben House
110.

Dr. Andy Galpin
110?

Dr. Ben House
Yeah.

Dr. Andy Galpin
Excuse me.

Dr. Ben House
Yeah. Low.

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Dr. Andy Galpin
And the others that got to 800, a 700-point swing here.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Based upon not just these studies, using these as examples.

Dr. Ben House
Yeah, I'm picking extremes because I think people can learn at the extremes.

Dr. Andy Galpin
100%. What in a combination of your experience, your intuition, and the other available literature, throw all those together for me and answer this single question.

Dr. Andy Galpin
What do we know about the relationship between testosterone and exercise adaptations?

Dr. Ben House
So for hypertrophy, muscle hypertrophy, inside of the eugonadal range, we have five studies, six with free testosterone, that I'm aware of, running this through as many gauntlets of searches as we can do. And these are hard to find because they're usually bolt-ons of other programs.

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
It's not like, "Oh, we're going after..." They're generally bolt-ons from a resistance training protocol. And you've had Mike Roberts on the show. Two of these are his. And all of them to date, every study to date, has not shown a relationship between total testosterone and the amount of muscle that people gain. They're all null. And this is a big deal because, you and I both know this as scientists, but if you only have null findings published, that means you got a lot more in the desk drawers of people's-- Because we do have a publication bias for positive findings. So if there's not any, I would bet that there's a lot more null findings that people haven't been able to publish.

Dr. Andy Galpin
Five for five is pretty-

Dr. Ben House
Pretty bad

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Dr. Andy Galpin
... did you need to see six for six? What do you need to see?

Dr. Ben House
Ooh. I think the scientist in me does need, because in the exercise science realm, we are constrained by budgets, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
So I can imagine a well-powered study, not to say that Mobley was not. Give Mike Roberts his flowers. We're talking about 60 people. In our world, that's a pretty large study. Nothing doing. Nothing. And by nothing doing, I'm not talking about, "Oh, this is close to significant." No. Our values of borderline zero relationship.

Dr. Andy Galpin
So let me ask some kind of rapid-fire questions on this point, the relationship between total testosterone and muscle growth. And we're talking men at this point.

Dr. Ben House
Let's not piss off the entire internet.

Dr. Andy Galpin
Oh.

Dr. Ben House
In that the eugonadal range, not related to the resistance training hypertrophy adaptations. Okay? You throw gear at it, exogenous, you have a dose-response relationship, in that more gear, more muscle. And this is a basin study from 1996. It does look like it's at least additive. So you run 600 mgs, you're going to get a lot of growth. You're talking about, I think it's 10 kilos in 20 weeks or something like that. The reason I run it, I understand the run-and-gun kind of TRT usage is like, if I did that, I'm 180, call it 12% body fat. I've been MRI, DEXA. I've done every body comp available, full body MRI, body comp, you name it. You give me some gas, I'm at 190, 10% body fat pretty easily.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And that's not even that much gear. So I understand the allure of this in our social media kind of era. And I think a lot more people are doing this than you think. And again, I have no shade. I understand these incentives. But if you're going to do that, again, I don't care. It's just like have

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informed consent. Do it really, really well.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Don't just like, "Oh, I want to be jacked," and then have raisins for desolate.

Dr. Andy Galpin
And then pay for it the rest, because I now-

Dr. Ben House
Potentially

Dr. Andy Galpin
... oh, I didn't realize I can't have kids now.

Dr. Ben House
Fertility, for sure.

Dr. Andy Galpin
Fertility's going-

Dr. Ben House
Yeah

Dr. Andy Galpin
... out the window. So the relationship, you said eugonadal. We'll just continue to define that as 300 to 1,000-

Dr. Ben House
Yeah

Dr. Andy Galpin
... plus-ish.

Dr. Ben House
Yeah. There's one person in one of those Hahn and Mobley studies who's at 1,900, and I don't think that's an error. And they were middle of the pack in terms of-- You just look at the scatter plots of this. I've looked at these scatter plots. And you got guys, and some of these people were in the 200s gaining two to three kilos. I think there was one dude in that study, we looked at him, I think he gained eight kilos of muscle in 12 weeks and he was at 500 nanograms of desolate. So you start looking at-

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Dr. Andy Galpin
Super middle of the pack.

Dr. Ben House
Yeah, you start looking at the individual data, and you're like, "All right. Wow, there's some outliers here." You clean that up, but there's just nothing there.

Dr. Andy Galpin
Yeah.

Dr. Ben House
It's just a flat line.

Dr. Andy Galpin
And all the other studies basically suggest the same thing.

Dr. Ben House
So the two that reported data were flat line. The other ones just said null.

Dr. Andy Galpin
Oh, yeah.

Dr. Ben House
And some of them use this framing, like we put all of the hormones in the mix and none of it explained more than 25% of the variance in hypertrophy.

Dr. Andy Galpin
Yeah. Right.

Dr. Ben House
We put everything in the model.

Dr. Andy Galpin
Have any of these studies looked at anything besides testosterone?

Dr. Ben House
Yeah, DHT, androgen receptor sensitivity, androgen receptor content, androgen nuclearization, change in androgen receptor content. There's-

Dr. Andy Galpin
IGF-1.

Dr. Ben House
Yeah. The problem with the changes, this is getting granular. I do have a little bit of a rub with the deltas here, because I think sometimes with the deltas, you're just picking out people who train

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harder.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So you're not really-

Dr. Andy Galpin
Yeah

Dr. Ben House
... looking at the hormone. You're like, "Oh, that person actually got after it. They had more IL-6." So IL-6, that's a inflammatory cytokine.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Right? That's my problem with the deltas in a lot of these scenarios.

Dr. Andy Galpin
Yeah. You've done these training studies in the lab before. I can straight up tell you, some people come in there for the $500 gift card that you give them, and some people come in and they're so happy. They're so excited to get a free training program. They start eating, they start sleeping, they start training. They start dialing everything in. And then it turns out they are hyper-responders.

Dr. Ben House
Yeah, you get the waterfall plot and they're like way up.

Dr. Andy Galpin
And they're just way off the chart because they're like, "I get eight weeks of training for free. I get to be in the lab. I get to all this stuff." And others are just like "I just wanted this training." Or here's some other behind the curtain stuff. They don't want to change their training.

Dr. Ben House
Mm-hmm.

Dr. Andy Galpin
So they'll come, and they'll do the minimum in the lab with you, but then they go do their own training on the side and they do other stuff like that, right? Or they refuse to do it. So there's things like that happen where you're like, "Oh, physiological responders." Like, no, she took it serious and she was just in it for the Visa gift card.

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Dr. Andy Galpin
That kind of stuff happens.

Dr. Ben House
And that stuff can't ... really come out of the wash-

Dr. Andy Galpin
No

Dr. Ben House
... when you only have 12 subjects.

Dr. Andy Galpin
Exactly.

Dr. Ben House
That's why we have to pool these together to the best of our abilities, and we have to look at the conglomeration of data.

Dr. Andy Galpin
Man, I'll tell you, to be candid too, I didn't even think about this. This is a good point. I've done so many of these studies.

Dr. Andy Galpin
They will function like their own ecosystem, like a classroom where the popular kid the first day of class is a shithead, and the whole class all semester sucks because they take the energy. You get the opposite or the same, right? Where you'll get two or three people in the study, and they're so happy and jacked, and then everyone else in the study is like, "Oh, yeah." And then you get this amazing study, or you get the opposite, and you're just like, "Oh, man."

Dr. Andy Galpin
On paper, it's the same. You read the study, it's the same. You can't tell.

Dr. Ben House
There's no way to account for that.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And the other part about a lot of these exercises, none of them, they're underfunded, underpowered. Everybody's doing their absolute best. We've both been in labs.

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Dr. Andy Galpin
Yeah.

Dr. Ben House
I'm not throwing shade at anybody doing science.

Dr. Andy Galpin
Yeah.

Dr. Ben House
I understand they're probably working under the best available ways in their constraints. And the other part is we're always asking like, "Okay, did you measure their sleep?" So, all of these studies, I'm like-

Dr. Andy Galpin
Yeah

Dr. Ben House
... "All right, what were their sleep patterns? What was their diet like? Did they eat enough fat?"

Dr. Ben House
But a lot of these resistance training studies, that's why the Longland study was so crazy. They didn't have sleep data, but anything on the physical activity side, the steps-

Dr. Andy Galpin
Yeah

Dr. Ben House
... they had everything that you wanted, and they just absolutely sent it, and they got the best results at the group level that we've ever seen.

Dr. Andy Galpin
Yeah. I'm cruising at 350, and the guy in the gym next to me is my twin brother. He's doing the exact same job. Everything else is identical. He's at 750.

Dr. Ben House
Ooh.

Dr. Andy Galpin
You're going to tell me-

Dr. Ben House
Twin, legitimate twin.

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Dr. Andy Galpin
My legitimate twin.

Dr. Ben House
Ooh, I would be curious if you got hit in the head.

Dr. Andy Galpin
Okay. Okay, well-

Dr. Ben House
Yeah

Dr. Andy Galpin
... fair.

Dr. Ben House
Because there is a large-

Dr. Andy Galpin
Fix this scenario

Dr. Ben House
... heritability component of this.

Dr. Andy Galpin
Okay, I'll make it worse. It is my identical mono, it's my twin brother, and I'm clamping. I got a testosterone clamp on.

Dr. Ben House
Okay. You got Zoladex on you.

Dr. Andy Galpin
Yeah. Yeah, I got Zoladex going to keep me 350.

Dr. Andy Galpin
Are you trying to tell me-

Dr. Ben House
You're microdosing Zoladex for no reason. Perfect.

Dr. Andy Galpin
Thank you. He and I, 10 weeks later, are going to have the same muscle growth-

Dr. Ben House
Okay

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Dr. Andy Galpin
... based on that factor alone.

Dr. Ben House
Ooh, man. That is such an interesting thought experiment. I don't know. Gun to the head-

Dr. Andy Galpin
It doesn't pass the smell test at all, does it?

Dr. Ben House
Zoladex is the reason that I might bet on yes. If there was no pharmacology there, then I would bet on no, because there had to be something underlying that I think would mess with it. Do you have sleep apnea?

Dr. Andy Galpin
I get it.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Something caused that to happen.

Dr. Ben House
Yeah.

Dr. Andy Galpin
So that's going to be the problem.

Dr. Ben House
There's some kind of confounder there.

Dr. Andy Galpin
Right. That's going to be the thing that actually limits the growth potential.

Dr. Ben House
Or you got hit in the head with a hammer, and now all of that whole pituitary axis is kind of-

Dr. Andy Galpin
Is knocked off your axis

Dr. Ben House
... messed up.

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Dr. Andy Galpin
What I'm trying to get at is this idea. Okay, we'll do this the other way. If I ran a contest, you were on "Beast Games" somehow, and we said, "All right. You get a million bucks cash if you can pick out of these five people in the room-

Dr. Ben House
Ooh

Dr. Andy Galpin
... who's going to be the biggest responder."

Dr. Ben House
Oh my God.

Dr. Andy Galpin
And all you got is their T, and none of them are on any exogenous. None of them are-

Dr. Ben House
I'm not. If you're trying to "Breaking To" this shit, we're "Breaking To," for people that don't know, this is "Breaking To," that's what they're trying to do. They're trying to use metrics, like your running economy, your VO2 max, to guess who's going to be the best at this.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And they're pretty good. We got to honor, the endurance world is pretty good at this predictive-

Dr. Andy Galpin
Super good

Dr. Ben House
... we're terrible.

Dr. Andy Galpin
Oh, on our side? Horrible.

Dr. Ben House
We're so bad-

Dr. Andy Galpin
Horrible

Dr. Ben House
... in the hypertrophy world. Am I going to go to war on total testosterone being predictive of their

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results in the weight room? No, I'm not going to go to war on that. I would rather have ribosome content. There's so many things that I think could matter a lot more than that. This is debated, but maybe not acutely, but maybe over the long haul, I'd want to know their skeleton. That probably matters to me.

Dr. Andy Galpin
Potential to put on mass.

Dr. Ben House
Yeah. We've had some good studies recently that acutely show that that isn't a big deal.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But I wonder, it's harder to convince me that your overall chassis doesn't matter for muscle mass. But no, gun to the head, out of that five lineup, I'm not. And they're all untrained, and I get their total testosterone, I would pick the highest one out of that group, not for testosterone, but because I think, not knowing anything about them, they're probably the healthiest.

Dr. Andy Galpin
Co-founder.

Dr. Ben House
Yeah. I would pick the highest one just from a co-founder standpoint.

Dr. Andy Galpin
More likely to sleep better, to do whatever.

Dr. Ben House
That's a great question that our field should really try to figure out. Because you and I have talked about this a ton. As we really get deep data capture on people, we're talking about transcriptomics-

Dr. Andy Galpin
Yeah

Dr. Ben House
... proteomics. We should try to figure that out. This is the crazy part, not only who's going to be the best out of the five, but also you take the other scenario of this, is I also want to know when they're going to stop growing.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
We think a lot about how-

Dr. Andy Galpin
Eight to 10 weeks away.

Dr. Ben House
Yeah. I'm more interested in why people stop growing than I'm interested in who's going to be... Because I think you just run it out over a long time, everybody's going to gain the mass that they're going to gain, whether that's 20, 30, 40 pounds of lean mass. But I'm much more interested scientifically in why people stop putting on muscle mass. And this gets back to that sexual and binding globulin piece. Are there rate limiters? Is it a capillary issue?

Dr. Ben House
Why do we stop growing? And it's so interesting to me, and we don't have all the answers.

Dr. Andy Galpin
Today's episode is sponsored by Eight Sleep Eight Sleep makes smart mattress covers with cooling, heating, sleep tracking, and more. I've personally been sleeping on an Eight Sleep mattress for more than three years now, and it's absolutely glorious. I love it so much that I hate traveling away from home because I can't sleep on my Eight Sleep Pod 5. As you'll hear me talk about endlessly on this podcast, there's really nothing you can do that makes more of an impact on your health and performance than getting a great night of sleep. And getting great sleep requires having your body temperature drop a couple of degrees at night, and that's hard to do on your own. The Eight Sleep has been a game changer for me because I run hot at night, and/or as my wife calls it, I'm a furnace. If I don't have something like an Eight Sleep helping me cool down, I'll wake up in the middle of the night overheating and not feeling great.

Dr. Andy Galpin
This is something I've also found in many people that I coach, especially those who are really physically active. The Pod 5 is the latest generation of the Eight Sleep mattress covers, and it can go on any mattress, heats or cools each side of the bed from 55 to 110 degrees Fahrenheit, and provides high-fidelity sleep tracking. If you'd like to try Eight Sleep, go to eightsleep.com/perform and use the code PERFORM to save up to $350 off your Pod 5 Ultra. You get 30 days to try it at home and return it if you don't love it. But I'm confident that you will. I certainly love mine and would never consider returning it. Eight Sleep currently ships to the US, Canada, the UK, and select countries in the EU, and even Australia. Again, that's eightsleep.com/perform and use the code PERFORM to save up to $350. We got our five people in the corner for a million dollars. Could you predict, sticking with testosterone, could you predict who would be the best if we didn't go for hypertrophy, but we went for fat loss?

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Dr. Ben House
No. There's no way. Because to flip it in reverse, you have bariatric surgery is causing it, on average, like a 207 nanogram per deciliter increase in testosterone.

Dr. Andy Galpin
Come again?

Dr. Ben House
Yeah. So obesity is the number one driver of low testosterone right now, and that's through an SHBG mechanism and probably through a leptin mechanism, probably not so much through an estradiol mechanism. It might be there in extreme obesity. But that's why we've understood this axis. We have the HPG axis, and obesity is the number one driver of hypogonadism in males. And when obese or overweight males lose weight, they lose adipose tissue, invariably testosterone goes up, and sex hormone-binding globulin goes up as well. And these are not low rates. These people are generally still obese. They're moving from 35 to 30 of a BMI. And if you don't understand BMI intuitively, they're going from 40 to 30% body fat. Something like that's ballpark.

Dr. Andy Galpin
Okay, you said something really sticky right there.

Dr. Andy Galpin
Number one cause of low T in men is obesity. Is it the same for women?

Dr. Ben House
Low T, they would be the opposite. So, obesity is going to cause an increase in androgen in women. PCOS, now it's PMOS now. But with obesity, you'll generally get a hyperandrogenic state in females, and then you'll get a lower androgenic state in males. The reason for this is similar, in that it is that SHBG mechanism, and that you drive down SHBG, and then the brain reacts-

Dr. Andy Galpin
Hmm

Dr. Ben House
... and drives down. And then you also have leptin resistance. So I've said that, I think two or three times now, so let me explain that. Leptin is a fuel gauge hormone. So as body fat goes up, leptin goes up. And leptin is a really good hormone to think about because if it's high, you can get leptin resistance at the level of brain. And leptin is, imagine as like a permissive hormone. So when leptin's low, this is like those military studies, which we're going to eventually contrast. You have Hammersland, Friedl, you got Veras Noviki. They're generally Norwegian names because that's where a lot of these studies-

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Dr. Andy Galpin
Yeah

Dr. Ben House
... are coming from. They're Special Forces studies. And so you hammer leptin down, that's the signal that the body doesn't have energy, and it lowers testosterone. This is, again, fun words, kisspeptin, at the level of brain.

Dr. Andy Galpin
Oh, yeah.

Dr. Ben House
This is like hypothalamic regulation.

Dr. Andy Galpin
Yeah.

Dr. Ben House
The brain is seeing, "We don't have enough energy. Insulin's low, leptin is low. Put the phone in low battery mode. We're cutting off all of the circuits that cost us a lot of energy and we are muscle bound."

Dr. Andy Galpin
We do not need to be reproducing nor growing muscle at this moment.

Dr. Ben House
When you're obese, you're getting a leptin resistance signal, so maybe the brain's not seeing that leptin as well. And then you also have this downregulation of SHBG, which looks to come from... Sex hormone-binding globulin is made in the liver. So when you get this hepatic steatosis or you get liver fat accumulation, you start to lower sex hormone-binding globulin.

Dr. Andy Galpin
Yeah.

Dr. Ben House
The crazy part about, in all of these scenarios, human physiology's always doing the best that it can given the scenario.

Dr. Andy Galpin
It's just giving you protection against something, and you don't like it.

Dr. Ben House
Yeah.

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Dr. Andy Galpin
Your libido goes down because it's telling you, "We don't have the energy to reproduce."

Dr. Ben House
It doesn't think we do. Now, libido and sex drive are interesting ones, because they, and this gets back to Zapolski, because we can't do these studies-

Dr. Andy Galpin
Yeah

Dr. Ben House
... in humans.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You can't-

Dr. Andy Galpin
You can in chimps, maybe.

Dr. Ben House
You can't castrate all the college kids. Inject them back with 10%, 20%, 30%, and watch how much sex they have.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But you can do that with animals, unfortunately.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And these studies are not recent. We actually have Zapolski did a cool field study where they watched They'd cataloged all of this. I think in bonobos, it might've been chimps. I think it was bonobos, though. Could be wrong there. Don't lock me down to the species. And they had a famine, and they looked, and so again, this fits in there. Testosterone just absolutely tanked, and sex went way down. And then they have the graded exposure, and at the individual level, so if you castrate male apes, they will have less sex, but they don't have no sex.

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Dr. Andy Galpin
Mm.

Dr. Ben House
And then if you give them back 10% of their original, they go back to having, for our purposes here, there's wiggle room here, and there's individual thresholds within this mix, but for our purposes here, they go back to having the same amount of sex that they did with 100%. And so this led the ideology from a sex perspective, and this is important because of symptomatology. So for erectile dysfunction, for sexual desire, for libido, sexual thoughts, it looks like there is this hyperbola, this is Wu et al. 2010, which was used for a lot of the-

Dr. Andy Galpin
Yeah

Dr. Ben House
... the new military guidelines.

Dr. Ben House
You get this blip right around 200 to 300 nanograms per deciliter, where those start to go down. And then again, Finkelstein has a number of papers that are pharmacological on this, where you get this graded exposure pharmacologically, and 100 nanograms per deciliters when that was the only time it was significant- ... for sex drive and things like that.

Dr. Andy Galpin
Yeah. This is why oftentimes endocrine societies will just have floors.

Dr. Ben House
Yeah.

Dr. Andy Galpin
And they'll just be like, "Just don't be below 300 or 265" or whatever.

Dr. Ben House
Threshold, yeah.

Dr. Andy Galpin
But they're not going to say anything between 600 and 400 because there's just no reason to think that that's going to actually change, in this example, things like libido and desire and-

Dr. Ben House
And the data, the control data, and the population data do match that. I'm less bullish on that data because I do think that I still have the idea, this hasn't been tested, it's hard to test. I do think that delta matters. Something about me has to think that the delta matters. I could be

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wrong there. I'm willing to be wrong.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's a loosely held belief, but I still hold that belief that the delta matters in a lot of these things.

Dr. Andy Galpin
It's just hard to imagine if you were walking around, because I've seen this. We have several 21 to 25-year-old pro athletes who don't even do all the things great, and they are cruising at 1,100. They're 1,080, 1,050, 1,150 sometimes.

Dr. Ben House
Sexual in the 50s.

Dr. Andy Galpin
Yeah. And they're just like, "You are full send." And then we have equally crushing ones at 500.

Dr. Ben House
Yeah. We're talking-

Dr. Andy Galpin
World breakers

Dr. Ben House
... fat-free mass indexes, which if that doesn't number me, are like 25 for a male is when we're worried about your drugs.

Dr. Andy Galpin
Gold standard.

Dr. Ben House
Like-

Dr. Andy Galpin
It's like you're not natural anymore

Dr. Ben House
... lifetime natty for sure at 26, 27.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
Those people exist, and-

Dr. Andy Galpin
Yeah

Dr. Ben House
... you're going to find them. Where are you going to find them? Pro football.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's your way to go find them-

Dr. Andy Galpin
Yeah

Dr. Ben House
... that's the funnel. You're going to go find the freaks.

Dr. Andy Galpin
That's the one in the US especially. You're not going to find those people on Olympic lifting platforms.

Dr. Ben House
I wish they were, but yeah.

Dr. Andy Galpin
You find them on a football field, though, where you're like, "What?" You're a different species. How are you currently thinking about testosterone over the last several decades? Right? There's a narrative here that, hey, testosterone is going down, and there are microplastics, endocrine disruptors, all this stuff. We don't have to cover that part of it. First of all, is testosterone actually legitimately going down in your opinion, population-wise? And then how much of that is-

Dr. Ben House
It does look to be going down. I don't know that that's all from obesity. Some of it's got to be from the environment for sure, but this is Santi et al., 2025, recent. Over the last 50 years, probably a significant drop in compare a 40-year-old to 50 years ago to a 40-year-old now. It does look like there's some secular decline, probably not all assay-based, so there is some signal-

Dr. Andy Galpin
Some measurement error, maybe

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Dr. Ben House
... potentially differences in technologies from the '70s to the 2020s.

Dr. Andy Galpin
It's 50 years. One would expect it to-

Dr. Ben House
But I do think there's a signal there for maybe less sleep, and you and I can have that war on sleep. And that's a good thing for obesity, too, because you have sleep apnea clusters with obesity, right? You have CPAP usage, debated whether CPAP will increase testosterone. But obesity is the number one drive of low testosterone right now. But this is the part, the chicken or the egg. All right, so does that mean that that person goes on testosterone?

Dr. Andy Galpin
I have another chicken and egg for you.

Dr. Andy Galpin
Are you saying then that my obesity, it was caused by my low testosterone?

Dr. Ben House
No. I'm quite confident, this is from Mendelian randomization, that body comp affects testosterone way more inside the euthyroid range than testosterone affects body composition.

Dr. Andy Galpin
Defend that position.

Dr. Ben House
This is like-

Dr. Andy Galpin
Because a lot of people are going to hear this as opposite and go, "Well, yeah, the reason I packed that belly fat on, the reason I got tired all the time, my testosterone must be tanked."

Dr. Ben House
No.

Dr. Andy Galpin
"It must be lower here."

Dr. Ben House
No.

Dr. Andy Galpin
"That's why I had lack of energy, that's why I had all this stuff, that's why I ate more," blah, blah,

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blah. And you're saying-

Dr. Ben House
No

Dr. Andy Galpin
... no.

Dr. Ben House
We can look at, that's one, Mendelian randomization does have its downsides because everyone's existing in the same ecosystem, right? But it is quite good at this, at looking at overall testosterone exposure through the life course. And we do not see the, this will hurt people's heads. I don't like to say this, but we've also looked at body fat and testosterone, and you get an inverse relationship with muscle mass and testosterone as well. The higher FFMI they have, the higher obesity they have, but also lower testosterone they have. That's not to say that if someone gets s- yeah, we can play this a lot of ways, like Kallmann syndrome, not. Those people aren't morbidly obese. You're talking about, we do have genetic-

Dr. Andy Galpin
Yeah

Dr. Ben House
... just Kleinfelters.

Dr. Andy Galpin
Yeah. There's eight billion of us. You're going to find a bunch of exceptions to what I just said.

Dr. Ben House
Yeah.

Dr. Andy Galpin
But in aggregate, independent of head injury, independent of growth, and tumor, like-

Dr. Ben House
The testosterone-

Dr. Andy Galpin
One job

Dr. Ben House
... is knocked down of the obese.

Dr. Andy Galpin
Yes.

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Dr. Ben House
The vast majority of the time.

Dr. Andy Galpin
I think you said at the beginning, if we just categorize low testosterone as sub 300 or sub 264-

Dr. Ben House
Yeah

Dr. Andy Galpin
... what'd you say, 25 or 30?

Dr. Ben House
So 25%, if you're just doing a fasting morning draw, everybody, all comers, 25% of the United States. And then if you take that to obese individuals, it goes up to, like, 40 point something, 40.2%.

Dr. Andy Galpin
Obese defined by?

Dr. Ben House
Greater than 30 BMI.

Dr. Andy Galpin
BMI. So something as crude as how tall you are and how much you weigh.

Dr. Ben House
Yeah.

Dr. Andy Galpin
If that number is above-

Dr. Ben House
It's literally from 10 to 40. Normal weight, 11, obese, 40 point something.

Dr. Andy Galpin
Another way to think about this, to make this more dramatic, if you are, according to BMI, the lowest individual possible accuracy way to measure obesity but finds population level, you got a little bit less than 50% chance to have clinically low testosterone.

Dr. Ben House
Correct. Total.

Dr. Andy Galpin
Total testosterone.

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Dr. Ben House
Total.

Dr. Andy Galpin
50/50.

Dr. Ben House
40/60.

Dr. Andy Galpin
40/60.

Dr. Ben House
40/60.

Dr. Andy Galpin
You're flipping a coin. It's a slightly mis-weighted coin by just being that, right? Now, there is plenty of people who are going to get that BMI metric because they're muscled, they're jacked. Okay, fine. But most people, again, there's your 40/60 flip. The inverse. If you have not that BMI, 90% chance you don't have low testosterone.

Dr. Ben House
Yeah.

Dr. Ben House
This is important. 90% chance that you don't have low testosterone, and a 0.9% chance that you have low testosterone plus symptoms?

Dr. Andy Galpin
0.9.

Dr. Ben House
0.9% if you're normal weight.

Dr. Andy Galpin
We could invert that and say 99% chance.

Dr. Ben House
I'm comfortable with that. 99% chance that if, ooh, sub, I think we have to say sub 70 there, maybe even sub 50. We don't have the data. We've looked at this in Anne Haines, Tommy and I, and we don't have enough data in 60 and 70 and 80-year-olds-

Dr. Andy Galpin
Mm

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Dr. Ben House
... to say this definitively. One of the problems there is there's not that many 60 to 70 to 80, healthy 80-year-olds in these data sets.

Dr. Andy Galpin
Yep.

Dr. Ben House
But if you're very healthy and under 50, I-

Dr. Andy Galpin
50 years old

Dr. Ben House
... under 50 years old, and your waist circumference is not more than half of your height, so if you're 70 inches tall, that's 35 inches, your waist circumference can't be higher than that. If your hemoglobin C is, if your blood glucose control is quite good, if your triglycerides are solid, and your HDL is solid, and your blood pressure is regulated, there's probably a less than 1% chance that you have below 300 testosterone.

Dr. Andy Galpin
I think your Anne Haines paper was, if I remember correct, that was sub 1%.

Dr. Ben House
Yeah. 0.9.

Dr. Andy Galpin
You're metabolically healthy, and your belly's not large, to be crude.

Dr. Ben House
Yeah.

Dr. Andy Galpin
You're not going to have low T.

Dr. Ben House
One to 2% of those individuals will. And this is an all-comers data set. There's got to be some legit source of hypogonadism there.

Dr. Andy Galpin
And data sets like this are not perfect.

Dr. Ben House
For sure.

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Dr. Andy Galpin
Of course, limitations, but okay, let's extend that. Let's say we're 5X wrong.

Dr. Ben House
But you could take it the other way.

Dr. Andy Galpin
It's 95%.

Dr. Ben House
But you could take it the other way. I can pull you the scatter plot of Anne Haines, and I can show you 80-year-olds with 800 nanograms per deciliter test.

Dr. Andy Galpin
Oh, yeah.

Dr. Ben House
I can flip this narrative on everybody.

Dr. Andy Galpin
Well, I can tell you right now, we have 75-plus-year-olds, never been on a peptide, never barely taken a vitamin in their life, eat McDonald's, do all the things, and they're cruising at 750. We got those people in our database right now. Real, actual people, and we're like, "Okay."

Dr. Ben House
They exist.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's the cool-

Dr. Andy Galpin
And they're not freaks. They're pretty common.

Dr. Ben House
So right now, and we've talked about TRT a lot, I get legitimately angry at this. It's because we've been sold this andropause narrative-

Dr. Andy Galpin
Yeah

Dr. Ben House
... because it's so simple. This is the race to the bottom on social media. Every narrative, "All

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right, talk to me like a fifth-grader." Sometimes this stuff is just complex, but this one really isn't. It just doesn't make anybody any money. And so we've been sold this, your testosterone is going to drop by 1 to 2% per year after the age of 30. Everybody says this. It's just like now, it's just like this is fact. And if you look at prospective longitudinal studies, I can throw 20 numbers at that and say, like, "Well, yeah, 1 to 2%, it looks like that." But how many of those studies are looking at healthy aging? The answer is almost none of them. So we have Carto et al. 2023, and what they did is, all they did was look at, longitudinally, who doesn't have comorbidities. Now we're not looking at health. We're looking at just who's not sick. And it cut it in half. It went from 1.5 to 0.8, and it was no longer significant.

Dr. Ben House
This isn't looking at healthy aging. This is just looking at not having a disease, which is not the same thing. There's one Shih et al. 2013, and I'm cherry-picking because everybody else cherry-picks the other way, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
So, this one actually did look at meeting zero criteria for metabolic syndrome. It was called metabolic syndrome there. Now it's called CKM. So this was the criteria. Again, not health. ... like these are these populations. Zero components of metabolic syndrome at entry, zero components, I think it was 23% of the population, zero components of metabolic syndrome at follow-up. Those individuals, testosterone did not go down. I'm bullish in that it doesn't even matter at the population level. Who cares? It just matters at the individual level. Just track this thing. Know the noise, know the signal, and just know your own range. And if it's, like for me, the highest I've ever been is 650. Okay, let me just, if it's 500 and I'm not freaking out, maybe I'm going to cut, whatever. I've seen 300s in a cut. I've probably legitimately been in the 20s. I don't have data from this, but I saw 3% on an InBody, so I was probably five or 6% on a DEXA, legitimately like glute striation lean, and had hot flashes, because my estrogen was so low, felt like absolute trash.

Dr. Ben House
And then I re-fed. I didn't even gain weight, because this was the experiment that we were running, because I was like my own little guinea pig, and I re-fed. My leptin was at .6, which won't mean a lot to people. I think the lowest we've seen is one-

Dr. Andy Galpin
Mm-hmm

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Dr. Ben House
... in all of our samples. So I was like, .6 is you're getting to the range where we can't measure this thing. So leptin was very, very low. But my testosterone was still in the 400s. So the only thing I did was re-feed myself out of this absolute on the downstream.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And I re-fed myself for two weeks, and then I got labs. My sex hormone-binding globulin was in the 60s.

Dr. Andy Galpin
And that rose during this, or did it stay, or is that wrong?

Dr. Ben House
No, that rose during-

Dr. Andy Galpin
Yeah

Dr. Ben House
... that, yeah. Again, this is why you need to know yourself.

Dr. Andy Galpin
Yeah.

Dr. Ben House
My normal's like in the 40s or-

Dr. Andy Galpin
Yeah

Dr. Ben House
... I've seen it in the 50s. But I'm not freaking out about that noise, right?

Dr. Andy Galpin
Yep.

Dr. Ben House
I don't have any symptomatology. Like everything's great. I'm maintaining muscle mass at 40. And so like, I don't need to do this. Now, all of a sudden, if in my life, I just spontaneously lose 10 pounds of muscle. You look at me, and three weeks from now, I'm 165.

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Dr. Andy Galpin
Yeah.

Dr. Ben House
I'm not going and getting my testosterone checked, guys.

Dr. Andy Galpin
Yeah.

Dr. Ben House
I'm going to a real doctor to see if I have cancer.

Dr. Andy Galpin
Yeah. Yeah.

Dr. Ben House
I do not think that andropause, if you are very healthy, is a thing. Sex hormone-binding globulin does go up.

Dr. Andy Galpin
Yep.

Dr. Ben House
And then after 70, we probably do get some Leydig cell, like there's chances that the parts don't work anymore. Like because oxidative stress, Leydig cells seem to be quite susceptible to oxidative stress, and we see this across the literature, like past 70, it does look like you get a steeper decline. Up until 70, I think that it's very possible that someone can maintain their normal level of testosterone. Sex hormone-binding globulin kind of goes up. But you should look at your, look, are you able to maintain your strength? This is why I always come back, you and I, we're always going to come back to outputs.

Dr. Andy Galpin
Mm.

Dr. Ben House
Like just track your outputs and marry them against these physiologic... It's the same thing. Like, what's your VO2 max? What's your max heart rate? What's your muscle oxygenation underneath that? It's the same type of practices.

Dr. Andy Galpin
So you would not expect at this point, based upon the currently available data, for testosterone to drop as a normal function of aging.

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Dr. Ben House
No, I would expect sex hormone-binding globulin to go up, though. If someone is healthy, I do not expect that, and this is like the largest study that we have, Marriott 2023, I believe, like crazy amount of people. They looked at like what predicted the decrease in testosterone, and age wasn't a factor until after 70. What was a factor? Diabetes, metabolic, like all the things. Those were the factors that-

Dr. Andy Galpin
Smoking, alcohol

Dr. Ben House
... yeah. Like smoking is a weird one. Smoking is actually a really weird one. Drives sex, like I don't even want to talk about this on the podcast, but does seem to drive testosterone somewhat up. I think that has to do with like an appetite regulation.

Dr. Andy Galpin
Hmm.

Dr. Ben House
I'm not really sure why, but it also drives sex hormone-binding globulin up.

Dr. Ben House
Nicotine's a, yeah, smoking's a weird one.

Dr. Andy Galpin
It's counterintuitive that testosterone would stay the same throughout my lifetime. The story makes sense to me, okay, you get older, you don't need to reproduce anymore, your energy goes down, you don't need to be able to be as jacked anymore. So it makes sense when I hear someone say, "Oh, okay, 1%." And I mean, I know some of those studies have looked at like a decade, and someone goes down 10%, 12%, so you can kind of back calculate, okay, 1% per year.

Dr. Ben House
Yeah, the longitudinal perspective stuff.

Dr. Andy Galpin
But you're actually saying that that's not-

Dr. Ben House
I'm not saying that data doesn't exist.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
That data for sure exists. We're talking about hundreds of thousands of people probably inside of those datasets, that dataset. But all of that is under the backdrop of what is the price of aging in our current society? It is BMI, body fat going up until later in life when body fat goes down because your appetite goes down, and then you lose muscle.

Dr. Andy Galpin
So if you adjust for body fat?

Dr. Ben House
You just gave me waist circumference.

Dr. Andy Galpin
Waist circumference. If my waist circumference doesn't change from 30 to 70?

Dr. Ben House
I would bet that your testosterone would stay within 10%.

Dr. Andy Galpin
Within lab measurement error.

Dr. Ben House
If I got standardized measurements, blah, blah, blah, I would bet that.

Dr. Andy Galpin
It doesn't seem to be how this is portrayed.

Dr. Ben House
For sure. That's my biggest beef is that I just have to flip the script. This is so believed that all I have to do is show you a scatter plot of this, and it's a flat line, and then-

Dr. Andy Galpin
Yeah

Dr. Ben House
... it goes down at 70, probably not because of the mean, but because there's so many people low.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So, like there's a failure of the apparatus or there's a sampling variance. Like we can talk about the scientific meaning for this, but the median is driven down not by the, so if you know what a

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scatter plot is, it's every do- In all of these large studies. And so the cloud of data looks like this. There's obviously people above, there's people below. But the cloud data looks like this, and then boom. There's a lot more dots on the low side towards the end of life.

Dr. Andy Galpin
Do we have data up to 80 to 90 plus years old, or does it really stop at 70?

Dr. Ben House
There's data. You look at Kelsey et al. 2014, which aggregated, I think it was 14 prospective trials. And I have my testosterone deck. That's the first one, because it's the prettiest graph. I don't know how much that graph costs. Probably hundreds of millions of dollars, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
Of research funds. These scatter plots, these clouds, they're really pretty. They're just a really pretty demonstration of, on the individual level, why you should give zero fucks about what the mean is doing.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You should not care. There's so many dots around that mean, you should just worry about you.

Dr. Andy Galpin
If I'm hearing that correctly, then the average person, even through 90, is potentially going to keep the exact same testosterone they had in their 20s. It's just that the variance after 70-

Dr. Ben House
Be that study.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's the other part about it is why not try to be that study?

Dr. Andy Galpin
Yeah. It shouldn't inherently go down, I guess is the question. It could. It's possible.

Dr. Ben House
We should all try to be that study, because that means that we're going to try to be as healthy as

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possible. If we think about testosterone as this canary, and it can go down for a lot of reasons. The two things are like, yes, okay, age does not likely inside of healthy aging, if you maintain your metabolic health, very, very likely does not lower testosterone. But the other part is if your testosterone does drop, the first thing shouldn't be exogenous.

Dr. Andy Galpin
No.

Dr. Ben House
That shouldn't be your first jump. And I hope people understand, this is a canary for something. And you should go look for what of those 110 things that could mess with this axis, what are they?

Dr. Andy Galpin
Of the 110, what are the most impactful ones? You've already mentioned it's not age. That's obviously not the thing that's going to be driving it, right?

Dr. Ben House
Yeah, it's not on-

Dr. Andy Galpin
It's not on your-

Dr. Ben House
Past 70. You could put 70 on there.

Dr. Andy Galpin
Okay. You mentioned obesity, so I assume that's going to be... Well, you clearly said it.

Dr. Ben House
Yeah.

Dr. Andy Galpin
That is the number one thing. So maybe this directive a question. If I'm past 25 years old as a male and my testosterone has dropped either symptomologically, I feel the symptoms of low testosterone, and-

Dr. Ben House
Yeah. I would say you feel the symptoms of testosterone, those being sexual, because we have the data that like, "Oh, you feel generalized fatigue." You can't chalk that to... That's the other part about these TRT ads that drives me bananas, like, "Oh, your vitality's down." I'm like, "Well, whatever, man." There's so many reasons that that could happen at 40. You got a mortgage. I got a mortgage and kids, man. I didn't have a mortgage and kids when I was 20. Let me tell you,

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my life is a lot different.

Dr. Andy Galpin
Well, there's actually data on marriage, right?

Dr. Ben House
Yeah. Co-sleeping, pair bonding does look like it lowers testosterone to some degree. It depends, though, on the species.

Dr. Andy Galpin
It's like 10%, though, right?

Dr. Ben House
Yeah.

Dr. Andy Galpin
It's not much.

Dr. Ben House
It is confounded by having kids and then sleep loss.

Dr. Andy Galpin
Everything.

Dr. Ben House
Yeah.

Dr. Andy Galpin
More likely of a stressful life situation.

Dr. Ben House
Of stress, yeah.

Dr. Andy Galpin
You're traveling more, finance, all those stuff, right?

Dr. Ben House
It's on the list, though. For sure.

Dr. Andy Galpin
Yeah.

Dr. Ben House
We have to honor that. I'll take my kids in a 10% drop in test. I'll take it.

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Dr. Andy Galpin
Today's episode is sponsored by LMNT. LMNT is an electrolyte drink that has an ideal electrolyte ratio of sodium, potassium, and magnesium, but no sugar. Hydration is critical to performance, both physical and mental. And countless studies have shown that even a slight degree of dehydration, even as small as 1%, can lead to decreases in physical output and mental performance. We also know that electrolytes are critical to proper hydration, which I've been harping on for years. But you can't do that, proper hydration, by only drinking water, especially if you sweat a lot. You need to get the right amount of electrolytes in the right ratios, and that's why I'm a huge fan of LMNT. In fact, many of you might remember that I featured LMNT in my YouTube series on hydration nearly six years ago. I featured LMNT in these videos because their blend of 1,000 milligrams of sodium, 200 milligrams of potassium, and 60 milligrams of magnesium really is unique and different than any other electrolyte on the market, and it has great scientific support.

Dr. Andy Galpin
I use LMNT on nearly a daily basis, especially when I'm doing really hard training in the heat and I'm sweating a lot. If you'd like to try LMNT, you can go to drinkLMNT.com/perform to claim a free LMNT sample pack with the purchase of any LMNT drink mix. Again, that's drinkLMNT.com/perform to claim a free sample pack. So that first stop in the train is, again, you're either feeling the signs of low symptom. You discussed, what's actually funny is behind the scenes, you want to get on TRT, especially as a therapeutic use exemption, a TUE-

Dr. Ben House
Mm

Dr. Andy Galpin
... for sports. You still all you have to say is, "Oh, tired all the time, fatigued." And everybody starts at the back like, "Well, time out. Did we get checked for sleep apnea?" "No."

Dr. Ben House
"Oh, great."

Dr. Andy Galpin
"Okay. Well, great." Then like, "Here's your symptom." Like, "Libido?" "Oh, amazing."

Dr. Ben House
Think about that.

Dr. Andy Galpin
Come on.

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Dr. Ben House
You get on gas, your EPO goes crazy.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You do have sleep apnea. Now you're living at night at altitude, which is going to drive your hematocrit up. Nobody's looking at this shit, and then you're just like, pop.

Dr. Andy Galpin
Boom.

Dr. Ben House
Malpractice in my opinion.

Dr. Andy Galpin
My first stop on that check is weight gain, man, right? If I've gained fat-

Dr. Ben House
Yeah

Dr. Andy Galpin
... that is not only-

Dr. Ben House
Centrally, visceral adiposity. You might be the same weight, but now you're carrying around in the midsection for sure.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's a big one.

Dr. Andy Galpin
Magnitude of effect here. If I gain 16 pounds, 18 pounds-

Dr. Ben House
Of pure fat

Dr. Andy Galpin
Yeah, nothing crazy. Whatever a normal, I was 180 pounds kind of in high school, college. Now I'm 40 and not 180 more now, now I'm 205. Nothing like I got huge. I'm 30-

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Dr. Ben House
I think that's probably enough

Dr. Andy Galpin
How much is that going to move it, though?

Dr. Ben House
It depends on how much muscle they have. It's hard to pin down. I think if you moved from a normal weight to an obese category, I think, yeah, the research would say that that's significant, right?

Dr. Andy Galpin
That's enough to move me from 500 to sub 300.

Dr. Ben House
I don't know that, but on the individual level, I'd be thinking, this is the work that you do, and the work that we do is I'd be looking at CRP. I'd be looking at what are some other measurements that are, what else is going, what's your blood glucose like?

Dr. Andy Galpin
Yeah.

Dr. Ben House
I'd be more interested in things like And I think we're going to get better at doing this. DEXA's very bad at tracking visceral adiposity.

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
VAT. People show me their DEXA VATs and I'm like, "Just throw it in trash." It's not good at that.

Dr. Andy Galpin
I never look at it.

Dr. Ben House
AI's going to make that a lot better, and it's going to democratize that measurement. So yes, if you've gotten fat. Now, let me give you a straight answer on this, and this comes back to this individual tracking. So, you've gained adiposity and you are still underneath your personal fat threshold. No, I don't think testosterone would be affected. You gain enough adiposity where all of a sudden you've filled up that subcutaneous adiposity store, subcutaneous being the fat that we don't like, the fat you can pinch. And now you're starting to store fat ectopically around your organs. Yes, I think now you're going to get a lowering of SHBG, you're going to get a lowering of

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testosterone.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Confident there. It has to do with that personal fat threshold.

Dr. Andy Galpin
What I'm trying to get at is when someone's thinking about, "I want my testosterone to go up," whether they're at 400 or they're at 600, because they just-

Dr. Ben House
Yeah

Dr. Andy Galpin
... they want it to go up. Maybe they believe you that it won't help them gain any more muscle mass when they're lifting, but they go, "I feel more dominant. I feel better, mentally. Okay, fine. I'm not going to go TRT. I'm going to go all the other routes to get my testosterone jacked all the way up there." Pick your favorite supplement. What I'm looking for is the magnitude of effect, right, of saying if you pick the most-

Dr. Ben House
Mm

Dr. Andy Galpin
... well-demonstrated supplement to enhance testosterone, what is that and how much will it go up, and contrast that to something like if you lost 10 pounds.

Dr. Ben House
It depends on where you're at in your personal fat threshold. You could lose 10 pounds and it tanks your testosterone.

Dr. Andy Galpin
So, I am 30% body fat.

Dr. Ben House
Perfect.

Dr. Andy Galpin
I need to lose some, but I'm not morbid. I can walk around.

Dr. Ben House
Yeah, that'll linearly result in testosterone going up. Linearly, and it'll stay there. You don't have to

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take any supplementation.

Dr. Ben House
The supplement research is quite bad.

Dr. Andy Galpin
For testosterone.

Dr. Ben House
Yeah. These aren't causing monumental changes. I don't know the tongkat ali research off the back of my head, but I don't think it's more than noise in the measurement, right?

Dr. Andy Galpin
It's like 10%, 15%.

Dr. Ben House
Yeah. You're talking about, I think high end, it's like 100. Which again, isn't nothing.

Dr. Andy Galpin
Of course.

Dr. Ben House
We've experimented with this stuff and we've seen it raise up, and I have no problem with that. I've taken tongkat ali. I've played with this stuff.

Dr. Andy Galpin
We've seen ashwagandha actually-

Dr. Ben House
Ashwagandha can do it. Mm-hmm

Dr. Andy Galpin
... move the needle, for sure.

Dr. Ben House
Mm-hmm.

Dr. Andy Galpin
All things controlled, and you're like, "Wow, it goes up 75." The obesity thing, though, you're talking about 150 to 200 sometimes.

Dr. Ben House
Yeah. It's people losing enough weight. You're talking about unlock.

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Dr. Andy Galpin
You're really, really moving the stuff.

Dr. Ben House
The research here is not great. It's ambivalent, and I will honor that. Sleep apnea is something that I think is in this conglomeration that people need to have checked, because that's another one that's hyper prevalent. You got a giant-ass tongue that comes along for the ride with this. Or, I think it's tongue more than neck. You're probably-

Dr. Andy Galpin
Or all of the above.

Dr. Ben House
Yeah. So, we have adiposity, but then we also have a lot of other drugs that are in the mix here, that are quite, like SSRIs. Again, I'm not a real doctor. I'm a PhD. So, opioids are a huge one. Opioids, if you-

Dr. Andy Galpin
They just rip it down.

Dr. Ben House
For sure. There's a lot of other things outside of just that we've talked about here that are going to be in that MD sector. So, we kind of chalk it up as medical, non-medical, which is hard to do. And then a lot of the medical stuff, like you have a pituitary adenoma.

Dr. Andy Galpin
Yeah.

Dr. Ben House
There's a tumor in your brain. These things need to be worked up to a certain extent.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And then if we're constraining ourselves to this non-medical aspect of testosterone, I think the heaviest hitters are going to be weight loss on both directions. So, weight loss when you're lean, and then bringing testosterone down, multi-stressor environments reliably. So, we haven't talked about Fredo and Hammer's land yet. That's the other way to drive yourself into 69 and 80s, is to go on some seven-day operative thing. And they give people LH, which they give people hCG, and this is not an apparatus, this is not a parts problem.

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Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
This is the brain wants it this way. Part of me wants to put myself in the brain of the people that are most likely to listen to this. If you're seeing your testosterone and you have high sex hormone binding globulin, and your testosterone is going down, I want to refeed you.

Dr. Andy Galpin
Yeah.

Dr. Ben House
I want to ask what you've been doing, because we know from these trials, like Fredo is insane. The graphs on that, we've talked about these graphs. We show them to clients. It is absolutely insane. Sexual hormone binding globulin goes from 20 to 50 on mission. They refeed them for one week, goes back down to 20. And we think this is an insulin-gated mechanism. So, I think a good carb refeed if you've been cutting, yeah, let's go. I love that. So that's a big one. If I'm trying to think of other ones for this, sleep is tough to track down. We don't have sleep data for you sleeping like trash for three years. That data does not exist.

Dr. Andy Galpin
For testosterone or related things.

Dr. Ben House
Yeah. We just don't have that.

Dr. Andy Galpin
Well, actually, for damn near anything.

Dr. Ben House
Damn near anything. Not even for CRP.

Dr. Andy Galpin
Yeah.

Dr. Ben House
The data that we have is very, like you don't sleep... These are controlled experiments, so it's like eight days of five hours per night.

Dr. Andy Galpin
Yeah. The most you're going to see are couple of week stuff where we restrict you to four hours, things like that, or long-term comparative-

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Dr. Ben House
It's the shift workers. Which is hard because then, I hate the shift worker stuff because then I get into, you know me, I get in the draw time thing.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Like, are you drawing them after they've been up for 24 hours? Worthless.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You and I have looked at every sleep study and testosterone and-

Dr. Andy Galpin
Like every one

Dr. Ben House
... every one. Every-

Dr. Andy Galpin
One by one

Dr. Ben House
... one of them. Every one of them. And sleep deprivation causes lower testosterone. It's like a moderate effect. Sleep deprivation will, this is not sleeping. But this is problematic because you're not getting any slow-wave sleep, so we would expect that. We would expect that to happen. Now, if you look at the Leopold 2011 is the one that everybody puts the number on it, and this is an interesting one because they did more than one time point. They looked at the area under the curve. And the area under the curve for just, and I'm going to frame this differently. I could frame it either way, right? Like eight days of five hours per night. So just that caused a 15% decrement. I could frame it that way. I've also framed it like, you could go either way with that. So is that the start of a larger decline?

Dr. Andy Galpin
Yeah.

Dr. Ben House
Or is that the decline itself? My hunch is that it is probably the start of a larger decline. I don't know that, but you wouldn't want to place that bet anyways. Why would you want to place that bet like, "Oh, I'm going to sleep four hours a night for a decade and see what happens"? I'm not

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playing that Russian roulette.

Dr. Andy Galpin
Yeah, it's hard because then how many months do you have to do that before your system goes, "Oh, this is what we're going to do? Now reverse course. Go stay around." Because-

Dr. Ben House
The big one here is that we do know that inflammation is an independent driver of lower testosterone. So low sleep shift work is a carcinogen, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
So it does have to have some effect. So I'm cognizant of inflammation in that way, in that I do think that you do not want to... And that's one of the reasons that obesity, we have this brain mass mechanism, we have SHBG, but there does look to be some inflammation hitting the Leydig cells.

Dr. Andy Galpin
I don't think, in my experience, I don't know what yours has been, I just personally haven't seen that many people cruising around with lots of inflammation, candidly. You hear this other narrative of-

Dr. Ben House
Mm-hmm

Dr. Andy Galpin
... everyone's inflamed.

Dr. Ben House
Yeah. Outside of our secondary sample is not the-

Dr. Andy Galpin
Correct

Dr. Ben House
... normal human being.

Dr. Andy Galpin
For sure. But if you're listening to this podcast, you're probably-

Dr. Ben House
Probably not the normal human being.

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Dr. Andy Galpin
Yeah. You have secondary inflammation from obesity, right? So obesity, you mentioned this a couple of times, but you can have things like effectively obesity-induced diabetes, type 2 diabetes, right? Insulin resistance. Same thing with inflammation. You can have those things there. Again, my experience is I'm not seeing loads of people walking around with just crushing levels of inflammation. And no matter how you chalk it up, we've seen it occasionally. So I haven't really seen that be a driver of low testosterone. I certainly would recognize it will be, but I feel like there's so many other things ahead of that for the average person. If you are in that sub 400 range, you're 200, I feel like if you're walking around and your inflammatory markers are high, something else is coming along for the ride. You are obese, you are massively-

Dr. Ben House
Again

Dr. Andy Galpin
... sleep deprived. Something else is there, and the inflammation is almost as much of a signal like the low T is, rather than a direct cause. Although, I'm sure it's doing that, too, and contributing. These are always multifactorial.

Dr. Ben House
Yeah, micronutrients are, I'm trying to think of like-

Dr. Andy Galpin
Sure

Dr. Ben House
... micronutrients, you don't want to be low on zinc, you don't want to be low on magnesium. I don't think going super crazy on those is going to raise it up more, right?

Dr. Andy Galpin
Copper.

Dr. Ben House
Yeah, copper.

Dr. Ben House
All of those mitochondrial pathways, anything that's mitochondrial related, because this stuff costs money.

Dr. Andy Galpin
Yep.

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Dr. Ben House
This is like, I don't bring up old school functional medicine stuff very often, but we're deep in this podcast, so I think I can do it. So stomach acid, if you think about the stomach, this is going to be weird for a lot of people, and they'll get what I'm getting at. Stomach acid is one of the most expensive things we make. To maintain the stomach environment of a pH of two, literally rip you apart.

Dr. Andy Galpin
For sure. Melts your skin on contact.

Dr. Ben House
Yeah. Like horror movie type shit. And your parietal cells maintain that, and they just massively chalk. So one of the big things for me that is interesting is a lot of indigestion is maybe an early sign of, I'm just thinking about it in my head, like, "Oh, is this mitochondrial dysfunction?"

Dr. Andy Galpin
Yeah.

Dr. Ben House
And so your skin, everything that this is just something that people can pay attention to. Anything that is replicating quickly, so hair, nails, skin. If that's going down, if that's different than it was normally, I think the outside matches the inside in a certain extent. And that's a thing to me, like, okay, what are we lacking here? What is the system lacking from an energy production inside of all of that electron transport chain? How can we fill that? I think we're going to get better ways to test that, but right now I'm just like, throw the kitchen sink at it.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Let's get you micronutrient repleted. This is just old school, like Pottinger's cats type scenario.

Dr. Andy Galpin
Yep.

Dr. Ben House
You do not want to be the fourth generation of a micronutrient deficient diet.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You're going to be worthless.

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Dr. Andy Galpin
That was a good reference.

Dr. Ben House
Yeah.

Dr. Andy Galpin
That was a nice pull-out.

Dr. Ben House
And a lot of people are. So that's the other part about this is right now we're going to get 20 to 30 year olds who are obese, and they're starting to be the third generation of nutrient-deprived-

Dr. Andy Galpin
Yep

Dr. Ben House
... micronutrient-deprived, but nutrient through the roof type scenario. Not their fault at all. So they might have inherited some level of leptin resistance. Population-wise, we are in a really tough spot. And luckily, that's why GLP-1s are so interesting to me. So interesting in that this is the first thing that has been able to really move that needle. We don't have a ton of data on this, but the meta-analysis that we do have does look like GLP-1s are increasing testosterone. They have their own problems, right? Nausea, whether you need them for life or not, all that stuff that we don't need to go down. But it is interesting, they provide, like I mentioned, bariatric surgery is going to raise it by 207. But GLP-1s, if they cause 20, 30% weight loss, you could be in the same boat. We need more data on that, but it is interesting. On the flip side of that, bariatric surgery, you think about the problems with bariatric surgery, you can't eat that much.

Dr. Andy Galpin
No.

Dr. Ben House
So you can't, how are you going to get enough micronutrients? So you kind of got to thread these needles. You can't just be a one-trick pony. You have to honor your blind spots in all of this, and that's why testosterone is just one signal in a lot of signals.

Dr. Andy Galpin
So it's clear at this point, age is not the major culprit that's pulling stuff down the average person testosterone-wise. We don't predict it. It may have some slight impact, maybe over 70, but for the most part, it should peg alongside that. If one's total testosterone is dropping significantly as they get older, the first thing you would think would be obesity. Did you gain weight? Did you gain visceral fat specifically? And others, okay. Past that, you might be thinking sleep. Past that,

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you might be thinking, what would be maybe the next one or two things on your list? Again, we'll skip off head injury. It's a real thing, but...

Dr. Ben House
Yeah, I think micronutrient deficiencies is-

Dr. Andy Galpin
Would be the next one

Dr. Ben House
... for the people listening to this podcast would be the next one. Then the next one would be maybe other drugs. I think that's a good workup.

Dr. Andy Galpin
You did mention that, yeah.

Dr. Ben House
There's some blind spots there that need to be thought of.

Dr. Andy Galpin
Alcohol?

Dr. Ben House
Alcohol, yeah. Depends on how much.

Dr. Andy Galpin
I'm sure if it's in excess-

Dr. Ben House
Yeah

Dr. Andy Galpin
... seven-plus drinks a week, that's probably ripping stuff down, but...

Dr. Ben House
Yeah, I'm not worried about it at, I'm really not that worried about it inside of moderator ranges, but who can moderate?

Dr. Andy Galpin
Yep.

Dr. Ben House
Marijuana's an interesting one. I'm not sure which way. That data's mixed. But if I'm thinking about other things inside of our population other than sleep and micronutrients, I would hammer those, and then if it doesn't, if those don't move it up, if you know you're nutrient replete, you

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know you don't have any kind of sleeping disorder, then I'm going to go to stress, and this is the part I don't want to go to, but let's go there, over-training.

Dr. Andy Galpin
Mm.

Dr. Ben House
Let's go to that. Because I don't know that over-training has its own unique signal in this relationship. That meta's hard to do. We're working on it.

Dr. Ben House
The meta that we're trying to figure out how to do, and this is pooling of studies. Studies of studies. So we're trying to figure out, can you find studies that overreach people-

Dr. Andy Galpin
I know where you're going with this, and I don't think you can do this.

Dr. Ben House
Yeah, yeah. It's tough. Without a caloric deficit, right?

Dr. Andy Galpin
Yeah. Right.

Dr. Ben House
And they exist. Volume studies that are nutrient replete.

Dr. Andy Galpin
The thing is, too, is you're also going to pack into that, you're going to see less sleep. You just see this happening because the reason people... What ends up happening is when people bring on more training volume, they typically bring on more training sessions. More training sessions mean you're either trying to get one in earlier in the day or later in the day. Almost always, when you see advanced training volumes go up, you see sleep go down. So now, that's why I jumped to this immediately. I'm like, "Okay. You're trying to tease into the fact, is it an actual physiological overload, overstress, or is it the fact that sleep went down, or is the fact that you are under-caloried or a combination of both? Or, thrown on top of all that, some combination of psychological stress?"

Dr. Ben House
The studies that we've found that have not resulted in significant weight loss have not changed total testosterone. So these are acute increases in training volume. They're not long, though.

Dr. Andy Galpin
Yeah. You couldn't very long.

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Dr. Ben House
These are six to eight-week studies of more volume. So you asked, what are the things that could potentially cause low testosterone, and one that I invariably miss that is kind of an uncomfortable one to talk about is varicocele. And those are an enlarged vein that comes off the testicle. And this doesn't sound like it would be very likely, but in populations of lifters who are doing Valsalva a ton, it is very, very, very common. We're talking about some of these studies in Olympic lifters are, like, 80, 90%. Having this surgically repaired can bring testosterone up by 150, same level as obesity, like 150 to 200-

Dr. Andy Galpin
Slow me down. Slow me down. Walk me through this again.

Dr. Ben House
Yeah, yeah.

Dr. Andy Galpin
You just hit a number of things. A Valsalva maneuver, 90%, varicocele, give me these-

Dr. Ben House
Yeah

Dr. Andy Galpin
... piece by piece here.

Dr. Ben House
Yeah, yeah. So whenever you're lifting, you're generally going to throw a lot of pressure down into the pelvic floor. And so when you do that, you can, like hemorrhoids are the same mechanism. These are going to cluster together. This is the reason that it's important to see a good urologist or, this is going to be a urologist. And they're going to know from across the room if you got one of these things, generally. And there's different grades to them.

Dr. Andy Galpin
Varicocele.

Dr. Ben House
Yes.

Dr. Andy Galpin
They'll know about this varicocele.

Dr. Ben House
Yeah, yeah.

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Dr. Andy Galpin
Very easy to identify.

Dr. Ben House
These are enlarged veins coming off your testicle, and that means that the testosterone can't get out. So there's a block. So it's like a physical block. And when these are repaired, it generally increases testosterone. We've been talking about all these things that could potentially cause low testosterone in people that are listening to this, and this is statistically, for the population, it is a potential large one.

Dr. Andy Galpin
Yeah. We've seen this. You and I have seen this together, where it's funny because you're just like, "Let me ask about the veins coming off your balls." And you're like, "Excuse me?"

Dr. Ben House
For sure.

Dr. Andy Galpin
And as far as I understand it, maybe Rena Malik could help us, but it's a pretty simple procedure to fix.

Dr. Ben House
Yeah. It's laparoscopic. Again, anytime someone's taking a knife to your balls and your scrotum, you probably want that person to be the best in the world, right?

Dr. Andy Galpin
Yeah, yeah.

Dr. Ben House
But fixing it reliably increases testosterone. The odds are not low. Again, if it's a low grade, it's probably not causing a problem.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But we're talking about if your testosterone is 300, and this is a thing, you probably want to do this.

Dr. Andy Galpin
Okay, would this be fair to say? If you are reasonably lean and you're lifting weights, you're not doing any of the obvious stuff, your sleep is fine, and your testosterone is, you've verified it two or three times, it is 250, 300- Should you go to a neurologist and get this checked before you go

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on gear?

Dr. Ben House
1,000%. That person should. That's what we talked about. The first step should not be TRT. These are the steps that someone-

Dr. Andy Galpin
Because you might be able to have a very simple procedure, and then your testosterone goes way back up, and you're done

Dr. Ben House
The other part is this same type of ideology, if you're a cyclist and you don't have one of those seats that has a gap for your boys, same thing. You're just constricting them in a hot space. So like, there are-

Dr. Andy Galpin
It'll smash them up. Yeah

Dr. Ben House
Yeah, you just smash your boys. For 20 hours a week if you're a triathlete.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Right? We talked about training volume, bringing your training volume down, being educated about that. So if your testosterone is coming back low, run a deload. But also look at some other markers that are necessarily related to over-training. What's happened to DHEAS, which is another lab marker that's another androgen. You can look at testosterone to cortisol ratio. You can look at IGF-1. So there's a conglomeration of values that can be related to CRP, creatine kinase. And so some of these other values can really hint at, is this an over-training, overreaching scenario? How bad are you kicking it into gear? And then I do think that you, me personally, rather than go on some lifelong prescription, I would want to run down what are all the possible mechanisms that could be leading to this. Because those could also be hurting my performance in some form or fashion.

Dr. Andy Galpin
100%. It's not like the only benefit you're going to get here is your test. Yeah. Well, maybe we'll get you to write up a little algorithm, like a five-step, "If I think my T is low, I'll check these five things first," and then you can put that on your website or something. From there, move me into that other side of the equation. What if I'm not obese?

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Dr. Ben House
Yeah. By far, the most likely person, if you are a lean male, let's quantify that, sub-20% body fat, sub-50-

Dr. Andy Galpin
Okay, but you're not talking like crazy lean.

Dr. Ben House
No, no. I-

Dr. Andy Galpin
Your average kind of lean guy.

Dr. Ben House
Yeah

Dr. Andy Galpin
But not like, "Oh my God, like I shredded."

Dr. Ben House
Correct. Oh my God, you're shredded, then definitely, I think you're probably in the land of gained testosterone. So this is the other side of that coin, which we've meta, and I think we've found the majority of these studies. The story is more interesting in the N of one studies that we have, because we have a lot of those. Because they're more palatable for people.

Dr. Andy Galpin
Case studies.

Dr. Ben House
Yeah. So we have a ton of bodybuilders who go down into these ranges. We have my friend, we have eight years of data on him. The lowest testosterone we saw was a 26.

Dr. Andy Galpin
26 total.

Dr. Ben House
26 total.

Dr. Andy Galpin
Not free.

Dr. Ben House
26 total. Thyroid hormones immeasurable.

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Dr. Andy Galpin
This is castration.

Dr. Ben House
Yeah, he castrated himself by dieting.

Dr. Andy Galpin
Yeah. Dieting induced castration.

Dr. Ben House
Yeah, he did.

Dr. Andy Galpin
Thyroid didn't show up.

Dr. Ben House
Free T3 was unmeasurable.

Dr. Andy Galpin
All right.

Dr. Ben House
And 190 shredded to the gills. So FMI of 26-

Dr. Andy Galpin
You got to be talking less than 5% then body fat.

Dr. Ben House
Yeah.

Dr. Andy Galpin
As low as you can get on a body fat-

Dr. Ben House
Yeah. People aren't asking, at this point they're not like, "Wow, you're shredded." They're like, "Are you okay?"

Dr. Andy Galpin
Yeah.

Dr. Ben House
This is dead behind the eyes, this is bad. So 26, and then re-fed him back up to 12% on a body fat, back up to 650 total testosterone.

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Dr. Andy Galpin
How long?

Dr. Ben House
Sex hormone binding globulin for him, this is interesting. This is why the individual data sometimes breaks my head. Sex hormone binding globulin for him stayed pretty, I think it was like 25 to 35. He didn't get a huge hit in sex hormone binding globulin. He just got all of it from total test.

Dr. Andy Galpin
Oof. How long is this re-feed? Like weeks? Three? Four?

Dr. Ben House
So the literature that we have in this degree is generally over months.

Dr. Andy Galpin
Yeah.

Dr. Ben House
This degree of leanness. And they're always gaining body fat. The thing we don't have is we don't have the Instagram life story of, "I dropped down to 5% body fat, and then I maintained that for two years."

Dr. Andy Galpin
Yeah.

Dr. Ben House
I don't know that story. That's one you should get your own data. We know that if you replete energy and you start to get on that upswing where you're gaining body fat back, we do have Mitchell et al is like, I think they were still, I want to say 8% on a DEXA or something like that, somewhere like that, and they came back up.

Dr. Andy Galpin
If the obesity thing didn't drive the point home enough, what you're effectively saying was in these case studies of bodybuilders, or akin, their energy regulation is 100% regulating testosterone.

Dr. Ben House
Yeah, 1,000.

Dr. Andy Galpin
Because you're going from 600-

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Dr. Ben House
The brain is killing it

Dr. Andy Galpin
... to 30 to 600 again.

Dr. Ben House
Yeah, this is a brain-based mechanism.

Dr. Andy Galpin
I mean, what bigger of a spectrum do you want? This is the whole thing.

Dr. Ben House
Mm-hmm.

Dr. Andy Galpin
Which, I don't know any other way than to conceptualize what is the biggest thing in most people driving your total testosterone.

Dr. Ben House
The brain.

Dr. Andy Galpin
It's just-

Dr. Ben House
The energy intake

Dr. Andy Galpin
... energy in the brain

Dr. Ben House
And it makes sense. The energy in the brain is the largest signal because it's why we turn calories into babies.

Dr. Andy Galpin
Yeah.

Dr. Ben House
That's the whole point of existence-

Dr. Andy Galpin
Right

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Dr. Ben House
... is turning calories into more people.

Dr. Andy Galpin
So you're talking a situation where if I am obese, defined in the crudest ways, which I keep saying that because I actually love it that way. If it's that crude and it works this clearly-

Dr. Ben House
Waist circumference and BMI

Dr. Andy Galpin
... then you know there's a real signal here, right? This is why this stuff, waist circumference, BMI, anyone can test these at home in seconds, right? With nothing there. If you are in that spot and you lose a reasonable amount of weight, I think you said earlier something like going from 35% body fat to 25%, so not even getting really friendly.

Dr. Ben House
Yeah, I think 35 to 30.

Dr. Andy Galpin
35 to 30.

Dr. Ben House
It's going to be linear-

Dr. Andy Galpin
This is going to-

Dr. Ben House
... if you're in that camp

Dr. Andy Galpin
... increase your testosterone 50, 100-

Dr. Ben House
200 even

Dr. Andy Galpin
... 200 points.

Dr. Ben House
Mm-hmm.

Dr. Andy Galpin
However, once you get below 20% body fat-

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Dr. Ben House
Yeah

Dr. Andy Galpin
... we might start to see the opposite thing happen here. This is the second half of the equation, right? Some point caloric deficit too much goes from elevating testosterone, so then you got kind of lean, you probably are holding on, and now you continue to cut diet Now your testosterone starts to drop again. So we get a curve here.

Dr. Ben House
I think that this is inverted U, and this is where I think your and my experience and the number of people that we've seen is so important because, again, I come back to population versus individual dynamics. The population just guides the individual. It's like trying to get us in a better place from zero data. I've seen three clients who have lost half of themselves.

Dr. Andy Galpin
Oof.

Dr. Ben House
We're talking 300 to 150.

Dr. Andy Galpin
Wow.

Dr. Ben House
Or even 330 to 180. I've had three of these clients. One of them had a testosterone of 850, on top of the world, fucking crushing it. Another one, anemia, testosterone in the tank. Another one, absolutely just floored, like 200 testosterone. None of those people were under 15% body fat. So some of this has to do with relativity, because your brain gets used to whatever leptin was your highest point. So that's why I think the absolute percentages here are less important to me than the relative percentages of where someone was. So I think if, this is why you and I both want to look at this, I wish the "Biggest Loser" study had these type of metrics, because I think eventually you're going to get to a point, even in obesity, where you run down the backside of that U. So for the average listener who's never had, hasn't gained 30 pounds of body fat, and this is why I think you get the Instagram challenges.

Dr. Ben House
These don't happen often, but every once in a while, a trainer's like, "Oh, I'm going to gain 40 pounds of fat by eating McDonald's every six months." I'm like, okay, even if you lose it-

Dr. Andy Galpin
Yeah

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Dr. Ben House
... you have changed your physiology probably forever.

Dr. Andy Galpin
Yeah.

Dr. Ben House
What your brain sees as safe. And so that's where I think of this as the individual dynamics are negative. And you probably want to take, if you're in the obese category, and this isn't to say that weight loss is easy in our current environment, everything that comes along with that, but on paper, you'd want to take it till you get to that drop point, right?

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
I would guess that's your window of where your healthy weight loss is.

Dr. Andy Galpin
I'm in this 20, 25% range, I think. I don't have a test. But I think I'm kind of in this ballpark. I want to lean up a little bit. I'm not going to be a bodybuilder or compete. I want to get down to 15%, 12%, something like that.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Didn't grab a blood test, can't afford it, whatever the case. How do I know if I'm cutting too much?

Dr. Ben House
Ooh, yeah. You're not that lean. So part of me is like, we can bring this back to Longland et al. You can run Longland et al.

Dr. Andy Galpin
Yeah.

Dr. Ben House
You can take the fast way. And some people argue if that brings high motivation, you get out of that deficit fast.

Dr. Andy Galpin
This is the anti lose 1% per week. This is the-

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Dr. Ben House
Yeah

Dr. Andy Galpin
... lose 9% as fast as you can.

Dr. Ben House
Correct. And then get back into a refeed.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Again, you know me, I'm a big informed consent person. So if someone's motivation's super high and they want to play that game, I'm down. I don't know what's going to happen, but I think you can recomp. I think you can do it. Now, what's going to happen to your internal physiology, I want to see. I'm on the team. And then I want to refeed you. So the thing that I want to do is I would bet the farm that if you refed the Longland group who started at 23% body fat and stopped at 19% body fat, they got amazing results, in four weeks, it was just heavy on their system. If you refed them, lowered their training volume, I'd bet the farm they just came back up to 500.

Dr. Andy Galpin
We've seen not that, but we've seen similar enough studies to where you tank tests with going too low in calories for a while, and you give them their calories back, right back.

Dr. Ben House
Yeah.

Dr. Andy Galpin
They're right back to the middle.

Dr. Ben House
Yeah. If this person is very trained, so 20 to 25% moderately trained, this is where the option space is, in my mind, is quite vast.

Dr. Andy Galpin
Okay.

Dr. Ben House
And this is where, in nutrition, I have a PhD in nutrition, I hate the needless constraint of the option space. I think we love to do that in the nutrition world. Think of all the things, all the restrictions that we put on, like, all right, we're going to time-restrict your feeding. We're going to restrict these macronutrients. In your scenario right there, world is your oyster, probably. 25%

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body fat, want to get down to 15% body fat, fucking shoot it. Shoot it any way you want to. Make sure you're micronutrient replete. You want to do high carb, low carb, vegan, non-vegan, choose your shot. Whatever you're going to do. I just want to see the other side of that, and I want you to refeed.

Dr. Andy Galpin
Let's take the case of GLP-1s. Are you concerned that people are in a caloric deficit too much such that it'll drive their testosterone down?

Dr. Ben House
This comes down to incentives. This is a fun study, Biodome. Carmagi et al., 2010. This is long-term caloric restriction. This is living at a 10, you're like, how do the people live at a 10 to 20% caloric deficit?

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
Their body just gets used to it, right? And then their body down-regulates thyroid hormone. They get lean enough. These people had low IGF-1, low testosterone, high sexual body glycogen. Is that worth another five years of living in that state? I don't know that math.

Dr. Ben House
I don't know if that math maths, number one, okay, yeah, maths in whatever, mealworms, but I don't know if it maths in humans.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And it's not a bet that I'm willing to take. But yes, we know that long-term, low-level caloric restriction in lean individuals will lower anabolic signals.

Dr. Andy Galpin
Testosterone's going to go down.

Dr. Ben House
Yeah.

Dr. Andy Galpin
How much? Like meaningfully amounts?

Dr. Ben House
I think these individuals are in the three or 400s.

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Dr. Andy Galpin
Meaningful amounts.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Would it be reasonable for someone to go, "I've been kind of dieting a lot, six months, nine months, and I kind of just feel really crappy. Energy's gone. Libido's..."

Dr. Andy Galpin
Do I automatically know testosterone's low? In other words, can those symptoms be the same as someone who's just hungry?

Dr. Ben House
In that scenario, it doesn't necessarily matter. The throughput is get your calories back up and see what happens. The problem there is the people that I talked about.

Dr. Andy Galpin
Yep.

Dr. Ben House
So this is why I think our individual experiences with these kind of very interesting cases is this is a new world problem, and I'm working on extremes here because it's helpful.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So if someone was 350 and now they're 150 and they're still 20% body fat and their testosterone's 200, and they're re-fed, and they look at a cake, and they just want to eat every cake they've ever seen.

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
That is a new world problem. I don't think they're like, "All right, we need to drive more self-discipline in this person who's plate..." They probably need some pharmacological help.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
I think that's, whether that's TRT, whether that's GLP-1s, that's a new scenario. Now, what you're asking for is a less extreme version of that. 25 to 15% body fat, and they're low energy. They have everything that... They look like an end-stage bodybuilder.

Dr. Andy Galpin
Mm-hmm.

Dr. Ben House
Most bodybuilders are living at 15% and then body fat and then dropping down to 5%. Relatively, that's the same change, right?

Dr. Andy Galpin
Right.

Dr. Ben House
So I would re-feed them long term, and then look at all of these measures, see if that changed. And if it didn't, then you have different individual math to do.

Dr. Andy Galpin
You mentioned several times about re-feeding. How do you like to do it?

Dr. Ben House
Ooh.

Dr. Ben House
There's the quintessential nutrition answer, and go right back up to maintenance.

Dr. Andy Galpin
Okay.

Dr. Ben House
Like, "Oh, yeah."

Dr. Andy Galpin
Like the next day or over time or...

Dr. Ben House
Yeah. So this gets into reverse dieting or how you want to do it. And I'm skeptical either way. I'm going to leave this up to the client to some degree, and some people are very scared. If you're just absolutely lean, I don't want you to get into some kind of binge-eating scenario.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
That's probably the negative there. But if we're talking about this 25 to 15% body fat, I'm going to stair step that. And say they dieted in this scenario, say they were dieting at 2,200 calories or some normal-ish amount of calories.

Dr. Andy Galpin
And this is a 800-calorie deficit, 500 calories.

Dr. Ben House
Somewhere in there, right?

Dr. Andy Galpin
So, you're going to be hungry, but you're not going to be just dead all the time.

Dr. Ben House
They played the game exactly right.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And they ran it out. This 10% cut took them 20 weeks.

Dr. Andy Galpin
Yeah.

Dr. Ben House
They did it really well. They had higher protein. They maintained muscle mass. Maybe they even gained some muscle mass. I'm going to likely stair step that up. And this is the art of this. They're invariably going to be low on carbs or fat, just from the math of it all. And the robots are very good at this math now. It's not complex. It's not rocket science. It's just because of the constraints. They're at 2,200 kcals, and they got to get 180 grams of protein. There's 800 kcals around there. So you got another 1,400 kcals to work with.

Dr. Andy Galpin
Yep.

Dr. Ben House
Right? So you can't really go lower than 50 grams of fat. It's really hard. Just the diet itself becomes logistically difficult because you can't have anything with fat. So it's really hard to cook things. Mixed meals are hard. You're eating prototypical bodybuilder foods, rice, tilapia, and broccoli. So my first thing is if they're low in fat, I want them to get above, my absolute is 80. I like guys to get above 80 grams of fat. The research, Whittaker et al., I don't really think about

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percent diets of fat, but it's generally you want to be over 20%. I think 0.8 grams per kilo is a number that you could throw out there if you wanted to do an absolute amount. But I think 80 is going to get most dudes in the ballpark. Females, 50 to 60-

Dr. Andy Galpin
Mm

Dr. Ben House
... is going to get them in the ballpark. So I want them to be above that threshold for fat, and then I want carbs on board. And generally what this looks like is I'm going to stair step carbohydrates up. But it might be fat, too. I'm down to do either one. But I'm generally going to do this in a week by week.

Dr. Andy Galpin
Mm.

Dr. Ben House
And I'm going to do it by 25 to 50 grams of carbs.

Dr. Andy Galpin
Per week.

Dr. Ben House
Per week, and which is generally a piece of fruit. I want you to have a piece of fruit with lunch. The other part of this is you're not only on-ramping calories, you're also probably, from a coaching standpoint, you're offloading some of the neuroticism. You're trying to offload the counting, and all of those people that lost half of themselves, they all had so many Excel spreadsheets that they were ready to show me, right?

Dr. Andy Galpin
Oh, yeah.

Dr. Ben House
Because they are cognitively regulating all of this.

Dr. Andy Galpin
Yeah.

Dr. Ben House
The other thing is you don't want to take all the things away, and I understand weighing and measuring, all these things can be... But what level of that do you need to do to maintain your results? So you're trying to move, that's why I think food first in this scenario. Can you add half a sweet potato three days a week or something like that? And from the coaching standpoint, it is

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like a threat analysis. At this point, what do they think of as a threat?

Dr. Andy Galpin
Mm.

Dr. Ben House
And then I let people know. Another part about this is, and this is the coaching aspect that you and I have figured out. If you don't tell someone about something that's going to happen to them, you're the fucking biggest asshole. If you do tell them what's going to happen to them-

Dr. Andy Galpin
Yeah

Dr. Ben House
... you're a wizard. And so getting on the front side of this pre-mortem is, you're going to gain. I'll just tell them straight up. "You are going to gain two to three pounds of mass in your GI tract. You're going to gain two to three pounds of water. I know this is going to happen. You're going to eat one more peach with lunch, and you're going to gain two pounds. Listen to me. You've been glycogen depleted for 20 weeks." Right? And so they're like, the math doesn't work there. I show them the math. I'm like, "There's no way, unless you fell into five pizzas, and even that would be difficult, that you could legitimately energetically gain three to five pounds in a week." You would have to do a lot of work to do that. You'd have to be at steakhouses. Believe me, I've seen people actually do it.

Dr. Andy Galpin
Yeah.

Dr. Ben House
They get kicked out of the face. And so you want to stair step it up, and you want to also offload the psychological burden, and I think that's what good coaching looks like. And you're ramping up probably whole food carbohydrates. And the other thing, from a coaching standpoint, I like to have a skeleton of whole food, and then I like people to be able... Once you have the skeleton of fiber, the goal of your diet is not to max out fiber.

Dr. Andy Galpin
Yeah.

Dr. Ben House
And everybody's got their own individual thresholds, but you're running 80 grams of fiber, I don't think you're having a good time. So I want the skeleton of whole foods, and then I'm willing to ... play ball with some other things.

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Dr. Ben House
Again, this is a very individual thing. If you can't moderate it, it's probably going to be tough. You can maybe have it out, but don't have it in your house. And so these are just general coaching techniques, but I'm going to try to get them. Fruit is a great one. Volumetric is a big deal here. You want people to stay full-

Dr. Andy Galpin
Yeah

Dr. Ben House
... in these circumstances. But that's what I'm generally going to try to do is, stair step this up.

Dr. Andy Galpin
That might not sound like a lot, but I'm telling you, if you've been, not even crazy hard, but kind of hard dieting for three months-

Dr. Ben House
Oh, and you get a peach, dude

Dr. Andy Galpin
... and you get a fucking orange.

Dr. Ben House
Dude.

Dr. Andy Galpin
Oh.

Dr. Ben House
Or even orange, half the carbs of a peach.

Dr. Andy Galpin
You've coached a ton of regular people. But you've also spent the last decade in the NBA and with lots of people in the NFL and Major League Baseball and other pro sports. So, please don't name any names. Of course, you wouldn't, but I'll say it for you. We don't like to do that stuff. But that said, with professional athletes and testosterone, does any of this story change? Are they different? Are they the same? Do they automatically have the upper end of testosterone? Are they like anybody else? So give me that contrast on everything we've been talking about and where it is the same or different in these really high sports athletes.

Dr. Ben House
So let me just clarify. Thank you for the intro. I did a three-year run in the NBA. I came up at UT basketball, and then I spent a lot of time just consulting, kind of in the private sector. Some of

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those were with NBA teams. So I've been in and around pro sports for a long time. And I have to say, the majority of these athletes are insanely talented and at the highest level, a lot of times, they are successful in spite of everything. In professional sports, I've become more open that we can raise individuals' peaks with all of this stuff. And I think the majority of that comes with the ability to recover.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Because you look at all of these professional seasons, doesn't matter if it's the MLS, NBA, MLB, NFL, they're all a gauntlet.

Dr. Andy Galpin
NHL is brutal.

Dr. Ben House
NHL is just as brutal as the NBA, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
And it's just a different animal in terms of energy system usage. Even golf.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Golf is a gauntlet, dude. Tennis. Every one of these is just like, there's this survival matrix to it.

Dr. Andy Galpin
We played over 30 tournaments one year with one of our golfers. You're just like-

Dr. Ben House
F1

Dr. Andy Galpin
... 30 tournaments.

Dr. Ben House
F1, just the-

Dr. Andy Galpin
Brutal

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Dr. Ben House
... the timezone changes. So, I've been in pro sports long enough where you talk to people in pro sports, and they think their problem is the hardest problem.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Everybody's got the hardest problem, right?

Dr. Andy Galpin
Yeah.

Dr. Ben House
And everybody has different constraints, they have different resources, they have different option spaces, and they're doing the best that they can. So I think that from a professional athlete standpoint, the things that they have in their favor are they probably have the deepest data capture availabilities of everyone. The things that they don't have in their favor is a lot of times, they don't have control of their schedule, and they maybe don't have control of their external loads, right? So, I've broken down my thought process on how I can help a professional or collegiate athlete into two sides. There's one side that's just pure support. So, what supplements are going to help them? What can I do on the sleep side? What can we do on the recovery side so that they can take that loading better? And then the other side is, if you have the manipulation of external load to potentially marry these two.

Dr. Ben House
And I think that's where the magic happens. And so if I'm thinking about an athlete's peak, it generally comes from recovering more, so that they can adapt to the volume that they are inevitably going to see. I'm not saying anything that isn't known. So, a lot of draftees, if you're a mid-first-round pick, and all of this is common knowledge, some of these dudes are just doing 20 to 30 draft workouts-

Dr. Andy Galpin
Yeah

Dr. Ben House
... in the matter of-

Dr. Andy Galpin
In the draft process, yeah

Dr. Ben House
... three to four weeks. So they just get absolutely burnt. And then they got to go to Summer

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League. So the rookie year is a really tough year. And you think about, that's a time period where I think that our practices and everything we're doing on the recovery side, being locked in can be really helpful, because you have no hold on your external load, and you just have to survive.

Dr. Andy Galpin
One thing I have to point out here is you will hear this in commentators all the time, and any of you that watch the NFL, the rookies always fade towards the end of the season. And you know what they always say? "Ah, well, the season's longer in pro sports than it is in college," right? And I'm like, "No."

Dr. Ben House
They didn't have an off-season.

Dr. Andy Galpin
Here's what happened. In football, you start training camp in June. You ran all the way through January now, because that was when your bowl game is. You immediately, the next day, went into combine prep. You trained as hard as you've ever trained to put up the best possible numbers in April. And then you got drafted, you had a four-and-a-half-week break, and then you go back to rookie mini camp. And now, next December, you get a little tired. This is not them adapting to a long season. This is, they got no break. The whole thing there. So all you sports fans out there, if you're wondering why, again, you see it in baseball, you see in all these people, they just fade towards the back of year one, because they are on a year-and-a-half run where they have had three weeks off.

Dr. Ben House
And not to mention, a ton of psychological stress on top of that.

Dr. Andy Galpin
All of it. Change the course of your entire family's history or not. And you've got plays to do this.

Dr. Ben House
Yeah. Let's think about two avatars. Let's think about that avatar. I think, man, helping that person recover, I think so much to gain there. So that can not Any athlete that's now able to adapt to the stress rather than survive the stress-

Dr. Andy Galpin
Yeah

Dr. Ben House
... I think you've really, really helped them. And we do see this. There's actually data in the NBA that's published in vets, and they get more lean throughout the season. They get more fit

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throughout-

Dr. Andy Galpin
Oh, yeah

Dr. Ben House
... the season. And this is probably because they, in general, they're coming in less than fit than they were. There's obviously lots of variance around the mean there, lots of different categories. The other part that I think that we can help, and so I do think-- I used to say that I don't know that I can raise someone's peak. I do think that we probably can now, especially if someone is young, and they still have adaptive capacity. I think we can help them adapt to that on a ton of different tissue levels, and I'm thinking more about this from a brain. Like, can I help people learn the sport? How fast-- like, do you have the energy to actually learn and understand the sport? That's probably the biggest one. And then body composition-wise, where are you at? Do you have a body that's meant for this? And then the other one is something that you and I have looked at a ton, and that's more just the soft tissue aspect of this, like ISOs.

Dr. Ben House
Like, we don't have a good way to quantify this yet. Like, we've ran the gamut on MRI. You and I have both done this through Springbok, and these tissues are the hardest to quantify by far.

Dr. Andy Galpin
Yeah.

Dr. Ben House
We do not have this mapped out yet. And so it's like, how can we get these guys to adapt, and then how can we hold that adaptation for as long as possible? And this is where the money is because the money in all of these sports is the third and fourth contract.

Dr. Andy Galpin
Oh, yeah, and some of them it's the second.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Right? Just get the next one.

Dr. Ben House
Yeah. How many do you get in the NFL, right? Like, I think the average-- like, the NFL is very different.

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Dr. Andy Galpin
You get a second contract in the NFL, you're-- you get a third? So-

Dr. Ben House
Depending on the position, right?

Dr. Andy Galpin
100%. I have to finish by asking, those recovery tools, what have you found-

Dr. Ben House
Mm

Dr. Andy Galpin
... really moves the needle?

Dr. Andy Galpin
If you're willing to share any that don't, the things that you've tinkered with. Maybe there's data behind them, you just haven't seen them do much. If nothing fits in that category, fine. But whether this is supplements or tools, tactics, nutritional strategies, physical tools, any come to the top of your mind if you answered that question by saying you think recovery is the real difference-maker here, what have you been finding most effective?

Dr. Ben House
Yeah, I think the ability to-- like, from my side, I'll answer the question, but for my friends on the other side of that equation, I want to give them some love. I think you have everything on the recovery side, but then I do think you have educational loading. Like, everything that an NBA team hires me, an NFL team hires me, they're generally hiring me to be in the room to talk about loading, and then they're talk-- like, how can we load these guys more? How can we get them to adapt, right? So I think the stimulus is just as important as everything that you're doing to recovery. So managing that stimulus is-- and sometimes that's manageable, sometimes it's not, right? Just because of the, well, you got to play 82 games if you're in the NBA or the NHL. You got to play, hopefully, play 17 games. Hopefully, you're playing a lot more than that in the NFL. Hopefully, you're playing a lot more than that in both of them.

Dr. Andy Galpin
Yeah.

Dr. Ben House
But on the recovery side, I think you look at, to me, the stakes are so high at the professional level. I'm throwing everything at it.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
Fire hose it all. I'm-

Dr. Andy Galpin
Whatever they're willing to do.

Dr. Ben House
This comes to the coaching aspect. Every athlete is different. Some athletes are willing to take all the supplements. Some athletes are actually cautious around supplementation for good measure. They don't know if it's voodoo or whatever. Like, they're skeptical of it, which I underst-- I'm down with healthy skepticism. Question me. I'm down for that. But for me, it's I got to build this relationship of trust. Like, that's the first thing because I want them to know that we're working together, and you've seen me do this, because once they trust you, the athlete doesn't-- they're managing so much. Like, their psychological burden is quite high with all of the people that they have to talk to, like all the relationships that they have to manage, all the, like just the overall stress of the game, having 60,000 fans yell at you. So if they have trust, then they'll offload a lot of that decision-making for you.

Dr. Ben House
And so then I want to make it as easy as possible. Like, build them sup packs that have all the recovery supplements like SPMs-

Dr. Andy Galpin
Mm-hmm

Dr. Ben House
... curcumin. Everything that has some data behind it that isn't gonna cause them GI distress, I want in the mix. That is a big thing. Like, then asking the questions like, how is your GI tract functioning? Can we get that better? How is your sleep? Getting data there, and now because the data capture is so large, you have-- the trust is so important because if they're not sleeping on the road, they have to know that like you're gonna be a confidant in that adventure, not like a tattletale. That's where managing the relationship is really, really important. But those are my two biggest ones is like, all right, how can we get you sleeping better? And a lot of that is unwinding faster because you think about the constraints in their environment. Like, these dudes are playing under the lights until 11:00 PM sometimes, like 10:00 PM. I don't know what time zone they're at. These guys have to be able to on-ramp really fast, and they have to be able to off-ramp.

Dr. Ben House
They can't be staying up till 2:00 and 3:00 AM. And sometimes that is the best-case scenario, right? Like, just live a little bit of a nocturnal life and then sleep till 10:00 AM because that's

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probably one of the paths. But those are the biggest things. Sleep has to be a huge rock there. We have to say it. And then there's a lot of other like ancillary stuff, like massages. Anything that moves blood around. Like, how much are you really willing to do? Like, just make it easy. I'm a big fan of hot. We can do contrast if you want to do it, but I'm a big fan of heat.

Dr. Ben House
The compressions, Normatecs, like anything that's gonna move blood around is really, really helpful. And then also, like, I like restorative analgesic kind of movement. Not gonna take away from their adaptive capacity, but like low-level ISOs could be in this group. Like, your prehab, rehab-type stuff, just low-level aerobic work. A lot of people think that athletes are very active. They're generally not. They play their sport, and then they're pretty sedentary. And I think that's not a great way to recover.

Dr. Andy Galpin
Yeah.

Dr. Ben House
I think you do want to probably hit, in some way, 8,000 steps. And for someone who's jumping around or getting a lot of contact with the court or the field, you might not want to have that be ambulatory. So that's where bikes are really, I think if I had another one, it would be just low-level aerobic work.

Dr. Andy Galpin
Well, I didn't plan on spending the entire time on testosterone, but that's kind of how it worked out. You threw too many things out there that were just so interesting, and I knew some of that stuff, but I appreciate you outlining a lot of it. And I absolutely know 100% fact that anyone who listened to that learned a tremendous amount about that. We will put links to all your stuff in the show notes, so if you want to read some of these papers, and I'll reiterate, you do this stuff, you publish it, but then you also write it for non-scientists. You put it up in a way that other people can go read it, in different formats and more complicated ones, simple ones, easy ones, short ones, and all different various. You're one of very few people who I have subscribed to for years in terms of your deep-dive content. And then you went dark for a number of years because you couldn't do it, and I was like, "God dang it."

Dr. Andy Galpin
But now we've brought you back. Is there anything about testosterone, though, that we just forgot to mention, or you had teed up, but you were like, "Ooh, I really wanted to say this." I mean, we covered so much ground.

Dr. Ben House
We talked about this diurnal pattern of testosterone-

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Dr. Andy Galpin
Yeah

Dr. Ben House
... where you go whatever, 6:50 you drop 30%, 40%, and that's your day-to-day normal rhythm. Whenever someone goes on exogenous testosterone, they are no longer at that rhythm. They're at the rhythm of whatever it is, their injection schedule or their gels or whatever the half-life and the timescale of that exogenous testosterone is.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So what I see a lot of in this world is we have the TRAVERSE trial, and the TRAVERSE trial was monumental in that all of a sudden, cardiovascular disease risk is off of the label of testosterone. We're no longer worried about cardio. So this is like, all right, cardiovascular disease does not apply to testosterone. The TRAVERSE trial was gel, it was AndroGel, and it was bringing diagnosed hypogonadal men back to the mid-normal range. And it did not result in increased major cardiac events or cardiovascular disease in comparison to hypogonadal males that were given placebo. That is what that study found.

Dr. Andy Galpin
Important. Helpful.

Dr. Ben House
It did not find that someone running, gunning testosterone up to a peak of 1,500 and then coming down to 1,000 and then going back up to 1,500 again and not managing their hematocrit and not being dehydrated or all the other things, and having low estrogen or whatever they're doing, it did not find that that is not related to cardiovascular disease risk. And so I've had multiple people tell me that testosterone is not related to cardiovascular disease risk. Meanwhile, they have a hematocrit of 54. Their testosterone three days after injection is still at 1,200. Brother, that's not TRT. You're running gear. I don't know how to tell this to you. You are being the data. We don't have that data. And the data that we do have is very interesting. This is KERNIS 2026, and this isn't the best study because we're never going to have the best study, because you can't do the best study. You can't give people who don't need testosterone, testosterone at higher levels than is physiologically normal.

Dr. Ben House
You can't do that study generally, and you're definitely not going to be able to do it. You can do it somewhat, but you can't do it in a large population. And so what they found was there's a 51% increased risk of major cardiac events in the individuals who did not have any diagnosis of

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hypogonadism and went on TRT. There's a ton of confounders there, but I think that that population that they've identified, and it wasn't a small number, unfortunately, it was one-third of people who got testosterone.

Dr. Andy Galpin
Ooh.

Dr. Ben House
Yeah. That population had an increased risk. And so if you're in that population and you're listening to this, and there's no shade, I would find somebody who's good at this, because you could be saving your life. And I'm not trying to be scare tactics. I'm not trying to fearmonger or use salience of outcomes. I just think that this is a clear thing that you're not using TRT as is necessarily intended. You are using it outside of the research that we have. Again, not bad or good. I don't care.

Dr. Andy Galpin
Informed consent, like you've said 1,000 times.

Dr. Ben House
I just want you to, if you're going to do that, do it as well as you can do it, because the downsides of that are, whatever, five to 10 years from now, and you might not even know if you're playing that game, and you probably don't.

Dr. Andy Galpin
If you missed the jargon there, when you say TRT versus gear, what are you meaning?

Dr. Ben House
Yeah, I'm talking about running exogenous substances at super physiological levels.

Dr. Andy Galpin
Yeah. So traditionally, when we say things like TRT, we're meaning you're taking exogenous hormones to get you right back into a normal range.

Dr. Ben House
Yeah.

Dr. Andy Galpin
Where when we joke and say things like gear, that means you're taking it to get to 1,500, 1,800. You're taking it to peg all the time and never dipping below 1,100.

Dr. Ben House
The new military guidelines are targeting, man, I think the peak might be in the 6 to 700 or something like that.

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Dr. Andy Galpin
600, I think yeah.

Dr. Ben House
Yeah. And then if it's more than that, they want to reduce your dose. So it's very conservative.

Dr. Andy Galpin
That's actually exactly what that says, yeah.

Dr. Ben House
That is not what is happening out there. And so that's where, again, informed consent, you want to run that hot, whatever, but look for these other things, manage them well. And also honor that we don't have that study

Dr. Andy Galpin
It may be fine.

Dr. Ben House
I don't know.

Dr. Andy Galpin
We just don't know.

Dr. Ben House
We legitimately don't know, and we're never going to know.

Dr. Andy Galpin
Yeah.

Dr. Ben House
So if you want to be that study, fine. That's great. I don't care. Legitimately, I don't care. If you want to be the study that you don't take TRT, and you try to maintain your testosterone throughout the life course, good with that study, too.

Dr. Andy Galpin
Yeah.

Dr. Ben House
Be that study. Be either one of those studies. Whatever study you're going to do, do it really well. I don't care.

Dr. Andy Galpin
Yeah.

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Dr. Ben House
Just do it better.

Dr. Andy Galpin
Shout out Shane Gabriel Lyon for all that work on that document, which we'll cover later. But man, been such a pleasure to have you here. You were one of the very first people I wanted to get on the show when we first started taking guests, but we couldn't because you had your embargo. In the NBA, you can't talk to lowlifes like me. But we pulled you out of that job. We got you back on the open market and got you free. So this has been seriously so tremendous. I'll reiterate, I wasn't intending to go testosterone the entire route. But you're such an unbelievable knowledge conveyor in that space of the data, but then what's actually happening in the real world, and then what's your opinion based on expertise, which to me is the most valuable combination. So I get a true sense of what's going on. I feel more comfortable on the topic. It was super engaging to me. I'm really interested, so just I can't thank you enough for being out here and all the stuff you've done over all the years.

Dr. Andy Galpin
It's such a joy and pleasure to watch and read, and I hope you continue.

Dr. Ben House
Thanks, Andy. Thanks for having me.

Dr. Andy Galpin
Thank you for joining for today's episode. My goal, as always, is to share exciting scientific insights that help you perform at your best. If the show resonates with you and you want to help ensure this information remains free and accessible to anyone in the world, there are a few ways that you can support. First, you can subscribe to the show on YouTube, Spotify, and Apple. And on Apple and Spotify, you can leave us up to a five-star review. Subscribing and leaving a review really does help us a lot. Also, please check out our sponsors. The show would not exist without them and their exceptional products and services. Finally, you can share today's episode with a friend who you think would enjoy it. If you have any content questions or suggestions, please put those in the comments section on YouTube. I really do try my best to read them all and to see what you have to say. I use my Instagram and X profiles also exclusively for scientific communication, so those are great places to follow along for more learning.

Dr. Andy Galpin
My handle is @drandygalpin on both platforms. We also have an email newsletter that distills all of our episodes in the most actionable takeaways. We have newsletters on how to improve fitness and VO2 max, how to build muscle and strength, and much more. To subscribe to the newsletter, just go to performpodcast.com and click Newsletter. It's completely free, and we do not share your email with anybody. Thank you for listening, and never forget, in the famous

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words of Bill Bowerman, "If you have a body, you are an athlete."

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