

Boosting Testosterone & Understanding Your Testosterone Levels (Aging, Muscle Growth & Nutrition)

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Dr. Andy Galpin

The science and practice of enhancing human performance for sport, play, and life. Welcome to Perform.

Dr. Andy Galpin

I'm Dr. Andy Galpin. I'm a professor and scientist of human performance, and in today's episode, we're going to be talking about all things testosterone and performance. In the previous episode, I had my colleague and friend, Dr. Ben House, and we talked at length about all things testosterone and performance. And I left that thinking we covered so much ground, but yet there's a few things that we either went through quickly or just didn't get the chance to touch upon, and I just wanted to come right back in the studio and complete that conversation. So that's our goal today. These two episodes should be viewed as independent. You can watch this one, watch the previous one, or you could watch them both, which of course would be my recommendation. But I want to be really clear, this is a standalone episode. It is not a summary of the conversation with Ben House. And we're going to cross some territory, of course.

Dr. Andy Galpin

But as I mentioned, the real goal here is to extend that previous conversation and cover some more territory and certainly more in depth with more specificity than we had a chance to do in the previous episode. This is a fascinating area. I learned a ton from Ben. I learned a ton in the last several months preparing for this and going over the topic. So that said, let's dive in and start talking about testosterone and performance. So I want to start with a quick overview of some of the most interesting and novel points that Dr. Ben House brought up in our previous discussion, and then we'll extend past those points. First and foremost is he made a really compelling argument that according to the analyses and studies that he's published in the last few months, there doesn't seem to be a drop in testosterone with aging. Now, that doesn't mean someone who's older won't have lower testosterone than someone who's younger, but it's not the age that's doing it per se.

Dr. Andy Galpin

In fact, what his data indicate are that this is primarily driven by obesity or other forms of

metabolic dysfunction. And when you tease those parts out, rather, it seems to be driving almost all of a drop in testosterone through age. So that alone is going to catch some attention. So pretty good information evidence that testosterone will stay the same in terms of total amount in men across the course of your life, and I will get into some of those details here momentarily. He also brought up another novel point, which others have discussed, but he really hammered it home, in that things like your total testosterone is not what's going to predict how well you respond to strength training as long as you are within what's called eugonadal range, meaning your total testosterone level is normal. It's not clinically low or exogenously, meaning an anabolic steroid use, elevated. So if you have a natural, normal testosterone range, which is generally considered to be something like 300 nanograms per deciliter, up to 1,000 or maybe 1,100.

Dr. Andy Galpin

If you're within that range, it does not seem to be predicting how much or how well you respond to strength training. We'll get into more of those details in a minute, but we'll go over that stuff quickly. On top of all that, I think one of the other major things I gleaned from our conversation was the fact that low testosterone is highly reversible, and I'm calling it reversible because this is where this word of constraints comes in. If you are doing something in your lifestyle that is constraining your testosterone, once you remove that constraint, it really does want to naturally rebound. And then we'll go over the exact numbers here so you can see how much of a magnitude I'm talking about. But weight loss is the most prominent one. Psychological stress and sleep are probably the other two biggest levers. And really, when you compare that to things like supplementation, it's not even close the magnitude of benefit you get from just restoring those things.

Dr. Andy Galpin

And one thing that I found really interesting is you don't have to be perfect, and I will share with you here momentarily the difference between just getting kind of good in those areas versus really bad. And the spoiler of it is that's actually your biggest win. So no one needs to be perfect here, but as long as you get out of really bad, you're going to see huge, and I mean huge elevations in testosterone. So that was kind of what we're talking about. Diving in then specifically, what does this total testosterone number look like, and how is this changed throughout our age and with alterations in body composition? So we're going to talk about the opposing ends of the spectrum. The first one is overfeeding. This is simply consuming more calories than I need, which is going to result in an excess gain of body fat. And then we'll cover the opposite. What happens to my total testosterone when I don't eat enough calories?

Dr. Andy Galpin

Now, I like this because the majority of the research and public conversation is around obesity and health, and that's important. But I actually see the opposite end of the spectrum more than I

see that, which is people with high caloric outputs, people exercising a lot or trying to lose body fat for whatever reason, sports or otherwise, and so they're under-consuming calories. So we're going to spend time on both of those so you can really have a clear understanding of if you're at risk of low testosterone because you're not eating enough or if you're eating too much, and then how to understand where you're at in that spectrum. The presenting sponsor of this podcast is Momentous. Momentous makes the highest quality supplements on the market, period. Every single one of Momentous' products is third-party tested to ensure quality, and many are even NSF certified for sport. While I love all their products, I'm really loving their new creatine powder, which is called Signature Spec Creatine.

Dr. Andy Galpin

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Dr. Andy Galpin

Again, that's livementous.com/galpin, and use the code GALPIN for up to 35% off your first order. So getting us started, quick reminder, generally, people are going to consider clinically low testosterone being less than 300 nanograms per deciliter. From here on, I'm probably going to stop using the units, and I'll just call it points or just give you the numbers, but you can convert that to different units if you're used to other forms, depending on where in the world you're at on this one. So 300 to 1,000 is kind of our rough range. If you look around most of the studies, you're going to see something like 25% to 30% of adult men will be clinically classified as low testosterone, meaning a quarter or so of adult men have a testosterone less than 300. Now, that's true. The data are not wrong. That's not a manipulation. It's not falsified. But at the same time, it can be misleading, because when you break down those data further, what happens is this is heavily biased by people who are clinically obese.

Dr. Andy Galpin

In fact, when you look at those set of people, you got about a 40% chance, meaning around 40% of people who are obese will have clinically low testosterone. The opposite end of the spectrum, it's less than 10% of people who are not clinically obese, meaning as long as your

waist circumference or body mass index, your BMI, does not clinically diagnose you as obese or higher, there's a 90% chance your testosterone is not clinically low. There's also an interesting part here about causality, and so a lot of times we'll see this and be like, "Oh, okay. So then therefore, the fact that I'm overweight, is that what caused my low testosterone?" And the current data suggests probably not. The causality looks to be almost always the reverse, where the obesity causes the low testosterone, not the inverse. In either case, you still might feel like crud. You might feel crappy because your testosterone is low.

Dr. Andy Galpin

But this matters because it alters our recommendations about what to do about it, and this will come up a little bit later. A theme I will come back to here is these crude metrics. And so a lot of the research I'm talking about, and almost all of it in the field, uses things like body mass index. This is simply how tall you are divided by how much total weight you have. And those are population-level valid, meaning if I get 100,000 people randomly selected from any part of the world, on average, people that have a higher BMI will have a higher body fat. They don't work at the individual level, because you might be high in your BMI because you have a lot of muscle mass or something like that.

Dr. Andy Galpin

But I think this actually strengthens our argument. If I can use something as simple as body mass index, or another really common one here is your waist-to-hip ratio, and the fact that those alone can so sharply tell you if you're at risk for low testosterone or the opposite, I think strengthens our point. The obesity is really, really driving this equation. At the individual person level, it doesn't guarantee someone who's overweight will have low testosterone. It does not guarantee someone who is of normal weight will not have low testosterone. But we can see the impact, and we can really start to hedge most likely scenarios. That's the best way to interpret these data. So if we go on that and we say, okay, really, there's a decent chunk of people who will have clinically low testosterone, and a lot of that is driven by obesity and metabolic disease, and we'll get into that a little bit more.

Dr. Andy Galpin

But on top of that, if we go one step further, I'm an outcome person. I'm not a molecular mechanism person. I'm not a clinician.

Dr. Andy Galpin

I'm an outcome person, meaning I want to know how you look. I want to know how you feel. I want to know how you perform. And then I'll use labs and biometrics as a secondary or complementary outcome. So when we pay attention to things like that, the next question then is, well, how many people actually don't feel well? How many people are struggling with libido or other byproducts of having low testosterone? And so when you combine that and you say, "Well,

how many people have low testosterone as well as have clinical symptoms of low testosterone?" And that number falls from 25% of men to sub 5%. And so there's some natural conclusions here, I think, that are fair. And I'm starting here, this is typically stuff that I would conclude with at the very end of the podcast, but I want to get going right out the gates with this stuff. So is it fair to say low testosterone is dangerous, it is debilitating, it is harmful?

Dr. Andy Galpin

Yeah. Absolutely. All very, very true. Is it fixable? Absolutely. Is it totally fixable? Well, I don't know. Maybe I should have said, is it modifiable? Completely. Is it also fair to say we need more awareness, more conversation, more access, and less stigmatization of low testosterone and testosterone therapy? Absolutely. We need people to understand their medical options. I couldn't be more of a proponent for that, and people shouldn't feel afraid or fearful or embarrassed or anything like that about what's happening in their physiology. So we want to make sure information is out there. I'm giving you this preamble because I really genuinely feel that. I don't want this entire podcast to come off as the opposite. I'm not against TRT or anything else here. But what we are for is accurate information. That's the most succinct way I can say it. So at the same time, are we dealing with an epidemic of people with low testosterone?

Dr. Andy Galpin

The answer is really no. We have a good chunk of people at a high risk, but it's not as a lot of media are portraying it to be, especially if you are lean. Just because you're older, you shouldn't be terrified that your testosterone is going to be crashed. That is just simply false. It is an unfair burden to put on society. Is it a fair burden to put on society that, hey, people have gotten a lot bigger. Obesity has risen for decades and decades. Yeah. And because of that, not exclusively because of obesity, but it is a big player in lower testosterone, and lower testosterone is harmful. Yeah, all those things are 100% true. So I hope the nuance of this topic is coming through in what I'm trying to say here. We, at one point, want people to be more aware. We want you to advocate. If you're not feeling great or you're concerned, or you just are feeling okay, but you want to feel your best, you should absolutely have this conversation with your medical provider.

Dr. Andy Galpin

At the same time, I don't think it's fair to scare everyone into thinking just because you're 50 years old, your testosterone is probably tanked. That's just simply not accurate and not helpful, and the reality of it is less than 5% of people that'll be true for, and in some cases, less than 1%. To me, that is the overarching story here with total testosterone. But I want to actually transition now and go the opposite direction, and that is under-eating. So we know now that if you are obese or overweight and you restrict your calories, by losing body fat, your testosterone will rise dramatically. So this is what I said earlier, we have pretty good evidence about the causality line there, which is causing which. We know whether it's bariatric surgery, GLP-1s, caloric restriction.

When you lose body fat, if you are obese or overweight, testosterone will probably rise substantially. But that's a little bit different than if you are normative weight or even pretty lean and do the exact same exercise.

Dr. Andy Galpin

So what's the evidence line here? Well, we don't have a ton of publications on high-level athletes and testosterone, but the ones that are available as well as, I have thousands of these people in my database. Something in the neighborhood of 15 to 25% of elite athletes will have clinically low testosterone or sub-clinically low, so right in the neighborhood of it, which jives and lines up pretty close to that number I said earlier, 25 to 30% of the general population. But almost always, this is coming at the other end of the spectrum. This is caloric suppression-induced low testosterone. You may have heard this before, and we've talked about it on the show previously, something called RED-S, R-E-D-S. So this is a syndrome most associated with women. Alternatively, sometimes you'll hear it called exercise hypogonadal male condition, where people are either exercising so much or eating insufficient calories or a combination of both, and this actually causes testosterone to go low.

Dr. Andy Galpin

And the hypogonadal is the clinical term, so low gonadal output, low testosterone. Those are equivalent terms, roughly, okay? Some numbers to think about here, and Ben said this really quickly, and I wanted to spend a little bit more time on it. There's some research here of a high enough quality in women or in females that around 30 calories per kilogram of fat-free mass per day is a caloric intake that is roughly normal. So what did I just say there? About 30 calories per kilogram of fat-free mass. Now, fat-free mass is not muscle mass. Fat-free mass is not lean body mass. You can easily calculate fat-free mass. But think about it, if you've ever had a body composition test or a scan or something, you can go look at that, or we'll put stuff in the show notes about a ton of different free or easy ways to calculate or get close to fat-free mass. But if you think about it something like this, if you are, we'll call it 50 kilograms of fat-free mass, and you have 30 calories per kilogram, that is 30 times 50.

Dr. Andy Galpin

This would mean you're at about 1,500 calories per day. All right, so again, you can scale up and scale down. There have been studies that have taken these numbers and dramatically dropped the caloric intake to as low as 15 kcals per kilogram of fat-free mass or some that have gone even sub-10. So you're talking about some people who would normally be eating 2,500 calories a day, and you're dropping them to sometimes as low as 1,000 calories a day. So that's the magnitude we're talking about here. This is so interesting because in the past, we've almost always looked at this from an exercise perspective. A lot of the research here comes from endurance athletes because the volume is so high, the caloric output is so incredibly high

relative to strength training, relative to most sports. There are some exclusions there. The bulk of the research here, though, has come from military. So you'll put people in a situation where you're going out for days or a small number of weeks, and you're going to be rucking and moving and burning just an enormous amount of calories, and even if you're trying to keep up food ingestion, you just can't intake enough calories to match that, so you end up in these negative calorie balances.

Dr. Andy Galpin

But what's actually happening now is we're getting the same type of research with GLP-1s because we have so many people that are in caloric deficit as a result of these ones. So this is a bunch of stuff we need to go figure out. Unfortunately, the research for men is not as clear.

Dr. Andy Galpin

My indication, and a lot of people I've talked to about this, I actually feel like, but this is Andy here, this is my intuition, this is not evidence-based. I think men can handle a little bit of a lower number than 30. I think men can get away with 25 or maybe even 20 for a longer period of time than women can without seeing these endocrine or hormone crashes. We need more research. So maybe in two or five years, we'll come back, and I'll tell you if that hypothesis held true or not, but we are just limited by the available information at this point. But what I've seen personally is that, again, men can just hang a little bit better with a more severe caloric deficit for these outcomes than women. So what you're ultimately getting here with this entire calorie in, calorie out, and testosterone conversation is an inverted U. So at one end of the spectrum, call it the far right, if you are overweight, obese, and I'll reiterate, define this however you'd like.

Dr. Andy Galpin

If you have an actual body fat measurement, great. If you have BMI or something like that, fine, it actually still works. If you are over something in the neighborhood of 25% body fat or a BMI of over 30, and you go into a caloric deficit, this will generally result in testosterone increasing, total testosterone. Once you get a little bit leaner, again, for men here, in the 20% body fat range, caloric deficits of a moderate amount, you might be able to hold on. But as you see getting past that, caloric deficits can actually drop or reduce testosterone. And where this goes off the rails is when you get lower than about 5% body fat. We do not have giant databases. We do not have studies where we have hundreds of people randomized at 5% body fat, at 8% body fat, at 12% body fat. We just don't have those. So what we're basically looking at are what are the studies that have been done in kind of a normal range?

Dr. Andy Galpin

Again, 15% to 20%, 25% is a more common average body fat for an adult male. And then what are these case studies? Meaning we have one individual person, they are still science, they are still peer-reviewed, they are published, but you've got one person doing something special. And

we've got a handful of these to work off of. These are almost always people that are in bodybuilding or fitness and physique type of competitions. And what happens? Well, you will see a dramatic, and some of the papers actually indicate up to basically a castration level drop in testosterone. So these people are often starting off in the 400 to 600 nanograms per deciliter range. And even as they drop calories, it's not uncommon to see them go from 600 to 50. So you're talking about an order of magnitude drop-down. Even if they aren't super lean yet. So there are some case studies where people are still 14%, 15% body fat and their testosterone has dropped sub 200 or even sub 100.

Dr. Andy Galpin

So this stuff can happen. So when I say things earlier about, hey, here's population level, I want you to always remember something. Research can never give you individual specific recommendations, or very rarely can. We're trying to just get to concepts for the most part. So what's most likely to happen to most people? So when I say something like your testosterone is probably not going to drop that significantly until you're very, very lean, it is absolutely possible that yours will drop significantly even if you're not super lean yet. And I have personally seen this. I've had a client, many actually, who are on extremely restricted diets. You're talking about a 1,000 calorie a day diet for months on end for people who are 170, 190, 200 plus pounds. And I've seen testosterones in the sub 50s. With no medication, no hormones, no anything going on. And they're not lean. They're 15%, 18% body fat, maybe slightly lower.

Dr. Andy Galpin

So I want to be clear there. You don't have to be super, super, super lean for extended caloric deficits to really tank your physiology and health. At the same time, it doesn't guarantee it either. You need to be your own self-experiment. So I have seen plenty of people, plenty, plenty, hundreds, who have a testosterone that's just fine, 400, 500, 600, 800, and they are sub 8% body fat. And sometimes that's just natural for them. Sometimes they are actively dieting and their testosterone just holds on. So to summarize this basic energy deficit and total testosterone point, if you look at, again, the available case studies, you will see them range of a drop of total testosterone from as little as 20% to, again, upwards of like 80%, which is starting to get into this castration level reduction and drop. So, not uncommon, again, I've seen it myself, people going from 700, 800, normal, natural, not taking anything, to dropping below 100 as an exclusive result of aggressive dieting for a long time.

Dr. Andy Galpin

The good news is though, almost always it responds perfectly when you come back out of that hole. So plenty of studies, now I got at least four in mind that I've seen where people have started in those ranges, and what's crazy is if you plot all those studies together, you will see these people drop into what's called a nadir, N-A-D-I-R. That's just like a science word of saying,

what's the lowest point they get to? So their maximum is sometimes 900. Their nadir can get all the way down to 200. But then as soon as they refeed or recover or eat back normally, it goes right back up to 900 or even more. And so I don't think we have enough evidence at this point to suggest that dieting, even extreme, will permanently crush your testosterone forever. It might. I'm not saying it doesn't. But I'm not saying it guarantees it either because we have enough of these studies and I will reiterate in my personal experience, it rebounds.

Dr. Andy Galpin

You're talking about a refeed of sometimes weeks to months. You're not talking about all-out gorging of food. You're just talking about bringing calories back up to maintenance or maybe 10% or 15% or 20%, a little bit higher. But it seems to be robust. And so I think what you're seeing there is not a collapse and shutting down of the system, but an acute response. The brain is signaling and understanding this is not a time for reproduction. I don't need to be creating babies right now. I don't need to be maximizing muscle growth. And so let's just start shutting down these areas. But as soon as that energy comes back, it brings the system Right back online. So I think my final summary of this energy deficit and total testosterone point is maybe summed up in the following. First, a modest and slow deficit, so this may be something like 200 to 500 calorie deficit per day, just as an average.

Dr. Andy Galpin

Even if you're already lean, the available evidence does not suggest it'll lower testosterone that much.

Dr. Andy Galpin

I personally agree with this. I've seen this countless times. You can put people in a deficit for quite a long time if it's not that bad, if it's not aggressive. Testosterone doesn't drop. Now, they might feel low energy. They might feel fatigue. Their performance might go down, but their testosterone will likely hold on. Where the data get different here, and this is where perhaps people not being as prudent with the research, not the scientists, but people reading it or the ones conveying the information, can purposely or totally accidentally mislead you. Because there are plenty of studies that'll tell you the exact opposite, that this stuff will crash your testosterone. Now, I already gave you a categorization of the first ones. These are case studies and people doing extreme diets and are already pretty lean. Their step counts are 10 or 15 or 20,000 a day. They're doing a lot of stuff.

Dr. Andy Galpin

But the other real area of research here are these military studies where they're in aggressive deficits. They're really low. They're less than 10 kcals of food per kilogram of fat-free mass, like really cutting calories by half or three-quarters. You're also oftentimes combining that with multi-stressor. It is the psychological stress of being out, performing, engaging, learning stuff in

military environments, just all the stuff that are associated with that. Sleep is oftentimes highly restricted. Calorie expenditure from physical activity is often double, triple, or even quadruple their normal amount. So in my mind, it's really difficult to then say, "Hey, if you drop your calories, your testosterone falls off," because these are kind of arbitrary and unique situations. I'll go back a few minutes. I think what you're seeing here is simply the body saying, "Whoa, we need to survive right now."

Dr. Andy Galpin

We are way low-caloried. We are highly stressed. This is the last time we need to be reproducing. This is the last time we need to be trying to grow muscle, divert all energy to the brain, divert all energy to our critical organs, and we're just going to shut down or greatly reduce it." So this, I think should be thought of more akin, honestly, to exercise. This is no different than after exercise, how you're a little bit weaker. What do you mean? I did a hard workout. Shouldn't I be stronger right now? No, you're weaker at the end of your workout because you're tired. This is the equivalent. Your testosterone will get kind of, quote-unquote, "tired." It's not adrenal fatigue. It's not going to adrenal fatigue. You're just diverting and altering and shuttering energy. That's really all you're looking at.

Dr. Andy Galpin

And on top of that, to kind of finalize the story, in those studies, and there's only been a couple that have done things like that and then refed people or recovered them, their testosterone always comes back within a matter of days or weeks. So be really careful when trying to interpret this stuff or this field as short-term exposure, which is real important and something to pay attention to, versus this will then carry on the rest of my life. Now, what we don't have are studies that extend that period to weeks and months or even years. I have to have a hunch here that if you were to do something like that and you kept it up, that it would eventually lower your testosterone permanently. But again, we don't have extended research to support that. 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.

Dr. Andy Galpin

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. 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.

Dr. Andy Galpin

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. The next big thing I want to talk about, again, into a little bit more detail, is this relationship between total testosterone and age, and as I mentioned at the beginning, how this relates to metabolic disease. We started off here kind of talking about it, and I went through and I said, "Okay, great, obesity is the driver, but what's the detail here?" And this is fascinating. So again, Dr. House has a study that he's got in peer review right now, the meta-analysis. What he did in his analysis is he took a categorization of metabolic health defined by five categories. Again, I'll share them with you right now, but you don't need to memorize them at all.

Dr. Andy Galpin

These are not things he made up. These are really common ways to categorize a metabolic disease and so forth. So these are standardized numbers and so forth. Just for a matter of record here, these five criteria were blood pressure being below 120 over 80 milligrams of mercury, meaning ideal health would mean your blood pressure is lower than that. That's generally accepted medical numbers. So blood pressure is number one. Second one is fasting glucose or HbA1c, so fasting glucose being below 100 milligrams per deciliter or HbA1c being less than 5.5%. So in your mind, you're thinking right now, hopefully making a checklist. Is your blood pressure generally less than 120 over 80? It is? Check. Good. Is your fasting glucose less than 100 and HbA1c less than 5.5? Let's assume it is. Check. So two green checks. Are your total triglycerides less than 150 milligrams per deciliter? Check. Is your HDL cholesterol higher than 40 milligrams per deciliter?

Dr. Andy Galpin

That's our fourth. And our fifth criteria, is your waist-to-hip ratio less than 0.5? So half there.

Dr. Andy Galpin

So if you want to go down the checklist, you can. I actually think it'll help, and I want to know what your number is. So best score here is five out of five. Worst score is zero out of five. I'm not going to come back to these individual numbers ever again. You've got them written down. They'll be in the show notes.

Dr. Andy Galpin

What matters, and the point I want to get to, is something I said earlier. You do not have to be perfect on these five criteria.

Dr. Andy Galpin

Obviously, being zero on the criteria is really bad. But what you're going to see quickly develop here is if you can just get to one or two, then your life is a whole lot better. So here's what I'm talking about. In his analysis, what stood out is obesity was the primary driver of these four, now defined as waist-to-hip ratio. So if you take the five criteria and say, okay, if I combine the triglycerides and HDL and call those blood lipids. If I combine the fasting glucose and HbA1c and call them lipids and glucose regulation metabolism. So I've got blood pressure, metabolism is a global second category, and then obesity is a third category. The obesity is going to double if not triple your risk of having clinically low testosterone.

Dr. Andy Galpin

Now, the other ones matter, blood pressure being the least important here. So those metabolic markers do, but obesity is, again, double, and more specifically, I think the number was two to three and a half times your risk of having less than 300 milligrams or nanograms per deciliter of total testosterone. So that's the thing we're talking about. So all these risk factors are bad. In fact, each risk factor, no matter which one you pick, if you add one risk factor, it increases your likelihood of having clinically low testosterone by about 71%.

Dr. Andy Galpin

So you don't want any of them. Risk goes up the more and more you add. But the biggest driver is that obesity. Now, something we really need to pay attention to. Those folks who are classified as obese alone had about a seven and a half fold risk of low testosterone relative to people who are normal weight. This is the type of stuff I'm talking about. So this is why we're going to drive so hard on this point is because it's not increasing your risk of having low testosterone by 10% or 20. You're talking about big multipliers of risk. So let me go a little bit further. If you compare someone that had five out of five, green checks all across the board, that person's risk of having clinically low testosterone is less than 1%, meaning if you grabbed 100 people out of a room randomly, and they all perfectly scored green on all five criteria, only one person in that group of 100 would have low testosterone.

Dr. Andy Galpin

So it's not a guarantee, but geez, 99% is a pretty good thing to go about it. So if you're the type of person who you're lifestyle driven, you want health over everything, you center around these types of things, if you can knock off those five criteria, the chances of you having low testosterone are just very small. You're in a really good spot. You're hedging your bets dramatically. Some other additional points that I thought were just fascinating from the data. This is then to say somebody who is 70 years old, seven zero, and has all five perfect criteria would have on average somewhere between a 70 to 100 points higher testosterone than somebody in their 40s that has one of these molecular signatures.

Dr. Andy Galpin

Couldn't be more clear about that point. It's not an age thing. It is really the amount of metabolic dysfunction that you've got going on. The magnitude of effect here, comparing someone who's five out of five versus someone who's zero out of five, is about a 200 nanograms per deciliter. So this is the difference between you being 600 or 400 or 500 or 300. So we're not talking about 10 nanogram points or 30 gram, 50. And sometimes, depending on the exact data set you look at, sometimes that's as high as 250 or more. It really is the biggest thing that you're going to notice. You will not notice whether you're at 500 or 400. I can't imagine any human being would ever be like, "Oh, I'm at 600 today versus 400." But you will know and feel the difference most likely between 400 and 200, and it could all be driven by these lifestyle factors.

Dr. Andy Galpin

Some other interesting things came out of these analysis that at the same time, sex hormone binding globulin and free testosterone are going the opposite direction. And we'll share more about what those are later if you're like, "What are those? What are those relevance?" We'll come back to it, but keep that in mind. What you're going to see here is a pretty consistent elevation in sex hormone binding globulin through age, and I'll go through all those numbers here shortly.

Dr. Andy Galpin

But that's what seems to happen. So total testosterone, independent of metabolic changes, will stay the same across your age, but sex hormone binding globulin and free testosterone will move. We'll unpack all that here when shortly. But something to flag while we're on these numbers. In other studies, and if you look at other meta-analyses and other review articles, you will constantly see these numbers cited that testosterone drops about 1% per year after the age of 40.

Dr. Andy Galpin

You'll also see numbers like 10 or 12% drop per decade, which is about the same thing. It's about 1% per year. Again, those data aren't wrong. Those papers are fine. But generally, they don't acknowledge body composition. So in this analysis, when you teased that out, not only did testosterone not drop through age, it totally abolished the drop, but the exact opposite happened. In this particular data set, and I'm so formal on that point because it is the most fair way to say it here, this is only based upon the data available in this analysis, you actually saw an elevation of about eight nanograms per deciliter per decade of aging.

Dr. Andy Galpin

So these data indicate not only does it not go down, but it actually increases with age as long as you don't add on to the equation one or many other forms of metabolic dysfunction or obesity.

Dr. Andy Galpin

So whether or not that's a real phenomenon, I do not know. We need more work there. We need actually access to additional databases. Things can happen when you look at more data sets. But I think it's pretty clear evidence that it's not going to go down. At the same time, pretty much every data set is showing that elevation in sex hormone binding globulin by around eight nanomoles per liter or so per decade, even after correcting for body composition and metabolic health changes. So all then to say at equal cardiometabolic health status, older men are going to have as much, if not maybe even slightly more testosterone than younger men. If that's not enough, let me keep going. If we simply start categorizing again, five out of five green versus zero out of five.

Dr. Andy Galpin

Your zero out of five are going to have about 20 times greater risk of lower testosterone than your five out of five group. That's the stuff we're talking about, 20X. Now, if you look at those five criteria, it's actually pretty hard to get all five out of five. So then what I started doing is looking at, what's a more realistic understanding here? What does it look like if you have four out of five versus zero out of five? What's it look like if you have three out of five?

Dr. Andy Galpin

And the story's pretty good. So if you're five out of five, like we said before, less than 1% chance you're going to have low testosterone. But as long as you're four out of five, you're still at less than 5% risk. Meaning, as long as you have good metabolic health and then maybe your HDL is a little bit low, 95% chance your testosterone is going to be fine. Or your blood pressure is maybe a little bit high, but all the other markers are good, same thing. If you go down to three out of five, it starts to pick up a little bit, but it's very manageable. You're talking about things like now your risk of having clinically low testosterone is 20%. So it's higher than you'd like, but if we're talking about what's a realistic scenario for people who don't obsess over their health, they don't have access or money or time, give me three out of five green checks. Okay, then we got an 80% chance your testosterone is going to be fine.

Dr. Andy Galpin

But if you get past that and you start getting into the you're one out of 10 or you're zero out of 10, that's when our risk of low testosterone just starts accelerating or just ballooning off the charts. There are plenty of other things that can be constraining or lowering your testosterone. Obesity, metabolic health is the largest driver. It is not the only driver. We mentioned earlier psychological stress and a few other things. And I'll show you here in one moment, or we'll discuss what those other risk factors are and how much they impact it. But this is one of the most modifiable ones we could see, and it is the ones that has the largest impact. So hopefully that is to summarize to say few of us are going to be perfect with all five of these criteria. But most of us can be in a spot

where we've got four to five checked off, or at least three to five. If you're less than that, I think an almost an exclusive focus in those areas will be your biggest return on investment by far.

Dr. Andy Galpin

And to reiterate, you're talking about changes in testosterone routinely seen between 200 and 300 points. I have seen this more times than I can count. We have seen people go from 600 to 800. We've seen people go from 400 to 750. Those are not weird numbers in our coaching practice at all. We've seen plenty of people in the 300 range go to 500 or 600. This stuff can happen with just pretty good lifestyle. I could keep going with data points here, but hopefully, we've made the point and you believe me about what's going on. What I want to do next is talk about those other things that move the needle.

Dr. Andy Galpin

In the previous episode with Dr. House, he mentioned some of these, but I wanted to go into this further and give you the magnitude of effect here. We get it, obesity is our driver, metabolic health, cool. We've gone over those numbers. The other things that impact it probably the most are things like diabetes, which we've already accounted for here. Lipid-lowering medications unfortunately can cause this in some people, but you're talking about most common changes are in the 20 to 40 points range. Certainly open to the possibility that anyone could have any reaction to any medication. I would absolutely believe you if you said you went on a lipid-lowering medication and your testosterone dropped by 200 points. I'll believe you. I'm simply-- Because the standard deviations in the literature are there, to be clear. You'll see really wide responses here. But the average number you would expect would be something in the neighborhood of closer to 20 to 30 points of a drop.

Dr. Andy Galpin

So that, it matters to some people, may not matter to others. Where I think you need to conceptualize this the most is this is a problem of stacking rather than as individual impact. So I could go through the list. We were actually joking about how there's funny research on getting married and having kids. Those things will drop it, but they typically drop it by 10 or 15 or 20 points. You're dropping it by an amount that starts to actually exceed our accuracy of testing anyways. So it's real. There's enough data there, but the issue starts to be things like when you have hypertension or high blood pressure, maybe you're smoking, and you're having a little bit of alcohol, and you're on this medication. Well, when all those things are resulting in 10 or 20 or 30 point drops, and you have three or four or five of them, that's how you get those 150 or 200 point drops. And so now if you start building this math in your head and you start going, "Okay, I can start exercising a little bit.

Dr. Andy Galpin

I can lose a little bit of body weight. I can cut down on the booze," and you start stacking these

health habits, this is how you put 300 points on your testosterone. It doesn't take these miraculous overhauls where you get super lean and look like you could be on the cover of a magazine. It just takes you stacking habits. With all that in mind, we can now go into discussion of testosterone management. And no better place to start than the new Defense Health Agency guidelines for clinical practice. This was the result of a lot of people's extremely hard work, including a dear friend of mine, Dr. Gabrielle Lyon, and her husband, Shane. Kudos. Much love. This is awesome, and to me, represents true progress. There are additional things that need to be done and more work to do, but I will reiterate, this to me is strong progress in the area. I think we should walk through it in detail. You can have your own opinion, as always is encouraged to do so, but this represents a nice way for us to continue learning about the true nuances of testosterone.

Dr. Andy Galpin

So what I want to do is highlight some of the differences between these new guidelines as well as the more traditional endocrine society ones and why they're changing. And I'll reiterate, at that point, you can make your own decision there. But what Dr. Gabrielle and her team and colleagues have put forth is the suggestion of number one, starting with a basic total testosterone screen of everyone over the age of 30. Now, right out the gates, this differs highly from most national endocrine societies who actually actively discourage such a thing. There is scientific rationale on both sides of this, I'll admit it. But as I've shared over the years now on this podcast, I'm a bigger fan of earlier screening. I'm a huge advocate of doing so for body composition. I'm a bigger advocate of doing it for bone health in women. I think the guidelines of waiting till your mid or later life stages are just ridiculous, to be blunt, and I could go on and on.

Dr. Andy Galpin

So this is just my personal preference here. I like it. I think people should be screened if they do it appropriately. The reservation against early screening is understandable. There's two major points against this. One, it's incredibly unlikely that you're going to find people with clinically low testosterone at age 30, and we've printed the data, especially if they're not obese. If you check someone off for obesity and they're 25, they're just very unlikely to have it. And so then you get into a conversation about over-testing and who's paying for that, as well as false flags. So the next step on the guideline, I think, is what adequately addresses that.

Dr. Andy Galpin

I cannot be more clear here. You really should avoid taking hormone replacement therapy or testosterone replacement therapy or any medication or even peptide relating to testosterone production based upon a single blood draw.

Dr. Andy Galpin

You can, for a million reasons, have massively inflated testosterone reduction. We talked about

this earlier. Remember those military studies where they put people under tons of psychological stress. They put them under sleep restriction. We put them under lower calories. If you do that over just a matter of a couple of days, this can drop your testosterone, as I said, by hundreds of points, 50%, sometimes 75% reductions in that. And so I think what was really compelling and clever in these new guidelines is to say we are advocating for screening early, whether that is simply hitting the age of 30 or available upon request. So now they're advocating and letting people just request it, which was not allowed in the past. That said, a diagnosis of low testosterone requires at minimum of two morning fasted lab tests. Two important notes there. It's got to be in the morning, and it's got to be fasted.

Dr. Andy Galpin

If you're the type of person who's just looking to get on TRT, fine. I have no judgment here. Do whatever you'd like. You can cook the books, whatever. If you're actually genuinely wanting to do what's best for your health, you have to get these tested early in the morning, and you have to get them done fasted. And the reason you've got to get multiple tests done is because of the stuff we talked about. In these guidelines, they explicitly state that neither of these tests should be done within 30 days of extreme physical training, sleep deprivation, or acute illness. And that, I think, is their hedge against the concern about over-flagging, and I think it's brilliant I don't know how realistic it is. I've helped and worked with I can't tell you how many people on blood draws and being like, "Okay, great. Give me a 30-day window in which you don't get sick, you don't get sleep-deprived, you don't do any crazy training."

Dr. Andy Galpin

And that's hard to find. It is the most scientifically accurate. It is completely consistent with the data.

Dr. Andy Galpin

I don't know how super realistic it is, but for us, we always require a minimum of seven days. Now, you can train. I'm not saying don't exercise, but just don't do any extreme training like is done in some of these military studies. And to be also more clear, in case I maybe insinuated something that's not true, I don't prescribe testosterone therapy to anybody. I'm not an MD. Never comes out of my mouth. But for me to be like, "Hey, I think your testosterone is low," I'm never going to make that decision off of one blood draw, and I'm always going to look back. As soon as I see it low, I'm going to go, "Okay." Before I even think that it is low, I'm going to start asking these questions. "All right. When was the last time you trained? When was the last time you got sick? What was your sleep like?" Ding, ding, ding. Because we have such clear evidence that it can drop it to such a meaningful amount.

Dr. Andy Galpin

The next step of the guidelines say if you've got those two tests and you have that

standardization stuff, then we need to go to sex hormone-binding globulin, we need to go to free testosterone, and we need to go to symptoms. On top of all that, if you're going to administer or recommend testosterone therapy of any kind, you need to watch something called hematocrit. This is a measure in your blood. It costs a couple of dollars. It's on basically every blood test ever, and it is a percentage of your blood that is red blood cells. It's how viscous or how thick your blood is. You need to measure this and other hematological measures, so like tons of other measures of your blood cells. And why this matters is we know that this is a cost of doing business with testosterone therapy. When you go on it, very likely your red blood cell count will increase. Now, this sounds great, and it's part of the reason why you feel physically different.

Dr. Andy Galpin

Energy goes up and so forth, potentially. But it can get out of whack really quickly. And in the conversation with Dr. House, he kind of would refer to this as you have ketchup in your blood. So if you heard him say that a bunch of times, you're like, "What is he talking about?" He just meant your blood is getting too thick and viscous. This can immediately cause heart disease or heart failure or a number of death here. You get starting north of 52 to 54% on hematocrit, and we're at serious risk of, again, an acute event here. So you got to pay attention to that.

Dr. Andy Galpin

We've seen this a ton, way more often than we-- basically every time, for the most part. So you have to manage that. So going back to the guidelines, number one, we're not going to make any choices off of one blood draw. We're not going to make any choices off of multiple if we've had these extreme environment or extreme lifestyle changes in the previous 30 days. If we go on it then, we're going to make sure we're watching hematocrit and hemoglobin. They also recommend a diagnostic evaluation of the entire endocrine system. You should be looking at things like luteinizing hormone, FSH, prolactin, TSH, T4, ferritin, CBCs. If you don't know what I'm talking about, don't worry about it. If you do, that's great. The point is to simply you need to pay attention to more things than that. I think that Dr. Lyon and her group and myself, Dr. House, and virtually anyone who I think who's doing testosterone work appropriately would agree, before you go to hormones, you need to do a full, proper evaluation of the entire endocrine system, including even potentially pituitary imaging.

Dr. Andy Galpin

You'll see a lot of conversation about blood measures of that, but maybe even direct imaging to see if something's going on there. And if you can cross all those off your list, then you need to think about a couple more things before starting the hormone therapy. The first is, do you care about procreation, fertility, having children? If you do, you need to have a deep discussion about that because very likely that will be compromised. Okay? Not impossible to fix or come back from, but think about that. You also need to think about the anatomical changes that happens in

the testicles. Again, some men will care about that, some won't. It's just about informed consent. Here are the risks. Here's a thing to think about. And then lastly, what I also appreciated about the guidelines is they are advocating that you continually test and to test more frequently to ensure that that total testosterone stays within 300 to 600 nanograms per deciliter.

Dr. Andy Galpin

Now, that's interesting because a lot of people who go on TRT will rock it up to 1,000 on purpose. They'll want to live at 800, 1,000, 1,200. And so what they actually advocate is if your dosage or form of testosterone you're taking gets you past 600, that you lower the dose, which was nice to see. Now, you may or may not choose to do that, but I think it was an appropriate scientific thing to do to indicate that there is a reality in which health and your lived experience are declined if you have clinically low testosterone. And using medications and therapies to relieve that is a reasonable decision. But using that to get out of a range where it's not really providing medical damage or disease, that's not the same thing here. So using those therapies to get back into a normal 300 to 600 range, maybe slightly higher is fine, but using that to gas yourself up to feel like Superman, it's not a medical need.

Dr. Andy Galpin

Now, again, you do you. Make whatever choice you want. But that was a pretty important distinction, and it was nice to see that in those guidelines. 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 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.

Dr. Andy Galpin

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. 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 to summarize this before we move on to our next big category of things that we were not able to get into in our previous episode, your total testosterone really shouldn't drop that

much as a result of age per se. And if it does, it's probably a result of something happening, i.e., weight gain, drop of physical activity, stress, sleep, change in metabolic health, or so forth.

Dr. Andy Galpin

It will drop as a result of short-term changes in energy output, caloric expenditure, and so forth, but these are normal. It's an adaptive response, and as soon as you recover and sleep and eat some food again, this thing bounces right back. If you happen to get a blood draw during this time, it's unlikely you are truly suffering from hypogonadism. You just saw yourself in a depleted low-energy state that is there. We probably need to start having discussions about different diagnostic thresholds that are more age-specific. Total test is fine, but, and as I'll share more detail here shortly, sex hormone binding globulin and free testosterone do change through age. And so we need to alter those. In fact, one thing that we have seen way common, just almost everybody, sex hormone binding globulin, I think the reference ranges are too low. Basically, every fit person we see is lab high or really close to lab high in SHBG.

Dr. Andy Galpin

So much so, again, I think those guidelines should move, and I think those probably should change through age. Some standardization places do that, others don't, and I'll give you some numbers here in one second. But that is, I think, the appropriate way to think about that. As I mentioned several times now, testosterone replacement therapy utilization is, and can be life-changing. It can be the thing that makes you want to feel motivated or even able to make lifestyle changes. And so one difference between the newer guidelines and the older ones are they're advocating for allowing people to start hormone replacement therapy and not having to wait for lifestyle changes. They want both. And again, there's some debate there, but it's a reasonable thing to say we're not going to withhold these therapies from someone until they can show us they've lost 50 pounds or something like that. They want them both working at the same time.

Dr. Andy Galpin

So the evidence on hormone replacement therapy as it stands now, it does generally improve sexual function if libido, erectile dysfunction, and other issues are persistent and you are clinically low in total testosterone. It can change body composition. It can help you add muscle mass. It can help you lose fat. That seems to be pretty consistent. There may be some benefits there in bone density, and then there's some markers of mental health that improve as well. At the same time, the evidence actually doesn't look great for things like energy, vitality, and cognition. Probably need to come back and do a full show on those points specifically, but I wanted to draw that out because you will really often see things like low energy and fatigue as proxies of low testosterone, and I don't think that's fair. Those things can exist while you have low testosterone, but that does not guarantee your testosterone is low just because you feel

tired, you feel low energy.

Dr. Andy Galpin

There are so many other things that explain that that are not testosterone. And then you couple that with the data that show when you go on it, you don't necessarily feel more energy or more vitality. So I think we have that. That's one of these really common things that are espoused that aren't necessarily as true as you think they are. So there's one other thing I want to talk about on this total testosterone that is interesting to think about. The entire discussion thus far has basically been on total testosterone, but we have a need to move this field further. I see very few people doing this. I don't see any really technology available to do this, and I actually think this is a bigger unlock than total testosterone, and that's what's called your diurnal rhythm, your range of testosterone throughout the day. So your total testosterone is the highest it'll ever be at night, and then it's basically a free fall from that.

Dr. Andy Galpin

And we're talking about magnitudes of changes of 150 to 250 points. And so you'll feel this huge drop. The second you wake up, it starts changing, and then it starts accelerating back the opposite range through night. And so this is why these standardization procedures like making sure that not only you're testing your testosterone in the morning, but you do it at the exact same time. So if you are someone who typically wakes up at 10:00 in the morning, you work swing shift, or you work some other reason you do that, and your only available appointment is 7:00 a.m. or something, fine. But the next time you get your blood drawn and you get it done, even if you're still fasted and you get it done at 10:00 a.m., those numbers can be off by 100 points or more. And this would represent no real change in your physiology. It only represents a different diurnal variation. It is at a different point throughout the day on purpose.

Dr. Andy Galpin

So that's a critical thing to pay attention to, and a lot of the previous research in this field doesn't account for time of day. It doesn't even account for being fasted or not. And so you can see the magnitude of change is so high that those data are effectively useless for this question. The other subtle point here that I want to make is, I actually think the magnitude of change that your testosterone has throughout the day is something that is changed with symptoms. So if you have a normal swing of 200 points from your highest part of your day to your lowest part of your day, some initial evidence, and it is initial, we need more, suggests that that range will drop. Instead of having a 200-point swing, maybe it's 100, maybe it's 50, maybe it's less.

Dr. Andy Galpin

I don't know this to be true, but I'm actually interested to see how the data comes out in the next handful of years. I wonder, though, if that change, not just the total amount, but the amount of variation you have throughout your 24-hour cycle, if that has a bigger impact on your perception

and how you feel and how you experience the world more than the total amount. My hunch is yes, but it's a hunch at this point. We do have evidence to suggest that that is altered with age. So some initial studies looking at people 55 years of age and older suggest that the curve, if you will, the wave function, is not as amplified. That may explain some of the changes that you actually legitimately do see in how you feel, perform, and function through age while total testosterone doesn't. So I want to flag that little teaser out there. We really don't have much more information on that than what I just shared.

Dr. Andy Galpin

So an interesting thing, and I think this is, again, a place where the field needs to evolve. With that in mind, I want to start branching out to these other aspects of testosterone. We've been focusing heavily on total testosterone, and for good reason. But I want to just maybe clear up some terminology. First, you have total testosterone and you have free testosterone. Now, 99% of your testosterone in your body, or probably more accurately somewhere between 97% to 99%, will be in what's called a bound state. The other 1% to 2% will be totally free and unbound. If it's free, it can readily go to cells, in our case, muscle cells. It can go into them. It can activate androgen receptors and get going. But it's untrue that the other 99% can't. And so some different terms here. Bound versus unbound. So bound is meaning your testosterone is on or attached to some protein. Unbound is the same as free.

Dr. Andy Galpin

So when you hear those two terms, you can consider that to be the same thing. Just means they're not attached to a protein. That doesn't mean they're not active or available.

Dr. Andy Galpin

So another term you hear often is bioavailable. All right? So if we go back into the bound category, remember 99% are bound. This comes in two forms, basically. Tightly bound to sex hormone binding globulin and loosely bound to albumin. Loosely bound can easily come apart and be used. And so some people actually don't care as much about free testosterone as they do bioavailable. And all that simply is the free testosterone plus the testosterone that is bound to albumin. And so when you look at your labs, most of the time all they measure is sex hormone binding globulin, albumin, and total testosterone. Because from there, you can easily calculate free or bioavailable. So from a free perspective, you can kind of just move whatever your total testosterone is down by a digit. Pretty easy. Again, because it's about 1% of it.

Dr. Andy Galpin

More likely than not, you're going to have somewhere between 35% to 45% will be actually bioavailable because so much of it is bound in that loose albumin site. So if I kind of confused you with numbers there, I hope I didn't, but that is something that hopefully helps us understand what I was talking about here. It's not true that only 1% of your testosterone is usable. It is not

true that bioavailable is more important. It's not true that free testosterone tells you everything. In fact, the reason we've spent so much time on it is actually, and most people that we engage with, total testosterone is still probably the biggest factor here. So the question then becomes, if that is the biggest factor, what do we actually know about the relationship between things like free testosterone, total testosterone, and my ability to grow muscle? And how does that change when I age? That's the next set of questions we can get into.

Dr. Andy Galpin

So starting with these sex hormone binding globulin and free testosterone numbers. One point I made earlier was I actually think that the SHBG numbers are off the rails. So depending on which company and lab organization you work with, the general reference range for SHBG is something like 15 to 55 nanomoles per liter. That alone isn't super helpful. I mean, 15 to 55 is just a wild range. It's very similar to saying your normal range for testosterone is 300 to 1,000. So it doesn't really tell you that much.

Dr. Andy Galpin

Some organizations will advocate that if you're over the age of 50, that that upper end goes from 55 or 56 to more like 75. And I think that's more consistent with the data, but not all do that. So if you get your labs back and you're like, "Oh my gosh, I'm at 60," but you're 60 years old I personally, I'm not your doctor, but I actually don't think you're high. I think you might be a little bit lab high, but that's actually total normal, and that's actually what the data are more consistent with. The same thing happens in women, for the record. So pre-menopausal women, if you're 18 to 50 or something like that, your kind of normal range for SHBG is 25 to 125. It can be really, really high. We routinely see high performers, men and women, way over these numbers, and I'm just not so concerned about it, to be honest. We always tell them to go talk to their doctor, all that stuff. I'm not going to just disregard it, but we see it so commonly, I just think we actually need to spend another step in the evolution of this entire field figuring out what's really normal for sex hormone binding globulin and how that changes with age and how that changes with women.

Dr. Andy Galpin

Post-menopausal women, the reference ranges aren't that different. You're still talking kind of maybe a little bit lower. Some organizations will drop that down to 17 and then open up the top end to maybe 130 or so, but it really isn't that different. Actual values here, here's kind of what you're looking at. If you were to take somebody and you go back to these metabolic health criteria, what you kind of see is this interesting opposite reaction. Remember, total testosterone is basically going to stay the same through age. However, you get less metabolically healthy, it goes down. Fine. Granted. Sex hormone binding globulin looks like it just simply goes up with age about five points per decade, plus or minus. So kind of the average 50-year-old will be at

about 45. The average 60-year-old will be 50, and it just kind of keeps going up about five points or so per decade. A lot of conversation, discussion, and debate about what that is or why it's happening or what's going on or the relevance, I don't know, but that seems to be common.

Dr. Andy Galpin

Whether that is perfectly normal, yet to figure out, but it seems to be really common. The exact opposite happens as you start going from five out of five on our metabolic criteria to three to two to one to zero. So maybe I'll just give you some specific numbers, not because they matter, but just to highlight the concept here. If you are 50 years old and you are five out of five, just in the best spot possible, you might be 45 on your SHBG. And if you go from five out of five to three out of five, you'll probably drop from 45 to 40, and you go all the way down to zero, the least healthy, you're probably down another five. And so the difference is most healthy people here versus least healthy is about 10 points. Now, this is interesting because typically people talk about sex hormone binding globulin. This holds your testosterone, meaning you can't use it, a la more SHBG bad. That said, it's going down with worse health, not up.

Dr. Andy Galpin

And so what ends up happening is this.

Dr. Andy Galpin

It starts to rise as you age, but it goes down when you lose metabolic health.

Dr. Andy Galpin

And typically, people lose metabolic health as they age. So what ends up happening, you get this math problem to where you are 60 years old, you're not in great metabolic health, but it elevated with your age, it dropped with your poor metabolic health, and so you end up being smack dead perfect in the reference range when you, in fact, are the opposite. So we don't know what this means or really how to think about it, but the data are pretty clear at this point that this is what happens. This is why we need to pay attention to lab numbers with context. So the change in SHBG over your lifetime, as well as how you differ with your metabolic health status, is an interesting and somewhat confusing area to figure out. So this is why a kind of a normal total testosterone can still be misleading. Now, I need to acknowledge a little bit of a personal bias. I'm into human performance, so I'm always going to default to things like, does this result in more muscle growth or strength or some total human outcome?

Dr. Andy Galpin

But not all of you maybe see the world the same. So insofar, our discussion has been focused on testosterone so much, but really as it relates to body composition, muscle mass, strength, age. I will readily acknowledge everything I've said thus far, it may have a different answer if we turn our attention towards optimizing for mental health or libido or even things within human

performance that are more geared towards, say, endurance rather than strength or muscle mass. So potentially something I kind of started the conversation with or ended it with, but it felt natural right now because what we're going to transition to is the research on what is the role of this testosterone now that we understand what happens or doesn't happen with age and obesity and such, but what is the role of this related to exercise? So in kind of thinking that in my head, I thought, all right, actually, I'm really not focusing or optimizing these conclusions based on anything else other than the human performance.

Dr. Andy Galpin

So those caveats are there for you to pay attention to, and they're there for a good reason. That represents the most of the research, but it is important for me to say that if you are far more interested or concerned about other aspects of human health and experience, then some of this stuff may differ from you. That all said, what do we know about the relationship to testosterone and muscle health? What do we know about how it impacts muscle growth and strength, and then how should this alter our training recommendations, our nutritional recommendations, and so forth, that's how we're going to finish today's episode. First and foremost, this one is short. But you'll hear a lot of conversation about certain types of exercise or programs that cause testosterone to increase. Couple of ways we need to think about this. One, acute increase versus chronic. Okay. What do we know about the acute rise in testosterone as a response to exercise, and thus should I do a form of exercise that gives me a greater bump in acute testosterone versus the other one?

Dr. Andy Galpin

Well, we can actually go all the way to the end of the story. We have plenty of research showing the actual results in muscle growth eight or 10 or 20 weeks later, and so in my opinion, I'm outcome-based. I'm more concerned about that. If I can see a study that definitively says this style of training gives you more muscle growth after two or three or five months or a year, I don't even care what happened to the testosterone because I'm only using the testosterone as a proxy to assume that means more muscle growth, and that relationship between testosterone and muscle growth is very minimal. Ben covered this a ton in his conversation, but total amount of testosterone gives you almost no prediction of how much muscle you're going to grow, and it won't predict who's going to respond better or who's going to respond worse. The same is basically true for the acute rise in testosterone. So if you think about this from an absolute perspective, yes, multiple forms of resistance exercise cause your testosterone to jump way up post-exercise, but you're talking about elevations in the neighborhood of 25, 50 nanograms per deciliter, maybe some.

Dr. Andy Galpin

And so if you look at the total amount, if you're walking around at 600 and you get a 15 or

20-minute bump from 600 to 650, well, the change you had throughout the day was probably 200 or more anyways as we talked about earlier, so it really isn't enough to do anything. So I'm not saying it's irrelevant or it's useless or it's fake or it's wrong, it just is so pulsatile. It's so small, the duration of increase in terms of how long you'll be elevated for is in the order of a few minutes, and the magnitude of jump is so small, it doesn't actually make much of a difference. All that then to say, I don't think there's any strong evidence to make your exercise programming choices or nutrition choices based upon which one will give you a short, acute rise or bump or boost in testosterone. I could go on, but it's a pretty easy one. I think the most appropriate summary of the evidence would be this.

Dr. Andy Galpin

If you are below 300 in total testosterone, you are going to constrain your ability to grow muscle, but you will not eliminate it. Really clear on that point. You can still grow muscle, you can still get stronger even if you are clinically hypogonadal, but it will blunt it. If you are in the normal range, 300 to 1,000, this doesn't seem to be predictive of responses at all, meaning someone that's walking around at 400 may grow as much or more muscle on the same training program as somebody at 900. Plenty of evidence. That said, almost all that research is in younger individuals, 18 to 30. Whether that holds true from 60 years old or 55, we actually don't really know. So it is plausible that story changes at age 50 or 60 or 80. We just don't have the research to say one way or the other. What we have available suggests it doesn't matter at all, and so that's the best conclusion we can draw with the available information.

Dr. Andy Galpin

Third kind of point here is that exogenous testosterone does change the equation. In fact, it looks like it's pretty much dose-dependent, and it can significantly increase the amount of resistance training-induced muscle hypertrophy or muscle growth, and that's been as clear as possible for five or six decades at this point, if not longer. I mentioned these two ends of the spectrum, both hypogonadal as well as elevated past physiological dosage. That's not new, but I want to just add numbers here because when I say things like it'll lower your ability to grow, but it won't eliminate it, how much are we exactly talking about? A couple of studies that have actually pharmacologically lowered people's testosterone, and we talked about these in detail in the previous episode, but the numbers you're talking about here are difficult for me to say whether they matter or not, meaning if I lower your testosterone to a 10 or 20-fold amount that you normally had, so I really bring it to the floor, I take you from 500 to 50, you will not grow as much muscle.

Dr. Andy Galpin

You will not lose as much fat. But how much? Well, the few studies we have indicate something like maybe a difference of if you did eight to 10 weeks of strength training, you would gain, I don't

know, half a kilo of lean muscle versus one kilo, maybe two. So what you're talking about here is not orders of magnitude of a difference in muscle growth. It's not like if your testosterone is low, you'll gain one kilo of muscle, but if you're normal, you'll gain eight or 10.

Dr. Andy Galpin

And so the question really is for you. If I said you would grow a kilo of lean muscle after two months, or you would gain two kilos, does that matter? I can't answer that. That's not a science question. That's not a physiology question. If you think, man, I don't want to go on testosterone. I don't want to do that because it's expensive. I have to work with a doctor. I got to be on it the rest of my life And you're talking about after three months, the difference is I gained two pounds versus four? I can absolutely see some people going, "It's not worth the risk. It's not worth the money." Great. That's a you question. At the same time, I can absolutely see people going, "Are you kidding me?"

Dr. Andy Galpin

I can double my growth? Then that's totally worth it."

Dr. Andy Galpin

Absolutely understand. So this is where I think we need to have the nuance. We need to just say, "Here's the information," and I can't value statement that for you. I can't say worth it, overblown. Actually, I think it's somewhat irresponsible for science communicators and educators to do that. What you value versus risk versus cost, that's a you question. The impact of low testosterone on strength is a little bit different. It's a little more forgiving than muscle growth, but it's pretty similar at the same point. So whether or not those are relevant to you is, like we said, up to you. On the other end of the spectrum, if we're talking about, well, how much can I accelerate things if I go hyper-physiological and I give myself testosterone to bring myself over the natural limits? It is impactful, but it's not always as impactful as you'd think. There's really clear evidence that if you do that, you will grow muscle independent of lifting.

Dr. Andy Galpin

So you have such a sensitive and responsive nature to exogenous testosterone that you'll put on some muscle. But if you did that in combination with lifting, some of the studies have shown things like the addition of another kilo or two of muscle after eight to 10 to 12 weeks. You're going to lose maybe an extra kilo of fat. It's pretty similar, right? It's almost the exact opposite of the spectrum. I think that my giant summary to all this is, yes, testosterone obviously matters, and what you're typically looking at is on the order of a few pounds or a kilo or two of muscle and fat.

Dr. Andy Galpin

Not 30, 40, 60 pounds. Not 15 kilos, not those. Now, if extended to years and decades, then

that's when you're going to see those. But if you're talking about weeks to months, that's the magnitude of effect that you should be looking at. Moving on from these points then, if we have made the story clear, your total testosterone is unlikely to be the single biggest driver in how much muscle you will grow outside of those two exceptions, right? Being low or high. The next obvious question is, well, then what is it? It's not the free testosterone. Doesn't look like it's the sex hormone binding globulin. In fact, a lot of studies have looked at the inner consistent kind of up and down. IGF-1, inflammatory markers, insulin. You can just really look at it all, and it doesn't seem to be anything in the circulating hormones that predicts how well you're going to respond to growth when you're in these normal ranges.

Dr. Andy Galpin

In a previous episode with Dr. Mike Roberts, and we'll have a link in the show notes, we've talked about this in detail. This is one of the things that his lab focuses on is trying to answer this question, and so I'll lean on a lot of his research here, but the extension was this, and I bring this up because we'll hear this commonly in people and colloquially discussing, "Okay, my testosterone's not predicting it." Is then the bigger deal what's called androgen receptors? And so the physiology of testosterone, if it's bound or unbound, regardless, it has to engage with receptors on the cell wall. Because I talked about we're focusing mostly on muscle here, let's just think about the muscle cell. So that has these androgen receptors. This is where testosterone binds. Now, the receptor then has to translocate or have some activity through signaling proteins to get into the nucleus of the cell.

Dr. Andy Galpin

That's the part that holds your DNA. That's what tells you to replicate, to grow your cell, to engage in a process called muscle protein synthesis. All that summarized to say kind of the active way of testosterone is to bind to that receptor and tell the cell to grow. So it was a logical extension to say if it looks like these hormones in total amounts is not what determines how much I will grow, is it the receptor? If I have more of the receptor, do I grow faster? If my receptor is more sensitive, do I grow faster? If it's better at getting from the cell wall to the nucleus, do I grow faster? And the end of the story is this. It doesn't look like it's the answer either. It just doesn't seem like anything is there, unfortunately. So like we've said many times, this is not evidence that androgen receptors are unimportant to muscle or that they have no relevance or that you could delete them or that anything like that is true.

Dr. Andy Galpin

We are not saying the opposite. We are simply most appropriately saying, I think this is the most fair summary of the data, is that as these measures are currently being done in a laboratory, they don't explain why some people gain more muscle mass than others who are in the exact same situation, same training program, same nutrition, same sleep, so on and so forth.

Dr. Andy Galpin

I don't know what the answer is going to be there, but I can certainly tell you it doesn't look like either predicting the magnitude of how much muscle you'll grow or why some people grow more than others is a reflection of normal endogenous hormone concentrations or these androgen receptors on the cell. We got to go figure out the next thing, and we'll have to see what that actually is. I want to finish by getting to the practical recommendation side.

Dr. Andy Galpin

Based on everything we've talked about, should I change how I train or what I eat if I'm trying to maximize muscle growth and the role and understanding of what testosterone is or isn't doing? Well, there is something relevant to say here. Good evidence behind this phenomenon called anabolic resistance, meaning as you age, oftentimes the amount of muscle protein synthesis So this cellular process of growing muscle, that will dampen in response to the same amount of protein or amino acids. So if I give you 25 grams of protein at age 30, you'll see a jump in muscle protein synthesis. I give you that exact same amount 50 years later, the jump won't be as high. And so as you age, you become more resistant to anabolic stimuli. And this does again seem to be real. It is also exacerbated greatly by obesity and mediated by insulin resistance and inflammation. So you could run the exact same exercise we've been doing.

Dr. Andy Galpin

How much of this is actually age, and how much of it is obesity, metabolic disease, or subclinical metabolic disease, or even low-grade inflammation? I don't have those data, but it's some portion of it. I think it's also real to say this is probably a real phenomenon with aging. Unlike testosterone, this I think does happen as a natural part of aging. And so there's parallels to what we were talking about earlier. So that said, it is, I think, more appropriate to say we should alter some of our recommendations based on aging, not because of testosterone, but because the cell itself, for some reasons we have an idea about and others we don't, is becoming more resistant. It's being less sensitized.

Dr. Andy Galpin

We have seen changes. In fact, I saw a paper literally come out today from Dr. Stu Phillips, probably the most well-regarded, well-published person in the entire area of protein, especially as regards to muscle, and even he put out a new paper talking about this. But there have been changes in recent dietary guidelines regarding protein, in large part because of this anabolic resistance concept. This is a topic for an entirely different day. We should do a whole show on protein. I'll give you the summary right now, though. Here's my opinion, here's what I think if I had Dr. Phillips, and hopefully we'll have him in the show one day, what he would say. I think we can also hopefully end a lot of confusion on the protein talk. So to be clear, the RDA recommendations have always been set as 0.8 grams of protein per kilogram of body weight.

This has never been set as the amount that will maximize muscle growth or that you should have to improve dietary adherence or anything else.

Dr. Andy Galpin

It is simply been there to say if you go below that, you're increasing the risk of something happening bad to your health as a result of not having enough protein. There's not a lot of argument behind that number. Most of the time when you see values like this, especially in non-developed countries, it's because you're trying to help large organizations and medical societies understand, hey, if you get to a population of people that is really struggling, this is the number to get them to. And where do we need to deploy resources, and who do we need to help? That's how we should think about that 0.8. That said, very recently, the new federal guidelines in the US have changed that number and increased it to 1.2 to 1.6 grams of protein per kilogram of body weight.

Dr. Andy Galpin

And this is the controversy. In the end, I think that number's probably right. The process of getting there is debatable, probably wasn't followed appropriately, but nonetheless. Here's what that number means in my opinion. If you are closer to 0.8 grams of protein per kilogram of body weight, as long as you don't fall below that, I think you will avoid most negative health.

Dr. Andy Galpin

But the 1.2 to 1.6 range has been established in large part based upon research for body composition. And so it does appear if you're trying to maintain the most amount of lean body mass and minimize body fat, getting a little bit more protein, 1.2 to 1.6 grams per kilogram, seems to be effective. So whether or not that should be our national guideline, that's up to someone else to discuss, but that seems to be pretty consistent with the evidence base. That said, there are other things to consider that are not really being folded into these recommendations. We also need to consider there is really very marginal benefit, even with things like muscle growth in response to strength training, with going above 1.6 grams of protein per kilogram. In fact, the evidence is somewhat robust at this point. It's marginal gains at all, if any. And so some people actually have the position that going above 1.6 is totally useless or unnecessary.

Dr. Andy Galpin

You could make that argument depending on which outcome variable you're focused on. I don't always agree with it, but I absolutely understand when people say that, and that seems to be pretty consistent. So I would say if you are worried about body composition, especially as you age, 1.2 to 1.6 grams per kilogram is probably the number to get to because anabolic resistance is probably real, but those numbers probably get you out of that issue. And that's why I'm talking about this, to go back to the main point of today. My testosterone is probably not lower, but I

probably am a little bit more anabolic or resistant. Therefore, I need to add protein. But how much? As long as you hit that floor, that's probably enough to help keep your muscle around as you age. It is also true, I personally and many others have said the number I like is actually about 2.2 grams per kilogram of body weight. That's your one gram per pound, okay?

Dr. Andy Galpin

Now why did I say that? Why do I recommend 2.2 rather than 1.6 if I am at the same breath admitting there's really marginal benefits to body composition, if any? Well, now is when you have to fold in other factors. I like going a little bit higher because I feel like it helps people feel full. I feel like it helps them eat a lot. I feel like it helps them avoid other things. So these are entirely practice-based questions and not physiological. Whenever we get into nutrition and training, we have to understand when we're talking about actual physiology versus does this impact behaviors? That's why I like it. So my argument personally is I generally like to be people closer to 2.2 because of the other fringe benefits that come along with it, not because I actually feel like it accelerates muscle growth that much more. That said, not very often are we literally holding people to the fire to ensure they have exactly 2.2 grams per kilogram.

Dr. Andy Galpin

The honest reality, having tracked this countless times, some days you're going to be 1.4, and then other days you're going to be at three, and then what we're looking at is like, all right, over the week, over the month, are you getting close to this 2.2 range? And then we're adjusting based on preference, timing. How do you feel in your stomach? What are you trying to do? Our goal. There's so many other ways to get there. All that to say, I really don't think the debate over 1.6 versus 2.2 is really that big of a deal.

Dr. Andy Galpin

I think you're better off 1.6 than you are 1.2 for the most part. I think you're really better off getting up to that upper range if you're concerned about anabolic resistance or in that aging process. That said, if you don't like being that high, if it's too expensive, or protein is difficult for you to come by because of access, or you don't like it, fine. I don't think you're losing gains. I don't think you're compromising your health at all being the lower end of these ranges. But the last point, if you're concerned about muscle growth with aging, and we've checked testosterone off the list, we also should acknowledge that resistance training is by far the bigger stimuli of muscle growth than protein. So we're making a lot to-do about almost nothing on this side of the equation. The protein is the icing on the cake. Protein is anabolic, but it's a very small amount, and strength training or resistance exercise is an incredibly large stimuli for muscle growth.

Dr. Andy Galpin

It is doing, this is not a real number, but it is doing 90% of the work, 95% of the work, where your protein intake is doing the last 5%. So if you're a focus major in the majors rather than a major in

the minors type of person, the majors would be here. Don't worry about your testosterone as long as it's in the normal range. Get high-quality strength training in, and get enough protein as defined by probably minimum 1.2 grams of protein per kilogram of body weight. Anything past that is a preference issue or something else. If you're trying to maximize muscle growth and you want to just be as high as possible, probably head to being a little bit higher on that, and it may or may not help, but it won't hurt anything either.

Dr. Andy Galpin

So if that is the case where resistance exercise is the primary thing, what do we know about that? It does not appear that the ability to get stronger changes much with aging. You can increase your strength basically equally across age domains, but that is not true for muscle growth. It is compromised with aging. It is more difficult to gain muscle size at 70 relative to 30. I don't think I'm stirring the pot much by saying that. But what do you do about it? Effectively, not much. We talked about protein. In terms of strength training, you don't need to change that much. I know of actually a review article that came out and meta-analysis in the last month looking at things like intensity, and it works. High intensity, low intensity. They work when you're young, they work when you're old. For muscle growth, for bone density, it works. It's hard to get strong when you use light weights, but that's true when you're young, that's true when you're old.

Dr. Andy Galpin

So we actually don't see a very clear age-specific difference. That's the part I want to drive home. Your strength training program doesn't really need to differ as you age. So I don't need to actually walk you through a specific training program for middle-aged or older individuals. And I'm saying that because I actually get that question a ton. I get emailed that constantly. I get messaged that constantly. Like, "Will you do an episode on strength training for middle age?" And maybe I will, but I'll tell you right now what I'm going to say. It's the same. It's the exact same thing. Exercise selection, order, intensity, volume, range of motion. There's no fundamental difference between men and women. There's no fundamental difference between 30-year-olds versus 80-year-olds. There is always a fundamental difference between one human to another human. Always. Injury history, preferences, how many times you can work out, your stress load, your body comp.

Dr. Andy Galpin

All of these factors should go into it. But I have yet to see any strong evidence, and in fact, I will reiterate, there is a lot of evidence that says the opposite, that we should have independent recommendations for aging. What we should consider are things like it's going to take a little bit longer, recovery might be slower. So if you want to use that to say, "Hey, we are a little bit less aggressive. We go a little bit slower. We progress slower." That's fine. That's reasonable. But I would hope you're doing that with an 18-year-old, too. I hope if a 25-year-old's coming back and

saying, "I'm still super sore," that you're adjusting their program. Or if a five-year-old or any age-- These are not age-exclusive things. These are just good coaching. This is just paying attention. This is listening. This is talking to your clients. This is measuring things. It's just appropriate coaching. So our guidelines for strength, they're pretty equivalent.

Dr. Andy Galpin

You'll get equally stronger whether you're untrained or highly trained. That will change how much muscle you grow. But age, sex don't. Whether you're doing other times of physical activity, all those other factors change it more so than age or sex do. I hope you learned a ton today, as well as in the previous episode with Dr. Ben House, about everything from what should you measure, total testosterone, free testosterone, sex hormone binding globulin. What do I ask for? We covered those details in the previous episode, so the types of biomarkers to look at. And we went over numbers and numbers and numbers. So you should have pretty good understanding about how to interpret those results across all of them. Then we talked about the constraint idea. The vast majority of the good quality research on how to elevate and increase testosterone is really the removal of constraints. Don't have those things that we know really suppress and compromise it, and you'll get really, really high.

Dr. Andy Galpin

You probably don't need to go higher than that to feel good, to perform at your base. Your body will be at a bit of a normal level. Another important thing for us to finish on is, of course, keep in mind, when it comes to things like your hormones and endocrine system, you should be working with your doctor, your medical doctor, your qualified, certified person who's paying attention, who's thinking about these things, who's not just receiving one phone call or an email and then prescribing medications. I don't need to belabor that point. I think, I hope you know what I'm saying, but I'm all for all of it. I hope this has helped you. I just want people to be as informed as possible. Perhaps we'll do a follow-up here soon or potentially down the road. 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.

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