

SHOW NOTES

Tune in to this the most recent episode of our RecoverMe Podcast with Warren Willey doctor of Osteopathic medicine and director of medical weight loss as he discusses the performance of athletic individuals, the drugs they take.

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TRANSCRIPTION:

[00:40](#) Hi there, Dr. Willey here. Welcome to another episode of the RecoverMe podcast, the medicine that meets you where you are and also understands we can't change your stressors. So let's help optimize your body and your mind to deal with some better.

[00:55](#) Today's podcast is going to be somewhat a cultish one. And what I mean by that is there's probably less people interested in this topic than more. This is more directed towards your performance space. People, your athletes, your personal trainers, your athletic trainers, other people in the medical profession that deal is athletes. I want to talk about Ergogenic aids. Ergogenic aids are anything that helps improve someone's performance. Basically the definition is a physical, mechanical, nutritional, psychological, or pharmacological substance or treatment that either directly improves your state or improves your ability to perform or indirectly improves it by other variables associated with exercise performance. Plus we removing subjective restraints. It's amazing how much right here between the ears is involved with performance in improving psychological capacity. So that is a definition of where your Ergogenic aids. These are things that help people perform better. Now, I just said it might be a little cold to us, but if you think about it, if you're a busy executive, you want to perform better.

[02:14](#) If you're a high school janitor you want to clean better. If you're a stay at home mom, you want to be a better mom. So I think this could apply to everyone if you understand the bigger picture of the RecoverMe aspect of it, that it has a lot more meetings and just steroid use and athletes, which I am going to cover it today. But I think if you really look at it that way, I might have mistaken. We said it's for a cultish audience. This may be for everybody because this is just the first part of a series of podcasts I want to do on optimizing performance. One of my favorite things to do in my medical practice is when people come in very healthy, they just want to be better and better. Not in terms of going from illness to nine illness, but better in the terms of I want to improve better.

[03:05](#) I want a better sex life, I want to bet relationship life. I want to be bigger, stronger, faster. I want to be able to think quicker. I want to be able to think longer. I want to maintain my cognitive abilities into my 80s and 90s that's what I mean by better. And I think this series on Ergogenic aids will help people understand that. So to repeat an Ergogenic aid is a physical,

mechanical, psychological, nutritional, or pharmacological substance or treatment that improves your brain and your body and its ability to perform better. In this podcast, I'm going to really focus on the pharmacologic, the drugs, if you will. In later podcasts I'll get into physical, mechanical, nutritional and psychological because I think they all play a different role and a very powerful role and when I sum up this podcast, I might cover a little pieces of those so you know what to look forward to or not.

[04:05](#) But that being said, because I'm going to talk about drugs today, I have to emphasize I'm not endorsing or condemning pharmacological Ergogenic aids. I'm just here to review them with you. I'm going to give you some resources if you want to learn more about them or see what the world anti-doping association, the International Olympic Committee, the NCAA, the NFL, MBL, all the big groups, what they view as an illegal Ergogenic aids. There's plenty of lists out there, so I'll cover that in a minute. This is also a medium for me to introduce hormones because everyone's familiar with Anabolic Androgenic steroids being the primary thought of Ergogenic aid, especially illegal Ergogenic aid according to the world anti-doping association and all those governing bodies I just mentioned. But I have a number of mini courses coming online that I hope help people really understand hormones. There's one on the thyroid hormone, one on the sex hormones for women, sex hormones for men.

[05:06](#) We already have the testosterone masterclass available on my website at drwilley.com if you want to know all about male hormone replacement, go watch that master course. But I think other hormones are so important that we understand Insulin, Leptin, Adiponectin, your brain hormones, your gut hormones. I mean there's just so many hormones in your body that dictate, dictate and regulate function and control that understanding them. We'll give you a great advantage of weight loss, muscle gain, psychological performance, cognitive maintenance, all those things that the hormones play a role in. So again, this one will act as an introduction and we're really gonna focus on the pharmacological. So let me dive right in and ask a question. Of course I'm going to answer it cause no one can respond to me in this medium. But what do you think is the estimated percentage of high school athletes using one form or another of an Ergogenic aid?

[06:03](#) I'll pause while you think about that and then I'll just tell you, it's estimated up to 20% of high schoolers are using anabolic energetic steroids out there. Huge amounts. And I could I say, I would have to agree with that cause I could see a lot of kids that come in or their parents bring them in and if they will be honest with me and if they're not honest with me, they don't realize this old guys know how to, certain ways to tell if you're using drugs or not, which we won't get into. That's our secrets. But 20% of high school kids are using Anabolic Androgenic steroids. Nearly 80% of high school athletes are using other forms Ergogenic aids, protein powders, creatine powders, weight gain, pre post workout meals, all those things can be classified as Ergogenic aids. How about college athletes? What's the percentage of college athletes using Ergogenic aids?

[06:58](#) Pause for your thinking and up to 50% are admittedly using Anabolic Androgenic

steroids. Yes. Say test form in college, that's pretty easy. Just like any tests, you can get away with it if you don't know, and it's estimated 100% of college athletes are using other forms of Ergogenic aids such as protein powder creatine, pre and post workout meals, pre workout, stimulants, caffeine, etc. Anything again, remember the definition, anything to improve or enhance psychological and physiological performance. Let me ask another question just based on hormones. What do you think one of the most abused drugs and professional sports is that really isn't talked about, known, or even understood? Pause for your answer. The answer that I chose for this particular question is Insulin. Insulin can be bought very simply anywhere, any pharmacy in the country. Insulin is the most powerful growth promoting muscle building hormone there is when you eat right, so also the most powerful fat inducing hormone when you eat wrong.

[08:11](#) I learned a long time ago. It's not so much the food we eat, but what our bodies do at the food we eat. In other words, what is the hormonal response to food, excuse me, I talk about it in detail in podcast number 13 it's entitled when you eat is as important as what you eat. It's called food timing or chrononeurokinetics is the fancy word I like to say cause I always went on Hangman, when I play that word. Anyway, I wrote an article about it way back in 1997 called Insulin as an anabolic aid and it was published in the physician in sports medicine volume 25 number 10 October, 1997 so if you want to get on the internet and look that up, Google scholar, I'm pretty sure it would bring that right up for you. But it's a case report about Insulin as an anabolic aid.

[09:00](#) And since that time I have just seen it everywhere you see it. If you follow the bodybuilding physique world, you know how much Insulin is being used by the super large muscular men and women. So hormonal aids, pharmacological aids to improve performance or very common, even ones you wouldn't think of. So again, I'm not going to cover nutritional training, investigational, any of those right now. Let's jump right into better living through chemistry. That was supposed to be punny. Anyway, if you want to see the list I'm referring to, it's a world anti-doping association or W A D A, WADA. And if you go to any search engine, just type in water list 2018, you will pull up their entire list of banned substances. IOC follows it, NCAA follows it most of the major sports follow the WADA list. So just a little, if you want to do some research there.

[09:59](#) The things they list as categories in banned substances include anabolic energetic steroids, other anabolic energetic steroids, which I'll explain in a minute. Peptides and growth hormones, Beta agonists, hormones and metabolic modulators, diuretics and other masking agents, enhancements of oxygen transfer such as blood doping, gene doping, stimulants, narcotics, cannabinoid, glucocorticoids or, prednisone or things that lower inflammation. Alcohol is actually on the list as are some blood pressure and heart medications called Beta blockers. A lot of stuff on that list and we'll cover those. But let's cover first the anabolic energetic steroids. In general, all Anabolic Androgenic steroids are based on the testosterone molecule. They really are. Even though there's a lot of other and that's where water gets into other anabolic energetic stories or aren't necessarily testosterone based, but they're hormonally based. Testosterone is

the basis of Anabolic Androgenic steroids in general. There is a strict definition for hormones that I think we should cover and that's, the hormones are messengers.

[11:17](#) They're chemical messengers carried by the blood to non adjacent or target cells. So the hormones functions you, all sorts of things you're by, they're really master controllers of your body and that's why they RecoverMe method of weight loss and weight optimization really focuses on hormones from the HPA axis, the effect of cortisol to the effect of all these other hormones on your system. It's not so much how much you eat or how much you exercise or how much you don't eat or how much you don't exercise. It's more about what is the response, hormonal response of your body to food. If you come at it from that aspect, like the RecoverMe method, you're bound to lose weight but not just temporarily, permanently because now you understand the mechanism behind it. Starving yourself and spending three hours in Gold's gym does not last. You know it.

[12:09](#) I know it. And we're now that we're a mid February, we are going to start seeing the gyms empty out again. So all of us regulars are smiling big, at which is unfortunate actually because I would rather, it won't stay there, but their mechanism of weight loss, it has some serious issues as everyone knows. So let's quickly overview hormones. Like I said, this is going to be an introduction course to the bigger hormone mini courses I'm going to offer on my website. First of all, hormones regulate growth and development. That's obvious. You'll go through your puberty years or if you have teenagers in their puberty years, you know exactly what hormones are doing both to the body and the brain. We'll end it there. Homeostatic controls. So it regulates internal environment. Because our internal environments on a very narrow area, so my temperature, if it gets too low or too high. If it gets out of that 97 to 99 degrees Fahrenheit range, I get in trouble or I feel like crap. Because it is so finely controlled.

[13:18](#) And that goes for salt and mineral balance. That goes for water balance. That goes for your temperature. Hormones control all that stuff. They control the reproductive processes. Obviously ovulation and menstruation in women. The maintenance of pregnancy is very hormonally based. It has direct effects on behavior. So modification, modulation, initiation, specific patterns that you do, your reaction to your environment, your response to your environment are very hormonally modulated and hormonally control. So hormones, they are just absolutely essential to understand in the RecoverMe method of overall health and well-being. And that's why we spend so much emphasis and time on it. There's a two primary classes of hormones out there are chemical groups, which hormones fall. There's your steroids. So steroids in all vertebraes, so those of us with backbones, steroids are synthesized from cholesterol. By your adrenal cortex, by your testes, ovaries, and then in a pregnant mama, her placenta, those are made from cholesterol.

[14:28](#) They include cortisol, estradiol, estrone, testosterone, DHEA, a whole list of steroidal hormones. Then you have your nonsteroidal hormones, which includes your amines. Those are like norepinephrine and epinephrine two brain hormones. Also, the fight or flight hormones or amines. You have your peptides, oxytocin, the love hormone, the hormone that flat down when

a mama breastfeeds or after an orgasm or after a huge wonderful full body massage. Oxytocin is released, and that's a peptide. Antidiuretic hormone is another example of a peptide. Proteins are hormones. So growth hormone is 196 amino acid chain growth protein. Insulin is also a protein and it's a hormone we've mentioned earlier. Then you have your glycoproteins. Those are proteins with a sugar attached. So it's come lot of them are in your brain. FSH or follicle stimulating hormone, luteinizing hormone, which stimulates the male testicles by the leydig cells to produce testosterone.

[15:33](#) Those are glycoprotein. So those are your primary types of hormones. Steroid hormones and thyroid hormones work by gene activation. They're relatively small. They're lipid soluble, they diffuse freely into and out of cells and they affect target cells that have receptor proteins in their cytoplasm or inside the cell or in the nucleus of the cell. The hormone receptor complex ones that hormone binds can freely move into the nucleus to stimulate an action. And that action is via active transport. It binds the DNA and stimulates transcription of specific genes. In other words, it turns your cells on. It directs them to do something, whether it's a synthesis of messenger RNA, which causes protein synthesis and causes muscle growth as one example, especially with our current topic at hand. The full effect of these hormones are manifested over minutes today so hormones take why when we replace a woman or males hormones, I always tell him, you have to give it some time to work.

[16:37](#) They're not immediate. The steroid based hormones can take days, if not a longer time to get steady state and really show their action, their mechanism of action. Peptide and protein hormones, these work by a secondary messenger mechanisms. They do not diffuse into cells. The target cells for peptides and proteins have receptors on the cell surface, so Insulin and growth hormone is I use examples are both protein hormones. They bind to the cell and stimulate the cell via secondary messengers to go down to the nucleus and initiate a response. Now, peptides and protein hormones have a very rapid, if not immediate response, seconds to minutes from when they're stimulated, and that makes perfect sense. If you think about Insulin, if I go eat a chocolate cake or a chocolate donut, my blood sugars skyrockets. I've got to get that blood sugar out of my system because that's very toxic to my brain and heart.

[17:34](#) So Insulin immediately does it's accident and pulls that blood sugar out of my bloodstream and puts it in the appropriate tissues where it needs to go. Not that a chocolate donut has any appropriate tissues in your body, but you get the point of what I'm saying. So those are your type of hormones or let's talk specifically about Anabolic Androgenic steroids real quick. These are a group of hormones, again, that are meant to duplicate the beneficial aspects of testosterone. So when anabolic energetic steroids are utilized by an athlete, it causes an increase in protein synthesis, which allows the muscles to grow faster and recover quicker. And that's a very important point. I'll come back to. It increases creatine phosphate synthesis and that's the substrate needed for energy. So it gives you energy, it makes you stronger, faster, quicker, like the movie that's out there, it increases the storage of glycogen, which is the storage form of sugar and the muscle cell, which increases the cell size and the amount of glycogen.

[18:34](#) It pulls water with it. And so you get bigger muscles and bigger muscles means stronger muscles, not necessarily more athletic muscles, but they're bigger. It also increases nutrient uptake by the cells. So anabolic steroids if you're eating properly, and that's why a lot of bodybuilders and people using steroids eat six to eight times a day, is their efficiency in pulling nutrients out of the bloodstream into the muscles is much greater with anabolic steroids. Simply put anabolic steroids, improve recovery. If I had to sum it up, it recovers there. So a person uses steroids can go and bench press 400 pounds today and tomorrow go and bench press 400 pounds again. Where if any of us not on steroids, tried to bench 400 pounds today. Not only would most likely be crushed, but we certainly would not do it again tomorrow. So remember steroids work by causing recovery. Very important thing to know.

[19:35](#) Let's quickly talk about peptides and growth hormones. Peptides, if you think of a protein, this is the simplest way and this is a very simplified way to look at it. Let's say you have a steak here. That's a protein, right? Well proteins are made up of amino acids, we know that. But in between them you have peptides. So peptides are biologically occurring short chains of amino acid monomers linked by peptide or what we call amide bonds. Number of examples, Insulin growth factor one, IGF one, melatonin, CJC 1295 [inaudible], GHG frag 176-191. I mean there's all these peptides I could cover with you cause we use peptides in medicine both in disease treating, wound healing, optimization of physiques weight loss. I mean peptides are really an up and coming neat field and and medicine, particularly a regenerative anti-aging medicine. Really needs stuff.

[20:35](#) But there is a huge list of among the Wada list, because they are banned substances right now. So I'm not going to cover all those. I may spend another based on listener feedback, which we're trying to direct next season's podcasts on the feedback received from our almost 20 episodes this season. I really trying to direct what I'm hearing and people are asking to do podcasts and those things to generate more interest. So if you have more questions about peptides, I would be more than happy to talk to you about them. I think another one we need to talk about is the protein class in particular human growth hormone. I get questions literally weekly. Either via email or a patient comes to my office asking me about HGH human growth hormones. Let's cover what human growth hormone does first. It increases calcium retention, strengthens and mineralization of bone.

[21:34](#) So HGH is a great thing for people with severe osteopenia or osteoporosis. It increases muscle mass through sarcomere hypertrophy, so it makes some muscle grow. It promotes fat burning or like polycyst. It increases protein synthesis. It stimulates the growth of all and internal organs except your brain doesn't affect the brain that way. It changes the way the liver views sugar. It promotes gluconeogenesis for production of sugar from non sugar sources in the liver. It contributes to the pancreatic function. It stimulates the immune system. It increases the conversion of T4 the inactive thyroid hormone to the active thyroid hormone T3 I mean I just could go on and on about all what HGH does. The question I get on that, is it something I should do doc, and I would say that's a very personal decision between you and your doctor. I think

there's a lot of peptides we talked about earlier that stimulate growth hormone and turn it on so you get all those benefits without having to directly use it yourself.

[22:35](#) Remember anytime you take a hormone from the outside, you turn off internal production of it and just cost prohibited nature of current pharmaceutical base. Human growth hormone is ridiculous. I know a lot of people are buying human growth hormone on the internet. It's been guests over 95% of it's fake. It's all HCG, Human Chorionic Gonadotropin. The hormone that's produced by a woman and found in her urine while she's pregnant is what is actually being sold out there is HGH. So just something to consider there, but it is on the WADA, so I thought I'd quickly cover. Another one on the water lists that I think is very interesting for people is because we're seeing such an increased rise in asthma out there, the Beta agonists like Albuterol are actually banned substances. You can only have a certain amount of your system under the water regulations.

[23:30](#) They stimulate Beta cells. Hence the name Beta agonists, Beta 2 and Beta 3 receptors specifically. And one in particular I talked about a lot in my book, Obtainable was Clenbuterol an anabolic agent that also is quite the fat burner, but also makes heart rate go about 200 miles per hour and the brain go about 300 miles per hour. So there's side effects to all of these things. The Beta agonists are very interesting, substances or Ergogenic aids when used appropriately hormone and metabolic modulators. These are things that are different hormonally active. For example, probably the best example is aroma taste in hamburgers, [inaudible] or rim index. These are things that block the production of estrogen from testosterone. So testosterone and everyone's body is converted to Estradiol or E2 via aroma tastes, particularly in the fat, especially in the fat around the gut. And liver, aroma taste inhibitors stop that.

[24:31](#) SERMS, selective estrogen modulator drugs like Clomid, and SARMS, selective androgen receptor modulators are also under this class. SARMS are huge right now. I know you can buy some SARMS over the counter. Others are prescriptions through specialty pharmacies. They're out there everywhere. And we may want to spend a full podcast on serves and sarms because they're really, really powerful drugs that have some neat applications when used correctly. Remember even pizza's bad if he too much of it or don't have enough of it. So myostatin inhibitors is another one. Icar modulators, those activate AMP protein [inaudible], I'm just talking for those who, uh, think I'm talking to the foreign language. I am. These are things that just stimulates cell energy and activity. Insulin actually falls under the hormonal and metabolic modulators cause the IOC and water realize its powerful effects when done right.

[25:31](#) Some of the other ones I didn't cover in this short podcast. Diuretics and masking agents obviously if you're taking anabolic steroids or any of these other Wada banned substances, you can try to hide them with masking agents or diuretics. So the world, anti-doping associates or agency tests for those. Enhancements of oxygen transfer. There some really wild drugs out there, including some gene doping techniques, but blood transfusions of blood doping. So most common form of that. Stimulants are obvious. Stimulants are basically your speed, if you will, whether it's pure amphetamine, methamphetamine, uh, or any of those are banned because

they do make you quicker, stronger and faster between the years, which means you're faster below the neck. Narcotics to high pain, so you can push yourself harder and harder and farther. They also changed the way the brain sees things. And so it's actually a great psychological benefit to utilize narcotics in sporting events.

[26:37](#) It goes for cannabis too. Now that we're seeing so much legalization of marijuana, smoking dope before you go on a long run, it can be very beneficial for your time and your run, but also illegal. Do you know that runner's high? We all talk about getting into that runner's high where you feel good. That's actually stimulation of the endocannabinoid system. So if you hit that early with a joint, then your exercise is probably going to be better. Glucocorticoid steroids so your anti-inflammatories, your prednisone, your kenalog, your dexamethasone, all these medicines that people use to keep inflammation down obviously our band because if you don't feel that pain of that swollen twist today go, you can keep performing on it. Not that it's good for in the long run. Just like everything I'm talking about. All of these things have consequences if you decide to do it.

[27:30](#) Alcohol, I mentioned alcohol and Beta blockers are used in like biathlon sports where you have to do a lot but also hold very still. If you're shooting archery, those things, that's where those drugs are utilized. Then I'll bring us to the future of Ergogenic aids. It's kind of funny though. There's a debate and I'll probably do a podcast on this with a good friend of mine, another physician, cause we get into these debates all the time and that's on fat free mass. Is there a limit to human performance and muscularity? Some would say there are and measuring fat free mass is a way to do that. If you really look at sports over the last 20 years, we haven't seen that many records being broken. We haven't seen that many new achievements are nutritional. Our training have probably reached close to the peak and what I used as analogy in my book [Better Than Steroids](#) is I think everyone has a genetic ceiling that you get to the top of like the Sistine Chapel.

[28:33](#) You get to the top and look at that beauty and then from there you just get better. By going across that ceiling doesn't mean you can necessarily go higher than it. So I want to talk about the future of Ergogenic aids as we do other ones. What are some possibilities where we might see some new technology coming out? Are we really capable of getting stronger, better, faster without drugs? It's a good question and I think it's something we should cover and the recover me method of treating disease actually delves into that because I think the better you are, like I mentioned earlier, the less likely you're going to have to worry about disease states and that's the whole thing. Or if you decide to be a smoker, let's optimize everything else. So you're smoking doesn't affect you the same. Again, back to the recovery method.

[29:20](#) If you decide to use Anabolic Androgenic steroids or any of these WADA banned substances. All right. Again, I'm not going to judge you for it either way, but I'm going to say, "okay, let's do this to optimize your overall health and wellbeing. Let's be prepared for these consequences and try to combat them this way." So hopefully that was somewhat interesting, if not beneficial for people in and outside the cultish audience I talked about earlier, discussing

Ergogenic aids. Again, thank you so much for listening. If you have any questions, don't hesitate to email me at anytime at D O C @ D R W I L L E Y .com doc@drwilley.com. Check out the website, drwilley.com. Go to free stuff. Checkout Obtainable. It's a great reference guide for of just a lot of stuff I even mentioned a couple of these drugs in there in the book if you're interested in learning more about it. So remember RecoverMe is a medicine that meets you where you are. We can't change your stressors. We can just optimize your body and mind to deal with it better. Until next time.

HIGHLIGHTS:

01:20 Ergogenic aids are anything that helps improve someone's performance. Basically the definition is a physical, mechanical, nutritional, psychological, or pharmacological substance or treatment that either directly improves your state or improves your ability to perform or indirectly improves it by other variables associated with exercise performance.

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07:01 50% are admittedly using anabolic androgenic steroids. Yes. Say test form in college, that's pretty easy. Just like any tests, you can get away with it if you don't how, and it's estimated 100% of college athletes are using other forms of ergogenic aids such as protein powder creatine, pre and post workout meals, preworkout, stimulants, caffeine, etc.

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09:04 If you follow the bodybuilding physique world, you know how much insulin is being used by the super large muscular men and women. So hormonal aids, pharmacological aids to improve performance or very common, even ones you wouldn't think of. So again, I'm not going to cover nutritional training, investigational, any of those right now. Let's jump right into better living through chemistry.

10:10 Peptides and growth hormones, beta agonists, hormones and metabolic modulators, diuretics and other masking agents, enhancements of oxygen transfer such as blood doping, gene doping, stimulants, narcotics, cannabinoid, glucocorticoids or, prednisone or things that lower inflammation. Alcohol is actually on the list as are some blood pressure and heart medications called Beta blockers. A lot of stuff on that list and we'll cover those. But let's cover first the anabolic energetic steroids. In general, all Anabolic energetic steroids are based on the testosterone molecule. They really are. Even though there's a lot of other and that's where water gets into other anabolic energetic stories or aren't necessarily testosterone based, but they're hormonally based. Testosterone is the basis of anabolic androgenic steroids in general. There is a strict definition for hormones that I think we should cover and that's, the hormones are messengers.

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14:28 They include cortisol, estradiol, estrone, testosterone, DHEA, a whole list of steroidal hormones. Then you have your nonsteroidal hormones, which includes your amines. Those are like norepinephrine and epinephrine two brain hormones. Also, the fight or flight hormones or amines. You have your peptides, oxytocin, the love hormone, the hormone that flat down when a mama breastfeeds or after an orgasm or after a huge wonderful full body massage. Oxytocin is released, and that's a peptide. Antidiuretic hormone is another example of a peptide. Proteins are hormones. So growth hormone is 196 amino acid chain growth protein. Insulin is also a protein and it's a hormone we've mentioned earlier. Then you have your glycoproteins. Those are proteins with a sugar attached. So it's come lot of them are in your brain. FSH or follicle stimulating hormone, luteinizing hormone, which stimulates the male testicles by the leydig cells to produce testosterone. Those are glycoprotein.

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20:27 peptides are really an up and coming neat field and and medicine, particularly a regenerative antiaging medicine.

21:26 HGH human growth hormones. Let's cover what human growth hormone does first. It increases calcium retention, strengthens and mineralization of bone. So HGH is a great thing for people with severe osteopenia or osteoporosis. It increases muscle mass through sarcomere hypertrophy, so it makes some muscle grow. It increases protein synthesis. It stimulates the growth of all and internal organs except your brain doesn't affect the brain that way. It changes the way the liver views sugar. It promotes gluconeogenesis for production of sugar from non sugar sources in the liver. It contributes to the pancreatic function.

It stimulates the immune system. It increases the conversion of T4 the inactive thyroid hormone to the active thyroid hormone T3

24:31 SERMS, selective estrogen modulator drugs like Clomid, and SARMS, selective androgen receptor modulators are also under this class. SARMS are huge right now. I know you can buy some SARMS over the counter. Others are prescriptions through specialty pharmacies. They're out there everywhere. And we may want to spend a full podcast on serves and sarms because they're really, really powerful drugs that have some neat applications when used correctly. Remember even pizza's bad if he too much of it or don't have enough of it. So myostatin inhibitors is another one. Icar modulators, those activate AMP protein [inaudible], I'm just talking for those who, uh, think I'm talking to the foreign language. I am. These are things that just stimulates cell energy and activity. Insulin actually falls under the hormonal and metabolic modulators cause the IOC and water realize its powerful effects when done right.

26:51 Do you know that runner's high? We all talk about getting into that runner's high where you feel good. That's actually stimulation of the endocannabinoid system. So if you hit that early with a joint, then your exercise is probably going to be better.