

## Paleo Solution - 403

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Robb: Holy cats, folks. Robb Wolf here. Another edition of the Paleo Solution Podcast. Man, I just wrapped up one of the best podcasts, I think, we've ever had on the show, Dr. Anthony Jay. Dr. Jay is a biochemist by training. He has done a deep dive on the topic of estrogens and the potential impact of estrogenic compounds in our environment, what the health implications are.

I took two pages of notes during this thing. I'll take notes during most of my podcasts where I have a subject matter expert on. I have never taken two pages of notes. It actually tripped up some of my follow-up questions here and there because I was so focused on getting information written down that I didn't fully have my head in the game for the interview itself. But despite that, I think it was pretty damn good. It is just mind-blowing.

The estrogenic topic has been something that I've noodled on a fair amount over the years but I haven't really gone deep on it. Dr. Jay has a fantastic book on the topic, an amazing website. If you're interested in performance, health, and longevity, you've got to check this one out, share it with folks. You will enjoy this interview with Dr. Anthony Jay.

Dr. Jay, really great to get to chat with you today. Estrogenic compounds are pretty hot topic. I think it can range all the way from maybe underappreciated to folks maybe possibly being over concerned about them. Maybe you're going to set that stuff straight today. Great to have you on the show.

Anthony: Yeah. Thanks for having me. I've been looking forward to this one, Robb, because I've got a really good friend down in Boston who introduced me to you, and shout to Joe and Karen, and they actually have been following you since literally your first episodes.

Robb: Wow. Awesome.

Anthony: I think you actually saved their fertility. They struggled -- Well, you/Paleo. They struggled with infertility for ten years. They've got a boy now same age as my youngest boy. Like I said, shout out to them because I've actually become a fan of yours over the years now from those guys. I appreciate what you're doing.

Robb: Awesome. It's funny when we were running our gym, not as a first day intake but a little bit in we would chat with people and like, "Hey, when you start eating this

way and you start exercising, people become really fertile." And people were like, "Yeah, I tried to have kids. No big deal." We had women that had gone through the full IVF deal and all that and they're like mid-40s and all of a sudden they're pregnant and they're like, "You weren't kidding." It's pretty incredible what getting sleep, food and exercise dialed in can do for you. It's pretty crazy.

Anthony: I know. I actually get a lot of testimonials with my work regarding fertility too because it's really weighed down these days.

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I mean, it goes beyond just the diet because a lot of these estrogen chemicals are suppressing fertility, men and women, and that's one of the reasons I got interested in it to begin with. It's just such a big -- It's such an ever increasing problem. Just like breast cancer. I mean, breast cancer is up 250% since 1980. All we're doing is passing out pink ribbons, raising awareness.

It's like Bill Burr says, dressing up football players like newborn baby girls isn't solving the problem there. We need to look and see what's the real issue. We've got all these estrogen mimicking chemicals. I call them estrogens. Some people call them xenoestrogens. They're all over the place. They're pervasive. They're causing a lot of health problems. I'm putting that together and I put that book out, Estrogenation, on this and just trying to help people get healthy.

Robb: Doc, let's put a little bit of maybe background and framework into this. Clearly, estrogen, for both male and females and throughout, I think, the totality of vertebrate physiology, we have these hormones in action, some variation within different critters, but they're really important. They're important within certain upper and lower bounds. There tends to be a pulsatile characteristic to them. What is the ancestral norm with regards to estrogen and then how have things shifted over time? Where is this all going sideways?

Anthony: Well, what's really interesting, you'll probably find this more interesting than most, is estrogen -- Well, testosterone, actually, has been decreasing for thousands of years. We know that because of the bone structure changes, are becoming more feminized. There's subtle differences. I'm not an expert in that but that's what I read.

But what's really crazy is the testosterone has recently just tanked since probably the '80s. I mean, the average testosterone, even in the '20s when we are very first able to measure testosterone, it was almost double what it is today. In the '80s it was probably 500, was the average male. In the '90s, it was about 400. In the 2000s, it's about 300. That's what you are seeing now

Testosterone and estrogen are intricately connected. Obviously, I read a lot about that. But just to give you guys some range, to give you and your listeners some range, estrogen in men is about 20 nanograms per liter. It fluxes a little bit but, I mean, plus or minus ten, plus or minus 20, whatever, 20. Women also have about 20 nanograms per liter, which certainly surprises you a little bit, but they range up to about 400, 20 to 400 depending on the time of the month.

It's really not that different. Most people intuitively would think it would be in the thousands. We're talking about nanograms here, meaning, ten to the minus ninth grams. That's a really difficult thing to measure, takes really precise technology to measure that. You can throw that balance off pretty easily with artificial estrogen mimicking chemicals which now we're seeing and we can talk specific ones but we're seeing them in the thousands.

For example, Atrazine is one. It's an herbicide. It's the second most used herbicide in North America. The legal allowable level in your drinking water for Atrazine is 3,000 nanograms per liter. I specifically translated the units back to nanograms per liter because that's what estrogen, that's how we measure estrogen. Sometimes doctors use pictograms per mil but that literally translates exactly as nanograms per liter.

You don't want to get caught up in the units. It's basically men have 20 and then we're drinking 3,000. And, yes, you see health impacts from that. In some people it's more so than others. I do genetic analysis to help people decipher that but the fact is we're all affected at some level when we start drinking those kind of levels or we're eating it on our grains.

Robb: Right. Doc, help me with this a little bit. This maybe gets out into the weeds a bit. But in one of the things about medicine that's made me as a chemist a little bit crazy is nanograms doesn't really tell me how much is there versus nanomolar. When we're talking about a molecule to molecule equivalent, do you know off the top of your head what that looks like? If we were to put it in a general unit of if 20 is equal to one unit of estrogenic potential, how much then does that Atrazine represent? Is it five units or--

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Anthony: Yeah. It's hard to--

Robb: And this is maybe something we could do post show. Okay.

Anthony: No, no. I think it's a good -- It's a great question. It's a question a lot of people have because it's real practical. It's like, well, if I drink 3,000, is it actually having

as much impact as if I'd literally was drinking 3,000 nanograms per liter of estrogen?

Robb: Right. And then my other question, we have this molecule by molecule equivalent and then also the other question, is it a stronger binder of the estrogen receptor, a weaker binder in estrogen competitive inhibitor? What's its mode of action there?

Anthony: The ones that I'm interested in are the ones that activate the estrogen receptor and generally give an estrogenic response. Sometimes that's different. Scientists oftentimes they consider the gold standard to be uterotrophic assay. Meaning, they measure the weight of the uterus in the animals that they dose with these things. The problem with that is even that varies. The receptors vary there.

We actually have alpha and beta estrogen receptors and then we also have another one called the estrogen-related receptor. I recently gave a talk at the Mayo Clinic here about the estrogen-related receptor because BPA also binds and activates that one. I mean, it gets complicated honestly. It hasn't really been worked out. I wish I could say I knew exactly what the equivalents are for all these different estrogens.

There's a lot of different ones and the ones I tried to highlight are the ones that you see the most estrogenic impact like the increase in breast tissue development. Yeah, sometimes the uterotrophic assay. But I want to see the direct binding to the receptor. I like to see those assays. I'm a biochemist. That clues me in that it's activating the receptor. Then we can start looking at downstream activation. Soy is a big one, phthalates, BPA, all these plastic chemicals. It's hard to say though. It's a great question. I wish I knew really clean cut answer for you.

Robb: At least on the molecular weight side, ironically, they're almost the same. Atrazine is 215 grams per mole and estrogen is 272 grams per mole. It's remarkably close. You could at least like a molecule by molecule basis make a case that nanogram equivalent is pretty darn closer, even a smidge more number of molecules of Atrazine versus estrogen. And then, I guess, to some degree, the question then is how potent of an activator they are.

But many of these xenoestrogens or estrogenic compounds have a higher affinity than biological estrogen. Could you talk a little bit about that? Maybe walk people through the release of estrogen, how it's mobilized for the body, how it's cleared, the toxicology a little bit, and then we can compare and contrast with something like Atrazine.

Anthony: Estrogen, of course, is a sex hormone and a steroid hormone. What that means broadly is it's made from cholesterol, just like testosterone, just like some of these other sex hormones. As you know, butter floats on water. Cholesterol floats on water. Estrogen floats on water so it can't get throughout your bloodstream because your blood is aqueous. It's like water. What it has to do is it has to ride on this protein called SHBG. I call it the limo service for the sex hormones, SHBG, sex hormone-binding globulin.

There can be a little bit of free estrogen, little bit of free testosterone in your blood but not too much because it would float. It's riding around the limo. It's riding around in the blood on SHBG. Of course, it can be released into cells. That's how it acts. But going throughout your body, you have these little receptors sticking out. I know you know this, Robb, but it's probably worth just telling the story from the beginning so listeners can pick up on this.

You've got receptors on different cells. And leptin is a great example because leptin is not -- it doesn't have receptors in every cell in your body. There's real specific areas, for example, in your brain that have leptin receptors so when you eat food, fat cells secrete leptin, goes throughout your blood just like estrogen going throughout your blood, but it goes into your liver. It comes out. There's no receptors there.

It goes into your kidneys, it comes out. There's no receptors. But when it hits your brain, it sticks. There's receptors there. So, it's cruising around. It gets to your brain, boom, it sticks, tells you to stop eating. Satiation hormone. But estrogen is unique and so is testosterone because there's receptors all throughout your body.

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You've got them in your liver. You've got them in your muscle. You've got them in your brain. So then you cease depression. You start saying depression increase in association with an increase in BPA exposure, for example, in children. And so those are the really brief broad big picture here of how this system works. And then, of course, these xenoestrogens, these artificial estrogens, they ride that same SHBG hormone including birth control, by the way.

That's one of the reasons your body starts to -- the physiology changes. These things cross talk with each other. SHBG levels change, testosterone levels change, natural estrogen levels change. In a complex system like in human, there's a lot of variables in terms of which chemicals are broken down, which ones are staying in your body longer, how they affect the natural hormone levels.

Sometimes, they affect other hormones like thyroid hormones, like soy, for example. It gets complicated really fast. For the lay person, and I really wrote my book for the lay person, I try and focus on what are the practical implications and maybe which ones are the worst, but more important, which ones are we exposed to every day, the daily exposure. Because, yeah, Agent Orange disrupts your endocrine system. Agent Orange can disrupt your testosterone, estrogen balance. But we're not exposed to Agent Orange, you know what I mean?

I don't focus on Agent Orange in the book, of course. But Agent Orange is a great example because you don't see that many impacts. If you give somebody Agent Orange and you say, "Well, let's see what happens. Give him 20 nanograms per liter." You don't really see it. But you see it at the epigenetic level and then ten years later, three decades later, whatever, you start seeing the impacts. That's what really got me interested and excited about this because epigenetics are really what's driving this, the long term changes.

The fertility is the premier example because in animal studies you can do long term multigenerational studies and I'm sure you remember the publication back in the mid-2000s probably that showed epigenetic transgenerational inheritance from BPA. There was fish studies and then they came out with mouse studies. I met the guy who did that study. His name was Michael Skinner. He even gave a Ted Talk on this. I ate lunch with him at the Mayo Clinic.

He's really pessimistic about the whole thing, just basically saying we're all exposed, we're all screwed in the long term for this. But then it was funny because his daughter is pregnant. He got a 20 something year old daughter. He bought her a \$5,000 whole house filtration system. He's working on it. He's doing what he can. I think there's cheaper ways to eliminate the vast majority of these estrogen chemicals but I think a lot of people are underestimating the epigenetic impacts because it's relatively new science but also because it's not that motivating to say, "Yeah, 30 years from now you're going to have massive health problems." But frankly, that's true.

Robb: I was just chatting with some folks and they were talking about some food reactivities. You eat a food on Monday and you may not actually experience negative reaction until Thursday. That's devilishly hard. And the negative impact may last for three weeks or something like that. It can be really hard to unpack what's going on. Do you have a sense of what the acute issues might be versus five-year versus 20 years? What might people experience today and then what maybe is the manifestation of exposure during -- I'm 46 years old. What could potentially be manifestations throughout my life living in this industrialized world?

Anthony: Did you hear the episode with Joe Rogan talking to Jordan Peterson a few weeks ago?

Robb: That's the one I'm thinking of, yeah. That's the one I'm thinking of.

Anthony: That was fascinating, right? So the listeners, the last half of the episode, he was really going into it. Man, that's interesting stuff. I see that frequently with a lot of people including myself because I'm really gluten sensitive, I think, like you are. I think you and I have a similar situation. My wife can get away with a lot and I can't. I'm a lot more sensitive, a lot more observant with this stuff.

The stuff that you see with these artificial estrogen chemicals, that's imminent. Usually it's things like fat gains. You do see obesity. It triggers, the estrogens, normally they act in your nucleus, which is one of the reasons there's epigenetic modification because epigenetic means marks on the DNA.

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I mean, there's other epigenetic modifications, as you know, based on histones but just in really simple terms epigenetics means marks on top of your DNA. Estrogen, because when it binds the receptor, it literally goes through the nuclear membrane, nucleus has its own membrane, estrogen binds receptor, goes through the nuclear membrane and acts on the DNA but it can also act on a protein called PPAR gamma, which acts like a fat switch. It turns on fat signaling in cells.

Effectively, it's telling cells, "Store fat, put more triglycerides into the system because we need more energy here." There's a lot of drugs out there that are PPAR gamma inhibitors or activators. They're manipulating that system, the PPAR gamma system. They try and manipulate fat stores. It's not super successful because sometimes they increase fat but they improve your metabolism, which is weird.

But I don't want to go down that rabbit hole too far. The point is, that's one of the big -- Man, excuse me about my voice, by the way. I keep having phlegm here. I was just eating. That's one of the reasons you see the fat gains and that's one of the imminent things with these estrogens. The other one is low testosterone. You can drop your testosterone pretty quickly with estrogen exposures, artificial estrogen exposures.

You see breast cancer but, yeah, that probably takes a long time. You see depression, blood clotting issues. There's a lot of diverse things. I think it's interconnected. There's immune system issues too. You can see immune system issues immediately in some people when they take birth control but then other

people it takes ten years of constant exposure to birth control before you start seeing weird immune system problems.

It varies based on the person how their cells respond. Honestly, I think what their parents ate and what chemicals they were exposed to as children. That's hard to quantify. It's impossible really. But you can have clues. A lot of people consult for, they have these weird symptoms. Their genetics doesn't explain it. I'm looking through their 23andMe data, just digging in deep, trying to find some reason they've got all these estrogen like problems.

We eliminate all the estrogens, all the artificial estrogens. They still have problems. And then I ask them, "When your mother was pregnant, was she prescribed a drug called Diethylstilbestrol, DES? And they say, "I don't know. Let me go ask." They go back and ask and, yeah, their mother was pretty commonly prescribed this. They were prescribed this drug back around 1980 and it was a morning sickness drug but it acts like estrogen and it's a similar problem.

You didn't see health issues for a lot of years and probably zero, you didn't even see the health issues in the mother but then you start to see it in the daughter. Now, it's illegal because of the health issues they've come across with that drug. We'll find that. We'll find a lot of parents that were using Diethylstilbestrol. And other examples like that. Sometimes you see immediate problems, sometimes you see long term problems. Hard to predict. Probably it's accumulation of epigenetic changes over time.

The research is pretty young. I mean, epigenetic research is expensive. It's young. There's not a really high throughput assay, like 23andMe type thing. I would love to see that but it's not there yet.

Robb: It's interesting so much of our diet and lifestyle shifts -- We have multiple vectors. If we just ignore the estrogenic compounds themselves, which can enhance adiposity and fat gain, just our diet and lifestyle changes tend to shift us towards a more estrogen dominant profile because we have more fat mass. That fat can convert testosterone and estrogen. This is germane both for men and women.

And the you overlay an estrogenic environment on top of that, like even if we pulled all the xenoestrogens out of the environment with a wave of magic wand, if we're still eating, not sleeping, not exercising in the way that we're currently doing, we've got a shift towards an estrogen dominant physiology. And then you overlay these xenoestrogens and you've got a hell of a downward spiral.

Anthony: I think that's true. That's something I probably forgot to mention earlier when I said these things, we've seen testosterone dropping over thousands of years



now but in the last couple decades we've seen it really tank. I think it's a combination, for sure. You get the fat gains, you get the lifestyle changes. Because a lot of people are interested in the testosterone question too.

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Why is it dropping? Is it all because of these artificial estrogens? Is it lifestyle? Yes. The answer is yes to all of that stuff. I'm trying to work out a book on testosterone right now because I started looking into minerals and how they impact testosterone and I was surprised a lot of these micronutrients, they actually decrease testosterone. I was surprised and I said, "Well, gee, I got to research this."

And then I started doing the deep dive in every single micronutrient and then I found out that gut bacteria impacts your testosterone, like LPS drops it. If you've got a leaky gut and you got LPS in your system, which a lot of people do, then they're dropping their testosterone from that. And then I also found out that cold immersion type stuff drops your testosterone, which a lot of people, I think, tend to side with the opposite view.

But if you're actually measuring it, people like, for example, that work in freezers and they've done studies on people that work in cold rooms like four degree Celsius refrigerators, their testosterone is crazy low chronically. I mean, yeah, maybe people should watch out for some of that stuff too. I think in general, if you're exercising, you're eating healthier, you're flushing a lot of these things out of your liver a lot better. You move your bloodstream, you move your body.

But as we age, there's also detox genes that drop. I mean, that's why we get gray hair. Our body just doesn't clear stuff as well. Hydrogen peroxide is a good example. Any of these toxins. They might not be as visible as a gray hair but your body is not pushing them out as quick. You want to be more cautious as you age. And then there's the stem cell question which is at younger ages we're impacting our stem cells and that's having a long term impact, which I'm also investigating right now in labs at the Mayo Clinic.

Robb: Man, just on the stem cell thing, the medical procedure of clamping immediately after delivery and it basically limits the amount of blood and stem cells the babies get and, yes, that's setting stuff up at a really terrible situation, at least potentially or in theory. I don't want to go too far down this rabbit hole but it's really interesting.

You listened to the Jordan Peterson interview. You're probably familiar with Dr. Shawn Baker and this whole carnivore diet story. It's interesting you mentioned that potential overabundance of micronutrients could actually be antagonistic to

testosterone function and a lot of folks who go keto, and in particular going towards this carnivore diet, on the one hand, there's this concern about a paucity of nutrients and ending up with nutrient deficiencies.

I got to say I'm not really seeing that in these folks, not the same way that I would with a vegan, for example, with some of these B12 and zinc issues and what have you. But again, all that stuff is new. Could this even in a transient level be part of the reason why folks are seeing a performance enhancement with keto, carnivore...?

Anthony: I think so, yeah, for sure. I mean, the B vitamins themselves are unique with testosterone. I'm literally looking through my folders right now in my computer because I don't want to say something inaccurate and I've got all this information on B vitamins relative to testosterone. But, yeah, I was just consulting with somebody yesterday who was a vegetarian, maybe a vegan.

It's interesting because her genetics were exceptionally good for being a vegetarian and that's really rare. I think most people have a lot of genetic issues with their B vitamin metabolism whether it's B12, B6, whatever B vitamin. But, yeah, you definitely move away from those issues when you start eating meat. Yeah. Retinol. I'm looking at my little spark notes version that I created for myself.

Retinol decreases testosterone. Lycopene, at least in animal studies, decreases testosterone. I mean, a lot of these vitamins. Like I say people assume they're increasing things. And the studies could be hard to find like the dose response to studies where they just give more retinol and more lycopene or whatever. Obviously, I think when there's a complete absence of nutrient like when they did these studies where they have just total void, just complete lack of whatever vitamin, yeah, you're going to see low testosterone.

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You're going to see low everything. You're going to see health problems across the board. If you compare normal people to people with really high levels of certain micronutrients, it's surprising. It's surprising how much impact, what impacts they have. And actually with the carnivore, I don't often see the high testosterone. With Paleo, I certainly do and the keto.

Keto diet is really conducive to high testosterone. A lot of people attribute that to the cholesterol that's there, which is probably legitimate. A lot of people contribute it to low LPS levels but that's tricky because fat can increase LPS.

Robb: Translocation.

Anthony: Yeah. I think there's a lot of really cool questions that are just coming up out of a lot of this stuff. I'm glad people are doing it. The jury is out a little bit. One thing that Sean Baker and I disagree on is where you get your meat. I think you really should get it -- I think people really need to focus on grass fed healthy animals that are out in the pasture like buy half a cow or something. That's what I do. Or just shoot it yourself which is also what I do, at least for the venison and moose and whatever.

The Atrazine in the bloodstream of these cows, it's crazy the levels, the feed lot cows I've got to study. Yeah, I mean, there's other factors too. I brought up Atrazine before but we haven't talked about mold estrogen. There's a mold chemical called Zearalenone, ZEA, zearalenone, and I mean, that's -- Just imagine the people are getting exposed to pretty high levels of that with the grains. But imagine what the cows are getting because they're certainly not giving them pristine grains.

That ends up in the blood without a question. I want to say with the Atrazine, it's 70,000. Actually, it's 700,000 nanograms per liter of Atrazine in the blood of feed lot cows. I don't have my book in front of me right now but almost positive because, yeah, it's like a shockingly high number. It's like, yeah, sure, it's in the fat. It's in the bacon. You got to be careful what fats you're buying, what oils you're getting. The estrogen chemicals that are in those fats especially if you're on keto diet. But it's even in the red meat, I think. I think people need to be aware of that. I think people need to watch out and place a bigger emphasis on eating good quality meat. That yields a lot of studies.

Robb: It's interesting because I've always advocated for grass fed meat, pastured meat for sustainability reasons, ethical reasons. I'd been a little bit nonplussed to health potential beyond that but I had never thought the xenoestrogens--

Anthony: Yeah, in Europe, they regulate Zearalenone. They have real strict limits on the legal allowable limit. Not only do they regulate how much Zearalenone -- Again, that's the mold estrogen. That's one of the reasons mold is so darn toxic. It secretes this chemical that imitates estrogen in your body. But not only do they regulate Zearalenone in human grains, the breads and all that stuff, they regulate it for animal feeds in Europe. And guess what the legal allowable limit here in the USA for Zearalenone? They don't have one.

Robb: I wouldn't even venture -- They don't have one. That was initial thought was there is none.

Anthony: This is a true story. Sometimes they don't pass inspection with the animal feeds for Zearalenone and they ship it over to the United States which is because the

mold estrogen is too high in the grains. Gosh. And then, again, that doesn't even go into what these animals are eating, how that's affecting our bodies. I think with the keto diet, I know you're doing a lot with keto recently, and I always try and cycle in keto here and there, but when you're eating a really high fat diet I think you're really especially need to be careful.

Bacon is a great example because these things definitely store in the fat. I mean, yeah, they cause fat, they stimulate fat, but they also store within the fat cells so that's a constant trigger. I call it the estrogenic paradox in my book because they're triggering fat storage and they're sitting there in the fat. They store in the fat. In fact, they've recently done studies with the radioactive molecules and they show that fat cells, the average life span of a fat cell is a year and a half in humans.

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But they can find fat cells up to ten years old. It can be difficult to get these out of your fat cells but also the animals. When we're studying things like bacon in the research lab, we're feeding some animal like a rat or something bacon and we're finding metabolic disorders or whatever, we have to wonder how much of that is estrogenic related, artificial estrogen related, how much of that is actually with the bacon. I think that a lot of these studies are skewed with estrogenic chemicals. They're stored in plastic too including these vegetable oils they're giving them.

Robb: Right. Are there any plastics? Even a jar of mayonnaise, it's in a plastic container. I try to buy glass containers with any type of oily substance but is there any type of a plastic that they're using in food manufacture that is safe from an estrogenic perspective?

Anthony: Styrene is one. When you go to Dunkin Donut's, they have these paper cups coated with BPA, those little paper cups at Starbucks for the small coffee, but then if you get the medium you get the Styrofoam cup. Styrofoam does not have estrogenic chemicals but it apparently has carcinogenic chemicals and it's pretty bad for the environment. I don't usually advocate people use Styrofoam.

But plastics number two, four and five are pretty good in terms of estrogen. And I go through all this in my book. There's seven different numbers. The recycling assembly, you see the little arrows that make a little recycling symbol like a triangle, usually it's at the bottom of the container. Plastic number one stands for Polyethylene terephthalate and I emphasize the word phthalate because it's full of phthalates.

A lot of people, including scientists, they don't want to admit that. It's just like BPA. When BPA was first being manufactured in plastics, everybody was saying, "Oh, there's no such thing as BPA in the product. It doesn't leech." Because it's all linked together. Because what they do in the chemistry is they link these molecules together, make these big polymers. But there's always free molecules of BPA. There's always monomers.

That's a technical term but, basically, you'd get leeching. It's inevitable. Phthalates is the same thing. Plastic number one is by far the most common plastic these days because it looks amazing and it doesn't smell. It tricks your senses into thinking that you're good. Including the juices, by the way, which makes you wonder how accurate are the juice studies when they're doing juice studies on animals and how much of that is estrogen related.

But, yeah, I worry a lot about plastic number one. Plastic number seven is BPA or BPS or other BP, bisphenol analogues. That's something a lot of people don't realize too is that just because it says BPA free doesn't mean it's okay. It could be BPS, it could be bisphenol S, which there's publications that looked up at estrogen receptor activation and say, "Hey, this is just as estrogenic." There's a whole backlog of bisphenol analogues. There's BPAF, there's BPF, there's a ton of them.

Robb: They can just shift the -- Like what folks started doing with the performance enhancing drugs. You tweak one little element of it and then it's a brand new so you're free in a way at least for a while.

Anthony: That's right. Sometimes it tricks your body, your liver and stays in your body even longer. That's even worse, but at least they can say BPA free. And the reason they really were motivated to do that is because the Federal government has done nothing with BPA to make it illegal. And so 17 states have come out and made BPA illegal at least in children's products like pacifiers and things.

There's a recent study that just came out showing high levels of phthalates in those same children's products, the teething rings and things. It's a real problem because I think these things frankly just need to be made illegal because I've talked to people from Dow Chemical and other places at New Jersey and talked to actual people that worked at these facilities, real high PhD level, high functioning people, experts.

They say, "Hey, man, we would use alternatives. They're out there. There's a lot of them. They're great. But it's one cent cheaper per plastic bottle or whatever. And that one cent puts us out of business when we're competing against this other company. We have to use them."

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I think as consumers right now, at this stage, we just have to educate ourselves and say, "Look, I'm going to avoid these plastics that have phthalates and phthalates, yeah, they're worse than BPA." If you dig into the research long enough, you'll realize that it's not a good alternative. You're probably harming yourself more. They're super estrogenic. And, of course, you can find conflicting research.

I wrote a whole chapter on that in my book because soy is another great example of conflicting research in terms of phytoestrogen. I think a lot of that is driven by corporations. You can make a conflict out of anything. When there's money to be made you're going to find conflicting research but I think to sift through that you have to look at the big picture and be skeptical.

Robb: With soy, and it's been a long time since I dug into that, but my sense is that the apparent benefit in some cases with some of these is that they may work as a competitive inhibitor, a weak binder of the estrogen receptor so they're actually protecting you, in air quotes, from an overlay estrogen rich environment but it's at best a band aid and it might have all kinds of knock on effects, and I might be completely wrong about all of that.

Anthony: No, no. That's a great insight. I think you're absolutely right. Well, there's part of it is that and part of it we're not doing epigenetic studies, at least we haven't been. Number two is that soy at least is natural enough where the gut bacteria have seen it and they can break it down and they're happy to break it. You got a great gut you're going to breakdown that phytoestrogen. You're going to break those down. They're not going to spike your blood that much.

And then you end up with these byproducts that are actually healthy in a lot of different ways like aglycones and things. Flax is another great example because flax and soy are the two plants that have just really outrageously high levels of phytoestrogens. They've done studies, Robb, where they looked at over 100 different food items in plants and literally all the food items were under 1,000 micrograms per 100 gram of phytoestrogen. Under 1,000 except for soy and flax, and those were over 100,000.

In other words, it's night and day, night and day between if you're comparing soy and flax compared to all the other foods. Black beans, some people, like vegetarians and things, they try and tell me black beans also have phytoestrogen or chickpeas or whatever. Yeah, chickpeas have phytoestrogen, nine micrograms per 100 grams.

Robb: Versus 100,000.

Anthony: Exactly. Soy has 120,000. You got to have a damn healthy gut in order to break that stuff down. The gut bacteria break lignins. They enjoy eating lignins from flax but, man, if you get that stuff through your system it's going to act on you estrogen receptor sometimes in unpredictable ways. And then the recent argument put forth by the vegans, and I won't mention any names, but there's this idea that, okay, we have estrogen receptor alpha and we have beta receptors. We have two different types of receptors.

The soy estrogen, and they cite this paper, the soy estrogen, the phytoestrogen activates just the alpha receptor. And so that improve -- but it doesn't activate the beta receptor, or vice versa, I can't remember which one. It only activates one of the receptors and the one it activates is not the one involved in breast cancer. That's how the argument goes. But it's involved in all these health properties because estrogen is healthy, natural estrogen, to some degree.

You don't want too much of it like anything else but, obviously, you want them balanced, a balanced amount, and in certain ways it's healthy. But the problem even with that argument is, number one, the paper that they cite to make that argument, the estrogen receptor alpha versus beta activation, is they have another figure in that same paper that showed the exact opposite, literally, with the different cell line. It's completely inconclusive.

You can cherry pick research all day long. You pick out one cell line and it's going to activate the alpha and then you pick out the different cell line, it's going to activate the estrogen receptor beta. You can go down rabbit holes like crazy and I have because I debate a lot of these people, not publicly, but at scientific meetings and things like this. You can cherry pick but the crazy, the other crazy thing about if it's only activating the beta receptors, those are really high in your testes so you're going to expect to see a lot of male infertility.

**[0:45:00]**

There's going to be impacts from that too. Almost no matter how you side, if you've got poor gut bacteria you don't want to eat a lot of soy. I mean, that's my take home.

Robb: Right.

Anthony: Yeah, everybody wants great gut bacteria and exactly what that means and how you go about achieving that, I mean, that's a complicated topic.

Robb: Super complicated, yeah. I'm still trying to figure that out.

Anthony: Yeah. Everybody is, I think. But you have an intuitive sense too. You know if you've got mediocre gut bacteria or gut lining. Some people, if they've got an iron gut lining, they know. At the end of the day, I still think you want to avoid artificial estrogens because that epigenetic thing just keeps coming up because who knows what's you're doing to yourself in the bigger picture in the long run and what you're doing to your children?

And most people are overlooking that what they're eating impacts their children before their children are even born. And the stem cells. They carry that stuff a long ways. Your gut has a lot of stem cells but so does the rest of your body and you modify those stem cells and you're going to -- It's going to take a lot of years to reprogram and get healthy.

Robb: Doc, what are the major vectors of estrogenic input? You've mentioned some dietary factors. I hear a lot about cosmetics and shampoos. I assume things like new carpets, indoor living in a building and all that stuff. What are the major vectors that we're getting this? It sounds like also herbicides of various kinds.

Anthony: Yeah, for sure. In fact, there was a recent study that showed that glyphosate with soy just really exacerbate the estrogenic impact. But Atrazine, I think Atrazine is a lot worse in terms of how much estrogenic effect it has. It even feminizes frogs at 200 micrograms or nanograms per liter. They call it reproductive abnormalities a lot of times but if they're being honest they'd call it male feminization in the scientific literature.

But, yeah, I think you're absolutely right. Most people don't realize a lot of the carpets are made of phthalates, Polyethylene terephthalate. You can buy the nylon carpets and, of course, you can buy a lot more expensive ones made of wool. Nylon is fine. I've looked into it. Yeah, it smells like chemicals. You probably want to go through it with a carpet cleaner, rent one of those carpet cleaners and get a lot of those chemicals out of it but at least it's not made up of phthalates and it's going to be constantly leeching phthalates.

They've done studies on cars, the new car smell, and shown that's high in phthalates and Benzophenone, which is another estrogenic chemical found in sunscreen, by the way, which was just made illegal in Hawaii because it's killing off the coral reefs. It's also been made recently illegal in Australia. I've been working with people over there because it's killing off coral reefs over there. It's real clear.

I feel like my books have a big impact in that regard because I don't even think the word Benzophenone was on people's radar and it's super estrogenic. It's an estrogen chemical. In sunscreen they usually call it oxybenzone but that's just another name for Benzophenone-3, BP3. Frankly, you got to filter your water



and not store it in plastics. The phthalates are really high in a lot of these personal care products, just like you said.

You don't want to be rubbing them on your skin. They do go through your skin. I've had people try and tell me they don't based on molecular weight arguments but then I looked up molecular weight and I looked up studies and it's the opposite. I mean, these things go through your skin including the sunscreens. There's great alternatives. It's not something that's super expensive to go out and get zinc sunscreen and use that. It's natural. It's not harming the bacteria on your skin, hopefully.

Another one is linoleum. A lot of these linoleums have phthalate. I don't like the laminate type floors, the phthalates, these fake, I don't know -- even the couches. And then a lot of clothes now are made of phthalates. They're made of polyester. It's frustrating position to be in. I think you have to just pick your poison and say here's where I draw the line. I got to get the big ones out of my life that are easy like filtering your drinking water, buying some reasonably healthy personal care products so you're not rubbing it directly on your skin every day. I actually put together a little thing on my website, [ajconsultingcompany.com/whatiuse](http://ajconsultingcompany.com/whatiuse).

**[0:50:05]**

I don't make any money from any of those products but if people go there they can literally see the products I use because I find -- Because I've done a lot of research. It doesn't mean that's exhaustive. It's not an exhaustive list at all. It's a list of the products I use and I've done research and they're fairly cheap. I don't try and find the most expensive ones and then try to recommend those to everybody. I literally try and find the cheapest ones that don't have this crap.

Robb: Doc, what about cookware?

Anthony: There's issues with the non-stick coating. That kind of supersedes the estrogen, these perfluorinated compounds. I was approached by an MIT friend of mine. He's a PhD from MIT and he wanted to write a book just on that topic, the perfluorinated compounds, because there's a huge issue there too. But at least it's not estrogenic. My thing is, yeah, it's toxic. Don't get the non-stick coatings. But it's not going to change your epigenetics as far as I can tell and impact your health for ten years, you know what I mean?

You'll probably increase your risk for cancer in some of these other things. That's another frustration of mine. I mean, all these shenanigans we have in America, you don't see it in Europe. Even the Chinese have stricter limits on -- they have stricter regulations on Parabens and some of these other chemicals. It can be

frustrating. In fact, we regulate some of it. We force companies to spray anti -- flame retardants. We force them to spray flame retardants on children's clothing.

In Europe, those same exact perfluorinated compounds, those are illegal. They're not even allowed to use them and here they're forcing companies to spray them. There's some stuff you can get worked up about but I think the best approach is to be self-educated and do the things that are easy, that aren't that expensive, that have huge payoffs.

And for people that wonder if there's a list, yeah, my book has -- I have at the end of my book, last chapter, I have gold, silver and bronze plans for avoiding estrogen. If you're in college, you don't have any money, you follow the bronze plan, you get rid of the really big ones, the big sources of estrogen. If you're like a pro-athlete, and I do consulting for pro athletes and things, you want to follow the gold plan. You don't want any of these estrogens. That includes the carpets and the linoleum or whatever. You get really extreme. For the average person, maybe you want to hit the silver plan and just get the big ones.

Robb: Doc, you've mentioned a couple of times that the healthy gut is going to be a really important piece to mitigating this whole story. What about things like milk thistle, alpha lipoic acid, enhancing all those detox pathways? Do you have any supplement or food recommendations that help in the detoxing clearance of these xenoestrogens?

Anthony: Most people go to Diindolylmethane called DIM. I mean, for some people, that works. In general, I don't make global recommendations on that stuff because some people DIM increases their estrogen. They're using it to decrease it. And there's clear studies on that. It's just such a dose-responsive thing and it's unique. The best thing I think for the lay person is a sauna, frankly.

They've done studies where they do skin patch, literally like a nicotine patch except without the nicotine, they put these on people and then they have them sit in saunas and then they have groups of people that don't sit in saunas. And you sweat out BPA. You sweat out phthalates. You sweat all these -- Again, they store in your fat. And your skin is pretty fatty. Most people don't think of it that way but at the molecular level it's fatty.

Saunas are just phenomenal. With the gut bacteria specifically, it's interesting because sauna increase heat shock proteins. Gut bacteria, most people talking about that, they don't even think those suckers have heat shock proteins. Those things actually have a lot of these similar benefits and you actually improve your gut bacteria just sitting in the sauna. That can increase your testosterone if you improve the gut bacteria heat shock proteins. It's kind of a long--

Robb: It's a circuitous route there.

Anthony: It's not like a super connected story but it's true. It's a true story. I think the easiest cheapest way to get rid of them, if you want to do something like that rather than -- I mean, yeah, take supplements and balance your supplement.

**[0:55:05]**

Because choline, for example, is a really good epigenetic regulator. You've heard of choline, CH. I feel like not pronouncing it super crisp. In eggs, right? And then you also get the B vitamins are excellent epigenetic, positive epigenetic regulator. And actually so is sulforaphane. It's one of the reasons Rhonda Patrick talks about it so much and one of the reasons I like it so much and a lot of people are utilizing it especially if you use it from broccoli sprouts rather than just supplementing it.

It's a positive epigenetic regulator. Meaning, that it improves your epigenetics. So does exercise, of course. A lot of things. I think, just in general, having a healthy lifestyle and overall healthy diet is the best way to improve your epigenetics and reverse these changes.

Robb: I'm taking notes here, sorry. That's awesome. It's funny the sauna topic just keeps coming up again and again with just a host of different issues. My wife and I just the other night, we're looking at our bedroom and we're like, "Okay, we can get rid of that dresser and that bureau and then a sauna could go there and we need to rewire the 110 for a 220 outlet." We've been really motoring towards that but it's basically going to be like, okay, we're absolutely doing this.

Anthony: That's awesome.

Robb: Dr. Jay, this was mind-blowing. This was literally one of the best podcasts I've ever had. Would you be game to come back on in the future when you are getting ready to release more of the work on the testosterone book that you're tinkering with?

Anthony: For sure, Robb, yeah. In fact, I'm even doing stem cell work at the Mayo Clinic right now on infrared in stem cells. I'm trying to reprogram stem cells. Just looking at epigenetic regulators.

Robb: What type of duration do you need under infrared lamp?

Anthony: That's a good question. I think it's just like anything else where you don't want to overdose. You can actually cause harmful pathways. But, actually, the Joovv

company gave me an infrared unit and so I've been working on that. We do what's called an RNA-Seq, next generation sequencing, which is instead of sequencing the DNA we sequence the messenger RNA, all 25,000 genes, and then we look for increased changes in epigenetic regulators. A lot of interesting stuff. It's funny that it all ties together.

Robb: Yeah. It's cool because that big broad brush stroke approach of heal the gut, find the diet that works for you, get appropriate exercise, I mean, those are still the big ones and then depending on what your situation is, like you said, I really like that gold-silver-bronze approach of what degree of buy in you need. If you're really, really sick you might need -- Or the flipside, there's the funny things. The two brackets of our population, the elite athletes and the very ill, they have to really tightly manage what they're doing if they want to get the results that they want. And if you're a little bit more on the middle of that, you've got a bit more latitude with what degree of neurosis you want to do with it.

Anthony: That's why I'm so glad you do what you do because the Paleo principle is basically what you just outlined there including -- That includes eating like your ancestors would and avoiding artificial chemicals that your ancestors would have never been exposed to. And so it's the perfect -- It's been a great model for a lot of people. It's changing a lot of people. I think it's the perfect model. It's just a question of what is our ancestral optimal outline or whatever.

Robb: Right. Yeah. Well, Doc, we could do 20 of these shows and I suspect not even scratch the surface but definitely want to have you back on in the future pretty much carta blanche, like any time you want to come back. Just let me know. We do this with Dr. Michael Ruscio. We just run across a few folks that are right at the cutting edge of both the research and the clinical application and I find that those people are just both balanced but also Johnny-on-the-spot with regards to what the science is and is not telling us and then also some practical takeaways for what we can do.

So, would love to have you back on the show. But before we wrap up here, remind people about your book, where they can find you on the interwebs, all the pertinent information, and we'll make sure to get that in the show notes.

Anthony: Yeah, thanks, Robb. I just remember. I just realized I didn't even answer your question on the sauna. I think 11 minutes. You got to have at least 11 minutes, between 11 and 20. It just hit my brain and I said I got to say that because people are going to wonder. Between 11 and 20 is the sweet spot for decreasing all cause mortality based on a 20-year study.

[1:00:09]

Robb: Okay.

Anthony: Where people can find me--

Robb: I have a Joovv also. So, I get dialed in on that.

Anthony: It's amazing because it makes me feel tingly. It gives me that paresthesia. If you supplement -- Have you ever taken beta-alanine supplements? You got that paresthesia feeling. I get that but my wife gets nothing. She just sits there for ten or 20 minutes, gets nothing. It's definitely different in different people but I think it's beneficial in everybody in different ways.

Anyways, my book is called Estrogenation: How Estrogens are Making You Fat, Sick and Infertile. I do 23andMe consulting with people one on one. I look at their DNA in context with their lab stuff. I used to just do pro athletes now I've opened it up to just average lay people because it's so helpful for people, just to try and dig in and personalize where their health issues are, what are their goals, what's their current state, their age, their sex, whatever. You can find me on [ajconsultingcompany.com](http://ajconsultingcompany.com).

Robb: Awesome. Well, Doc, I cannot thank you enough. Just amazing work you're doing. This may very well be one of the really underappreciated health vectors that has just been flying under a lot of folks' radars. I have nosed around this topic but maybe it's going fiddle and making mewling noises in the corner because, oh my god, another thing. But, I mean, this is really compelling important stuff. To your point, there's some really major improvements people can make in their lives that are not onerous, not crazy and there's a level of buy in that can meet anybody's needs.

Anthony: Yeah. Thanks for having me, Robb. I appreciate all that.

Robb: Great, great having you on the show. Are you going to do any public speaking events anytime soon that folks can keep their eyes open for?

Anthony: Yeah. I'm at the Weston A. Price Foundation in November, I guess, is the next big one. I don't do a ton of events but I'm working on it. I'm busy.

Robb: Awesome. Cool. Well, really look forward to having you on the show again. hopefully, we'll pass paths in real life and thank you again. Just really an incredibly informative show.

Anthony: Thanks, Robb.

Robb: Take care. We'll talk to you soon.

Anthony: All right, bye.

**[1:02:37] End of Audio**