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Uric acid and balancing your metabolism

Guest: Dr David Perlmutter

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[00:00:10] Alex Howard

Welcome everyone to this interview where I'm super excited to be talking with Dr David Perlmutter. Firstly, Dr Perlmutter welcome and thank you so much for joining me.

Dr David Perlmutter

I'm delighted to be with you today. Thank you, Alex.

Alex Howard

So we've got a really interesting topic here. Dr Perlmutter has written a number of different books. I'm not going to read through his whole bio. It's an impressive bio. You can certainly read it below the video on the website. Particularly Dr Perlmutter is known for his *New York Times* bestselling book, *The Grain Brain* but there's been a series of books since then, and particularly in this interview, we're going to be talking about Dr Perlmutter's upcoming book, which is published on the 15th of February, which is called *Drop Acid*. I thought that was a great title.

As a starting point let's just open up really the key theme of *Drop Acid*, where you're exploring uric acid and why it's so important.

Dr David Perlmutter

So there is this thing in our blood floating around, it's called uric, U-R-I-C acid. And we've known about it since medical school. People have heard about uric acid because it relates to something called gout where crystals will form in a joint in your toes or your fingers and they hurt. And it's also somewhat related to the development of kidney stones. And pretty much that was it, at least in our training, that was it. And people have a uric acid level check at their annual physical, their blood work, and if it's not significantly elevated the doctor will say, 'well, no big deal'.

But what we've now really learned over the past 20 years is that there is robust global research indicating that there is a much bigger story to tell as it relates to uric acid. That uric acid is actually a fundamental player as it relates to our metabolic problems. When I say metabolic problems I'm talking about things like weight gain, problems with our blood sugar, elevated blood pressure, problems with our lipids, our good and our bad cholesterol, elevated triglycerides.

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And the reason these issues really matter, beyond simply taking a pill to fix it, is because these set the stage for all of the bad chronic degenerative conditions that nobody wants to get. The heart disease, Alzheimer's, cancer, diabetes. The biggest cause of death on planet Earth. It's not coronavirus or anything else infectious, it's not war or anything like that. The number one thing that's killing us globally are these chronic degenerative conditions that are very much related to lifestyle, as a matter of fact. The food we eat, the exercise we do or don't get, the amount of sleep that we get, the amount of stress in our lives, our relationships, how much time we spend out of doors in nature. All of these things conspire to either set the stage for wonderful health, charting a healthy health destiny, as it were, or set the stage for the issues that I've just talked about.

One of the biggest inputs that relates to chronic degenerative conditions is trauma, not dealing appropriately, not contextualizing the traumas in our lives. They don't just go away. They smolder in the background and continue very much to influence our health moment to moment. It's a powerful toolbox that we look at when we try to look at those things in our lives that can help us deal with previous traumas because they continue to manifest.

Well, another powerful tool in the toolbox that we are deeply involved with now is this uric acid, and hence the title of the book *Drop Acid*. That's all it's about. It's not about anything else that's for sure. Because we now know that getting uric acid under control is a really powerful lever to pull if we are going to rein in our metabolic health and really take ourselves away from metabolic mayhem.

And the research is global and it is profound. We know that a very large study came out of Japan and Turkey that looked at, actually that was just a Japanese study, looked at close to 100,000 individuals, followed them for 8 years. And they found that those people in the highest category of uric acid had about a 16% increased risk of death from any cause. They had about a 38% increase risk of death from cardiovascular disease and about a 35% increase risk of death from stroke.

Interestingly, for every point elevation over the number 7, the risk of death from any cause was increased by 8% to 13%. So it becomes a very big issue that we know about this uric acid now and that we should be checking it right along with our blood sugar, our insulin levels, our blood pressure. How much do we weigh? What are our triglyceride levels? We need to check our uric acid levels. And what's really exciting is that around the globe doctors are really getting this message and checking uric acid and then modifying lifestyle factors to bring that uric acid under control.

Alex Howard

Can you say a little bit about some of the sources of uric acid, both in our diet, but also what causes levels to become excessive in our body?

Dr David Perlmutter

Well, that's a great question, because it's actually very simple. Uric acid is derived from only three sources. Number one would be alcohol, and specific alcohols, as a matter of fact, we'll unpack that in a moment. Number two are a class of metabolites called purines. They are the breakdown products of DNA and RNA. So we want to try to avoid animal products that are very rich in purines, for example, organ meats or game meats. And the third source of producing the uric acid in our bodies that is so threatening is the sugar fructose.

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That's the big elephant in the room because we know that so many foods are enriched with sweetener and by and large these days they are derived from high fructose corn syrup. And as such, we're getting fructose left, right and center. What happens to that fructose is it becomes uric acid. It triggers some important pathways in our physiology that basically are telling our bodies to prepare for food scarcity. And we'll look at that in just a moment because it's a fascinating story. But fructose through uric acid is saying, pretty soon you're not going to have food or water, and we're going to get you ready for that. So we're going to increase your body's production of fat, we're going to lock that fat away so you can't burn it, we're going to increase glucose production so your brain will be powered and we're going to raise your blood pressure because you may not have water availability. So it was a very powerful survival mechanism mediated by uric acid.

And the history of it is actually fascinating, if you allow me, I just love talking about it because it's so cool. The changes that took place happened around 14 to 17 million years ago and affected our primate ancestors. Humans, of course, and our hominid derivatives hadn't even been presented yet but in our primate ancestors, during that time, the world became cooler. And there was significant evolutionary pressure on primates to find food. And those who were not able to find food or did not have the dietary resources to survive, they would perish. And they developed, over more than a million years, a series of gene mutations in an enzyme called uricase, such that the uricase enzyme that normally breaks down uric acid, became less effective.

So there was a small population of primates that because they didn't have the enzyme uricase, their uric acid levels went up. And what did that do for them? Well, it allowed them to make fat more aggressively, it allowed them to store fat more aggressively, so that when the chips were down and they didn't have a lot of food, they had a little bit of an advantage by having more body fat. And a little advantage over a long period of time is something that gets selected for.

So those genes get passed on. And you and I have that same genetic issue going on today where our bodies want to do everything they can when they are exposed to fructose, fruit sugar, which is what our ancestors had access to, to make fat, store fat, raise blood sugar, become insulin resistant, raise our blood pressure. All the components of metabolic syndrome are activated in an attempt to keep us alive. But now, in a time of food abundance, it's not serving us very well. We don't need to store and make fat. We don't need to raise our blood pressure.

So it's fascinating, the history, isn't it? And then now that we know the triggers for elevation of uric acid, we know what foods we should avoid if we need to bring our uric acid level down. It means, very simply, call your doctor, because most people have already had their uric acid checked. It's part of the annual blood work that people get but always looked upon in the context of gout. But now we know that it has a far more important role in our physiology and our metabolism.

So to know your uric acid level or at least what it was, let's say, 6 months ago, it might be as simple as making a phone call, but even beyond that, what's so exciting is because it's become so important, you can buy a home uric acid monitor that works just like a blood sugar test where you put a drop of blood on the strip, the next thing you have uric acid level and you know where you are. Then you start to modify your lifestyle factors, and we'll talk about what those are in a minute, until you get your uric acid level below what we call the ideal level. It's lower than 5.5 milligrams per deciliter.

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Now, if your level is below 7 your doctor is going to say, 'hey, everything's fine. Don't worry. You don't have gout, you're not going to get it'. True. But as it relates to the metabolic issues we're talking about, you want that level to be lower than the level for gout. You want it to be 5.5 or below.

Alex Howard

And how much to those levels... Is it like blood sugar which is changing during the day?

Dr David Perlmutter

Good question. It does change during the day. It doesn't change as dramatically as blood sugar levels do, but it does change over the course of several weeks.

One interesting study was published recently that looked at, in the British medical literature, looked at a group of 22 rather young men who had mild elevation of uric acid, and they were placed on a nutritional supplement called Quercetin. Quercetin is a plant derived product. It is a bioflavonoid. The dosage was 500 milligrams per day, which is a typical pill. That's what I take each day. And their uric acid levels, without any other adjustments in their exercise level, their sleep, their diets, their uric acid levels fell substantially by about 8% in just two weeks.

We know that vigorous exercise beyond what you would normally do, to the extent that you might break down some muscle tissue, will elevate the uric acid as soon as the next day. So you have to be aware of that. Fasting elevates uric acid transiently. Eating a lot of fructose, or drinking more commonly, a lot of fructose, as in fruit juice or a soda will elevate the very next day, the uric acid level. So these things are good to keep in mind that it does vary. But that's why you want to check more frequently than every year at your annual blood test.

Alex Howard

And how about variables that affect you? Obviously there's the food element, there's the lifestyle element, is there an aspect also where there's these chronic health conditions and perhaps there's inflammation and that that's playing a role also in driving these levels up?

Dr David Perlmutter

Yes. And in fact, a lot of these metabolic issues that people have fed through uric acid, raise uric acid to make people even more metabolically compromised because that was a mechanism for survival. Let me explain. As we become more resistant to insulin, in other words, our blood sugar is rising, our pancreas is making more and more insulin to try to keep up with our blood sugar, but eventually our bodies become a little bit resistant to the insulin and that's what makes things even worse. Insulin levels are high but insulin isn't working in the body. That's the prelude to type two diabetes.

Higher levels of insulin actually work in the kidney to keep us from excreting uric acid. What happens? Uric acid levels go up, and what does uric acid do? It makes us more insulin resistant. It compromises how insulin is both available and how it does its job. That was a survival mechanism. And it's interesting that uric acid also can assist in the production of the metabolism of fructose in our bodies. When uric acid starts to be elevated, it increases the activity of a particular enzyme called fructokinase. And what does that do? That metabolizes fructose, making more uric acid.

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So we call this a feed forward functionality, feed forward activity. Where a lot of times in our physiology when something gets up, the mechanisms go into place to kind of bring it back down. For example, if your blood sugar goes up, then your insulin levels go up, that brings your blood sugar back down. Not so with this whole cascade of uric acid. Higher levels of uric acid produce higher levels of uric acid as a survival mechanism. And now it's not serving us. Now it's really working against us because of this evolutionary environmental mismatch.

That's what the paleo movement is all about. It's trying to emulate what our paleolithic ancestors' lives must have been like so that we can cater to what our DNA wants to see. Our food is more than macronutrients and micronutrients. Our food is information. It's changing our gene expression. And when we embrace that we understand that there's this beautiful relationship between food, and certainly other lifestyle issues, and the expression of our life code, our DNA. And that's what's going on here. We've inherited this survival mechanism that works when food was scarce, when we didn't have a lot of fructose, we had to make the very best of it using our thrifty genome. And now look at what it's doing globally.

And interestingly, these metabolic issues, obesity, type two diabetes, elevation, blood sugar, hypertension, are all fanning the flames of a central mechanism that underlies all of the chronic degenerative conditions, and that is inflammation. So our bodies are on fire.

People have heard of in COVID what's called the cytokine storm, where you get COVID and suddenly your body is on fire, virtually from inflammation. It's called the cytokine storm because those chemical mediators of inflammation are called cytokines. Things like TNF Alpha, Interleukin 1 beta, things like that, they're cytokines.

But what really gets us into trouble in the long run, is not the storm of the cytokines, it's the drizzle. It's the low level elevation of these chemicals over time that sets the stage for some pretty bad things that we don't want to get, diabetes, heart disease, Alzheimer's. They are all inflammatory disorders.

Similarly, individuals who don't deal with trauma, who don't finally confront the earlier life traumas that they may have experienced, they become hyper inflamed at a low level, but over time, over weeks, months and years, that low level of inflammation that is brought about by the smoldering trauma in the background can lead to the increased risk, for example, of Alzheimer's in individuals who have experienced a significant trauma. We know that war veterans are at higher risk for Alzheimer's. PTSD individuals, significant increase for Alzheimer's.

And it's really, to one degree, based upon this mechanism of this increased level, though it's not huge, of these inflammatory chemicals in the background.

Alex Howard

So I'd love to talk a little bit about some of what we can do to start to bring these levels down. And of course, one option is we can wait a million years for our genetics to adapt, or we have to start to look at our lifestyle, our choices.

And just to start, Dr Perlmutter, you mentioned that some forms of alcohol will raise uric acid, but not all. So perhaps we could just start with that and some of the dietary pieces that we can start to look at.

[00:18:30] Dr David Perlmutter

Coffee. There you go. Coffee helps lower uric acid.

Alex Howard

Right.

Dr David Perlmutter

But I want to go back to something you just said in passing and that is, we can wait the million years for us to evolve, so that we can then be in sync with our environment. Well, we can't. The environmental evolutionary mismatch, we can't really mess with the evolutionary part just yet, though, that may be nearer than you think. But we can certainly work on the environmental part of that story.

And I'm thinking about a paper I wrote in 1971, and my conclusion was, "What about us today with the outdated machinery?", meaning our machinery is not consistent or adapted to our current environments as it relates to sights, sounds and foods and all aspects, threatening aspects, of our environment. And I was very much involved in this whole notion of environmental evolutionary mismatch back then. I wrote that I think when I was 15 and that was my first publication, and I kept it, and I actually put it in my new book because I've been thinking about this for half a century. Gosh time goes by when you're doing things you like.

But you're right. So we can't affect the evolutionary part of the balance beam but we can certainly look at the part that deals with the environment. What are those things that make up our exposure that we're involved with day in and day out that are playing upon these mechanisms? And certainly food is very influential. Again, we talked about the role of fructose, the role of purine rich foods, the game, the organ meats, the sardines and anchovies. Not that they have to be eliminated but the fact that you have to see, are they affecting my uric acid? And what can I do about that?

And as it relates to alcohol, it's an interesting story because the worst offender is beer. The reason beer is such an offender is because it has two things. It has alcohol and it's high in purines. Why does it have purines? Because it's made with yeast. Yeast is very concentrated in purines. And so the use of breweries yeast to make beer creates a product that absolutely fans the flames of uric acid production. And so we understand now why the beer belly happens. It's not from calories. I mean, you can drink beer that has 100 calories and get a beer belly because you're fanning the flames of uric acid that's telling your body to make and store fat.

Hard liquor as well, to some degree raises uric acid. But wine is the right choice in men having a neutral effect, in women actually being associated with decreased uric acid. So those are the big players.

Alex Howard

I saw that in the notes your team shared, and I wanted to ask you about that. Why the difference between men and women? Do we know?

[00:21:33] Dr David Perlmutter

Don't know. It's an interesting question, and it's good that you ask that question because so much of medicine avoids that question, avoids the notion of drug dosages for women based upon their body size but also differences in their metabolism, differences in their detoxification mechanisms that can be influenced by, not only the extra X chromosome, but also the fact that their hormonal array is different in terms of the levels.

And also children. Children are not just little adults, they have different types of metabolism and metabolize things in a different way. So it's good that we're now seeing research that is being much more specific. The role of female hormones in relation to uric acid hasn't been worked out yet. But what we do know is that by and large, women have lower uric acid levels, premenopausal than men. But postmenopausal, when estrogen is much lower, then we see their uric acid levels start to climb.

Alex Howard

Some sort of buffering with the estrogen.

Dr David Perlmutter

Yeah. Maybe that men and boys eat more meat, that was a simple explanation. But it's not. When you look at it and you control for that, you still see that women seem to have a lower level, and it's probably, maybe, the estrogen effect. And how that is played upon by wine I don't know. I don't think it's been worked out yet, but it's an interesting observation.

The other thing to consider is there are a variety of nutritious vegetables that are high in purines, based upon the breakdown of DNA in the cells of the plant. Things like the cruciferous vegetables, cauliflower, broccoli, kale, etc. But the good news is that you can eat all you want, and the more you eat, the more your uric acid level is. Well, you're saying, 'gosh, I'm eating a lot of purines', but you're also eating a lot of bioflavonoids, like quercetin we talked about. You're also eating a lot of dietary fiber that helps nurture the gut bacteria and therefore reduces inflammation, helps balance blood sugar, that has a role to play in uric acid metabolism and production.

So the good news is those vegetables are absolutely on the table despite their purine content. The big consideration from a diet perspective is the fact that, at least here in America, close to 70% of all the packaged foods have added sweetener. And by and large they are either fructose or derivatives of fructose from high fructose corn syrup. And therefore we're getting a massive bombardment with fructose day in and day out in hidden sources, in condiments and sauces and soups and who knows what else. So we've got to be really careful about that and recognize that while fruit is okay, to some degree, fruit juice is really a powerful concentration of fructose, hence the name "fruit sugar fructose" that is nothing like our ancestors would have consumed.

It's not like hunter gatherers are going to come across trees that have cartons of orange juice hanging from them. So it's very unnatural, despite the fact that it's organic and all the things. We don't need that sugar load because that sugar load is telling our physiology, prepare for winter, make and store fat because you're going to need it if you want to survive.

Alex Howard

I think sometimes people's concern can be when they hear about the importance of making changes, it's all about taking stuff out. So I want to highlight some positives here. So firstly, wine is still on the

table. In fact, there's potentially a benefit for women with wine. And what you're saying is the issue isn't less fruit, it's more the concentrate, which is a much, much higher amount. Is there a difference between different fruits? Like certain fruits that are neutral? Certain that will raise or reduce?

[00:25:43] Dr David Perlmutter

Actually, you probably could not eat, I guess you could if you really tried, but you can eat fruit. You know, "An apple a day, keeps the doctor away", maybe two or even three. But by and large, people don't eat that much fruit. And the fruit that they're eating may not be as sweet. Generally, we like some tart components of our fruit.

I would say the orangutan may eat hundreds of pounds of fruit to make body fat. We know that bears eat an enormous amount of fruit as they store body fat in preparation for hibernation. Some fruits are actually associated with declining or reducing uric acid. Tart cherry has been talked about for years as a gout therapy, a gout treatment, and therefore that's certainly on the table.

If you look at the cover of our book, and if you look at the 'o' in *Drop Acid*, I don't know if you can see that if that's showing up, but that's a cherry and it's falling to indicate that cherries are a good choice. Now, it doesn't mean three big bowls of cherries every day, but a cup of cherries is a good idea.

So it's a great diet, and we call it the LUV diet, LUV meaning lower uric values diet. And the good news is that it can be seen through the lens of other popular diets. You can be on the LUV diet and be paleo, you can be vegan, you can certainly be gluten free. All of the other popular diets that you may think are important for you as an individual, great, we're just going to layer on a couple of other considerations here as it relates to uric acid production and even some dietary choices that could help lower your uric acid. Stay on your paleo diet or keto, whatever it may be, and we're just going to look at the LUV diet through the lens of whatever your dietary preferences are.

Now beyond diet I think the notion of exercise is very important, to continue your exercise very important, but recognize, as we talked about earlier, that a sudden change and engaging a very aggressive exercise program that breaks down muscle will momentarily, the next day you'll see an elevation of uric acid. So we recommend that if you're going to be checking uric acid tomorrow, do your normal exercise today, but don't go out and do a half marathon if that's something you normally don't do.

Similarly, when you are fasting after a couple of days, the uric acid level will go up and will ultimately improve once you stop your fast. If you're involved in something called intermittent fasting or even prolonged fasting, you're going to see a rise in your uric acid level. We've not really seen any significant changes negatively from what's called time restricted eating, but that's sort of a nebulous term because when people time restrict in their eating that's variable. They may times restrict for 8,10 or 12 hours or even longer. I typically do 14. And so it's hard to say what that term means because people apply it differently.

We know that people who don't get a good night's sleep will ultimately have elevation of the uric acid and significant elevation of other inflammatory markers as well. So, many of the lifestyle choices that people engage, that are familiar with are really relevant as they relate to uric acid as well.

Alex Howard

What's the potential of these changes to actually impact on uric acid levels?

[00:29:31] Dr David Perlmutter

No, it's a very good question. If you have elevated uric acid and let's say you have gout, you'll go to a doctor and she or he will likely pull out the prescription pad and write you a prescription for a drug called Allopurinol, for example. And it works. Allopurinol is a relatively safe drug, and it targets an enzyme called Xanthine Oxidase that is what your body needs to make uric acid. And it'll lower your uric acid. What's so exciting is that there are products in the health food store that can work as well as the pharmaceutical.

So there's something called luteolin, for example, which is a bioflavonoid like quercetin. 100 milligrams a day is the dose that we typically recommend. And this is powerful in terms of lowering the uric acid. Quercetin, I talked about the research on that earlier. 500 milligrams a day that can lower uric acid quite handily as well.
So you can gain control over uric acid very quickly and very effectively. Might there ever be a time when you might need medication? I guess there would be. It's a situation like blood sugar. If your blood sugar is elevated, your first choice shouldn't be to take a drug. Your first choice is to look at your diet and see what the heck you're doing that's raising your blood pressure. Cut out the refined carbohydrates, get a little more exercise, pay attention to your sleep hygiene. All of those things should be what we say to a pre diabetic person who's heading towards diabetes and say, 'look, we're not putting you on metformin, or whatever the drug is, right now, but here's what you need to do, and we'll help you not get to that place'. Very effective.

Alex Howard

Yes. And when you see someone's uric acid level start to come back into balance, do people also then observe a kind of mirror of that in their vitality and in how they're feeling?

Dr David Perlmutter

Yeah. And the interventional trials where uric acid is manipulated, have demonstrated measurable things to prove that it's working. Studies have shown, for example, weight loss and improvement in blood pressure in people who've had their uric acid levels tweaked. Oftentimes those research studies will first increase uric acid by giving these research subjects fructose, who knew. That's derived from animal research where if you want to raise uric acid in a laboratory rodent, you give them fructose, the next thing you know the uric acid levels are sky high. Then the intervention is typically giving them a drug, Allopurinol being one of them, that will immediately drop the uric acid. Lo and behold, there is weight loss, there is improvement in blood pressure, other parameters seem to improve in lockstep with uric acid coming down.

Alex Howard

That's fascinating. And in terms of starting point, people can do simple home testing kits around this. It sounds like reducing some of these pieces, but if you were to summarize in two or three steps to leave folks with to start to put this in action, what would you say?

Dr David Perlmutter

Well, I'd say that you might not even have the ability to get your uric acid checked. Maybe you don't want to go to a doctor right now and you don't really feel like sticking your finger, and blood draw and all that because you just don't like it. Whatever. Understand that the biggest issue related to uric acid, even if you don't know your level, is your consumption of fructose, fruit sugar. There's a little bit of

fructose in an apple, that's going to be okay, about 5 grams. But our fructose consumption has gone, from 1970 to 1990, increased by about 1000%. That's remarkable. And we see why. And we see what's happening metabolically around the world in terms of obesity.

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Here in America about a third of adults aren't just overweight, but obese. And that's predicted in the year 2030, that's only 8 years from now, 50% will be, not just, again, overweight but obese. That's a scary prospect. And now we've known since 1970 in *The Journal of the Lancet* that fructose is very threatening to healthy metabolism. But we never fully understood the reasons. How does it happen? What's the mechanism?

And now that we've got our arms around the role of uric acid and can measure it and can follow it and can intervene to lower uric acid, man, that has become a very powerful tool. And what is so incredible about it is, while this is news, I think for many of your viewers of this event, the original work talking about uric acid in terms of blood pressure, in terms of diabetes, blood sugar, depression, dementia, was published in 1894 by Dr. Alexander Haig, a book called *Uric Acid as a Factor in the Causation of Disease.*

So, God, that's a long time ago, no one paid any attention to it until about 20 years ago, when the research really began under the direction of Dr Richard Johnson, a colleague of mine. And just incredible now, a global amount of research. In Japan if you have high blood pressure, they're looking at your uric acid and treating the uric acid to gain control over your blood pressure. That's where we are now, because it's the uric acid that's telling your body to raise the blood pressure because you might not have water.

So it's exciting. And people often say, 'gosh, well, why is it I've never heard of this?'. Well, there was a time when you never heard of a low fat diet, and then that went away. Then there was a time that you never heard of something called a paleo diet or a keto diet or a gluten free diet. There was a first day for everything. And I'm really enjoying watching how the world is just suddenly lighting up with their interest in this really simple idea. But when you look at the history of our ancestors, primate ancestors, from 14 million years ago and how this was a survival mechanism that's now threatening to us, it's just a really exciting story. It's a beautiful story because you understand it from beginning to now, the current implications. And beyond that it's a tool. What can you do to be healthier?

Alex Howard

Fascinating. It's a really interesting subject. I'm excited to see the book come out. To remind people, it's the 15th of February, but I'm sure they can preorder it already.

Dr David Perlmutter

Dr Perlmutter you say a bit more about how people can find out more about you and your work and what people can find?

Absolutely. So if people just go to... I'm Dr Perlmutter so the website is drperlmutter.com. I'd say that's probably the best place to start.

I have Instagram account @davidperlmutter, Facebook is David Perlmutter M. D. The book is *Drop Acid* and the website for the book is dropacidbook.com. So probably the best place is drperlmutter.com.

[00:37:03] Alex Howard

Fantastic. Dr Perlmutter, thank you so much. I'm excited to see this book come out and thank you for your time today.

Dr David Perlmutter

Thank you, Alex. Thank you for having me.