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[00:00:00] **Anurag:** The more CDAT cells you have, the better your longevity health predictor. This is the [00:00:05] number one intervention that has been shown to sort of reverse a lot of these immune aging decline. [00:00:10] MitoPure is your cellular health glue or your lubricant. Biologists have described [00:00:15] nine biological hallmarks of aging.

If I was to redraw these hallmarks, I would put [00:00:20] one in the middle and

[00:00:20] **Dave:** that

[00:00:21] **Anurag:** will

[00:00:21] **Dave:** be you're listening to the human upgrade with Dave [00:00:25] Asprey.

Today, we're [00:00:30] going to talk about mitochondria. Good God. How many times am I going to talk about mitochondria on the [00:00:35] show? An infinite number of times, one for each number of mitochondria in your body. [00:00:40] Okay, not really, but I've become increasingly convinced over the [00:00:45] last, oh, 25 years of studying [00:00:50] my mitochondria and mitochondria in general, that they are at the foundation of our [00:00:55] interface with reality and that they control a lot more in our bodies than, [00:01:00] than we're aware of.

And that science every single day is figuring more and more out. [00:01:05] Like, oh, let's study the brain. Oh, let's study neurons or glial cells. Oh, look, there's mitochondria behind them. [00:01:10] Let's study athletic performance. Oh, look, mitochondria, sex hormones, mitochondria. So this is [00:01:15] why you keep hearing about them on the human upgrade.

It's because they matter and because all [00:01:20] the different tools you can use will make you live longer and make [00:01:25] you perform better at whatever it is you want to do as a human being. And on that [00:01:30] note, we're going to talk about some things with mitochondria in your [00:01:35] skin today, and your immune system, and we're going to talk about a [00:01:40] compound called urolithin A that you may have heard about on the show today.

Our [00:01:45] guest is Dr. Anurag Singh, who's chief medical officer at Timeline Nutrition, [00:01:50] and he's a top mitochondrial and cellular health expert, and [00:01:55] has an MD in internal medicine, with a PhD in immunology, has [00:02:00] led 50 clinical trials, and written 40 plus scientific articles, and has 15 [00:02:05] patents. In other words, this is a guy who is steeped in [00:02:10] mitochondria.

Because they kind of run everything in your immune system. Enric, is that [00:02:15] actually true? Do mitochondria really run everything in your immune system, or am I being hyperbolic?

[00:02:19] **Anurag:** Well, [00:02:20] mitochondria, Dave, are in every cell type except your red blood cells. So, they [00:02:25] are, of course, in greater abundance in, in metabolic cells.

Uh, cells like our muscle [00:02:30] cells and brain cells and heart cells, but they're very, very important to, to what I [00:02:35] call immune fatigue with aging. So as with aging, you know, our immune system [00:02:40] declines and, and principally now the, the science is showing that the, the [00:02:45] key driving factor is mitochondrial dysfunction.

[00:02:48] **Dave:** I've done a lot of work on [00:02:50] reversing aging in the cells. I recently did another [00:02:55] thing to change the central aging clock in my brain, did a whole podcast on [00:03:00] that, and using stem cells and focused ultrasound. But the one area that I'm [00:03:05] most concerned about from aging is immune system aging. To [00:03:10] address that years ago, I did cultured natural killer cells.

I took mine [00:03:15] out, amplified them and put them back in, which is all I could find to really [00:03:20] do this at a heavy level, but it turns out there's some things we might be able to do [00:03:25] to lessen the effect of the immune system on aging. In my case, because I had chronic [00:03:30] fatigue, I've had autoimmune issues probably for my entire life.

This is one of my big risk [00:03:35] factors. What do we know about it? Inflammaging. What is it and what do mitochondria have to do with it?

[00:03:39] **Anurag:** [00:03:40] Yeah, so I've spent 20 years studying mitochondria and even a greater time studying the [00:03:45] immune system. And, and funny enough, the two roads are now converging. So, [00:03:50] chronic inflammation and, and, and sort of these leaky [00:03:55] cells.

So, you know, the more as we age, these cells become what they calling zombie cell or [00:04:00] senescent cells or leaky cells. They start. Releasing these fragments [00:04:05] of cellular debris, and that causes sort of a chronic inflammation, [00:04:10] you know, and as we age, this inflammation rises, and that's the term we have [00:04:15] called inflammating, and that's a broader part of what I call the three hallmarks of immune [00:04:20] aging.

One is inflammating, as I just described. It's like this increasing [00:04:25] chronic inflammation with aging. The second is immunosenescence. So, You started with a [00:04:30] very technical term, NK cells, natural killer cells. So with aging, we, we [00:04:35] lose our lymphocytes. So our body shifts from these, you know, trillions of immune [00:04:40] cells.

Where we have more lymphocytes, like, which are what I call the, the third arm of [00:04:45] our the elite forces of our immune system. They decline with aging and that's immune [00:04:50] senescence. And third is really, you know, this concept of immune resilience. And that's where we can talk [00:04:55] about mitochondrial health and how that is key for boosting your immune system.[00:05:00]

[00:05:00] **Dave:** If we look at all of the different causes of aging and my book, a [00:05:05] superhuman on longevity, I identified about seven. Some people identify up to 12. [00:05:10] How important is immune aging compared to all the other things [00:05:15] that happen?

[00:05:16] **Anurag:** So, you know, these are whether it's seven [00:05:20] biologists have described nine biological hallmarks of aging.

And now we've actually [00:05:25] included Expanded that universe and included three more and these three are actually, I think [00:05:30] these are the foundational pillars of what causes these other things. And these three are chronic [00:05:35] inflammation, gut dysbiosis, and a loss of what they call macro [00:05:40] autophagy, which is basically, you know, mitophagy and lysophagy, things that allow [00:05:45] you to clean yourself.

So I think it's If I was to draw, redraw these [00:05:50] hallmarks, I would put one in the middle and that will be inflammation and chronic inflammation. And they [00:05:55] all can converge on this one because I think poor nutrient sensing [00:06:00] or, or epigenetic modifications or mitochondrial dysfunction, you can [00:06:05] explain all of them with this concept of inflammation.

And that's what biology and scientists and [00:06:10] clinical clinicians are finding now.

[00:06:12] **Dave:** If your immune system is working [00:06:15] perfectly, you would have very little inflammation except from exercise or something like that, right? [00:06:20] What percentage of people have immune systems that work in, [00:06:25] you know, that work really well these days?

It seems like it's almost impossible.

[00:06:29] **Anurag:** Yeah, I mean, [00:06:30] listen the more sedentary we are the more processed food we eat, the [00:06:35] more, Uh, artificial dyes that we are getting in our processed [00:06:40] foods, you know, things like this, and then all the chronic exposure of [00:06:45] stress, sleep, all these are causing inflammation in a back, in a background, and there is a [00:06:50] very thin line between good and bad inflammation, a little inflammation is good, as you mentioned, [00:06:55] exercise causes a little low grade inflammation that is good, but over time, uh, [00:07:00] if, You know, with all the cellular systems not working and in perfect harmony, [00:07:05] this leads to really an accumulation of inflammation and the body can't control it.[00:07:10]

And so what I see, actually, we've looked at a lot of and if you look at all these [00:07:15] longevity studies and blue zones, et cetera, you'll find that they have very low grade C [00:07:20] reactive protein or interleukin six. These are these are, uh, factors that are in our [00:07:25] blood that are made by immune cells. And these are signs of if you have good, you know, [00:07:30] inflammation or not.

And, and so the, the more C reactive protein you have, the [00:07:35] more cardiovascular diseases you have, the more brain degeneration you have. So it's, [00:07:40] you can actually link just by one marker or two markers the entire sort [00:07:45] of longevity landscape.

[00:07:47] **Dave:** So if we wanted to measure

[00:07:49] **Anurag:** the [00:07:50] number one thing, it would be C reactive protein?

I think that's the old school. So I trained in [00:07:55] that medical school where they said inflammation is CRP, right? [00:08:00] That's probably the one tool. And the second, maybe you can do what is called as a [00:08:05] total leukocyte count. So you can count the number of your lymphocytes and, [00:08:10] and your, your neutrophils and all these other things.

Cell types. These were the two things that [00:08:15] probably even till today, the clinicians are using. Now, science is [00:08:20] progressing at such a high speed that with a little drop of blood, we can look at more than just [00:08:25] CRP. So interleukin, all these interleukins like interleukin 1 beta, TNF [00:08:30] alpha these are all factors when the cells get stressed, the immune cells, they, they, they release a lot [00:08:35] of these factors.

And so you can measure with a tiny drop of blood, a lot of these factors, and [00:08:40] then with a little drop of blood, I can actually look at millions and millions of cells in the [00:08:45] blood, which will give you like an atlas of immune system. Now, this technology sounds a bit star [00:08:50] Trekkie, but it's coming in. Let's say that clinicians will know more about it and [00:08:55] start using it in the next five years, 10 years time frame.

[00:08:57] **Dave:** And this is different than, like, DNA [00:09:00] methylation true age kind of things?

[00:09:02] **Anurag:** Yeah, so, true, yeah, true [00:09:05] diagnostic or, or looking at epigenetic age, you're just looking at methylation patterns inside [00:09:10] immune cells or any other kind of cells. Here, you're using a technique called this flow [00:09:15] cytometry. So you, you take, let's say, one ml of blood that you take, go for your regular blood [00:09:20] checkup.

There are about five to ten million immune cells. So you take these. And you run [00:09:25] them on a very high throughput machine called a flow side emitter. And you can [00:09:30] using dyes recognize every part of your immune system. So you, you know, [00:09:35] your first line of defense, these are what I call the police forces.

These are things like neutrophils [00:09:40] and other cells that help in wound healing. Then the second line of defense is your antibody producing. [00:09:45] And the third is really the, what you are calling these, these, these T cells and K [00:09:50] cells that are. These, like I call the elite forces of the immune system. And so [00:09:55] using this panel, we can tell who has low immune cells, T cells, low [00:10:00] NK cells.

Who has more of yeah, and I think this is known to [00:10:05] correlate the more CD8 T cells you have, the better your longevity health [00:10:10] predictor.

[00:10:10] **Dave:** So how do I have more of the CD8 cells?

[00:10:13] **Anurag:** So even in the [00:10:15] CD8 T cells, you have two kinds. One are what we call the memory T cells. These, these [00:10:20] are, you know, that's where vaccines are given.

And so you give a vaccine, which is like a [00:10:25] attenuated. Part of a virus or whatever. And these cells remember. So the next time [00:10:30] they see a virus or a cancer part of a cancer cell, they [00:10:35] attack it, but these viruses or cancer cells are very smart. [00:10:40] They fatigue these immune cells. And so you, you get basically a lot of bad goodies in your [00:10:45] body over time and over aging.

And so what you really need is these naive stem cell [00:10:50] like CDAT cells. And most of us can make it because we have an organ here called [00:10:55] the thymus that after a 20 starts going, you know, involuting and [00:11:00] become smaller and smaller. So we can make, and that's the term T cell comes from because they're all educated in the thymus.

[00:11:05] So if there are strategies to boost these naive CD8 T cells, then [00:11:10] we can reverse partially immune aging. One of the things that happens as [00:11:15] we age is our thymus goes away. Why does it go away? It's [00:11:20] funny. Um, you say that, I, I, I think it's like a programmed, uh, if you talk [00:11:25] to folks like Dave Sinclair, they'll tell you, these are, you know, the whole immune [00:11:30] system is like a compact disc it's all written.

And, and the thymus has a [00:11:35] certain, what we call in the immunology field sequence of patterns that it can [00:11:40] recognize a pattern of viruses, pattern of cancer cells, and once around in our it [00:11:45] peaks in our mid teenage and twenties, it feels like it's done enough. It automatically [00:11:50] starts receding, and there is a lot of effort being put in this field to keep the time [00:11:55] us around long time.

So there are hormones that, you know, people didn't give time us then or other, [00:12:00] uh, There's even efforts to reconstitute the thymus to regrow the immune system. So there are these [00:12:05] strategies out there, but why exactly it, it involutes, I think it's just [00:12:10] programmed in our aging. And I don't think there's a clear answer why it involutes today.

[00:12:14] **Dave:** [00:12:15] I've looked at protocols that regrow the thymus that seem to make people [00:12:20] much younger, and these are complex things with growth hormone and metformin and things like that. [00:12:25] Yep. Those are relatively extreme, and there's risks from taking growth hormone. Yep. [00:12:30] What are some things we could do to help with this inflamaging that [00:12:35] are a little bit more affordable and accessible?

[00:12:37] **Anurag:** So fasting, believe it or not, this is the [00:12:40] number one intervention that has been shown to sort of reverse a lot of these immune aging [00:12:45] decline. There have been studies done by Walter Lungo and colleagues that show that [00:12:50] not only do you reverse this biological age that you were talking about, this methylation pattern, [00:12:55] but you actually induce deep immune changes.

So these CDA T cells come back and [00:13:00] We have been, you know, I'm a trained immunologist and all the data we have been [00:13:05] seeing with certain nutritional interventions, and we can talk about one of them called urolithinae or [00:13:10] gut metabolites, points to a deep connection between our gut and our [00:13:15] immune system.

A lot of immune cells are actually in our, in our, in our gut. They are [00:13:20] educated also in the gut. And so what we are seeing now is that a lot of these mitochondrial [00:13:25] boosters can be used to, to rewire and rejuvenate the immune system and get more of [00:13:30] these NK cells, get more of these CDAT cells.

[00:13:33] **Dave:** One of the things that you're [00:13:35] most known for is urolithin A, the things you're doing [00:13:40] with, with Timeline.

And for listeners, if this is the first time you've heard me [00:13:45] interview Unrag I've been using Timeline since it first came on the market, [00:13:50] because there's like 10 years of really profound research in [00:13:55] this, this postbiotic. Technically is what you could call it for doing all sorts of good [00:14:00] things for mitochondria, including dealing with inflammating.

So what is the role [00:14:05] of urolithin A with or without fasting in affecting the [00:14:10] CD8 cells or the thymus or just inflammating?

[00:14:12] **Anurag:** Yeah. So I, I think about a year and a [00:14:15] half back there was a very fascinating podcast you had with, with a collaborator of mine, [00:14:20] actually, it was an oncologist Dr. Dominic Denk.

Uh, and, and, and, [00:14:25] He's a very young clinician. He has been studying the immune system for a long [00:14:30] time, and he's been studying cancer and cancer models, especially colorectal cancer and [00:14:35] models like this. And what they started seeing in cancer patients and in these [00:14:40] colorectal model cancer models was that the immune cells had depleted [00:14:45] mitochondria.

These, these sort of these elite force equivalent, um, these, these are our [00:14:50] stem cell like CDAT cells and K cells, et cetera. And they started looking for [00:14:55] interventions that could boost mitochondria inside these T cells [00:15:00] in these models. And what they found actually that in both these models and in a [00:15:05] dish where they took out human cells and they cultured them with this [00:15:10] postbiotic urlatin A, they could boost the more the abundance and the quality of the [00:15:15] mitochondria.

And so when he showed me that data, and I think he came on your podcast about a year and a half back, [00:15:20] we said, Hey, you know, we have to, you know, we have to run a randomized clinical [00:15:25] trial in healthy folks to see if, you know, from our furry animals, whatever you're [00:15:30] seeing in these models can be translated into humans.

And at the time I was running [00:15:35] trials with your litany and healthy folks more on the muscle side, but we will [00:15:40] always look at. Blood biomarkers and CRP, as we started talking about, C reactive protein would [00:15:45] always be dampened, whether it was older adults or a bit overweight middle aged adults. [00:15:50] So we did this trial we ran this with the, the Buck Institute of Aging which is one of [00:15:55] the top research institutes where they have this technology.

With to really do a deep immune [00:16:00] phenotyping and after a month of taking your litany, [00:16:05] we already start seeing significant reversal of this immune decline that I [00:16:10] started to tell you about. So the inflammation is dampened. This inflammation is dampened. [00:16:15] We see. More youthful CD8 T cells and a lowering [00:16:20] of these fatigue memory cells.

And then the fascinating, which I've always believed is the [00:16:25] two roads meeting that I was saying is now these immune cells have much about a [00:16:30] 20, 30 percent more mitochondria. And if you throw a virus on them, they, they kill it about [00:16:35] 20 percent better. So now you have a better chance. You have given.

Yourself, this [00:16:40] sort of rejuvenated immune system that has the resilience to fight infections or whatever. [00:16:45]

[00:16:45] **Dave:** What kind of dose

[00:16:46] **Anurag:** of urolithin A is necessary to do this? So, this [00:16:50] randomized clinical trial was done with a gram of urolithin A, and as a [00:16:55] trialist, I always go with where we have the most evidence.

So, in our [00:17:00] previous trials, we see the 500mg and a gram both impact mitochondrial health [00:17:05] and muscle health. The gram does, Impact more of the inflammation and [00:17:10] inflammation related endpoints in the earlier trials. So we went ahead with that approach and we tested only the [00:17:15] gram and now we have plans to repeat the same study with the 500 milligram but a bit longer because I [00:17:20] think it's really a kinetic of the time thing.

The 500 milligram dose you will need to [00:17:25] intervene a bit longer.

[00:17:26] **Dave:** And that's four timeline pills,

[00:17:29] **Anurag:** is one gram? So [00:17:30] each pill is 250 milligram and that's four timeline pills or two [00:17:35] powders, you know, one powder has 500 milligram. Is it better to do [00:17:40] 500 in the morning, 500 at night, or just one gram in a single dose?

Fascinating question. [00:17:45] And, and that's the randomized, I think you've asked me this before. That's a trial. And I always say I need to do it, [00:17:50] but this time I'm actually going to do that trial. So a lot of folks most of our trials are done with [00:17:55] intake in the morning because just easier from a compliance perspective in a randomized trial [00:18:00] to tell hundreds of folks to take it all in the morning.

But we do think that the [00:18:05] half life of the compound is about it. A day and it peaks about eight hours after you take [00:18:10] it. So it could make sense as you're saying to, to split the dose, maybe [00:18:15] take one 500 in the morning and then 500 in, in the late [00:18:20] afternoon or early evening so that your exposure in your body, the levels are always high and [00:18:25] that's a trial we need to run and I will, next time I come back, we'll have data.

[00:18:29] **Dave:** [00:18:30] I keep hearing this over and over. Yeah. No, I'm just kidding. [00:18:35] So if someone's taking four. Either capsules or two of [00:18:40] the powders in the

[00:18:40] **Anurag:** morning with or without food. So we've done that one. So we have [00:18:45] done the comparison where we've given a heavy breakfast meal with the powder or [00:18:50] the pill or in a fastest state, the absorption is identical.

So by that [00:18:55] I mean you get the same levels on a fasting versus a non-fat state. [00:19:00] And so I think it, it, it's the only reason we say take it in [00:19:05] the, in the fastest state is that potentially you may even augment some of the response [00:19:10] because people fast overnight and a lot of folks are, you know, [00:19:15] I, I don't eat breakfast, for example, I, my first meal is, is, is a lunch.

So I fast [00:19:20] 18 hours. And so you're allowing, you're actually boosting a lot of that autophagy that is, you [00:19:25] know, being induced by fasting. And then you take. Mito pure or urolithin A, which I think [00:19:30] is the foundation of which will even boost fasting or even exercise responses. That's [00:19:35] how I approach it.

[00:19:36] **Dave:** For me, it's 1230 in the afternoon.

I haven't had anything but danger [00:19:40] coffee and a handful of supplements, including four of the [00:19:45] timeline urolithin A capsules. But is the The surface or [00:19:50] the encapsulation material. Is that enough to mess with the fast?

[00:19:53] **Anurag:** No, the, the, the [00:19:55] capsules have zero calories. The powders maybe have, have some caloric because they're [00:20:00] fruit flavor.

Is there

[00:20:01] **Dave:** a

[00:20:01] **Anurag:** gelatin or something in

[00:20:02] **Dave:** them? I didn't look at RMHCP.

[00:20:03] **Anurag:** No, they're, they're, [00:20:05] they're vegan. So they, they have a vegan shell. And the caloric [00:20:10] values is, is absolutely zero. I have one of them in front. It can't, it can't be [00:20:15] zero

[00:20:15] **Dave:** aspect, one calorie. I mean, there's something in there unless it's not digestible.

[00:20:18] **Anurag:** So they have a, so [00:20:20] Euro tonite needs a, a fatty matrix. So they have, uh, MCTs that Oh, okay. So yeah, [00:20:25]

[00:20:25] **Dave:** they, MCTs alone accelerate fasting and give you more ketosis. So you've got some [00:20:30] MCTs, you've got a little bit of capsule material. Yeah. Which is probably hydro hydroxy [00:20:35] cellulose, which isn't actually, that's a prebiotic anyway, so.

It's not going to have any [00:20:40] calories unless your gut bacteria turn it into propionic acid or something like that. Okay, [00:20:45] so totally fasting compatible. Yeah, I do this every morning and sometimes I take a [00:20:50] couple more at night. Do we have studies of weirdos like me who are willing to do [00:20:55] six or eight because we're traveling or something?

[00:20:57] **Anurag:** Studies on on

[00:20:58] **Dave:** you mean fasting? [00:21:00] No, not fasting, just studies of taking a timeline or urolithin A. [00:21:05] So sometimes I'll do a gram in the morning, but then I'm like, that was a long day. I'm traveling or something. I'll do [00:21:10] another 500 at night just because, well, why not?

[00:21:13] **Anurag:** Yeah. So we've gone till a two [00:21:15] gram and you, you, you get the same effects, but you know, it's not like every time you double [00:21:20] the dose, you'll get more bioavailability.

I think the body needs time to, to [00:21:25] absorb and clear out the excess nutrients. And so. Having said that 500 [00:21:30] milligrams thrice a day, this is something, as I said or twice a day, we have to test it out. [00:21:35]

[00:21:35] **Dave:** Got it. So I love this. It's not tested, but I mean, conjecture is, is [00:21:40] at the base of science, right?

[00:21:41] **Anurag:** Yeah. I mean, I could argue, I mean, it's a hypothesis. It's [00:21:45] why I say research is two words, re and search. You, you always have an educated [00:21:50] guess, right? And research so you have to go back to the drawing board and you're making me think [00:21:55] and making me go to the drawing board. Okay.

[00:21:57] **Dave:** Got it. I love the elegance [00:22:00] with which you dance away from answering that question.

But fuck off. It's all right. Good, good [00:22:05] scientist. I'll say, well, we don't really know. And I'm like, well, guess, because you know more than someone who is just flipping a [00:22:10] coin. But I'm, I'm going to guess that Actually, I couldn't even guess when I think about [00:22:15] it. I mean, maybe having a big spike and then having a break, you know, maybe arrhythmic pulsing is better than [00:22:20] constant dosing, but I could see that being really hard to do.

Yeah.

[00:22:23] **Anurag:** In all our studies in, [00:22:25] in, in the different species that were published in 10 years back, I mean, you talked about 10 years of [00:22:30] research. It's really, you know, intake every few hours, these furry [00:22:35] rodents are taking it all the time. So after a while, and this is back to, is it [00:22:40] always going to be inducing mitophagy?

Well, you're going to clean the waste out and then the [00:22:45] body will, will allow for a more healthy mitochondria to seed in. And we see that, we see [00:22:50] PGC1 alpha, we see more biogenesis, whether it's the immune cell or the muscle cell. [00:22:55] So we need to figure out kind of how We pulse it and that can [00:23:00] reinduce mitophagy faster, I think it's a great idea.

I'm taking quick notes. [00:23:05]

[00:23:05] **Dave:** I'm intrigued, you know, do like a mega dose during a fast, you know, take 20 [00:23:10] grams and see what happens. And then who knows what would happen, maybe you get a big [00:23:15] synolytic effect, who that knows, but I'm the guy who would probably try that and then either [00:23:20] like what happened or not like what happened.

I'm not recommending anyone do that, by the way, I'm just like curious. [00:23:25] Okay I'm going to get into skin health and and urolithin [00:23:30] A in a minute here. But part of the recommendations that I make for people and that [00:23:35] you have as well is you should have a lower inflammation diet for [00:23:40] inflammation. And one of the primary measures of inflammation is the omega [00:23:45] 6, of the inflammation in the fats from the diet, is omega 6 to omega 3 ratio.

So, [00:23:50] one of my companies that's part of Upgrade Labs is called AxoHealth, and I just got my [00:23:55] results back, and we include an omega 6 to omega 3 ratio. And mine's at [00:24:00] 2. 6. And the longevity people say it should be four to one. That means you have four Omega [00:24:05] sixes for every Omega three you have. But a lot of Americans are at 40 or 45 to one, [00:24:10] which means they're just getting crazy amounts of canola and corn.

So it means you eat at restaurants basically, [00:24:15] or you don't know how to order at restaurants. So. Is there an ideal [00:24:20] omega 6 to omega 3 ratio that you like to target? And what does your olithin A have [00:24:25] to do with the inflammation levels when you're messing with your fatty acids?

[00:24:29] **Anurag:** So it's a [00:24:30] good question. I don't think there is evidence of combining Omega 3 [00:24:35] with Urolitin A, for example, in literature, what I can tell you is that Urolitin [00:24:40] A will increase the absorption of most nutrients we have [00:24:45] seen.

For example, we know it improves magnesium absorption, [00:24:50] and magnesium and mitopur together are really a potent combo. Omega 3 [00:24:55] we haven't really studied, Dave, to be honest together, and we haven't looked at the effect of [00:25:00] Urolitin A or mitopur on this ratio. But something we can do. Actually in our recently [00:25:05] completed trial that we just completed, we can easily measure because it's easy to measure this ratio, [00:25:10] but on other markers of inflammation we have a whole panel.

As I [00:25:15] mentioned, interleukin six is down, TNF alpha is down, IL 1 beta is down. [00:25:20] These are all very potent pro inflammatory factors that are made by [00:25:25] immune cells that will damage your gut lining, will damage your, your, your skin [00:25:30] barrier, will damage We'll, we'll probably disrupt your omega three to six ratio that you were [00:25:35] talking about.

And so in chronic intake of mitopure dampens these inflammatory [00:25:40] factors. So if you have another marker like this sounds like it's a very [00:25:45] innovative one. We can take a look in our clinical study.

[00:25:47] **Dave:** I'm really interested in all of the things you can [00:25:50] do to suppress inflammation without taking too many antioxidants because literature shows [00:25:55] you make energy with oxidation.

So if you take too many antioxidants, you don't get benefits [00:26:00] from exercise. You don't, you actually suppress good things in the body. [00:26:05] Does urolithin A have that same effect of suppressing it? The benefits of [00:26:10] exercise?

[00:26:11] **Anurag:** No. So we've actually run a randomized clinical trial with [00:26:15] exercise and in conjunction in actually elite runners.

Some of them, which were [00:26:20] Olympian level middle distance runners. And what we saw in the trial that [00:26:25] again, giving might appear with this exercise training regimen. It [00:26:30] improved sort of their performance measures up to a certain extent. But the real [00:26:35] dramatic effect was, was really blunting this exercise induced inflammation and muscle [00:26:40] damage.

So most athletes with overtraining, they get this real big spike. Bike [00:26:45] of CRP of interleukin six, and they have an increase of muscle damage [00:26:50] factor called cine kinase. We see all of them blunted when given in, in [00:26:55] conjunction with exercise. So that's where I see really a value in the recovery field of, [00:27:00] of miop pure in, in with exercise.

Okay,

[00:27:03] **Dave:** so we don't run [00:27:05] the risk of taking too much timeline [00:27:10] or urolithin A with exercise because it helps exercise. But if you were to take vitamin [00:27:15] E or even CoQ10, which I'm a huge fan of, if you're doing that with exercise, [00:27:20] it actually might blunt the responses of exercise.

[00:27:22] **Anurag:** So there are some, there are some things [00:27:25] like, as you mentioned, that, that are blunted, the blunt, these elite [00:27:30] exercise responses in runners and cyclists we ran the study exactly when one [00:27:35] of the top sports researchers for that reason, because of A, we wanted to see the absorption.

A lot of [00:27:40] nutrients are not studied. Most athletes or well trained folks absorb things [00:27:45] differently than, let's say, the regular Joes. And so what we see is similar levels of [00:27:50] exposure, and we see that we blunt the, the muscle damage and we [00:27:55] really have an anti inflammatory response in, in these folks. Well, in fact, any population, any [00:28:00] trial I've looked, I've seen that anti inflammatory aspect of urolithinae.

Okay.

[00:28:04] **Dave:** [00:28:05] That's, that's pretty cool. I, I would. I would say that this [00:28:10] is one of those foundational longevity and performance supplements that I, I'm [00:28:15] just truly believe in, and one of the reasons is that there isn't a [00:28:20] risk of, of taking away benefits from exercise or other [00:28:25] beneficial stressors in the body, which is why I'm, that was one of the many reasons that just as a longevity guy, I think this stuff is [00:28:30] pretty cool.

Let's talk about skin. So what does urolithin [00:28:35] A do specifically for skin repair?

[00:28:37] **Anurag:** Yeah, so this started [00:28:40] as a A weekend idea. Not that we didn't have a lot of work already in [00:28:45] our regular, you know, with a lot of the scientists and here in [00:28:50] timeline, we said, well, this stuff gets in the body has all these great effects.[00:28:55]

What if we actually put it in a cream and actually looked at what the [00:29:00] effects are directly on skin cells? And a lot of times in the longevity field, [00:29:05] People were asking me, well, what does improving mitochondrial function mean? Should I feel more energy? [00:29:10] What do I see on my face every morning? And so a lot of, yes, you can look at [00:29:15] energy, VO2 max and strength measures, but that led to the idea, well, what can [00:29:20] people see on their face?

Well, let's put it on a cream and, and, and see the [00:29:25] effects. And so we started actually studying skin cells from young and old people. I [00:29:30] couldn't believe that the exact same hallmarks of aging were going down. So you had [00:29:35] chronic inflammation, you had, you know, because of excessive. UV damage [00:29:40] in the skin cells.

You had photo damage taking place, causing inflammation. You had [00:29:45] the mitochondria in the skin field are very poorly studied. And we started looking at [00:29:50] young fibroblasts versus old fibroblasts. And the number one feature that [00:29:55] was down was poor mitochondrial health in these skin cells that are called fibroblasts.

And so we [00:30:00] started studying them. Of course, adding urotinamide up here into and seeing if you [00:30:05] could reverse it. And we did see the same reversal. We were seeing, for example, on muscle and immune [00:30:10] cells. And that led to a whole plethora of randomized clinical trials where we [00:30:15] designed the topical creams. We Took volunteers that were [00:30:20] men, women with wrinkles, poor skin, hydration poor skin barrier, [00:30:25] and these folks applied these skin creams for, for up to two months and what we, and [00:30:30] we took skin biopsies as well, just to really go deep into the biology and we [00:30:35] saw a reversal to a certain extent of the skin wrinkles, better hydration, [00:30:40] and the real key finding was that we actually Urolithinamide or [00:30:45] puritopathy applied, stop these collagen degrading enzymes that are existing in our [00:30:50] skin cells called matrix metalloproteinases, these are called MMPs, that really go up [00:30:55] with skin aging.

And that was blunted. So I, I think this is sort of a two pronged [00:31:00] approach. There's things like retinol, right, in the skin aging field that do attack [00:31:05] wrinkles, but they are, They leave your skin sensitive and a bit irritant. And so I think this [00:31:10] is a very natural, safe way to counteract different features of skin aging.

[00:31:14] **Dave:** [00:31:15] You talked about a super nerdy topic, MMPs. They're [00:31:20] one of my favorite unknown longevity factors. Define MMPs, talk a little bit [00:31:25] more about what they do in the body and outside the body and where they come from.

[00:31:29] **Anurag:** Yeah. So, you [00:31:30] know, wherever there's collagen, whether in our joints or skin or. You know, [00:31:35] collagen is people don't realize a lot of the collagen and proteins and things [00:31:40] also get synthesized in their mitochondria.

So if you think about it, [00:31:45] collagen with aging levels decline and you have all these collagen supplements that people are [00:31:50] are selling. But these are these are like proteins that will get chopped into amino [00:31:55] acids. So the holy grail in the whole aging field is to attack these set of [00:32:00] enzymes called MMPs, which stands for matrix metalloproteinases.

And there are several of them. [00:32:05] These are enzymes that basically Go up with aging. And so they keep [00:32:10] chopping collagen and degrading collagen. And so the good collagen never stays around with the [00:32:15] aging process. And that leads to, you know, loose skin that you think that comes with, you know, [00:32:20] the saggy skin, the wrinkling of the skin.

And so there are ways out [00:32:25] there. If you can attack the activity of these enzymes and prevent the [00:32:30] degradation of collagen, then You have a natural way to counteract skin aging. That's what we are seeing [00:32:35] with our we see an effect on MMP1 and 2 and other MMPs [00:32:40] on, and they're different kinds of skin cells, right?

So you have the first layer, which is the, which makes [00:32:45] melanin. That's the pigmentation cells. Then you have the keratinocytes and then you have a deeper [00:32:50] level, you have the fibroblasts. So these are the three main skin cell types, and they all Most of the [00:32:55] collagen is coming from the deeper layers. And so we see the keratinocytes and fibroblasts.[00:33:00]

And when we pull biopsies from these middle aged folks who have extressive [00:33:05] wrinkles, after a while we see wrinkles go away, but the expression of [00:33:10] MMPs in skin has gone down. And, and I think that's phenomenal because now you have a biology [00:33:15] to explain how your compound works for a certain health benefit.

[00:33:19] **Dave:** [00:33:20] MMPs seem like they're a part of aging throughout the body, not just [00:33:25] in culture because of the fascia throughout the body. I had a recent experience where [00:33:30] I ate a bad oyster in Las Vegas. And there's two kinds of [00:33:35] toxins or bacteria you'll find in oysters. The paralytic one that everyone is, is [00:33:40] probably, you've heard about, that's really bad.

But the other kind of bacteria that you'll find [00:33:45] in oysters creates high levels of MMP in the body. And [00:33:50] I sweated through the sheets that night. Took some charcoal, but that wasn't enough. [00:33:55] And I felt like a, a truck hit me the next day. Every [00:34:00] Site I've ever had an injury and sites. I haven't even just absolutely sore and [00:34:05] just felt really really awful And so I did the research.

Oh, yeah, I have high MMP levels that [00:34:10] overnight went to all of these sites in the body where [00:34:15] they're Probably has already disrupted collagen and things. And it's normal to [00:34:20] take about two weeks before you recover from that sort of a thing. And it's [00:34:25] rough on the liver as well. So I said, well, what can I do?

What do I know that affects MMP? Well, [00:34:30] there's Timeline. And then one of my other companies is called Wasabi Method, which is a [00:34:35] unique kind of pressure wave therapy. It's a device that practitioners can use to regenerate [00:34:40] tissues. So I took a bunch of Timeline, Bye. And I did the wasabi method all over, [00:34:45] but especially in those areas, to raise the enzyme that breaks down MMP, the [00:34:50] proteinase, and I was only sore for like a couple days compared to what would have been a much [00:34:55] longer time.

So, Regulating MMPs regularly seems like a good move [00:35:00] because we know some of them are made in the gut and some of them are just made as we age. Is there a good way of [00:35:05] measuring MMPs? Is this part of any longevity panel? How do you guys study that?

[00:35:09] **Anurag:** This is [00:35:10] using a very standard assay [00:35:15] called ELISA, so you're looking for their levels in either plasma in blood or when we do the [00:35:20] biopsies.

I think More and more, you will start seeing these assays come up in a [00:35:25] longevity panel because these MMPs, where I see the researchers, as you were [00:35:30] pointing out, they're actually driving a lot of, I believe, cellular senescence as well. And [00:35:35] so a lot of these so called senolytics will be used to look at the [00:35:40] effects will be used to look at the effect on MMPs.

[00:35:43] **Dave:** So not [00:35:45] something that most of us are going to get measured, but something that seems like it's more implicated in tissue aging [00:35:50] than, than. Most of us talk about, so guys, I have a pretty good track record of [00:35:55] calling it early. So wait five years and look at MMP in the field of aging, and I bet you'll find a bunch of [00:36:00] cool stuff.

I bet you'll find a lot more about urolithin A and you'll probably see [00:36:05] Dr. Singh's name on some of the papers. Am I right? Yeah, absolutely. Yeah, [00:36:10] it's a Bible. 15 years of research. So, yeah, that's, that's super cool. It's just a [00:36:15] walk into, uh, into what's going on now. I do use [00:36:20] timeline. On my skin. I use a lot of other stuff too, to be clear.

I don't use this one [00:36:25] product. I have ridiculously, like, supple skin. I also have [00:36:30] a lot of skin because I use way 300 pounds, like, so I have, like, a lot. Which is why, like, [00:36:35] you can see I have these, whatever they're called, marionette lines. But the, [00:36:40] the tissue quality is, is, Just really, really good, especially if you account for [00:36:45] the amount of sunshine that I've had growing up in New Mexico.

And you account for the fact that the calendar [00:36:50] thinks that I'm slightly over 50, even though my lab tests don't agree. So, [00:36:55] how long does it take if someone starts putting urolithin A on their skin to see a [00:37:00] difference, and what difference do they see?

[00:37:02] **Anurag:** Yeah, so this is not a, again, this is [00:37:05] not a, Magic pill or magic cream.

So it does. We start seeing the [00:37:10] earliest changes are after two weeks on the skin, so better hydration. So the [00:37:15] skin looks more moisturized and things like this. At about four to eight weeks [00:37:20] and it's really eight weeks where we see the, the real hallmarks of skin aging, like [00:37:25] if less redness, I mean, there are pictures I've seen of people with really eczema in our [00:37:30] trials and, and red inflamed skin and, and that goes away.

And of course the [00:37:35] wrinkles is, is we, well, people call it wrinkles. If it's really looking at the loss of [00:37:40] skin elasticity and, and, and, you know, how, how good the topography of the [00:37:45] skin is. So we studied skin roughness and, and we see the wrinkles go down. We [00:37:50] see skin roughness being improved and, and the skin be more elastic.

And yeah, I [00:37:55] mean that all these are can be. Linked to better yeah, if you block [00:38:00] MMPs, as we were discussing.

[00:38:01] **Dave:** Okay, interesting. That might be one of the ways, aside from just [00:38:05] helping mitochondria that you're seeing an effect on skin. So it takes, you [00:38:10] know, call it a couple months of regular application.

[00:38:13] **Anurag:** Yeah.

[00:38:14] **Dave:** Do you need to use it [00:38:15] once or twice a day?

[00:38:16] **Anurag:** So in our trials, we have done both. So we have a [00:38:20] suit of products. We have the, you know, we have the face creams that are used with [00:38:25] the daily application, and we have the clinical data on it that is published [00:38:30] now. And then we have the serum, which is just really like a more twice a day [00:38:35] application.

And a lot of folks love that one. And we have clinically studied that too, as well.

[00:38:39] **Dave:** [00:38:40] Timeline is you guys spent 10 years. Figuring out all the science behind urolithin A before you [00:38:45] came out with one of the new longevity molecules. And to be really clear, I, I [00:38:50] think this is at least as important as NAD, which is really well known in the longevity [00:38:55] field.

So I'm, I'm a big fan just based on the science. And that can't be the only thing [00:39:00] you're working on. I don't think you're a one hit wonder. So what, what's in the pipeline here? [00:39:05]

[00:39:05] **Anurag:** So

[00:39:05] **Dave:** the pipeline is,

[00:39:07] **Anurag:** you know, we've been lifting the [00:39:10] cross for a long time and now the buzz, the buzz is going to other scientists.

So we [00:39:15] were just at an aging conference and there were folks talking about brain health [00:39:20] and how, you know, this is, after fasting and MCTs, [00:39:25] this compound is inducing similar benefits in models of brain [00:39:30] decline, for example. So on one aspect, we, our main focus today [00:39:35] remains. Unlocking more newer benefits of, of this compound, because as we started off [00:39:40] saying mitochondria everywhere, so it has to have more than just effects on your skin or your [00:39:45] muscles.

So we are unlocking that we are running a study in, in pre diabetics looking at metabolic [00:39:50] health in GLP 1 production I mean, this is a postbiotic, it has to influence the gut [00:39:55] microbiome where GLP 1 is mostly made that a lot of folks don't understand. [00:40:00] And then we are, we are kind of.

exploring synergies with other [00:40:05] compounds which have a similar scientific rigor and, and where we can, you know, [00:40:10] hit different pathways of, of the hallmarks of aging. So stay tuned on that one. [00:40:15] We'll, we'll be running a lot of new trials and coming out with new products. A little bit more [00:40:20] specific.

Yeah, my, my my IP intellectual property [00:40:25] guy will not like it, but, uh. No,

[00:40:26] **Dave:** no, I don't, I don't want it. You guys have to file some patents. [00:40:30] I'm not asking for your roadmap for the future here. I'll give you an example,

[00:40:33] **Anurag:** brain health, right? [00:40:35] Brain health, uh, we are, are, Running to or planning to [00:40:40] kick off two new studies.

One is looking at folks, believe it or not, mid [00:40:45] forties, mid fifties, who all have sleep disorders. They have something called as REM sleep [00:40:50] disorders, and it has been shown that in multiple longitudinal [00:40:55] studies that 95 percent of these folks who have sleep disorders will [00:41:00] turn into Some form of cognitive neurodegenerative disease.

So whether it's dementia, [00:41:05] Alzheimer's, Parkinson's, whatever. So we wanted to catch them early in their forties and fifties when they [00:41:10] started having these REM sleep disorders. And so we are running this trial to improve [00:41:15] brain bionergetics. These are the same folks that have actually looked at NAD as a way to [00:41:20] modulate the brain and improve brain health.

And so we are, we, we, we. We now have data that your [00:41:25] litany or some other scientists have shown that you, your litany are actually also [00:41:30] boosts NAD. Levels by sort of the recycling mechanism. So we exploring that and [00:41:35] then we are looking at brain aging. So for example, there are nutrients like selenium, okay, [00:41:40] that are known to decline with aging.

There are nutrients like magnesium that [00:41:45] everybody takes for recovery, but nobody really has studied the interaction with [00:41:50] other supplements or other bioactives. And so the way I see it is that [00:41:55] MitoPure is your cellular health glue or your, your lubricant that you put. [00:42:00] Motor oil that you put in your, in your fast car and, and it, it revs [00:42:05] up other things.

So you, now, if you're taking a, an omega three, you'll absorb omega three better. If [00:42:10] you're taking magnesium, you'll absorb not just because all your cellular machinery is working so [00:42:15] much more efficiently. So that's something we are exploring. And yeah, there, we are looking at other [00:42:20] actives that are similar to urolithin A as well.

[00:42:23] **Dave:** The big [00:42:25] hypothesis behind my book Headstrong, which is kind of the cognitive enhancement Bible [00:42:30] as far as I'm concerned, is one of my really successful books. It [00:42:35] was that step one, upregulate mitochondrial activity in the brain, which drives down [00:42:40] inflammation and improves cognitive function just because you have more power.

And then [00:42:45] step two, Two would be increased BDNF because this [00:42:50] increases neuroplasticity. So now you have more power in a brain that can change more easily. Therefore, meditation will work [00:42:55] better and focusing will work better and just everything works better. It stands to reason that since [00:43:00] MitoPure, you know, the timeline flagship, your Lithin A stuff, since that does increase [00:43:05] mitochondrial function, if all the research in my book is right, then I would expect cognitive [00:43:10] effects.

And this is the first trial that you're, you're looking at to study cognitive effects for [00:43:15] urolithinae?

[00:43:15] **Anurag:** Yeah. So this is the first randomized clinical trial. We, we are leading, [00:43:20] there are trials underway by other investigators who, who partner with [00:43:25] us, but then they run their own trials. These are famous professors all around the U S and [00:43:30] outside the U S and so there are other trials happening.

Yeah.

[00:43:33] **Dave:** We also have this idea of [00:43:35] polypharma. In the pharmaceutical industry, we study [00:43:40] different combinations of drugs. And to see what, what do they do when [00:43:45] they're stacked. And in biohacking, of course we stack things, because we're results oriented. Like, oh, you wanted something [00:43:50] to happen? Do everything that's likely to make it happen, get the result, and then back off.

Like that, that's, [00:43:55] that's the, how do I change myself most quickly? Way of doing it, but I've seen [00:44:00] very few companies transition this idea of studying multiple compounds over [00:44:05] into cognitive enhancement and in the supplement industry. And it sounds like you're going down that path. [00:44:10] You're looking at combining your alythin with things that will amplify its effect.

[00:44:13] **Anurag:** Yeah, I mean, you have to [00:44:15] understand the biology of brain decline, right? There's mitochondria at play. One of the hallmarks. [00:44:20] Then you have, you talked about inflammation and inflammation. So you need something that [00:44:25] can be additive to mitopure. Then, you know, things like the B vitamins and [00:44:30] things like selenium and magnesium, they decline, you know, because they're transport to [00:44:35] the blood brain barrier.

Declines and, and maybe the old folks are also not eating [00:44:40] well. And so can you add other nutrients and other [00:44:45] bioactives and other pathways? So something that can regenerate your myelin sheet, for [00:44:50] example, and potentiate a phospholipid, for example. So that's what, how we are approaching it. So you will [00:44:55] see multiple targeted nutrients, all.

studied together and, [00:45:00] and validated in a clinical trial, randomized trial, and then we launched these products.

[00:45:04] **Dave:** I [00:45:05] do greatly appreciate the level of rigor that you guys [00:45:10] have. The 10 years of research to bring out your lithon A was impressive. [00:45:15] And When I look at my 150 supplements a day, and [00:45:20] I, it's not always 150, that's when I'm traveling at my most extreme, like I have to be on, [00:45:25] but most days it's, you know, 50 to 150.

Timeline is [00:45:30] one of the things that's always there, just because of the, Uh, the strong research on, [00:45:35] on baseline mitochondria, and it's one thing to take a, a nootropic that does a, a specific [00:45:40] thing for a neurotransmitter. That's very high level compared to just having better base machinery [00:45:45] that's running.

Are there other compounds that you like to take, even if it's something that [00:45:50] you don't, you guys don't manufacture, that you like to take regularly?

[00:45:54] **Anurag:** Yeah I, [00:45:55] I'm a big fan of omega 3. I did a lot of that research before in my former life. [00:46:00] These omega 3s do become processed, broken down into our body [00:46:05] into something called resolvents.

And so I studied resolvents a lot. And and so [00:46:10] I know, the, And the inflammatory aspect of these molecules, plus heart health [00:46:15] is a big one. We're all in that age group where we need to think about our heart health. So I [00:46:20] love taking omega 3, a good brand, at least 2 grams plus, [00:46:25] because most of the brands sell it at 2 grams.

Uh, less than a gram and, and most of the clinical [00:46:30] data is two, three grams plus for real efficacy. So I take that and [00:46:35] I take MCTs I, I, I take some ketones, ketone esters as well. They, [00:46:40] they really have this effect on cognition, but sometimes they give me a [00:46:45] little GI upset, but that, that's just a matter of dosing.

But those are my top three [00:46:50] stacks. Have you played with ketone diol versus ketone esters? [00:46:55] No. Which would that be? Which company would be selling that?

[00:46:58] **Dave:** Ketone

[00:46:59] **Anurag:** IQ. Ketone [00:47:00] IQ.

[00:47:00] **Dave:** Okay. That one I haven't tried. Those are interesting because the esters seem to [00:47:05] place a load on the liver because you have to, it has to process them.

And they [00:47:10] uncontrollably raise ketones. Ketone diol, the body still can regulate, but you can get up to about 1. [00:47:15] 5 on a ketone meter. And MCTs will get to, in my experience, like the [00:47:20] C8 stuff that I popularized when I was at Bulletproof. We'll get to about 0. 5, maybe 0. [00:47:25] 7 on an empty stomach with coffee, and coffee is an amplifier of ketosis.

So, [00:47:30] I've found I take MCTs regularly, and I'll take some, when I want extra ketones, I go for the [00:47:35] diols now. And I do take that with urolithin A. Is there an effect [00:47:40] on amplifying ketosis? When you take [00:47:45] urolithin A.

[00:47:45] **Anurag:** Yeah. So, you know, we, urolithin A loves being in [00:47:50] the matrix of fat and MCTs and it just absorbs much better.

So that there's [00:47:55] that one angle that ketosis will more certain amount of MCTs will [00:48:00] help you absorb more of urolithin A. And we have [00:48:05] certainly looked at the amplification and just through biomarkers. But I [00:48:10] think proper trials on cognitive function need to be designed fundamentally, yes, on [00:48:15] mitochondrial function.

We have evidence on cell based systems that if you add the MCT [00:48:20] or ketone bodies, you get better effects on, on inflammation, anti inflammatory [00:48:25] effects of mito pure. Or if you add things like CoQ10, you get [00:48:30] even better mitochondrial function. So there are additive angles to chase. I agree.

[00:48:34] **Dave:** [00:48:35] What I.

would hypothesize here, and I want to run this past your scientific [00:48:40] brain. There's still, I'm going to call them the keto bros. These are people who, [00:48:45] you know, maybe read the Bulletproof Diet. Oh, ketosis is the best thing ever, and I'm never going to eat a carb [00:48:50] again. And they'll sort of compete to have the highest possible ketone levels.

[00:48:55] And I always feel like that's the same as competing to have the highest possible blood glucose levels. [00:49:00] It means the body's not burning ketones if your levels are super high. So I would [00:49:05] hypothesize that anything that enhances mitochondrial function is going to make the [00:49:10] mitochondria better at pulling energy substrates out of the blood.

Absolutely. And That means [00:49:15] if you took some exogenous ketones like MCTs or [00:49:20] ketone or BHB salts, whatever you're using, that you might [00:49:25] have lower blood sugar levels or lower ketone levels if you take MitoPure because your [00:49:30] mitochondria worked better and they were better able to burn whatever was present.

[00:49:33] **Anurag:** Does that make sense? Absolutely. [00:49:35] In all our studies, when we look at this, what we call a substrate switch, so you can [00:49:40] actually look at is your cell. Now needing glucose or is it needing fats? And [00:49:45] we always see the switch to more fatty acid oxidation from a glucose glycolytic [00:49:50] energy pathway with the early tonight.

Now that means now you're utilizing your fats [00:49:55] more and more. And so I think that makes total sense to test even in a [00:50:00] randomized trial.

[00:50:00] **Dave:** It really does make sense. And for listeners, if you're in a keto [00:50:05] phase, and hopefully if you've read the Bulletproof Diet, you recognize cycle in and out of ketosis, for God's sake, don't stay in it forever.

[00:50:10] It's not a good idea. But if you're worried that your ketones aren't high enough, it could [00:50:15] just be that you're fat adapted because people who regularly experience ketosis have lower ketone [00:50:20] levels because their mitochondria can better burn ketones. And if you enhance mitochondrial function [00:50:25] with MitoPure, And your ketone levels drop by 0.

2 or something, it's probably because you're [00:50:30] using the ketones. Again, we don't have data for that, but it just makes sense. You want mitochondria that [00:50:35] can vacuum blood sugar or ketones out of the blood and turn it into heat or [00:50:40] electricity or other compounds your body needs, right?

[00:50:42] **Anurag:** Yeah, I mean, this is something I've thought about [00:50:45] long, long time, late evenings, nights, how to combine it.

The problem is, [00:50:50] Most people like popping pills and gummies and, and to get that [00:50:55] effect, at least with MCTs, you need a lot, right? You need what? 20 grams of MCTs. [00:51:00] So it's really a powder based proposition that you have to think about rather than [00:51:05] trying to, Put too much in a, in a pill. So that's the only challenge on the commercial [00:51:10] side, I think.

But otherwise, hypothesis, the scientific and clinical [00:51:15] rationale is very solid, as we were just discussing. Got

[00:51:18] **Dave:** it. You mentioned omega [00:51:20] 3s, since you studied them extensively, and you know a thing or two about mitochondria. I'm going to pick your brain about [00:51:25] those, with or without taking MitoPure. So we [00:51:30] have EPA, we have DHA, and there's also DPA.

Talk to me [00:51:35] about how much of each of those you like to get, and whether you even pay attention to DPA.

[00:51:39] **Anurag:** I [00:51:40] don't. All I want to Make sure as I get enough EPA and DHA and then they [00:51:45] are, there's a lot of research now on alternatives. I think that's some very exciting [00:51:50] stuff coming out. There's a fatty 15, there's other derivatives similar [00:51:55] resolvents.

You have to look into the resolvents as well. These are fascinating compounds as well, [00:52:00] much like metabolites of, like, of, of mega trees. So I [00:52:05] just go with the EPA DHA content.

[00:52:08] **Dave:** And what ratio do you like between the two [00:52:10] of those?

[00:52:11] **Anurag:** So I think it's something like two to one. In the whole [00:52:15] field of omega 3, they say take three grams, and I think you want to target [00:52:20] getting 25 30 percent of that to be EPA DHA.

I think that's where they are all headed [00:52:25] at.

[00:52:25] **Dave:** Okay. That, that makes sense. I've been kind of tortured by this since I [00:52:30] wrote my first book on fertility, which was my very first book. We know that babies [00:52:35] like DHA.

[00:52:36] **Anurag:** Oh, for sure. All the infant formulas have that.

[00:52:38] **Dave:** Yeah, it's, and it's important [00:52:40] for moms, even before pregnancy, a lot of women like, oh, no, I have fat on my, [00:52:45] my thighs and my butt.

I'm like, yeah, that's your DHA store and your first baby's going to drain that for you. You know, your [00:52:50] body's getting ready for that if you decide to have kids. But adults, it feels [00:52:55] like we need a little bit more EPA than DHA. Yep. And, and so there's probably some age [00:53:00] appropriate thing there. And again, I would stack all these things with MitoPure because better [00:53:05] mitochondria equals better results.

And I, I also appreciate you mentioned CoQ10, I take that as well. So, so this [00:53:10] is a nice stack, mix some EPAs some MitoPure and some CoQ10, and [00:53:15] you're probably

[00:53:15] **Anurag:** going to get good results. I, I think you, back to my, and [00:53:20] this is something again, another trial I need to run is I need to take, The stack of vitamins and minerals [00:53:25] and supplements and then add mitopurine show that now you're getting even better [00:53:30] exposure to all these, just like we were saying with ketosis or, you know, just [00:53:35] because now your cellular machinery is so optimal to absorb these nutrients.

I think this is a. [00:53:40] There's something we need to run to.

[00:53:42] **Dave:** It is. And I love that you said minerals and things like that. [00:53:45] So there's vitamin Dake and minerals 101 are two of the things I focus on as [00:53:50] foundational because mitochondria, even if they have mito pure, if they're lacking zinc and [00:53:55] copper and all the other minerals, they just don't work very well because they have no building blocks.

So you start with building blocks, do your [00:54:00] mito pure and just keep going up the stack. So I, I appreciate being able to [00:54:05] share this information and in a usable way. If you're listening to the show going. [00:54:10] You know, supplements are expensive. Yeah they are. They're not that [00:54:15] expensive compared to what you likely spend on going out for drinks.

And if you're not [00:54:20] going out for drinks, they're still less expensive than a single doctor's appointment. [00:54:25] and so I, I just look at this as the first place that I invest after eating food that's low in toxin. [00:54:30] Anything else we should know about, uh, How do you use [00:54:35] MitoPure to get better mitochondria?

[00:54:36] **Anurag:** I think we covered all the bases you know.

I [00:54:40] think it, again, a lot of people say, what dose should I start with? Is it 500 milligram or a gram? [00:54:45] That's probably the trickiest thing. And, and I put my You [00:54:50] know, again, as a trained doctor, we weren't trained to think about, [00:54:55] you know, prevention and, and go early to delay aging. I think if you're a [00:55:00] fatigue, if you feel like your body is sort of under stress and [00:55:05] inflamed, and if your blood labs are showing that inflammation, then a gram makes sense to start [00:55:10] off and you can always Bring it down.

I mean, we talked about that, you know, [00:55:15] this could be seen as an expensive supplement, even though it's like taking a coffee a day or even [00:55:20] cheaper. But it's again, if you are already doing all the good stuff like fasting and [00:55:25] exercise and taking a lot of vitamins and other CoQ10 mother mitochondria boosters, [00:55:30] then 500 milligrams is the dose we see already hits the cellular energy [00:55:35] and the recycling of these bad zombie like mitochondria.

So, you know, Yeah, that's probably [00:55:40] the only last stop parting thoughts. Okay. I

[00:55:43] **Dave:** do have an addition [00:55:45] on that one and it's take a gram if you've never taken it before, do it instead of taking [00:55:50] 500 milligrams a day for a month, do a gram for two weeks. So you'll feel it [00:55:55] and you might not feel it when you start taking it, but at the end of two weeks, when you stop taking it and you go back [00:56:00] to the way you used to feel, then you'll really notice it.

[00:56:02] **Anurag:** Yeah, this is so true. Absolutely. [00:56:05] So. Well, I also invented a test that allows you to know if your body can actually make the [00:56:10] postbiotic urlatin A my body doesn't and I'm running a study actually in my home country, India. [00:56:15] And I realize in, in Europe, in the French and the Italians that are kind of eating the good [00:56:20] Mediterranean diet, we see 30 40%.

In the U. S. and Iran studies, we see only 10 [00:56:25] 20 percent people have this molecule. India, it's less than 5%. And I don't know [00:56:30] why. I don't know why. It's probably a lot of antibiotic exposure. And even growing up, I [00:56:35] got so much antibiotics for everything. They give you antibiotics, probably. That's my hypothesis.[00:56:40]

My body, I feel it. I need to take a gram. And [00:56:45] when I switch to 500, I feel, a little crash. So, yeah. [00:56:50]

[00:56:50] **Dave:** Got

[00:56:50] **Anurag:** it.

[00:56:51] **Dave:** And for some people listening, they're like, well, that means there's something wrong with you. [00:56:55] No, it doesn't. It means that when your body is running at its full [00:57:00] efficiency, it's probably not going to do that without help.

Even if you were [00:57:05] a caveman and living in nature and all that stuff, your body doesn't want to [00:57:10] expend the resources to do that. And if you use biohacking, you take control of what goes into your body, [00:57:15] You can make it so your body has everything it needs to do that, and then it's going to do it, and you're going to like how you feel.[00:57:20]

So, one group of people say, well, that's cheating, or that means you're addicted to it. I'm like, [00:57:25] well, going outside makes you feel better because of the sunshine. Exercising makes you feel better. [00:57:30] Like, all of these things are just things you do to function better, feel better, and, and [00:57:35] have control of your biology.

So, I think this is really important. Just awesome stuff. And I'm grateful [00:57:40] to you for sharing some of your knowledge of what stacks well with your [00:57:45] Lithin A. And I also want to call out for people who are on GLP 1 drugs like [00:57:50] semaglutide, we have a whole episode talking about using Timeline [00:57:55] MitoPure and how important mitochondrial function is if you're on one of those weight loss medications.[00:58:00]

So you definitely want to check that episode out as well. And because we want to save you some [00:58:05] money, go to timeline. com slash Dave. They'll give you 10 percent off [00:58:10] your order. This stuff is just worth it. And I want to make everything as affordable as possible. So [00:58:15] thanks for sponsoring the episode and just sharing real unbiased data.

Guys, if [00:58:20] you're all into the, the super famous things like NAD or [00:58:25] testosterone therapy, both of which I'm a fan of and use, this is something that is equally important. [00:58:30] It's that big of a deal. So I appreciate you just doing the hard research and sharing it. Again, [00:58:35] timeline. com slash Dave, save some money and get some results.

See you [00:58:40] next time on the Human Upgrade [00:58:45] podcast.