## Introduction to Epigenetics and Longevity

But then there's this area that's rich with change where how we eat, how we live, how we feel, what we're breathing, just if we're moving our bodies, the stress load that we're under, these variables can very profoundly influence epigenetics, i.e.

influence gene expression. And it turns out that we just have an incredible amount of say and whether we're optimizing gene expression by our choices, our daily choices, our habits or not.

And it turns out these choices really make a difference in epigenetic clocks, in the rate of biological aging. This is Doctor Talks, real talk from real doctors on the issues that matter to you most.

I'm Dr. Isaac Jones and this episode is part of our exclusive series recorded at the Exponential Longevity Summit, a global gathering of cutting edge health experts exploring the edge of human performance, healthspan and longevity.

Let's get into it. Alright, welcome everyone. This is Dr. Rudy Mueller and today we are joined by Dr. Kara Fitzgerald, who is a leader in epigenetics and longevity research.

Her groundbreaking clinical studies have really shown that a targeted diet and lifestyle intervention in reversing biological age is possible and we can get that reversal anywhere from three to four years, men and women, within just eight weeks of intervention.

So Dr. Fitzgerald is the author of The Younger You and The Companion Cookbook, Better Broths and Healing Tonics, sharing the science behind her approach really to aging and reversing aging.

## Defining Biological Age and Epigenetic Clocks

She's a naturopathic physician with extensive training in nutritional biochemistry, has contributed to key functional medicine techs, and was honored with the Rosalind Franklin Society Special Award in Science for her research.

I have had the privilege of listening to Dr. Fitzgerald speak at numerous conferences, whether it be A4M or the Institute for Functional Medicine. So it's a pleasure to have you on today and to hear your expertise, Dr.

Fitzgerald. Yeah, it's great to be with you today. Thanks for inviting me on. Yeah, absolutely. So I think just to kind of start, when people hear biological age, what should they be thinking biological age is?

And then let's dive into a little bit more detail around epigenetics and longevity. Yeah, for sure. So chronological age is the number of birthdays we've celebrated.

We can't change that. It is what it is. Biological age is the rate that we're physically aging. And that's where science is really putting a serious stake in the ground, or many stakes in the ground, because it turns out that we have say in our rate of biological aging.

I mean, we all know people who look older than their chronological aging. We know people who look younger than their chronological age, and there's actually a really interesting study suggesting that that's accurate, that if we look old, in fact, if you measure the rate of aging, that individual is probably aging at an accelerated rate.

So there's just an epic amount of science happening right now in investigating biological age and how we can slow it down. Yeah, and I think, I mean, obviously you're leading that movement in your research.

So when we're talking about your work, it really emphasizes the importance of epigenetics in aging. So could you explain to us a little bit about epigenetic modifications that really influence this aging process?

And then what are some practical steps we can take that will positively affect our epigenetic expression? Yeah, so I want to give a little bit of background.

There's a little bit of a tussle happening in the scientific space right now as to, you know, there's a variety of tools around measuring biological age, the aging phenomena is incredibly complex.

And so one of the things that we're doing is we're tightening up our terms. And what I would say that we showed in our research is that we slowed biological aging as measured by the epigenetic clock.

So we changed specifically the epigenetic fingerprint of individuals towards something more useful.

## Dietary Epinutrients and the Younger You Program

It's incredibly important, but there's this background tussle in the scientific community that makes me want to get my terms, you know, buttoned up. So epigenetics is above the genes.

Epigenetics is the study of all of the biochemical variables that are influencing gene expression. So we've got the same DNA really in every DNA-carrying cell.

We have the same thing, but an eye cell is very different than a skin or a muscle cell or a heart cell. I mean, it's very, very different. And this is epigenetics.

We've got these biochemical marks allowing different gene patterns to be expressed in different cell types. It's extraordinary. And there's a continuum of epigenetic expressions.

So when an eye cell is not going to become a liver cell, so those epigenetic imprints are lasting. They're not changeable. An eye cell will always be an eye cell, eye cell, or retina cell, or whatever cell type you're thinking of.

But then there's this area that's rich with change where how we eat, how we live, how we feel, what we're breathing, you know, just if we're moving our bodies, the stress load that we're under, these variables can very profoundly influence epigenetics, i.e.

influence gene expression, and it turns out that we just have an incredible amount of say in whether we're optimizing gene expression by our choices, our daily choices, our habits or not.

And it turns out these choices really make a difference in epigenetic clocks, in the rate of biological aging. So this is, you know, the science is new.

It's exciting. Just as I prefaced, there's a lot of change and growth happening. But the bottom line is that, you know, we're being validated over and over again, you know, things that our moms and our grandparents told us, you know, eat your vegetables, you know, exercise, just all of these, this tried and true lifetime of wisdom.

I mean, there's really some truth in this when we look at gene expression. So let me just, put a pin in it there and yeah, you can ask me something, some clarifying questions.

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Well, I think, you know, the importance of lifestyle and the impact on epigenetic age is, I mean, it's the foundation, right? We learned it through the Institute for Functional Medicine.

We have that core base that we need, the foundation that we need to be focused on, whether it be diet, lifestyle or exercise, sleep, stress, relationships, connection to religion, connection to purpose.

So outside, I mean, of those things, what are you really seeing that are making a big epigenetic shift when it's concerning biological age within your research?

I want to say again, yeah, looking at it through a functional medicine lens is just so exciting. Just to have the science validating what we've been teaching in the functional medicine model forever is ridiculously cool.

So It turns out our dietary pattern, what we think is healthy for the most part probably is the dietary pattern that we use in the Younger You program is very dense in veggies, colorful green veg, lots and lots of them, fruits, berries, things like that.

It's dense in high quality protein, mushrooms, a whole array of spices, things like rosemary or turmeric, green tea, varieties of peppers. I mean, actually the list sort of goes on and on.

Seeds, nuts, fatty fish, et cetera. So a dietary pattern, eggs, let me say eggs, liver, if people are willing to eat liver, The dietary pattern, there's a lot of options.

There's a lot of these nutrients that we've identified to be epinutrients. That is, they favorably influence epigenetics. They favorably influence gene expression.

Probably the dietary pattern is doing the heavy lifting in our intervention, so we have a paper in peer review right now looking at all of the elements of what we did to see which had the strongest influence on the epigenetic clock.

measuring bio-age, and it was nutrients. In fact, it's a particular collection of epinutrients that we call methylation adaptogens. These are phytochemicals, so compounds coming from plants.

Polyphenols are one of the groups of these. compounds. And so these veggies really seem to do the heavy lift. I mean, we would argue that the whole dietary pattern together and not just isolating these nutrients is where we see the benefit.

But when we look at the data, it suggests definitely eat your veggies, eat your colorful veggies, get your turmeric, drink some green tea, et cetera, that those seem to be particularly important players.

I love it. And, you know, I remember, you know, Deanna Minnick and her research around eating the rainbow. And so in integrating this with people in the research or people that are going through the Younger You program, are there particular tips around how many blues or purples or greens or reds they should be trying to get in?

So we want people, this is an eight-week intensive program, and I'll underscore that.

## Vegetable Intake, Spices, and Methylation Support

One needn't live this diet all the time, year in and year out, unless it really works for you. It may be something that you choose to do a couple times a year.

We have people do that and repeat with us. But you're gonna, you know, just hunker down and know you're going to be eating a good chunk of veggies. You're going to be doing like anywhere from seven to nine cups.

You're going to be doing quite a bit of greens. Again, the colorfuls, cruciferous, you know, sulforaphane is a beautiful compound that's an epineutrient extraordinaire.

So it's a matter of just kind of being with the idea that it's gonna be a vegetable intensive moment, plus others, we're not leaving out protein, we're not leaving out good fats, and then just hunkering down and being willing to get those in.

One of the cool, cool things about the book, one of my favorite parts about the book, Younger You, is that we've got a 30 page epinutrient appendix. So if you're wondering what to eat, what you can eat, we actually have a down and dirty, We're going to give your listeners the full program in a PDF reference.

They can download it and they can see all of the target nutrients to go for. But if you want sort of the breadth of the epinutrients in our in our book publication that appendix is fabulous so what kinds of greens do we know are epinutrient extraordinaries what kinds of colorful and cruciferous etc it's just it's just this massive 30 page nutrient appendix, the only nutrient epi nutrient appendix that I'm aware of, but you can go in there and just make sure you're eating what you like.

You can see what you're already doing. Um, but yeah, that's a, it's, it's, it's a veggie intensive program. There's, there's no, no ifs ands or buts around that.

Yeah. Nice. Nice. And I think one of the things that you emphasized earlier that I think is often overlooked is really the herbs. and the spices and how much they can benefit.

So you mentioned rosemary and turmeric. Are there any other ones that you're noticing are making and helping shift that or contributing to that shift in biological age?

And if so, like how or the mechanisms that you think it's performing to be able to do so? Yeah, I mean, name a spice, you know, time, sage, pepper, you know, a variety of peppers.

I've lived here, I live in Mexico now, you know, arguably the pepper country in the world. There's hundreds of different pepper types. and I have no doubt that they house important, important, important epinutrients.

So our spice rack in general is just incredibly bioactive. It's just an epinutrient, you know, wonder resource for us. So there's many, many, many. They influence the enzymes involved in methylation, involved in DNA methylation, one of the fundamental biochemical processes that influence gene expression, which genes are on and which genes are off.

And so we want the best genes on the ones that are associated with health and longevity. And we want the ones that promote disease to be really turned off.

I mean, it's that simple. And so these nutrients seem to influence how that is happening. So there's two components. There's two nutrient classes in the diet.

We want to support, again, DNA methylation more broadly. We want to support this biochemical process called methylation. Foods like eggs, liver, leafy greens, mushrooms, fatty fish can support methylation foundationally.

And then you need to direct sort of how and where methylation is happening. And that's this layer of nutrients. And to your point, spices are a rich, rich, rich, rich resource of these sort of traffic directors.

So methylation, we want methylation to be happening with the foods in our diet. We want to support methylation with the foods and then direct how and where methylation is happening specifically.

So good genes are on. and then bad genes are off. And so we can do that through all of this information that we're getting from our food. But then circling back to a study that we've got in the works right now, the class of epinutrients called methylation adaptogens, the spices, the polyphenols, the colorful fruits and veg really seem to be extra important.

Beautiful. And so one tool that I've really utilized from, I think, your teachings and Deanna Minnick's teachings is

providing our patients with a food diary.

Be mindful of what you're eating, but then also to be able to like grab a box of crayons or markers and then be able to label out, you know, I ate four greens today and two blues, purples, reds, oranges, uh, and then really track that over the week of that food diary to be able to see what kind of nutrients they're getting in, just as a way to take inventory of what you're doing before implementing a program like the younger you program.

And then while you're implementing the younger you program. So I can appreciate so much how those polyphenols, those nutrients that we're getting from those wide variety of vegetables, fruits and spices really can impact our epigenetics and even the methylation.

I like that. I mean, that's fabulous. That's a really, really nice tool that will resonate with some people in doing this. I mean, that's one of the things that there's in the group we spend a good deal of time on.

How do you get these in? And what are the creative preparation methods, doing smoothies, et cetera? to make sure you hit the targets of the Younger You program.

There's a woman who reached out to us recently who has done an extraordinary job above and beyond kind of reversing her biological age as measured by methylation.

who just thinks about it in quantity. She's like, you know, I basically eat a pound of veggies a day. So you could do that. You could just pop them on the scale, measure out your veggies, and then just get that in over the course of doing the intensive program.

So when we're talking about nutrition, I would kind of want to stay in this lane for a little bit. We talked about seven to nine servings of vegetables, maybe a couple of fruits in there as well, herbs, and the diet being heavy in there.

We talked, you mentioned liver, which I definitely want to hit on liver because some people can't handle that. We talked about fatty fish or, you know, potentially good lean protein sources, eggs being another one with the choline benefit, I would assume, for the methylation.

When we're talking about it, so that's, that's like what to eat. How about when to eat? Is there, is there a fasting recommended with inside of this program and that within that eight weeks or, or where do you see fasting fitting into something like this?

Yeah. So in our research. We've only, it's a very gentle structure, intermittent structure, fasting structure.

## Fasting, Liver, and Nutrient-Dense Foods

So 12 hours on, 12 hours off, which some people would just call normal eating, right? You stop after dinner basically. I mean, I know today in this, you know, in that world we live in now, people are sort of noshing, you know, all day and all night, but we want people to have a hard stop really after dinner or maybe, you know, three hours before bedtime.

So just 12 hours on, 12 hours off, We wanted it to be just broadly adoptable we really wanted this program to be doable really by by virtually anyone so we end the other pieces is that we didn't want to research we didn't want to turn it into a fasting research study.

So we just looked at this in what we know we can do. So we actually worked on this program in our clinical practice for years before we got to research it.

And the design as it is was what was most broadly adoptable by our patient population. Makes a lot of sense. So I want to touch on before getting into the research itself and hearing about what kind of exciting things you were seeing there.

And then I'd love to hear a little bit more about the one that's in pure review currently. What about liver? So yeah, it's funny. Yeah, so it's funny.

You know, I'm thinking when we when we originally submitted our paper that, you know, kind of put us on the map was I think it was the third paper ever really in the world to show this biological age reversal phenomenon measured by epigenetics.

So yeah, we had a lot of attention, but one of the peer reviewers said, you know, what's up with liver? We got some pushback from a peer reviewer. It's really funny, but you know, if you have a nutrition background, if you have a background with, you know, thinking about nutrition, biochemistry, thinking about nutrient density, you know that liver is, I think, without exception, the most nutrient-dense food on the planet.

I mean, it's a multivitamin in a food matrix. It's a multivitamin mineral, actually. There's plenty of minerals in it. So it's just this incredibly nutrient-dense food, and it's delivered in a food matrix.

So it's delivered with and all of these accessory compounds that help with bioavailability, that help deliver the appropriate nutrients and the appropriate structure for our body to use.

I mean, we can't create that in a synthetic pill. I mean, we just can't do that. I'm a fan of vitamins. I take them myself. I prescribe them all of the time.

But I definitely have a food-first approach. And you can't beat liver. But how do you do it? How do you actually take it? When we looked at adherence data in our two publications out now, one looking at men, one looking at women, liver, especially in the first study, was pretty poorly adhered to.

People don't like to eat it. Nobody knows how to cook it. It doesn't taste great. For me, the only liver I like really is liverwurst or pate or something like that.

And it's hard to find really good clean-sourced pate sometimes. By the time we did the women's, we were recommending liver caps. So you can buy super clean-sourced mostly from New Zealand liver capsules.

And if you take, you don't even have to take six, a serving size is six, you could take a little bit less than that to adhere to our recommendations and hit your liver targets.

And that's what I do now. I'm not cooking liver. And there's not a heck of a lot of pate that I found down here in Mexico. So I do liver caps. OK, cool.

All right. So I'm German and my dad was the first one born here from Germany, my family. So liver was something that he really enjoyed. So liverwurst sounds amazing to me, but I know what they do to those animals prior to getting the liver.

I mean, they they feed them all of this crap to be able to fatten the liver up. Anyway, so if you can, I mean, if you can find an organic source of liver, obviously, that's what we're looking to target.

But I love that we can do liver caps as well. It's easy. I know it's easy. You just have to make sure. And I talk about sources in the book a lot. And you can get the book these days, folks.

We're pretty cheap on Amazon. There's used, available, and the paperback is out now. But you need to make sure that it's not defatted so you can get this freeze-dried, non-defatted liver and you're good.

It's liver in a capsule. It's freeze-dried liver in a cap. You're basically getting exactly what we're recommending. Yeah, perfect. Yeah, that's great.

Because I can only just imagine my wife coming into the kitchen as I'm cooking up liver and her reaction to the smell of it. But if you can handle it, liver is a great source for many vitamins and minerals.

And if you can't, liver caps may be the way to go. So with your research on the methyl aging and aging reversal, can you talk to me a little bit about your study on that process and maybe some of your trials and tribulations and the implementation?

I know the first study was with men, the second study was with women, and then what were the findings that really got you excited about where this was headed?

So this was a program that I started thinking about. So I started to really keenly think about epigenetics, gene expression through a functional medicine lens in maybe 2013, 2014. That's when the research was really sort of coming across my desk in a manner that really prompted me to stop and read it.

Most of the epigenetic science coming out at that time was looking at cancer because cancer very potently hijacks epigenetics, hijacks gene expression from us, changes gene expression in the tumor microenvironment to push the cancer growth forward.

So it really takes it over from us. And my biggest question was, are we influencing this favorably or not in functional medicine? And my sense was that we were.

That was my hypothesis. And are we doing it favorably? As I teased that out, it prompted me to, with Ramali Hodges, the director of our nutrition programs, to create this diet and lifestyle pattern.

## Research on Biological Age Reversal

I could see that we need it, so methylation always needs to be supported. As we age, we're not doing it as efficiently. DNA methylation is just one type of methylation process happening in the body.

There's hundreds of enzymes doing all sorts of things, from metabolizing estrogen to making adrenaline and dopamine etc etc that require methylation and it's just a carbon with three hydrogens going back to really basic biochemistry from high school but we're doing this process we're either taking this carbon and three hydrogens and putting it on to change compound activity or we're taking it off or we're making them in something called the methylation cycle.

As we age, we do this less efficiently, and this definitely shows up in DNA methylation. We do it less efficiently. So we knew foundationally we needed to support methylation, and so we include tons of methylation foods, and that includes liver, as we talked about to your point, eggs, you know, decent protein.

mushrooms, grains, et cetera, et cetera. So there's tons of foundational support for methylation. And then we layered in optimizing methylation and it's these cool polyphenol compounds that seem to direct traffic so that methylation is happening on the genome where we want it to.

And going back to cancer, which was our original question, there was a lot of in vitro, so cell studies or animal studies, so preclinical, not looking in humans, but showing that these polyphenols are really incredibly important players in re-expressing those genes that the tumor microenvironment can turn off.

I mean, it's amazing. So we look at these beautiful polyphenolic compounds and see that they've got this fundamental epigenetic role in protecting us from cancer.

And we can actually see this in the chronic diseases of aging more broadly, but most of the science is looking at cancer. And so we built this program out sort of looking at the lens of cancer.

So biological age as something that could be reversed was a pipe dream when we first started this investigation. I mean, we weren't even thinking about it.

Midway I mean we so we knew that we would be able to measure that the clock was available and that we would be able to look at it, but I wasn't holding my breath around changing it, I did have I did expect or hope.

that we would be changing gene expression, changing epigenetics favorably. But in terms of changing the epigenetic clock, we just hadn't seen that in humans.

And Steve Horvath, really the father of this field, didn't think that it was possible in humans. So it was midway in our study that the first paper was released showing that these epigenetic clocks could be reversed in humans.

And that was the TRIM study led by Greg Fay, And it was extraordinary. I mean, it's extraordinary. And we were underway already. But it made us, you know, it just was an exciting thing.

And we were excited to look and see if we may have, you know, if we if we influenced the first clock at all. So when we When we did, when we finished our study and we started to do our analysis and saw that we in fact had a favorable influence on Steve Horvath's clock on the, it's called the multi, the pan tissue clock, the 2013 pan tissue clock.

It was a big deal. It was really, really exciting for us to see that we had done that. And it, you know, commensurate to that finding the paper got a lot of just a lot of attention.

It was very, very exciting. So we showed in our treatment group. a epigenetic age reversal of over three years as compared to the control group. So it was the first study of its kind.

So it was the first in a lot of ways. It was the third looking at these epigenetic clocks in humans, but it was the first with a control group. So we could see that we did something differently than the control group did.

They didn't have that same change. And it was also the first diet and lifestyle intervention. So it was a cool first and a lot of things. And I'll forever be grateful to Brent Eck at Metagenics, who he was their CEO at the time, who green lighted this.

They gave us an unrestricted grant to study it. I feel just enormously grateful for that and for their support in doing it. Super, super exciting. So yeah, it was a first for a lot.

We've since gone on to not only tease out the heavy lifting nutrients, but we're also looking at, so we started by looking at the clocks and now we're looking more broadly and we're writing up an EWAS investigation.

So this is an epigenome-wide association study. So beyond just those methylation marks associated with the epigenetic clocks, the next question is how are we influencing methylation more broadly or gene expression more broadly and it turns out you know that original question looking at cancer and looking at some of the gene changes we can see that our study in fact favorably influenced some of those genes that the tumor microenvironment takes over.

So we're pretty excited about that. And that's a fourth publication that will come out or that we're writing right now, but we'll submit it in the not so distant future.

So just all sorts of exciting things to investigate and unfold with what we've created. And what I like about the younger you program and the content of the book and then the research that you've done in reading those reading the two that were published from the male the male study and the female study was that it really is geared towards the things that are modifiable that people can change rather easily.

It's not some expensive You know, gray area intervention that we're that you're implementing to try to reverse biological age is things that people can do today.

Yeah. Yeah. Yeah. And it's a healthy dietary pattern by any measure. And then, of course, we have. Yeah, it's just like it's like a one on one really healthy dietary pattern.

It's good fats, it's rich in, it's a little bit keto leaning, and we do have the triglycerides in our participants dropped significantly, so we likely put them into some background ketosis.

There's a gentle intermittent fasting structure. It's anti-inflammatory, it's hypoallergenic. So all of those really foundational and important things that you know as a functional medicine physician are baked in to this dietary pattern and then layered in are, you know, basically every single bite every morsel of food is is an epinutrient, is packed with a complex interplay of epinutrients.

That's perhaps the unique angle that this dietary pattern has from other dietary patterns that we really built that with the epinutrient influence in mind, but it's also brick by brick layered into just a smart dietary pattern that I think anybody trained in functional medicine would agree with.

There's no alcohol for the eight weeks. I'm sorry, folks. After the eight weeks, yes, you can go back to drinking, but it's anti-inflammatory. So we pull some foods out that you may love, but it's just, again, from this eight-week window.

And then once you get to the other side of that, you can bring them in, depending on how your body responds to that. And then just to your earlier point, we bring in lifestyle pieces as well.

Do you want me to talk about those? Are you ready to talk about those?

## Lifestyle Factors: Sleep, Stress, Exercise, and Community

They're important. We've been giving the diet. We've been talking about the diet a lot here. So it turns out sleep is an epi nutrient, exercise is an epi nutrient, stress reduction, some kind of an intentional stress reduction.

practice are epinutrients. That is they move favorably DNA methylation and epigenetics more broadly. So all of the lifestyle components that we added to this intervention have research on them.

showing favorable changes with good habits, and really conversely, negative changes with bad habits. So if you're not sleeping well, you're aging. We know that this is true by many different measures, not just by epigenetics, but if you're not sleeping well, if you're not hitting your targets there, it's pro-aging, unfortunately.

Stress is potently pro-aging, again, by many different measures, including the epigenetic clocks, high chronic stress. I'm not talking about short-term healthy stress of exercise or something exciting happening, but just that long-term grind that so many of us in the US are exposed to that is incredibly pro-aging.

Meditation, it turns out, is anti-aging. No great surprise there. you know, whatever that looks like. So we used a simple meditation exercise called the relaxation response created out of Harvard many years ago by somebody named Herbert, a scientist there named Herbert Benson, the relaxation response.

It's a simple breathing exercise and we wanted people to do that a couple of times a day. I think, you know, likely, I mean, and the research suggests that a good prayer practice, a yoga practice, a Tai Chi practice, like there's many ways we can, We can do that, but in our research to date, we've used the Herbert Benson protocol.

Exercise is an epinutrient extraordinaire. I mean, exercise, if you're looking at the epigenome, you know, looks like kale. I swear, it moves some of the same genes as a really good veggie choice does.

It's amazing. It will help those negative cancer patterns that I talked about very potently. And one of the cool studies that I love so much is that it's most effective in older adults.

So the epigenetic benefit of exercise is actually stronger the older you are. How cool is that? So every element of the program is designed to optimize epigenetics and specifically DNA methylation.

I like the reclassification of these lifestyle factors as epinutrients, right? Because all of them are impacting that epigenetic or the epigenome and also, you know, can be considered or thought of as a nutrient because of how it's impacting the epigenetic.

It's similar. I know. Like if you could do a blind study and say, was this a vegetable or was this exercise? I mean, I don't know that you would always be able to tell the difference.

It's pretty cool. Yeah, that's really neat. And, you know, something that you mentioned earlier was community and connection and prayer practice, you know, like a connected.

We obviously couldn't study that in a, you know, in a randomized control study, like how, you know, the control group, no community, no contact, you know, our group, lots of community, lots of hugs, et cetera.

But of course, those are important players as well, you know, when science bears that out. Yeah, I think a lot of the retrospective research looking at the blue zones and seeing all of the commonalities between these different areas, whether it's Okinawa or Seventh-day Adventist, they have that.

They have the community. They have a higher power. They have prayer. They have uh movement involved and it's not go out and let's jack up your vo2 max and see how great we can get that although i think that can be beneficial i'm not trying to take it away from it but right it's just movement regular movement that we would design functionally to do so yes that's right i i couldn't agree with you more you know on both ends you know if you're if you're up for some high intensity interval training yeah it's smart we didn't we didn't put that into our program again because we wanted it to be broadly doable so our exercise recommendation it was simply a minimum of 30 minutes, five days a week with a perceived maximum exertion between 60 and 80, a perceived exertion between 60 and 80 of your max.

So what you think is 60% to 80% of your max and you choose what it is you want to do. So yeah, I'm an exercise, I'm a committed, fairly intense exerciser, but for this program, we're meeting people where they're at.

Yeah, and that's what's really nice about the program too. So to shift kind of gears from being more group oriented to maybe more personalized medicine, obviously with the background in functional medicine and we are implementing personalized interventions that are specific to an individual.

I mean, are there key markers that people should be monitoring to optimize their specific health or slow aging or reverse biological age? Such a good question.

So I would say, yeah, I have a couple thoughts there. If you have the book or if you go to the website and on your summit page, there's a downloadable and you'll get all of the details to get over to my website and find these things.

We have a biological age quiz. I mean, that could be the first entry point into this conversation. If you're completely new to thinking, about biological knowledge, you could take this quiz and this would give you an idea of what your habits are looking like.

So I think it's very useful. And we've recently looked at it in relation to the key epigenetic clock we're using these days to see if there's any correlation.

So we looked at 70 individuals who took our quiz and did this clock, and we saw that it's actually tightly correlated. That's great. I know. We designed it with the best science, and we used a group of people to figure it out.

It wasn't validated, but now we're actually validating it and seeing it track. So as far as a budget biomarker, because it's 100% free, you could start with our quiz.

But to your point beyond that, the clock that we use currently is something called the pace of aging, the pace of aging. There's just great, great data on it.

And I think it's a fun tool. I think it's an important tool that we can incorporate it into an overall wellness plan. people to that end, people are welcome to work with our nutrition team in this space.

And I should say have a personalized bend towards the younger you dietary pattern based on what that individual's findings are. But I would argue that all of us, hopefully annually, work with a functional medicine provider who can really kind of look under the metabolic hood, look at our essential and our conditionally essential nutrients, look at our oxidative stress markers, look at our inflammatory markers, et cetera, do a stool test, do an oral microbiome, just kind of cast a net as appropriate and identify what's going on with that individual and correct those things and then, you know, layer in specific, you know, biological age pieces or concurrently layer them in.

## Personalized Biomarkers and Functional Medicine

But it's to your point that the personalized approach is so, so, so, so important. Having somebody work with you as you and not just jumping towards the endless biohacks that we're being inundated with these days.

Just who are you? Just a quick case from my practice, because I have a lot of these biohackers coming to see me now, which is fabulous. It's fun. I love working with them.

But I look at each individual through a functional lens. And so this was somebody who came to me taking all of the sexy new biohacking supplements out there.

And there's many of them. not paying attention to the inflammation of allergies. And we know that inflammation really of any form will drive aging forward.

So she was defeating herself with these sexy supplements, but it's fabulous. We identified it. We saw her individual needs. corrected her protocol, she can continue to do those supplements.

I actually just want to first actually work on her foundational stuff, and then we can bring those supplements back in. I'm not opposed to them, but it's that person.

It's that individualized component that we're so good at in functional medicine that I just think is essential. Yeah, absolutely. And it is so funny because you see the same thing, right?

They'll be coming in with blue light, red light necklaces or wristbands or, you know, I mean, I think all of these things have their place, methylene blue and taking different senolytics and all of these, all these have their place, but really it is beginning at the foundation.

And you're really hitting home and echoing what other speakers that we've had on this summit have said, it's the foundation that matters. And what I really appreciate is how much the research that you've been able to do is backing that.

I think we all intuitively knew it, but to be able to have it in the research is such a beneficial. Yeah, it's really great. So I think outside of that foundation, now that we're kind of hitting on some of these biohacks, How are you utilizing technology or AI to help with, you know, whether it's patient protocols or helping with reversing biological age?

I mean, really leave this question very broad so that you can kind of take it where you would like. But I'd just like to get a little bit more insight from you on how you're utilizing technology.

Is it through the biohacks? Is it AI? Is it a combination? Well, I don't do a lot of direct charting anymore. Which is amazing. It's such a gift for those of us who are kind of lousy charters.

So yeah, I'm using AI there. We're using AI in our research for sure. We're using AI in researching patient cases. It's not without pretty intense limitations.

So I would say that anybody who's really in there using it knows that the appropriate questions need to be asked. You always have to check and recheck everything.

So will it expedite the process? Yeah, in this amazingly useful way. In fact, we just looked at all of our genes that

we changed in our initial cohort and compared them to another publication that just came out, I'm going to present this, and we used AI to do that investigation and to help us analyze what genes were doing what, and we did it in 30 seconds.

Now, all of that has to be validated, but I'll be presenting this. I'm leaving shortly for a conference And I'll be showing, wow, here's a lot of overlap.

It was an intervention using a polyphenol compound and then our protocol. And we can see that there's a bunch of gene overlap. And we did that using AI in about 30 seconds.

But if we write that up for publication, which we might, yeah, we have to seriously do diligence, drill down in everything AI. I am thrilled about some of the technology, so the next generation MRIs with an AI overlay, forget about it, for brain MRIs.

Man, it's just game changing. It's game changing. It's game changing. Using a coronary CT scan with an AI overlay is also game changing. To be able to really discern the type of plaque and the quantity of plaque and the danger associated with it, game changing.

And it's only going to continue. So I am very much, Peter Diamantis has been talking about it for a while. you know, the AI train is leaving and you really need to be on it.

So I'm very much a believer in that we need to be kicking the tires of AI, for sure, because the possibilities are massive and it's really, really exciting.

And you gotta check, you absolutely have to follow up with everything. Like, it is, it seems like it's a lazy technology, you know, it's kind of going to give you the lowest common denominator body of information unless you really, you know, make it deliver the quality and caliber of information that you want.

At least that's been my experience thus far. But we use it all the time. We use it in content we're developing and editing and just all sorts of stuff.

And I think that, you know, I think the most exciting area is going to be in that diagnostic perspective and being able to really, quote unquote, screen and really understand where we are with, you know, avoiding those big, big diseases that cause cardiovascular disease, brain health, cancer.

That's really where I think that next phase is going to be the big thing. And then, yeah, yeah. I think AI, we're still really early on. If I give an analogy, and I heard somebody else say this, so I'm not going to claim this as my own quite yet.

I'll give it three more times, and then I'll claim it as my own. It's like a word processor or spell check. We're kind of in that area versus being able to Put in a thought and dump out a bunch of bunch of information when it comes to in respect to being able to look at a person's labs and genetics and all of that and be able to spit out a protocol that's specific.

So there's a lot of. There's a lot of expertise that needs to go into developing that personalized approach to each individual. Yeah, that's right. And we're not there yet.

But you know what? So I have a podcast that people can find if they're interested, New Frontiers in Functional Medicine. And I talked to Nathan Price, who is tussling with this.

So he was at the Institute for Systems Biology.

## AI, Digital Twins, and the Future of Longevity Medicine

And he's at Thorne as well. And they're working on a, quote, digital twin, which is It's just really cool. It's really,

really interesting. So to be able to throw interventions at that digital twin and see.

It's you. So this digital twin is you. And then you can go in there and try different cocktails of interventions and see what's going to benefit. Hopefully he'll launch it.

I had volunteered our clinic to be in the testing. I'll have to circle back and see where he's at with it. But that's just incredibly exciting, what he's working on, what he and his team are working on.

So if anybody wants to learn about that, they could just go to the website or go to iTunes and just search on Nathan Price and Kara Fitzgerald and find that conversation.

Yeah. And I'll just echo this. You have a great podcast with some really interesting people on there. So definitely, if you want to continue to learn more about this, check out her Kara's podcast.

Um, you know, I think we've covered a lot here today. Uh, is there anything additional that you really want to mention that you're excited about in this space?

Um, and then I'll, you know, then I want you to open it up and really, if people are interested in learning more about you, we've mentioned the podcast, we've mentioned the book, but where can they get more information?

I am ridiculously excited about this space. So I just mentioned that conference that I'm preparing a slide deck for. And, you know, there was a time when I was presenting on the younger you program, which, you know, we, we called it the methylation diet and lifestyle before it was christened the younger you program.

And there was crickets, like there was just nobody doing anything like it. And I think there was some, you know, there was some, some, some, some eyebrows, like what is this?

And it was by the grace of, you know, getting this unrestricted grant that we got to really study it and contribute to the first data in humans. So as I was preparing this lecture, I just hopped into look at what's happening using, you know, nutrition and lifestyle interventions.

looking at biological age as measured by epigenetics, looking at epigenetics more broadly in the influence of nutrition. And there are study after study after study after study.

So I limited it to 2022 to 2024. And there's just a ton, there's an explosion of research in looking at nutrients, looking at polyphenols, looking at lifestyle in humans in this space.

And it was just really, really exciting to be able to, you know, report. I will go to this conference and just report on this explosion of science that's happening that we've been thinking about in functional medicine for so long, but the reality is there it is, you know, clinical study after clinical study.

And it's just, and you know, retrospective investigations and all sorts of stuff just to breakneck pace coming out looking at nutritional epigenetics.

And man, it's very, very exciting and satisfying. I just expect we'll just see this moving forward. And we want to continue to research. We're working on grants through the NIH.

We're refining the program, so like the Younger You 2.0. in the clinic, thinking about personalized medicine, taking the younger youth principles and really interpreting them through the individual.

So just creating a younger youth program that's individually tailored to that human sitting in front of you and then their specific needs. I think, I haven't tested it, but I think has the best chance of the most profound biological age, epigenetic clock reversal.

Certainly, in patient after patient, we see really good outcome using the dietary pattern interpreted for the

individual. So I'm very excited about the field.

I'm just really, really excited. I think some of those more sophisticated and out there hacks are probably going to come to pass and become a part of the functional medicine world as well.

Those are still thinking about Yamanaka factors and so forth and so forth. They're not ready for prime time in humans at this point, but I have my eye open on it.

And to your point, bringing AI in and doing the heavy lift for us, yeah, I've got my eye towards that as well. So it's a very exciting time. And then coming over to our website.

So first of all, we're going to gift you with the program. It's an awesome, beautiful PDF of all of the important elements of the program. So your listeners or the people who are participating in the summit can download that and get it.

And then if you want to have that interpreted for you by one of the nutritionists on my team or one of the physicians who know this inside out and who've participated with me in the research around it, you can work with our clinic.

And then I'm also adding that we have that bio-age quiz. So get the download. It'll guide you over to the website. You can figure out what you want. And I think people will enjoy incorporating some of these younger youth elements into their lives.

Well, certainly it's a very generous gift and greatly appreciate it. Thank you for your time today. Dr. Fitzgerald, appreciate you. And yeah, I mean, it was a great interview.

And I think that we've simplified things and the research that you've been able to provide with reversing anywhere from three to four years in the biological age is impactful.

And I love the fact that if I go into PubMed and I search epigenetic age or biological age and interventions or polyphenols, I'm probably going to see this hockey stick.

that really you know you were at the beginning of and now we're seeing more and more research so it's so exciting yeah yeah really cool well thank you again i appreciate your time Yeah, thank you.

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