Automated: Bulletproof Radio, a state of high performance.

Dave Asprey: You're listening to Bulletproof Radio, with Dave Asprey. Today's cool fact of the day is that your body makes on an average day 640 quadrillion free radicals, unless, of course, you do endurance exercise, in which case you can multiply that number times 100. Now 640 quadrillion is a big number because you have only one quadrillion mitochondria in your body, which is interesting because that number is much larger than the number of cells in your body, which is also larger than the number of bacterias in your gut. Free radicals are a cool thing and we're going to be talking about those more today.

If you're interested in this kinds of thing ... If you saw the podcast with Naveen Jain, recently, we talked about a new service called Viome, that's V-I-O-M-E, that gets measurements four times a year of your mitochondrial function as well as the entire gut biome, your fungal load, your bacterial load, not just the load, but the actual species involved, including viruses and even bacteriophages. This is probably the most exciting new set of data in the human body that I've come across.

So, you can actually see whether your mitochondria are doing what they're supposed to do and whether all these external things that are in your body are affecting you. If you go to viome.com and use code Bulletproof ... In fact right now, I'm pretty sure that they still have some free copies of Headstrong left, which is a good deal and that's while supplies last. So you might get one of those and they'll put you to the front of the line. There's a big wait list for it. I'm on the advisory board of the company, but they're not paying me to tell you to do that. I just think it's incredibly cool. It's one of the most exciting technologies. That's viome.com with code Bulletproof.

All right, next up ... I was supposed to ask you guys, if you haven't gone to Amazon with Headstrong, and just left a review I'd be really grateful if you did that. Headstrong recently hit ... This actually blew me away. Headstrong hit the science monthly bestseller list right between two really well-known books. One's called Homo Deus and the other one's called Sapiens. It was on the same list as The Hidden Life of Trees and The Undoing Project, and some other just epic books. So, as an author, this is an unexpected and just a huge honor to be on the monthly science list, not the advice list.

If you're not an author, maybe you don't know the difference between the list. But, technically that one's called the big league. So if you take a second to just review the book on Amazon and say that it did something useful for you, I would be really grateful for your support on that.

All right. Today's interview is going to be really fun. This is one that's recorded live in studio at Bulletproof Labs here on Vancouver Island. So, if you have a

chance to watch it on video, you'll actually see a live video and at the end of this, I'm actually going to show you some new tech that's cool. You can go to bulletproof.com/YouTube to find the channel with all this kind of stuff on it, or if in your car, you're at work, and you're not going to do video, that's okay. We won't do anything that you can't process with just your ears alone.

Today's guest is Hans Eng, and we're going to have another guest towards the end of the show as well. Hans has a degree in materials science and applied technology and he's a co-founder of a company called NanoVi, and NanoVi ... Actually the company's called Eng Three.

Hans Eng: Eng three, yeah.

Dave Asprey: Eng Three. They make NanoVi, there you go. You can tell I've got my show notes right here, but I read them backwards. So, NanoVi is the stuff that I've been using lately. It's actually a form of tech and something that's blown me away. But, I wanted to have Hans on because Hans is one of these guys who can go really, really deep on the structure of water. In fact, he works with Gerald Pollack sometimes who was also on the show, who wrote The Fourth Phase of Water and spoke at the Bulletproof Conference.

So, we're going to talk about what's going on in your mitochondria. This is the theme for the year, given Headstrong, and we're going to talk about free radicals and when I speak with him, I just find that there's an enormous amount of things, little small details around protein folding and stuff like that that I'm not super clear on that he's clear on. We won't make it so geeky that you're just bored, but you're going to learn a thing or two about how the body works and how you can have a little bit more control over how much energy you have. So, I'm pretty excited. I've dug deep in this technology and played with it for a while, but haven't talked about it before. This is a first time I'm really coming out with it.

So, Hans welcome to the show.

Hans Eng: Thank you, Dave. Thank you for having me here.

Dave Asprey: Now, you are obviously from Germany.

Hans Eng: I am from Germany, from Berlin, yeah.

Dave Asprey: From Berlin, and your training in material science was in Germany?

Hans Eng: It was in Germany, yeah. At first, I worked in the field at a big company, medical device company. We were focused on the latest materials, material structure that is needed for implants, for hip implants.

Dave Asprey: Oh, neat.

Hans Eng: So, that was the part where cell biology is basically connecting to a product and materials science is not only the metal component, it is also the biological material for proteins.

Dave Asprey: It is a ridiculously complex thing to do implants. Lana and I started a medical lab testing company that was funding biological, basically immune resources to implant materials that weren't well-known in the industry for a while.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: And in fact, I would call it one of the more challenging things and you get ... No offense Elan if you're listening, but Neurolace, implantable stuff in the brain, I think we're going to have some problems with materials science there that are not on the radar. Do you agree?

Hans Eng: Yep. There's a lot of challenge. We have to know these different components who are actually in the game there to make the right choice.

Dave Asprey: Okay. By the way, I think we can get that from the surface of the skin, or even from off the body without having to stick stuff in the body, but that's just me. Now, first question, why do all the weird and interesting medical advances happen in Germany first?

Hans Eng: Competition, I guess. Yeah, high competition simply to survive in a field of a lot of other companies, yeah, and you have to dig in. You have to educate as much as possible yourself that a product comes out that is reliable and is proving to work.

Dave Asprey: So, we have this stereotypical German precision where there's a lot of respect for German engineering and BMW, things like that. But, I've also just as a bio-hacker and an anti-aging guy, for many years, some of the top innovations, these are like they came out of the Russian space program, or they came out of Germany and it's a very unnatural distribution across all of the different countries out there. Is there some sort of like an educational thing, a perspective of why is the perspective on energetic medicine coming out of Germany far ahead of the rest of the world?

Hans Eng: One thing is education, profession, yeah.

Dave Asprey: Okay.

Hans Eng: We have, as you know, in Germany, good education.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: The system goes in all different directions. And two, we have different approaches, maybe even into society, huh, to prevent a problem of to solve

when a problem happens in, a different way. So, there are some neat and different societies. When we see in Germany we have a highly aging society, we have to address the entire health structure in society in a different way than we have to address it in some other societies.

Dave Asprey: I was hoping you were going to say beer. Sorry. I just had to say that. Beer is [inaudible]. You guys know to take your charcoal if you're going to have your beer, etc., etc., and drink German beer. It's good, right? So, if you're going to drink beer, it has gluten and whatever. Don't drink beer. Drink vodka. Anyway, not to distract from things. Let's talk about how you migrated from medical devices into something, what you're doing with Eng Three. It's a medical device that makes ... Tell me if I'm saying this right. Basically a water vapor that is exclusions on water, the stuff that Gerald Pollack talked about that carries a certain signal. How did you get into even, thinking about carrying a signal in structured water that you breathe?

Hans Eng: Mm-hmm (affirmative). Yeah. The general background is a combination of materials science. We know what biomolecule are and how they work today, and all our proteins are bio-molecules. By the way, the proteins we have in our body are the workhorses for any kind of function our body's executed by these proteins and we call them enzymes, hormones, a lot of motor proteins, yeah? So, everything that is being executed that we can live, is done by proteins, yeah?

So, we know the structures and more than 100 years, it has been well researched all these things. We know the quantity of how many we have. We assume that our body has one million different proteins, yeah, and to address the problems that come with loss of protein function for our approach is not to replace missing protein or damaged protein, it is to improve the body's ability to reinstall the protein function. So, that is our background. The second one is biophysics. We are not in chemistry. We are ... Our background is physics and is a process of the protein function installment is the protein folding that is a pure biophysical process and that is related to the environment where the proteins are embedded and that is the water in the cell.

Dave Asprey: In the past 20 or so years of looking at computational biology, we've had this problem, which was how do we predict how a protein is going to fold. So, we get a set of instructions from DNA, and then we unwrap it with RNA-

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: ... and read it basically and then we say, "All right we're going to make a protein," and trying to predict how that protein is going to look, like how it's going to fold, has been just from a computer science perspective, really difficult, and we've gotten there to the point we're relatively predictive some of the time would you say?

Hans Eng: Mm-hmm (affirmative). Mm-hmm (affirmative). Mm-hmm (affirmative).

Dave Asprey: What you're talking about though is less about how a new protein is formed and more about how an existing protein gets either damaged or unfolded, or misshapen and then gets repaired, right?

Hans Eng: Yeah. Yeah. The protein folding sequence is ... R&D that we and research that we see today is very often related to the intent to produce an artificial protein.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... that will replace a missing component of our body. Our approach is, assuming that we have the right amino acids in our body, we need 20 to build all the proteins in there.

Dave Asprey: And that comes from food.

Hans Eng: That comes from food. 10 of them we have to eat, the other 10 our body produces. Then, assuming that the DNA is correct for the blueprint that creates amino acid chain to build the first level for the protein that that all works. The next and the last most important step in the body is the protein folding. And the protein folding mechanism is a thermodynamic process that is the same for all proteins.

Dave Asprey: So, if someone's listening to the show right now, they're probably ... If they're not into really deep biology stuff, why would you care about protein folding?

Hans Eng: Mm-hmm (affirmative). Only the folded protein's able to execute the task that it is designed for.

Dave Asprey: Okay.

Hans Eng: So the unfolded protein is not possible to do anything in our body. The usual and natural process is folding of protein and it's also natural, you mentioned at the beginning, the oxidative stress that always occurs [inaudible 00:12:20] our body, will also always damage the proteins. So, that is a natural process. By more having a higher task in our lifestyle, we are doing sport, we have a far higher performance level in our daily life. When we think about it, it's thinking for several hours intensively thinking, generate, need the same amount of ATP, like running a marathon. So, if we do this and we are doing it now, far later in our life, because [crosstalk].

Dave Asprey: If we do exercise you're saying, or ... Okay.

Hans Eng: Yeah. If we are working hard, if we are sitting in office, but working hard, we are running marathons with our brain. We are producing the oxidative stress. We are producing the damaging events. So, the question is how can we assist the body to repair this damage? We are not interested to avoid the damage. That's

your lifestyle, your environment is this to repair so that you can keep your performance level high.

Dave Asprey: Is it safe to look at least some of the proteins in the body as little molecular machines?

Hans Eng: Absolutely.

Dave Asprey: Okay.

Hans Eng: Absolutely, and they are working very fast as one of the problems why we don't know so much about them.

Dave Asprey: Yeah.

Hans Eng: They are folding in picoseconds. They have very short lifetime. They are only there when they are needed in the right amount, at the right place when they are needed. Also proteins are turning unnecessary proteins off. So, there is some constantly little ... We call it selectivity, kind of the thunderstorm in ourselves, turning on, turning off, so and having the best [crosstalk].

Dave Asprey: So, we have these little proteins and if you ever get a chance to see one on on-line and probably in the blog post. I'll get some pictures on, but these are incredibly complex. They look like a ball of yarn, basically.

Hans Eng: Yeah.

Dave Asprey: Like very complex and what it does, it's a little machine and in order to power the machine, we're getting electrons that come from mitochondria, right? Mitochondria's generating these things. I maybe simplifying. Tell me where I'm over simplifying.

Hans Eng: Yeah. Yeah. Yeah. Yeah. The proteins, they are executing then, biochemically a lot of work.

Dave Asprey: Right.

Hans Eng: And the fuel for biochemicals reaction to the ATP-

Dave Asprey: Right.

Hans Eng: ... that is why the mitochondria produces ATP out of oxygen and glucose-

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... to fuel our biochemical reactions.

Dave Asprey: So, the ATP essentially, when one of the P's is stripped off, it frees up an electron. It goes through an electron transport chain, which is then used by the proteins?

Hans Eng: Yeah.

Dave Asprey: So, the protein doesn't use ATP directly. It uses an electron that's basically made through the ATP resynthesis.

Hans Eng: Yeah. Yeah. They are different mechanisms. So, two proteins, several proteins come together, they create a new molecule that is executing something out of something-

Dave Asprey: Okay.

Hans Eng: ... very complex.

Dave Asprey: So, we'll see if we can zoom out on that for listeners who aren't as geeky as maybe you and I are. If you were to look at this little machine, a very tiny, very fast acting protein, and it's got to get raw materials, which may be other proteins, they may be amino acids, it may be fats, whatever the inputs are, and it needs energy to do this, and what we know and certainly what you've been working with for a while is that when you make that energy, and you use that energy in proteins you cause damage to some of the proteins some of the time. They become folded the wrong way. They become damaged.

Hans Eng: Yes.

Dave Asprey: Accurate?

Hans Eng: Basically, unfolded, that is the most common thing.

Dave Asprey: Okay.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: They unfold and then they must be refolded so that they can be functional proteins. What happens if you have proteins that are damaged or unfolded or that are shaped the wrong way because of biological activity? What do they do in the body if they're hanging around?

Hans Eng: Yeah. Unfolded proteins simply do nothing.

Dave Asprey: Well, they take up space at a minimum, right?

Hans Eng: They take up space, yeah. So, the [inaudible 00:16:07], the DNA, the blueprint creates these proteins. They are in there. They don't do anything.

Dave Asprey: They don't create free radicals, they don't make you get wrinkles.

Hans Eng: No. They don't do anything. They could not execute any biochemical reaction. No.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: So, therefore they are pretty useless.

Dave Asprey: They're useless, but I mean if 50% of your body weight was misfolded proteins, we'd be fat, right?

Hans Eng: You don't even need 50%. You need far less. You simply stop living.

Dave Asprey: Right. Okay. So, it's not a good thing to have non-functioning proteins in the body.

Hans Eng: Right.

Dave Asprey: You'll be more useful and have more energy if the proteins you have are all able to do what they were printed from DNA to do.

Hans Eng: Yes. Yes.

Dave Asprey: Okay.

Hans Eng: So, everyone knows hemoglobin, that's a protein.

Dave Asprey: Probably not. So, hemoglobin is a protein in your blood that carries oxygen. Okay.

Hans Eng: Yeah. And if they are not working anymore, for example, we cannot transport oxygen anymore-

Dave Asprey: Right.

Hans Eng: ... if not low oxygen generation. If you have certain enzymes in your digestion system that are not working, they have to be there, but they're unfolded, not working, you don't metabolize food. So, you see that if the function is lost, if the protein folding isn't there, the function is lost. And most of the functions that we lose or can lose are not recognizable by us because more than one million proteins run all the functions. Most of the functions in our body are not recognizable.

Dave Asprey: And that we just don't know what they are.

Hans Eng: And we don't know what they are.

Dave Asprey: Okay.

Hans Eng: And we also cannot influence ... We cannot influence the speed of our digestion. We cannot influence in a lot of areas our autonomic system. So, we cannot influence the gross speed of ourself.

Dave Asprey: But wait, we can, right, just take human growth hormone, for instance. It seems like we have some influence there.

Hans Eng: Yeah. When you take these hormones because they are missing, but if they are in your body, you cannot with your mind or anything, you cannot influence to work them better.

Dave Asprey: Are you sure about that?

Hans Eng: Kind of, yeah.

Dave Asprey: So, the reason I'm asking that is if you do say, heart rate variability training exercises or with the neurofeedback stuff that we do at 40 years, then we incorporate heart rate variability. But, you can actually do things with your brain that affect your heart. When your heart beat changes, the magnetic field around the heart changes.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: The mitochondria are listening to that.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: You can influence energy productions-

Hans Eng: Yeah.

Dave Asprey: ... which then influences protein generation. Another thing that isn't well-known is that when you have ketones present, and this is cool ... Whether they come from exogenous ketones, like brain octane, but not necessarily from ketone salts because half of them are not bio-identical, slight issue there, you actually can more easily read the DNA through something called HDAC.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: And so, things like that and environmental input allows you to make more energy or to more easily get instructions like that. It seems like we have some degree of control, but we don't have it at the protein where we can say, "This protein, we don't even know what it does for most of them." So, we can say, "This protein helps regulate that." Just because it's too complex, but there's

high level things we can do meditation wise or breathing or cold, environmental variables that we know trickle down 50,000 steps to make a protein different.

Hans Eng: Right. Right. If you are able to consciously influence in our ATP production-

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... that is what we do with correct breathing to avoid other uses for ATP. So, as I say, we should not do ... We can override our protein function capacity by, for example, not giving enough time to our body to do certain things, yeah? So, if I decide, you mentioned an amount of mitochondria that we have that also tells us that we only have a certain amount of ATP that we could use. So, if we override the use of ATP by simply saying I do sport. I do exercise, or I do thinking-

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... this ATP is not available for us, a very important task for bio-molecules. So, in this moment, we cannot have a good autonomic system balance that uses ATP if it is not available because we do sport, or we do ... We force our body to do other physical or mental performance. Then the performance is not being executed.

Dave Asprey: So, you're saying if you over train in the gym, or you overwork in the office, or wherever else, that you're using this energy that probably should have gone to making better proteins in the body.

Hans Eng: Yeah. Yeah.

Dave Asprey: Okay.

Hans Eng: And we all know that if you don't have enough rest and we don't sleep enough, we are not regenerating enough because the repair process needs ATP, and if that is not available, we are not regenerating.

Dave Asprey: This is one of the reasons that when I work with these CEO types who are type A, not only do I want to grow my company rapidly, I'm also going to run an ultra-marathon. I'm going to do the Kona Iron Man, and I'm going to fly all around the world while I'm doing all of this.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: And then you look at their heart rate variability, their autonomic nervous system is trashed and my belief after writing Headstrong is pretty clear that there's an energy that's going on here. It starts with mitochondria. There just isn't enough energy. Even if you eat more, even if you go into ketosis, even if

you do these things, there isn't enough time, and energy and communication in the cells to allow full repair and recovery, so you start declining.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: You also have concentrated very much on free radical formation. We mentioned at the beginning ... In fact the cool fact of the day was something that you told me about the fact that if you're doing endurance exercise regularly, you're getting 100 times more free radicals than normal. And that isn't necessarily a big thing in that free radicals can be helpful.

Hans Eng: Yeah.

Dave Asprey: But, they can also be harmful depending on what they are and where they are and whether you have enough energy to deal with them. Talk a little bit more about what free radicals do in this whole system of protein folding.

Hans Eng: Yeah. Like I said, free radicals are not only harmful, they are very essential.

Dave Asprey: Most people don't know that. We've been programmed through 35 years of antioxidants will save the world sort of thing to believe that free radicals are bad.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: What is a good free radical versus a bad free radical?

Hans Eng: Yeah. They are the same molecules. The question is what kind of tasks they are doing. So, any kind of inflammation is involving a huge amount of free radicals. So, the free radicals are kind of a protection shield for our entire body.

Dave Asprey: Free radicals are a protection shield. Okay.

Hans Eng: Yeah, think about if you have a splinter-

Dave Asprey: Uh-huh (affirmative).

Hans Eng: ... or you have an open wound and viruses, bacteria are coming in there. They have to be killed by the body. So, the only thing that the body can produce beside antibodies that is if you have another leak, free radicals.

Dave Asprey: We make hydrogen peroxide in our immune cells to kill things, right?

Hans Eng: Right.

Dave Asprey: And hydrogen peroxide is a free radical.

Hans Eng: Absolutely. So, it is a very, very important protection shield for us.

Dave Asprey: Okay. So, that's certainly a positive use of free radicals. But, that's not necessarily what you're doing if you're running a hundred miles.

Hans Eng: Yeah. The free radicals are also, when they go into chemical reactions with different ... Other things are creating or are causing protein damage.

Dave Asprey: Okay.

Hans Eng: So, the protein is unfolding that most common damage. They are falling apart and like I said this very weird not that every protein is unfolding and now they cannot execute this anymore. The good thing is now that these, some of these free radicals are very specific free radicals that is an excited oxygen atom, is able to trigger the repair, to assist with the repair.

Dave Asprey: So, some free radicals tell the cell it's time to fix yourself, buddy. Other free radicals though, like peroxynitrite, for instance, and dome of these other things are maybe not ever good for us, rarely good for us, help me understand this.

Hans Eng: Yeah. Like we just discussed, if the free radical damages a molecule that is necessary for us, we claim it as bad.

Dave Asprey: Okay.

Hans Eng: If it's damaged the molecule, like a virus, that is not good for us, we call it good.

Dave Asprey: Okay.

Hans Eng: So, it depends always on which kind of [inaudible 00:24:54] we are looking at. If free radicals are essential in the body, they are part of any inflammation and repair process, if we suppress the free radical activity in this process, we are even running into bigger problems.

Dave Asprey: In fact, if you were to fully suppress free radical production in your body, what would happen?

Hans Eng: We would come to this point when our technology's doing, or what we apply there, is basically proteins would not be able to fold.

Dave Asprey: You would die.

Hans Eng: You would die.

Dave Asprey: Yeah, and that is a really important thing. Just like we've had this ridiculous thing where people say salt is bad for you. Therefore, eat no salts, which is terrible for you, right? And in fact, there's pretty good evidence that getting

much salt is very hard to do because we just noticed that eating a high salt diet lets you eat 25% more calories without gaining weight. That's interesting.

Hans Eng: Yeah.

Dave Asprey: But, the point is, in almost every single nutritional dogma that's out there, ketosis is an example. Sugar is evil, and you must never have any carbs for the rest of your life, or you're a bad person, and if you're endlessly in ketosis, that's probably not ideal for most people. You might want to come out of that on occasion. So, it's about getting the right dose.

Hans Eng: Yeah.

Dave Asprey: With free radicals, there's types of free radicals. There's doses of free radicals, right? How does someone listening this know, "All right, so sometimes I want free radicals, sometimes I don't. " What do you do with that knowledge that sometimes ... What's actionable there?

Hans Eng: That is exactly the difficult task in all eyes. Yeah. Yeah. Also, to monitor exactly when do we produce more than we wanted. It's not only the sport and the marathon that we are running. If we are forcing our body to metabolize anything-

Dave Asprey: Oh, like margarine, which gets masses of free radicals that don't, right?

Hans Eng: Yeah, or if you go back to the beer, we are eating something. We are metabolizing, and so if I needed ATP. ATP needs oxygen. Oxygen produces free radicals. So, any kind of biochemical reaction that we are forcing our body to do, produces free radicals, not always bad, very often they are very important also, like we already visited this topic. The biology that evolved over millions of years, is dealing with our situation to handle the free radicals. And it pretty developed a very smart way.

Dave Asprey: Okay.

Hans Eng: And when we think about that we talk about anti-aging, living healthier, performing better, that involves more not avoiding. It also involves more improving the repair capacity in our body when we are exposed to this damage.

Dave Asprey: So, an example of that would be you do some curls, right?

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: You're creating free radicals in your bicep, right, and this is causing a hormetic stress. Hormesis is the idea that what doesn't kill you makes you stronger. But, if you were to overwhelm the bicep with free radicals to the point you just damaged so many proteins it couldn't repair, you'd get gangrene at a certain

point. And you could actually kill much of the cells, right? So, there's a line in there, if I'm doing curls 10 times a day, every day, I'm probably going to create more free radicals than my body can use as a signaling molecule to repair. I'm just doing too much damage. Am I getting this?

Hans Eng: Like I said, the body is very, very smart in biology. As long as your body has the capacity to repair this damage-

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... and everybody has the capacity to repair this damage-

Dave Asprey: And the capacity is based on energy, like ATP, or what's it based on?

Hans Eng: That is ... The capacity to provide the needed energy for the thermodynamic process to refold damaged proteins.

Dave Asprey: Okay. I want to be Wolverine, right? So, Wolverine, the X-Men character who you can cut him, and shoot him, and magically he rebuilds his proteins really, really quickly. How do I get my body to heal like I'm three years old, or five years old, instead of 44 years old. This is a protein and energy thing at the end of the day. What's your take on that? You spent 10 years working on this free radical problem and cell folding with Eng Three. We're going to talk a little bit more about what you've discovered. But, what can I do now?

Hans Eng: Our approach is not to make you younger.

Dave Asprey: Uh-huh (affirmative).

Hans Eng: Our approach is to understand ... Our understanding is to slow your aging.

Dave Asprey: That seems kind of weak. Can't you just make me younger?

Hans Eng: There are so many other things involved in this-

Dave Asprey: Sorry. I just had to say that. Slowing aging is actually a big part of what I'm doing now so I can get to the technologies that make me younger.

Hans Eng: So, another thing, aging is the simplest part of our cycle of life.

Dave Asprey: Yeah.

Hans Eng: The worst case scenario is actually that we get instead of distributable damaging effect, aging, age-related loss of protein function ...The worst case is that we get a chronic disease. Damage happens on a certain areas of proteins and we run into chronic disease.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: And we see that people are running into chronic disease in young ages for a lot of different reasons.

Dave Asprey: You're talking cancer, Alzheimer's, heart disease, diabetes kind of stuff?

Hans Eng: Diabetes, cancer, yes, chronic disease. This is a whole range. They run into different reasons, one are genetic reasons, one protein are being built, or they certainly not enough proteins are not being built. The other thing is, the environmental exposure creates or cannot keep up with repairing correct proteins and they run into this problem.

Dave Asprey: Okay.

Hans Eng: These are leading all to a loss of performance, cellular performance. And we as humans, we basically are concentrated on the performance that is important for us. So, thinking, sport, physical thing. Performance in the drops that is getting down and being handicapped with those things and we cannot change our environment ... We, I mean, our company cannot change the environment that you live in. What we have the tool to improve the repair capacity.

Dave Asprey: Okay.

Hans Eng: It doesn't matter in what kind of environment you are.

Dave Asprey: A big part of my anti-aging strategy, and I've been in a few really big media places lately, because I just found ... I was like, "Guys, I'm planning to live to 180 plus. I don't think it's unreasonable." With what we know today, 120 is achievable just by modulating lifestyle stuff, eating right, doing the things that make you live a long time. In the next 80 or so years, I'm pretty sure that we'll see some improvements in technologies because well look what happened over the last 80 years, things like, oh we discovered mitochondria, and antibiotics, a few things we didn't know.

Hans Eng: Yeah. Mm-hmm (affirmative).

Dave Asprey: So, over the next 80 years, we out to be able to add 60 years, I fact probably a lot more than that. I don't think I'm being radical with 180. So, right now, aging is death by a thousand cuts. And a lot of those are free radical cuts, or protein damaging cuts, right-

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: ... where okay, it was just one protein that didn't work and then another one and eventually like, okay, there's a lot of repair that needs to happen here and

our ability to repair declines with time as our mitochondrial function declines with time.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: So, you fix your mitochondrial function, and you've got more energy for repair, but then you still need the signals that cause the repair and old people don't heal as fast as young people. I just wrote a piece about parabiosis. You take blood from young people and put it in old people, and they get younger.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: By the way, I'm not doing that. There's a shortcut. You don't have to do that. You could just use the proteins that are in the old people, or sorry, that are in the young people. They're injectable. But, in the meantime, what you've been working on for the last 10 years is something that allows that healing capacity in the cells. It basically sends a signal to the cells to heal faster.

Hans Eng: Yeah.

Dave Asprey: So, if you do less of what causes damage and speed healing, the idea would be that you can extend at a minimum what we call health span, which is your ability to be youthful and healthy as your old. No one wants to be 100 years old if it means you're in a retirement home.

Hans Eng: Mm-hmm (affirmative). Yeah.

Dave Asprey: But, if you're a hundred years old and you're out riding your bike and hiking with your great grandkids, it's a different picture, and that's what I'd like to at a minimum do and I plan to do that when I'm 180 with my great, great, great grandkids or something like that.

Hans Eng: Yeah. Yeah.

Dave Asprey: So, what's the approach? Just describe the overall approach you've taken to speeding protein healing or preventing damage.

Hans Eng: Yeah. You're absolutely right. We can get far older. Yeah, when you asked that-

Dave Asprey: How old are you going to be?

Hans Eng: Well, I hope that I can get 500 years, because there are so many things that I would like to see what happens in 500 years.

Dave Asprey: So, everyone's hoping for 500 years, but what do you think is achievable for you today?

Hans Eng: I'm very careful because we are not doing-

Dave Asprey: You Germans.

Hans Eng: I am too much science. Yeah. Because people ask for numbers and sensible validation. My goal is to get as long as possible combined with as healthy as possible. So, we are already getting far older than the last two generations, yeah?

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: And you mentioned to do a lot of activities with your kids and those things. We are starting to sort of force career and business when we are mid 60 today.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: Two generations before, we were sitting in a rocking chair on a porch at 60. And 60, and there was no idea to have this performance level that we have today.

Dave Asprey: Are you stronger, smarter, faster, younger now than you were five years ago?

Hans Eng: Definitely mentally, I would say.

Dave Asprey: So, your brain's working better now than it was.

Hans Eng: Yeah. Yeah.

Dave Asprey: And it's okay if you say no. It's a hard question because you don't want to say, "Well, I don't know what I'm doing scientifically. We all are aging, but I'm finding that when people are really paying attention to this, a lot of people are saying I have better faculties than I did before.

Hans Eng: Yeah. Yeah. Simply you had enough time to apply more knowledge.

Dave Asprey: Okay.

Hans Eng: And you can execute better on a bigger scale, different influences from your knowledge so that all gives a better picture of having a higher performance.

Dave Asprey: Okay.

Hans Eng: You use more tools than you had if you have enough time to collect these tools anyway.

Dave Asprey: Got it. So, you're definitely seeing some effect. So, back to this question of what's your approach to either fixing or improving this protein damage and protein folding problem?

Hans Eng: Yeah. Our approach is to assist the bodies very identically to have the protein folded and refolded again.

Dave Asprey: What does that mean?

Hans Eng: The process in the cells for protein folding is a biophysical process. It means as the proteins unfolded have to get energy into the proteins so that they refold. Also, it's thermodynamic and unfavored direction from the unfolded to the folded state.

Dave Asprey: Okay.

Hans Eng: So, only with the help of energy input that happens. The question is where does the energy come from? What kind of energy is it? When we are talking about a biophysical process, it has to be thermodynamic kinetic energy. So, since decades, you know that the proteins, which I embedded in the water in the cell, have to be surrounded by water molecules, which have a higher order, which means visually seeing these molecules are a little bit closer together and have a certain kind of direction how they are located around the proteins. Then when enough of these ordered water proteins are around, a lot of water molecules are around the protein, the protein can as we said, can suck out the energy and turn into a next state in a different state of thermodynamic ... It's changing the entropy.

Dave Asprey: All right. That was a little deep for the average person. Even I was having a hard time following that. All right. Take me up a level. What's going on there?

Hans Eng: Okay. Yeah. The water molecules are providing ... The order of the water molecules are providing the energy to the proteins to fold. The next question would be how are the water molecules are getting this order? That is an energetic process, a certain kind of energy has to get absorbed-

Dave Asprey: When you say the water molecules are ordered, now we're talking about structured water, which used to be considered like this woo, woo science thing. After Gerald Pollack wrote his book and did like five years of corer water biophysics, water molecules actually do line up in biology and it's not the same as the water we drink. It's a different phase of water that's required for us to fold proteins, and required for us to make energy in our mitochondria, right?

Hans Eng: Yeah.

Dave Asprey: And you're saying, so we require energy to put water in that state-

Hans Eng: Yes.

Dave Asprey: ... so that we can fold our stuff.

Hans Eng: Absolutely. Yeah.

Dave Asprey: All right.

Hans Eng: Mm-hmm (affirmative). And this energy that is required to get this water in the state is always produced in the cell and there-

Dave Asprey: By mitochondria?

Hans Eng: ... another free radical is being the important thing.

Dave Asprey: Okay.

Hans Eng: That is why another, why there's another reason that the free radicals are so important. One very specific free radical is an excited oxygen atom. Unavoidable, always being produced by the mitochondria. Excited oxygens, generally excited atoms doesn't want to stay inside of it.

Dave Asprey: And this is because as we use an electron, when it's done, we've got to put it somewhere and we put it on an oxygen molecule. Is that accurate? Kind of simplistic, but I'm trying to build out a sense of-

Hans Eng: Yeah, kind of simplistic, it's more likely that the molecule is being ripped apart in the ATP production. One of the atoms has to be [inaudible 00:39:32] discarded. It's not needed. But, during the separation of the two molecules, it happens sometimes that the electron of the one atom is getting pulled to the outside.

Dave Asprey: This is an electron leak, and mitochondrial inefficiencies was creating this.

Hans Eng: And this electron then jumps back and is emitting a material fingerprint of the electromagnetic-

Dave Asprey: And that's the signal that tells the cell to start fixing protein.

Hans Eng: Yes, the signal is an electromagnetic wave. The electromagnetic energy, highly absorbable by water molecules, by water. A lot of other electromagnetic energy is not absorbed by water.

Dave Asprey: This is why I wanted to have you ion the show because no one's ever said this before in a way that I could comprehend and I dug deep when I was doing all this research on the book. If I understand what you're saying correctly, if you think of the way maybe a fluorescent light works or maybe a neon tube, right-

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: ... we have a gas in there. You excite the gas, and then it emits something. The same thing's happening in our cells, but it's just at a much higher ... It's in an

invisible wave length, like it's a far infrared, or a very far infrared light that is generated in the cells, so 1,200 nanometers or something like that, way beyond what we could see, but it's happening in our body all the time, and it's biologically really important.

Hans Eng: Yeah.

Dave Asprey: Why is that signal that's created by free radicals so important?

Hans Eng: Thew biological important thing is what is able to absorb this energy?

Dave Asprey: So, we make that energy when free radicals happen. It changes the water by ...Basically, the water absorbs it. And when the water absorbs it, what happens to the water?

Hans Eng: It's [inaudible 00:41:16] of these water vessels. Like we say in the cell, it's a surface, the water molecules are getting ordered.

Dave Asprey: They get ordered. So, this is what causes water to change from being what you drink, what you call bulk water, to being exclusions on water, which is what Gerald Pollack's, Body of Research is about.

Hans Eng: Yes.

Dave Asprey: He's referenced in Headstrong. He's been on the show, been on the stage. This is one of the preeminent discoveries in biology in the last 10 years or something.

Hans Eng: Yeah.

Dave Asprey: I'm blown away by it.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: So, you figured out the signal though that's causing this, comes from free radicals. So, if you have no free radicals, we have not structured water, we have not structured, we can't repair our proteins, and we can't make energy.

Hans Eng: Right.

Dave Asprey: Okay, and I didn't write in Headstrong at all about protein repair other than that mitochondrion provide energy for it, and frankly I didn't know you needed structured water to properly fold proteins in your body. And we know from this interview if you have damaged proteins, or proteins that are misfolded, then they're non-functional proteins.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: Therefore, your body doesn't work as well as it should work. Therefore, you're getting older.

Hans Eng: Yes.

Dave Asprey: If you have all proteins that do what they are designed by your DNA to do, and they're properly powered the way the mitochondrial DNA designs the mitochondria to power them to do, and the environments set up right, theoretically, we out to be able to stay young for as long time.

Hans Eng: Mm-hmm (affirmative). If you are always able to repair the damage, you will stay alive for a long, long time.

Dave Asprey: Okay. So, for 10 years, you've been working on some hardware, like as device that does this. How does this thing work? This is the NanoVi that I mentioned at the beginning. Okay, so we understand the nature of the problem that's happening in all of our bodies.

Hans Eng: Mm-hmm (affirmative). Mm-hmm (affirmative).

Dave Asprey: Actually, before we even talk about what your stuff does, what is Mother Nature's solution to this? What would we do if we lived in cave or forests or something like that? How would our bodies naturally approach solving this protein problem?

Hans Eng: Yeah. Most of the energy that is absorbed by the water for doing the protein folding thing is produced by free radicals, by the excited oxygen atom in our cells.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: So, we are generating most of this needed energy in our body generally.

Dave Asprey: Okay, and so this is energy that we're generating that structures the water as we need it to be structured so we can build rhe proteins.

Hans Eng: Yes. Yes.

Dave Asprey: You say most of it.

Hans Eng: Most of it.

Dave Asprey: What about the rest?

Hans Eng: The rest is why we are aging. You cannot keep up.

Dave Asprey: Shouldn't I just lay out in the sun and get some more far infrared? Serious question.

Hans Eng: The problem is like as it was mentioned, water has a high absorption capacity for the electromagnetic base. The sun is emitting the electromagnetic wave, but because the atmosphere's absorbing it, we are not getting very much stuff.

Dave Asprey: Because of the water vapor and the ionostream and all of that.

Hans Eng: The water vapor absorbs it.

Dave Asprey: Okay.

Hans Eng: Only in a certain situation, no water vapor in the sky, high sun, it could be possible that beside the right source of water vapor then, the sun would have the possibility to influence the water vapor.

Dave Asprey: So, we should all move to high deserts.

Hans Eng: High deserts would be, with dry air, a good place.

Dave Asprey: That's where I grew up. I miss that. I live in a rainforest on Vancouver Island. You're a Seattle guy. So, all right. But, by the way, you have a tan. You live in Seattle. What are you doing?

Hans Eng: I just came back from scientific congress in China.

Dave Asprey: You cheated. Okay.

Hans Eng: They have good weather. Yeah, the exposure in our life to this specific electromagnetic wavelength is very difficult because water is always absorbing it. As more water is around you, we have vapor, we have humidity as water's being absorbed.

Dave Asprey: Okay.

Hans Eng: So, some of the effects have to come together for assisting with technology the repair process. The water vessels, water molecules have to be small so that the volume has a big surface. Because we said the ordered water is only happened on the surface. You cannot order the water in a bucket of water.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: It is only ordered on the surface. So, for having the most out of it, we need small water vessels. That is why we use humidity, little droplets, the air flow for our technology.

Dave Asprey: Okay. So, in the NanoVi, what you're doing is you're making a water vapor, and just so that you guys know, for the past probably six or eight months, I've had this little device on my desk, and you might have seen it in a couple of the videos of Bulletproof Labs here at my house and this is probably a million dollar facility. Everything I can find that's going to make me live longer, I'm willing to try it. This a thing where I sit there. I'm doing email, or more likely I'm doing neuro feedback, but I'm breathing water vapor and you guys do something inside the machine to the water vapor so there's a tangible difference in how you feel after, after you do it. You're using this 1,200 nanometer, or give or take in some other stuff in there, in order to structure the water, and then you breathe the water. But, I also have a structured water drinking machine. Why don't I just drink structured water? What's the difference?

Hans Eng: It's at the surface is the important thing.

Dave Asprey: Okay. So, the surface area of water vapor is thousands or tens of thousands greater-

Hans Eng: Far bigger.

Dave Asprey: Okay.

Hans Eng: It is far bigger than the order process is not staying forever in the water.

Dave Asprey: So, it loses it quickly.

Hans Eng: So, you cannot bottle those ordered water.

Dave Asprey: Yeah.

Hans Eng: It's a physical process, the same thing like bottling high temperature eater.

Dave Asprey: Bottling hot water.

Hans Eng: It dims out. So, the same thing is happening with this kind of energy, energetic state. It will dim out.

Dave Asprey: What about carbonated water? Doesn't that have more surface area, because every bubble has more surface area?

Hans Eng: That is very right.

Dave Asprey: Okay.

Hans Eng: That is correct. When you have it carbonated. So, the moment you open and shale a bottle, you have a to of surface.

Dave Asprey: Okay.

Hans Eng: But, when you have it open for a while, then the surface is pretty much the same, because there are no additional bubbles in there.

Dave Asprey: Okay.

Hans Eng: Maybe with champagne. So, we have to go to the high quality-

Dave Asprey: Or beer. It sounds very-

Hans Eng: Yeah.

Dave Asprey: Okay. I hear you.

Hans Eng: Yeah. Mm-hmm (affirmative). Yeah. And the other thing with the energy transfer that is a very complicated ... The additional things is when you emit the 1,200 nanometers to water, so that the water is absorbing it and then leads to special ordering on the surface, there are a lot of layers of protein, of molecules where the energy has to be transferred.

Dave Asprey: Inside the water vapor itself.

Hans Eng: Inside the water , or incidentally, inside the water.

Dave Asprey: Okay.

Hans Eng: So, if you have a glass of water, the transfer length is far bigger than you have in a little droplet in vapor.

Dave Asprey: So, you can't send 1,200 nanometers deep enough into water because just one layer will block it and then the rest of the water doesn't get any structuring.

Hans Eng: Right. You will lose a lot of the ordered water.

Dave Asprey: Okay. But, with vapor, that's not an issue because the molecules are bouncing around essentially.

Hans Eng: Yeah, and they transfer ... When you have two drop[lets, one has an ordered surface, the other one has no ordered surface. And the moment they touch together they distribute this kind of energy level. They balance them out.

Dave Asprey: Okay. So, then with the NanoVi, I'm sitting there and I look really cool. I'm probably wearing my true dark glasses, you know the red glasses. I've got electrodes on my head, and I've got this little hose thing in front of me blowing water vapor into my face. I'm telling you this is how you get dates, just so we're all clear in it. Anyway, you do that and what are the ... Like, what are the effects

biologically of breathing structured water, which is a way of getting it that you won't get if you drink it. By the way, I also drink structured, but it's not the same effect. You can feel the difference.

Hans Eng: Yeah, when you see our material, we would not refer to structured water. Structured water has [crosstalk 00:49:24].

Dave Asprey: Very easy eater, yeah. Okay.

Hans Eng: Other things in the exclusion zone.

Dave Asprey: Right.

Hans Eng: Easy ordered water that is a kind of say, state of water that has a different other description other than the literature.

Dave Asprey: Okay.

Hans Eng: So, that helps to understand what [crosstalk 00:49:38].

Dave Asprey: So, easy water versus structures and fair point. Okay.

Hans Eng: Yeah, or ordered water.

Dave Asprey: Ordered. You prefer ordered or [crosstalk 00:49:43].

Hans Eng: Ordered water, yeah, because most of ... You find a lot of ... When you Google, when you got to Wikipedia about protein folding, that since decades the importance of ordered water.

Dave Asprey: Ordered water, okay, got it. And it's annoying because there's ... And I'm not saying it isn't the case, but if you pray over your water and you wave a crystal over it, it's going to somehow absorb things. Who knows? Water is a ... We don't know much about water as far as I can tell. I'm not saying it isn't the case. I'm just saying that it's not provable given what we have today. So, it tends to cast doubt on hard science about water chemistry, which is what you're doing. So, ordered water is a non-charged ... Well, if that's right, is a non-judgmental term for this stuff that scientists understand has a specific physics meaning.

Hans Eng: Yes, and it is also a measurable thing.

Dave Asprey: Yeah, there you go.

Hans Eng: Our technology produces with a measured and confirmed electromagnetic bioidentical [inaudible]-

Dave Asprey: Okay.

Hans Eng: ... is affecting the water vapor and it is also measurable and was measured at an institute in Italy that the product that is coming out of the device is actually ordered, or easy water vapor.

Dave Asprey: Okay, and it's bioidentical because it's exactly the same ordering of water that our cells do using their energy, but we're not using cells energy. We're using a machine to do it and add it to the body. So, it's an additive system that's bioidentical.

Hans Eng: Right. Yes. Yeah.

Dave Asprey: All right.

Hans Eng: Bioidentical, the protein itself that is being impacted doesn't care where the energy was emitted, if it was a special activated reactive oxygen species in the cell, or if it was our patented technologies that emitted this energy, the protein doesn't care. It will do when it is surrounded with the layers of oxygen.

Dave Asprey: Okay. So, if someone breathes this ordered water out of the NanoVi on a regular basis, or on a one time basis ... You guys have done some studies.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: What happens that's measurable in the body?

Hans Eng: Yeah. Measurable, it is with any kind of diagnosis technology that can measure protein function. They are very simply technologies out there, like there are oxygen saturation-

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... that measures basically the function of different proteins down to the hemoglobin.

Dave Asprey: So, oxygen saturation goes up.

Hans Eng: Oxygen saturation foes up if it was low beforehand.

Dave Asprey: If it was low, all right.

Hans Eng: Yeah, you're not making a superman out of you. We are only trying to install the general [crosstalk].

Dave Asprey: So, you can address pseudo hypoxia, which is something that happens when your mitochondrias don't work very well. You basically have a lack of oxygen even if you're breathing. That would be something that would be addressed by breathing ordered water.

Hans Eng: Yeah, there's also called a respiration chain from inhaling the oxygen to the exchange on cellular level, that is affecting a lot of proteins, not only the hemoglobin, then onto the cellular level, you have the metabolization of the oxygen in the cell by the ATP, which is a protein controlled process again. So, A lot of people who don't have enough cell energy, have a lot of reasons why they don't produce enough energy. Either the mitochondria is not able to produce it, whether the important building blocks like oxygen is not available because it was not transported. It was not released. It was not up taking from the lung tissue level. There are so many things where the proteins are involved.

Dave Asprey: Right. Well, what you just mentioned there is the core thesis for Headstrong. 48% of people under age 40, have early onset mitochondrial dysfunction and everyone over age 40 has it, we just call it aging. So, if your mitochondria aren't working that well, one of the many ways you can address this, is by breathing exclusions on water because you're getting so much more, much higher dose of it than you can get from drinking it and you're still counting on your body to make exclusions on water or you would die if you couldn't do that. But, just by boosting that amount up, you're giving your body more of what it needs to be able to do protein repair, which would be a core into aging strategy.

Hans Eng: That was a very good summary.

Dave Asprey: All right. Good deal. So, you guys listening, this is pretty deep science we're getting into here. Headstrong is about how do you get more energy in because you feel it in your brain first, and now we're saying well, what are you going to do with that energy? Well, one of the things you want to do with that energy is repair the body, not just think faster and all of that. So, we're talking about more rapid repair. What about things like VO2 Max, like for athletic performance? Does VO2 Max change if you're doing this regularly?

Hans Eng: If VO2 Max is in your case a protein controlled barrier that you would like to get up, yes, we can have improvement in this thing.

Dave Asprey: Okay, but that might be in someone who doesn't have good VO2 Max because they've been exposed to a biotoxin or because they're old or-

Hans Eng: Right. Yeah.

Dave Asprey: But, if it's a super athlete, what's going to happen in a super athlete?

Hans Eng: And we have a lot of athletes that are using our technology. When you train your body, you train and you enhance a certain kind of processes very often.

Dave Asprey: Okay.

Hans Eng: That is what training is on the first viewpoint. Modern, high end athletes are looking for far more [inaudible] to regenerate faster, because if they train they

understand that they damage, there's accumulating damage. They lost the ability to train, and then you lose the VO2 Max, and all those things. So, they are now focused on how can I repair the damage that I introduced by my training?

Dave Asprey: Okay.

Hans Eng: So, faster repair enables them to train better.

Dave Asprey: So, you can do more training, more heavily and one of the things I've stressed since the beginning of Bulletproof is you need to recover like a beast, not train like a beast.

Hans Eng: Right.

Dave Asprey: And what you're talking about here is you can train more heavily because you can recover more heavily because you're using a technology to add energy to the system.

Hans Eng: Yeah.

Dave Asprey: Okay. That makes a lot of sense. And what other quantifiable effects ... I know that I saw a study when I was doing research before I got the device on DNA double strand breaks, what did you guys find there?

Hans Eng: The DNA is in a normal person, and the average person, non-athletic person, is getting damaged around 150,000 times per day by free radicals.

Dave Asprey: In a single cell or throughout the body?

Hans Eng: In a single cell.

Dave Asprey: So, all right.

Hans Eng: That's a lot of damage. We know that the proteins, many enzymes, different enzymes are responsible to repair this as fast as possible. So, that's the next blueprint where the that come out of the DNA for the next generation of proteins are flawless. So, by having the proteins refolding faster, which I exposed to the damage-

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: ... they can faster execute the repair on the DNA.

Dave Asprey: Interesting.

Hans Eng: So, with the faster DNA repair, you are far closer to your goals of getting older, staying healthy, old, and perform higher.

Dave Asprey: So, this is interesting. I'm a computer science guy by training, and there are a lot of developers and technologists who listen to the show. If you're on the tech side of things, there's something called error correcting code in memory, and it's probably in your iPhone today. And it's fascinating because in a chip, you can lose data and this was a big problem in the first 30, 40 years of computing where suddenly things just wouldn't work because one electron would go to the wrong place. So, eventually we found a way electronically, a very elegant way, in order to make sure that we're constantly rechecking what's in the memory so that if we lose an electron, we can computationally reinsert that.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: What's going on in our bodies is orders of magnitude more elegant, because like you're saying, it was 150,000 ... Was it per second, per day?

Hans Eng: Per day.

Dave Asprey: 150,000 hits to the core instructions for how your body makes its hardware, and if we don't have a robust system to repair that, what we end up with is mutations, right?

Hans Eng: Yeah.

Dave Asprey: And so, mutations are a problem in that they can sometimes lead to cancer, and sometimes maybe other things. But, ideally, the body just effortlessly repairs these things. The problem is that the amount of effort required to repair these things is very high in the face of we don't get enough sleep, we're exposed to bad quality junk light. We're exposed to EMF's. We have too much stress. We exercise too much. We eat junk food. We do all sorts of bad things that we really, that this system wasn't designed to account for and this could be accounting for some of the chronic diseases of aging. So, one of the many pieces of my anti-aging strategy is when I'm doing something else, I don't mind spending 15 minutes breathing water vapor because I can do that-

Hans Eng: Yeah.

Dave Asprey: It doesn't take away time from something else, which is another thing, There's lots of stuff you can do. You spend 12 hours a day recovering.

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: You didn't spend 12 hours with your kids. You didn't spend it working. You just ... It's not a good return on investment.

Hans Eng: Yeah. Yeah. That is a other thing. We are not only focused on how is the biophysical process working? It is also how can you implement it in your daily life. It is not something you have to do for hours per day.

Dave Asprey: Yeah.

Hans Eng: It is designed that you use it in combination with a lot of other things. It could be a standalone treatment in a facility.

Dave Asprey: Okay.

Hans Eng: It could be done while you were working at your desk. So, there are a lot of different possibilities that it doesn't take more time, any time out of.

Dave Asprey: Okay, and I'll show you guys my setup, just so you can see what this is like. In fact, we're going to have Rowena come on, who's the other co-founder of the company who works with clinicians and athletes and trainers, and all that, like how people use this unusual, and not well-known today, way of basically making the body do what it does better. So, is there anything else that we should share with listeners about just the science of protein repair, either in DNA or in the rest of the body?

Hans Eng: We have a lot of information on our website.

Dave Asprey: Okay. I haven't even mentioned the website, but I don't have it in my show notes. What is your website?

Hans Eng: Www.eng3corp.com.

Dave Asprey: Eng3.corp.com, and you can tell that it's highly optimized for search engine optimization, easy to find, okay, maybe not. But, eng3corp.com. Ut, I'll explain what this stuff is and how it works and if you got to bulletporoof.com/YouTube, you just watch the end of the video. I'll show you the setup and all that stuff. And before Rowena comes on, this isn't cheap technology. It goers ... It starts at $5,000 and goes up to about $13,000 sop you're typically ... In order to do this, if you're a pro athlete or something like that, or a billionaire anti-aging guy, fine. But, for the average listener, this is something that you would find at your trainer's office, at your doctor's office or something like that.

So, you can go to the interesting website and find someone ion your neighborhood, or just go to wherever you normally go for this kind of stuff and say, "I would like to do that. Do you have this?" And this is a sort of thing. There are a lot of people who run facilities, who listen to this as well. It's the sort of thing that, I think, has a place where, in the workplace, when we open the new Bulletproof offices that we're working on right now, I will put one of these there, so employees can use that. If you're feeling a little odd, you can do that.

Hans Eng: Yeah. Yeah. Yeah. Mm-hmm (affirmative).

Dave Asprey: So, it's an additive technology. I would just say it like that. But, it isn't something that you necessarily have to buy for yourself. But, it's something that you can

share with many other people. Part of the goal of bio hacking for me, and even doing this show and writing is I want people to know about these technologies and my assumption is that when there's high demand and over time, that the availability and cost will drop precipitously so this becomes something like everyone has over time.

Hans Eng: Yeah. Yeah.

Dave Asprey: And so, I talk about clinical grade technologies like this one now-

Hans Eng: Mm-hmm (affirmative).

Dave Asprey: ... because I'm assuming that 20 years now, it'll be built into my iPhone.

Hans Eng: Yeah. Yeah. And you mentioned the exposure that a lot of people can use this per day.

Dave Asprey: Mm-hmm (affirmative).

Hans Eng: Like I said, in corporate awareness environment, for example, companies are installing this to have access for employees. It doesn't matter what age or what health state they are in, it works for them.

Dave Asprey: It's pretty easy to breathe in water vapor.

Hans Eng: And with extremely long lifetime the cost per treatment is so low-

Dave Asprey: It's pennies, yeah.

Hans Eng: ... it is so low that it is a very, very affordable at this viewpoint.

Dave Asprey: In fact, if you look on my Instagram, it's Dave.Asprey, and yeah, you should follow me. I do all sorts of weird stuff on Instagram that's not on Facebook. There's a picture of my parents up here, and they're in their 70's and my dad's got the [inaudible 01:02:47]. He's actually breathing from the NanoVi. So, you can definitely ... He had a heart attack 10 plus years ago, and all that stuff, and is working on staying strong. So, it's fun. He was able to use it. So, it isn't an age-related thing.

Well, I have a question for you before we have Rowena on to talk about what happens with athletes in an anti-aging process and things like that. If someone came to you tomorrow, and they said, I want to perform better at everything I do as a human being, so not just athletic performance or business or whatever, what are the three most important pieces of advice you'd have for them? It doesn't have to be anything about biophysics and about your field, but it can be. So, the most important pierces of advice, I want to kick more ass at everything. What do I need to know?

Hans Eng: Yeah. Take care that you have the right input of the building blocks for your life.

Dave Asprey: East good stuff.

Hans Eng: Eat good stuff.

Dave Asprey: All right.

Hans Eng: Avoid exposure, environmental exposure that damages the building blocks.

Dave Asprey: Do less of what makes you weak. I like that.

Hans Eng: Yeah, that could be very strong radiation and those things.

Dave Asprey: Okay. Such as stop sniffing uranium dust.

Hans Eng: Uranium dust is one of them. And the next thing is improve your repair and regeneration capacity.

Dave Asprey: Well, you're definitely a biohacker with list. Bam. In a nutshell that would be the entire set of things I'm doing to live a long time. Hans, thank you for coming on and you're with Eng Three and we're going to have your other co-founder, Rowena Gates, come on and just talk about what we're seeing in athletes and things like that. So, thank you.

Hans Eng: Okay. Thank you very much, Dave.

Dave Asprey: As sort of part two of this episode of Bulletproof Radio, I've asked Rowena Gates, who's a co-founder of Eng Three, which is also produced Eng Three, to come on and talk about just the clinical experiences of what's been happening with this stuff, and Rowena welcome to the show.

Rowena Gates: Thank you.

Dave Asprey: You've been working for 10 years on this kind of technology-

Rowena Gates: Yep.

Dave Asprey: ... with Hans, and it's one of those things that I think most people have never heard of, but it is backed by some real serious science.

Rowena Gates: So, that's not a very good reflection on me, but it's one of those things-

Dave Asprey: It's just the nature of innovation, right.

Rowena Gates: It's percolating up and it gets rolling, yep.

Dave Asprey: If you go back five years ago, how many people had heard of [Badcoin], and now it's all the rage. So, the nature of new technologies introductions, it's coming in faster, but there's an incubation period where people are working in a garage somewhere figuring out core biological-

Rowena Gates: Yep.

Dave Asprey: ... or other processes, and then it becomes commercialized, and then it comes in at the high level for pro athletes and high end race horses and special forces athletes.

Rowena Gates: Mm-hmm (affirmative).

Dave Asprey: And then it comes into clinical people dying and stuff like and new clinical trials and eventually it's built into your iPhone. That was the flow through.

Rowena Gates: Exactly.

Dave Asprey: And it may even enter your android if it doesn't catch on fire. I'm just kidding. Let's talk about what's happened over the past couple of years as you've started rolling these things out to training facilities and things like that. What's a typical user?

Rowena Gates: Well, our users are very often clinicians or health practitioners, trainers, or people very interested in improving physical and mental performance, and they can be across the spectrum. They can be people dealing with illness or disease with prevention or with performance, and so it's really all of those areas. A lot of our experience is helping people regain their health, people that have already lost function and are regaining it.

Dave Asprey: So, this would have been something that would have been really applicable for me 20 years ago when I started this. 300 pounds, pre-diabetic, all sorts of problems. In fact, one of the technologies that made a huge difference for me was ozone therapy-

Rowena Gates: Yes.

Dave Asprey: ... where I'm introducing free radicals into the body to trigger cell healing.

Rowena Gates: Right.

Dave Asprey: This is not introducing free radicals, but this is essentially the result of free radicals, is that they generate this ordered water and then that ... So, I likely generated some ordered water myself. It's a little bit more inconvenient and frankly dangerous to do ozone therapy, versus breathing water vapor like this.

Rowena Gates: Well, it's interesting because it's so complementary, and people do ozone therapy in combination with the NanoVi.

Dave Asprey: Oh, do they? At the same time, or one before the other?

Rowena Gates: Of course, because, and also with hyperbarics at either a NanoVi session following the other treatment or even in conjunction with ozone therapy at the same time depending on the type of therapy they're doing.

Dave Asprey: Okay.

Rowena Gates: But, ozone therapy also can kill pathogens.

Dave Asprey: Oh, yeah.

Rowena Gates: Anytime you do detoxification, you're really calling on the energy reserves of the body to take care of it. And so, whenever there's a detoxification process, then people also will combine NanoVi to help improve the overall outcome and not be so much restrain on the body.

Dave Asprey: Okay. If the body's using less energy to make ordered water because it just got a big dose of ordered water, it frees up some of that energy to do other, basically protein things, which is what you need to do if you're sick.

Rowena Gates: Right, those proteins are clearing up the carnage that you create by the detoxification.

Dave Asprey: So, most people listening who are not healthy, would be working with a physician, a lot of functional medicine, anti-aging kind of people. This is where you would find this natural paths, people like that.

Rowena Gates: Yes.

Dave Asprey: You're unlikely to find this at your local Blue Cross/Blue Shield hospital kind of an environment, right?

Rowena Gates: Correct. It doesn't have billing codes, so we're not in a standard hospital.

Dave Asprey: Well, that means it works, right?

Rowena Gates: But, the integrated physicians, that's the place to look for it because they appreciate, first of all, what you'd spoken with Hans about earlier. They appreciate biophysics. It's not purely biochemistry, which has been the American take on things. It's more pharmaceutical and I think the German take and well, our approach certainly is to draw on the energy side of it and the biophysics, not just biochemistry.

Dave Asprey: Okay.

Rowena Gates: It's integrative physicians that are thinking along those lines.

Dave Asprey: So, on that side of things, anytime you're making mitochondria work better or repair work better, broad improvements across-

Rowena Gates: Right.

Dave Asprey: ... everything rather than treating a specific thing. In Headstrong, I basically ... Everything you can find that happens from an acute injury to a chronic degenerative illness, they're all mitochondrial and they're all energetic in origin. This is one of the ways you can pump up the energetic system, which is why I have one in my labs, right? What about high performance though? So, let's say that we get an endurance athlete-

Rowena Gates: Well, those are related-

Dave Asprey: Okay.

Rowena Gates: ... because like with an electromyocardiogram, we've had a clinician show the improvement with the use of NanoVi, and it's showing mitochondrial function because when the heart works better, it's a reflection of how well the mitochondria are working.

Dave Asprey: Yeah.

Rowena Gates: And that's what you need for ... It doesn't matter if you're an athlete or a person recovering from an illness, that mitochondrial function is absolutely key and so for athletes, that's where they get the fast repair and they gain an edge, and it can be quite profound.

Dave Asprey: Is there an athlete you can name that we've heard of who's using this?

Rowena Gates: Okay. I'll call out Matt Boyd, who's a starting pitcher for the Detroit Tigers, and also one of the nicest people you'll ever meet. And he's been using it for some time, and he's young, but he's ... The pitchers are doing a lot in a short period of time, a lot of strain, wear and tear, and the recovery is a huge factor for them.

Dave Asprey: So, how would he or a pitcher or someone use it, after a game, before a game?

Rowena Gates: After all the training, and-

Dave Asprey: So, after training each time-

Rowena Gates: And then after games because that ... If you can recover your arm faster, you can pitch better.

Dave Asprey: Okay.

Rowena Gates: You can ... You're a stronger athlete and so that's a good example. Matt's a good example.

Dave Asprey: Okay. And what about ... I guess that's more of a strength and there's a lot of ligaments strain and things like that. What about say someone who wants to be an endurance cyclist?

Rowena Gates: Well, endurance sorts are ... Every endurance athlete should use this.

Dave Asprey: Okay.

Rowena Gates: And every iron man ... Andre Rosso is probably the biggest name person that you wouldn't have heard that uses it, but he's done the deca ultra marathon. Yeah, DECA ultra-marathon. So, that's the equivalent of 10 Ironmen races, ten consecutive days.

Dave Asprey: Is this guy the world's worst masochist or what?

Rowena Gates: It's unbelievable to me. It's unbelievable. And so, it's a ...It's a poster child for NanoVi, but on the other hand it's like, but that's not ... That doesn't sound like a good thing to be doing.

Dave Asprey: It's probably not an effective anti-aging strategy to do that [crosstalk 01:11:55].

Rowena Gates: Correct. But, he's of the extreme athletes, he would be the extreme of the extreme.

Dave Asprey: I admire the strength and willpower that it takes to do that. But, wow.

Rowena Gates: But, very iron man distance athlete, those kinds of people ... It's a lot of wear and tear. It's a lot of stress and the person who first got me interested in this is an integrated physician who said, "Well, I use it in my practice but where it's really amazing is because I train for Ironman Canada, and I need it to recover faster and feel better."

Dave Asprey: Okay.

Rowena Gates: And we actually have a video from him on our website because he really pushed to go after ... You need to start talking to athletes.

Dave Asprey: It seems like a lot of cross fitters would use this as well. Are you seeing a lot of them use it? It's that they're hitting it every day and they need to recover faster.

Rowena Gates: Right. Right, and they're really doing something, depending on how they train, some of them are ... It's pretty hard on them, and so we do have more of that

especially at one studio down in Oregon. But it's not a broad sector for us that I know if.

Dave Asprey: It seems like just a natural thing if you're running a cross fit box, if you have one of these, do your workout and do some extra recovery. I just thought of that, but it's-

Rowena Gates: Could you repeat that? Every cross fit gym should have this.

Dave Asprey: Anytime that you're doing physical training, right, and speeding recovery is something I've just been ... It's a mantra since the very beginning of Bulletproof Radio. It's like, "Look, recovery is the trick. Stimulating your body to cause damage is not that hard to do. Recovering effectively so you get stronger is hard to do"

Rowena Gates: Exactly.

Dave Asprey: This is, I think, an effective technology with some real science behind it.

Rowena Gates: Exactly, and one of the good things about guys like cross fitter, any athlete that really depletes themselves, like they go all out, then it's more noticeable because they know that they're going to feel terrible the next day, and so on. So, then when you use the NanoVi, it's very clearly different and I've had people say, "Oh, I feel cheated because I wasn't suffering the next day," that kind of thing. It's like, "I didn't feel like I worked out but I know I did."

Dave Asprey: What about jet lag and sort of the corporate athlete. I use it when I get back from a long trip. But, I also use everything else.

Rowena Gates: You don't take it with you?

Dave Asprey: It's not really that carry-on sized, not with everything else I carry on.

Rowena Gates: Yeah. Right.

Dave Asprey: If it was the size of this-

Rowena Gates: It's great for jet lag and it's great for hangovers and it's because both of them are repair processes. It's all about repair and also anything that affects the autonomic nervous system, rebalancing, getting back into homeostasis, those hormone functions, melatonin, all those things are the body rebalancing.

Dave Asprey: Okay.

Rowena Gates: If you help it with the autonomic nervous system, which is always measurable, it's easy to show with the device, then you help with something like jet lag and also other conditions that-

Dave Asprey: So, this would be ... The main use cases would be excessive life stress, which is jet lag and travel and all that sort of stuff. Hangovers, which is seriously-

Rowena Gates: At trade shows.

Dave Asprey: Yeah, trade shows would be a good thing, and then endurance or strength training just to be recovered from either one of those, during training or maybe after a game. Then, we talked about medical stuff. It seems like after a surgical recovery would be pretty powerful.

Rowena Gates: We have dentists and plastic surgeons that would use it to help their patients heal faster, recover faster. So, that's their use of it. If you ... For a plastic surgeon or a dentist, if they can reduce the swelling, bruising, and pain associated with the surgery, they get a better outcome. It can be pretty beneficial to them. So, it's used for that and then I think you mentioned before with Hans, all the chronic illnesses and there's a big number of home users that will use it to help address whatever condition.

Dave Asprey: I would imagine just having living with toxin mold, I did Mold Ease: The Documentary. If you're listening and you haven't seen MOLDY The Movie, modlymovie.com, guys like Mark Hyman, and Daniel Amen are in it and this is one of things where I felt good and then I moved into a new place or started working in a moldy place and I just lost my energy. You get a direct mitochondrial inhibition from these toxins and to recover from that adding more energy into the system, for me it was I used light, food, ketones, electrical stimulation, ozone, and this is another technology I didn't have when I was recovering.

Rowena Gates: Right.

Dave Asprey: But, if I was working on recovering now, I'd add that to my stack, right?

Rowena Gates: Perfectly. Yeah. Exactly, and most importantly getting the toxins out of your system.

Dave Asprey: Well, yeah, you have to do the whole mold protocol thing or lime-

Rowena Gates: Yeah, which can be taxing and so that's also where it would support that whole process.

Dave Asprey: Awesome. Well, I think that answered the vast majority of use case questions I had for you.

Rowena Gates: Yeah.

Dave Asprey: One thing I noticed ... It says in the instructions, "Warning. It may be really energizing." I'm like, I use energy for sleep. I'm a very effective sleeper. So, if I

increase mitochondrial function before I sleep, my sleep efficiency scores go up. So, I didn't Dr. Elan or my wife, really what was going on. I said, "Hey, sit here and breathe this thing for 20 minutes." So, she's a willing guinea pig most of the time, sometimes a little bit unwilling. But, anyway, she breathed the stuff, and she didn't sleep for four hours. And she's like, I have all this energy. What's going on. What's going on? And how common is that?

Rowena Gates: It's relatively common and it's ... Usually if it's used after about four or five in the afternoon-

Dave Asprey: Yeah, this would have been probably like eight, or nine.

Rowena Gates: Yeah, and then people feel perky and fresh, which is very common. They get a little clarity and they feel alert. But, you don't want that when you're trying to go to sleep.

Dave Asprey: It doesn't bother me at all. I guess I may be just one of those effective sleepers. I also ... I wrote almost all of Headstrong between 11 p.m. and four or five a.m. I'm naturally wired to be what Michael Bruce, the Power of Wind, the sleep doctor, what he would call a wolf, which means 15% of the population is generically night owls. 15% are those annoying morning people, and I just like to make fun of them because they've made fun of me for being a night owl. So, like, ha, ha. Anyway, But, I did for especially the last half of the book, I had the NanoVi by then, so I'd actually sit there and I'd like breathe it at night while writing the book.

Rowena Gates: Yeah.

Dave Asprey: ... because I'm wearing true dark glasses because I've controlled the lighting in my environment, I wasn't damaging my circadian rhythm, and I'd sleep and I'd be finer and it would all work.

Rowena Gates: Well, see once you get over that initial adjustment to it, it will help with sleep.

Dave Asprey: Okay.

Rowena Gates: In fact, it's widely used for sleep.

Dave Asprey: Oh, it is? Okay.

Rowena Gates: Because it's balancing the autonomic nervous system. So, that settling effect helps people sleep better and is very measurable that they can sleep more soundly. So, once you get adjusted to it, then it can be a great tool for actually initiating sleep. Some people that don't sleep well will wake up and do a session at night and go back to sleep.

Dave Asprey: Now, I'm going to totally, probably piss you off right now, but I just thought of this. So, I'm just going to tell people to do this who are biohackers. If you have sleep apnea, and you have a CPAP machine, here's what I would do, okay? I would poke a hole in the side of the hose and I would plug the water vapor output from the NanoVi into the CPAP machine so that while I'm getting the CPAP, I would also be getting NanoVi at night and since you already have a vacuum cleaner sound while you're sleeping you might as well do this. Did I just violate some HIPAA thing?

Rowena Gates: No, you just described at least one doctor and some people I know that-

Dave Asprey: I just thought of that. I was like, "I'm so cool." And there you go-

Rowena Gates: No, one medical doctor told me that and I've had other people, so they can be used definitely in combination.

Dave Asprey: In conjunction with CPAP. You could also just put the [inaudible 01:20:07] on your nose if you're willing to be all wired up in your sleep. I don't have sleep apnea and I probably could sleep with the noise, but it seems like you'd move around enough that you wouldn't get the water vapor dose to matter.

Rowena Gates: Yeah, the best thing is to reclaim your health so you don't need the other interventions because they're disruptive to sleep. They save your life on one hand, but they can be disruptive. So, the more you can reclaim your health, your natural rhythms, all of that, the better.

Dave Asprey: That sounds so slow and old school. Isn't there more we can do while we're asleep, because that's free time? If I could put 50 different biohacking technologies on my body and sleep better and wake up better-

Rowena Gates: You just said you were the advocate of recovery, right?

Dave Asprey: Yeah, I know, but-

Rowena Gates: That's when your body recovers. It has to repair things at night.

Dave Asprey: But shouldn't I give it even more repair juice at night? That's what this is.

Rowena Gates: People do sleep with it and use it at night, but it's usually when they're ill and they really need more time on the device.

Dave Asprey: All right. I got it. And the normal time on the device is like 15 minutes on the heavy duty one, or up to an hour on the lighter weight one.

Rowena Gates: Correct. Correct. And so if people do one session a day, then if they're really struggling with a challenging condition or an illness, they might double that or

do three or four times the normal amount in which case they can run out of time and then they'll use it at night.

Dave Asprey: Is there any reason I shouldn't just have it running eight hours a day on my desk?

Rowena Gates: There is no reason at all and there's no possibility to overdose. The gain is biophysical, not biochemical. So, the only thing that happens is maybe your body doesn't need any more of that signal and it's actually not helping anymore. But, it could never hurt.

Dave Asprey: All right. That's super cool. I realize I never asked you that. So, it's a good thing because I sometimes overdo a few technologies.

Rowena Gates: That's the beauty ... That's one of the real glories of this technology is that it doesn't have the potential for interactions.

Dave Asprey: Okay.

Rowena Gates: It doesn't have the potential for harm.

Dave Asprey: Okay. That's helpful because that means I didn't harm myself.

Rowena Gates: Because it's triggering mechanisms in your body that don't have the potential to do harm-

Dave Asprey: Okay. Cool.

Rowena Gates: ... or to interact in an unknown or undesirable way.

Dave Asprey: Well, thanks, Rowena. I think now we should end the official episode.

Rowena Gates: Yes.

Dave Asprey: But, if you're going to tune in on YouTube, bulletproof.com/YouTube to get here, we're just going to take the camera over and it's got to be the camera with my mic on it, which means that camera. I'm just telling Elliott that, and then we're going to just turn the camera around. You'll see the studio and you'll see my setup, now I've got this setup. That's actually right next to my neuro feedback thing here. So, walk on over with me. We'll check that out. In the meantime, if you're interested in learning more about this, you can ask at your local, wherever facility ... You can go to the Eng Three ... It's eng3corp.com, properly pronounced Eng Three, but you can spell it Eng, like engineering 3corp.com and then they have a finder sort of thing, and I don't have an affiliate deal or anything like that. This is a really cool piece of tech that I'm using and I think that it's worth looking at from a mitochondrial and a systems repair

perspective and you're going to see how I do it. So, walk with me over to this and we'll check it out.

All right. This is it, and so you guys know, this screen at night is way too bright. It's blue light so I actually out black tape over the green light here because green interrupts circadian rhythm or I'm wearing my true darks, and I usually cover the screen, which is something that I would like to not have to do, and since Hans is hearing me say that, I bet you anything that they'll have a red light ion theirs pretty soon, right.

So, all you do is you sit here, and you do what you're doing. It looks like I have a microphone in front of me and I'll put my mic up to this. You hear that? It's basically a very soft, a very soft just blowing of slightly moist air, and you just sit and you breathe it, very simple and you get that very high surface area of ordered water that saves your mitochondria the energy of making that.

So, this is something that I do at my standing desk and just floats the camera around my standing desk because back there, sometimes I put it on my desk, and come back to me Elliott, and then behind me I have some of the neuro feedback gear from [inaudible 01:24:35] and just on the table. We don't need to zoom in on that or anything, but I will use this while I've got the electrodes on my head, or I will use it just pretty much whenever I'm going to be in one place for 15 minutes and I don't obsessively use it. Some days I don't use it. But overall, it's an additive thing, and when you're looking at aging, and death, and all that, it's lots of subtractive things.

So, anytime I can get an opportunity to add something back in instead of take something out, I'll take it. Anytime I can avoid doing something that causes extra damage, I'll avoid it. And that general strategy, which is to not be perfect, but to just move things in the direction of less damage and more repair equals more performance now. Your brain works better now, and you'll probably live longer, along the way. So, there you go.

Have an awesome day. Thanks for listening. If you like this, got to iTunes and say, "I liked this," and share with people. Leave a review. I think we've passed 1,500 reviews. I'm grateful for that, and something that will be even more impactful is go onto Amazon, take 10 seconds and leave a five star review of Headstrong. It's got a couple hundred reviews, but it's a really impactful book, maybe even more important that the Bulletproof Diet. The Bulletproof diet is very food-based, very actionable, and Headstrong's got as lot of good sciences understandable, and it's got actionable stuff returning on mitochondria that goes way beyond just diet and the first place you're going to feel mitochondrial function is in your brain. Your brain turns on first, then the heart, then the rest of the body.