Announcer:

Bulletproof Radio, a state of high performance.

Dave Asprey:

You're listening to Bulletproof Radio with Dave Asprey. Blood vessel damage matters to a lot of people, and I wanted to bring on someone who I was really impressed by when he came on the show last time. I'm talking about Dr. William Li, who is one of the authors of a study that was published in the New England Journal of Medicine, and a real experienced internal medicine physician and author of Eat to Beat Disease, a very well credentialed, thoughtful, intelligent guy who's really dug in deep on what's going on in our blood vessels, both with COVID and without. Dr. Li, welcome to the show.

Dr. William Li:

Thank you, Dave. It's always a pleasure to speak with you.

Dave:

You're also part of the Super Human Audio Series that people got when they purchased Super Human, my last book, so I just wanted to do a quick thank you for being a part of sharing information about the endothelium. If people didn't get that, didn't read the book, what is endothelium and why do we care?

William:

Endothelium is just a fancy word to describe the cells that line the lining of our blood vessels. That's actually the lining that, that's a single layer, which is pretty amazing, and align 60,000 miles worth of channels that connect every organ or body. That's what makes it important. The work that we've been doing is really trying to understand why people who are infected with COVID actually have all these weird problems that we didn't expect from a simple respiratory virus related to the common cold. That was my invitation to put together a team of crack researchers from around the world and do a little bio hacking of my own.

Dave:

I have so many thoughts about what's going on with this stuff, but I'm a little bit obsessed now with the endothelium, because I had Dr. Mansoor Mohammed from the DNA company on the show. We talked about my DNA company test results and it turns out I'm in the 7% of the population with the highest risk genetically of having problems with my endothelium. In other words, if you're to say, which of the four killers is the one that's targeting me most aggressively, it would be cardiovascular disease, but that's okay, killers can target me, I'm still not going to let them do it, so screw you, cardiovascular disease.

But I'm intrigued with ways to prevent damage to and even regrow or enhance or make more resilient this lining because cardiovascular is such a big deal. Are there things that you know about COVID and the lining of the arteries that maybe aren't well-known? Then, I want you to tell us, what can we do that might work to protect arteries whether or not we have COVID?

William:

Right. Let's start with the beginning. We are all formed from one blood lake when we're actually in the mom's womb.

Dave:

I think I saw that in a vampire movie.

William:

Pretty much. It's vampire-ish. It's one like that scene in the Terminator, where this ball of liquid metal?

Dave:

Cool.

William:

Imagine that that was blood, and that's how we'll start. Then there's a lining that forms around that like the covering of an egg, like beginning an eggshell. Then, that's the endothelium, that's the first lining that we ever have in our entire body and then that starts dividing and bridging and turning into these different cool channels until we first form our circulation before we form any of our organs, because otherwise, the organs wouldn't stay alive.

We start at the beginning. It tells you just how important the endothelium is because it really is the connector, brings blood, oxygen, nutrients, everything to every single cell in our body, and if we block those channels, we wind up actually having big problems that happen in the heart, happen in the brain, and then diabetes. It can actually happen in your toes, for example, or in your foot, and you wind up not be able to heal your wounds. Basically, healthy endothelium is healthy body. By the way, that's how athletes grow as well. When your muscles grow, your endothelium actually also flexes their ability to expand. This lining, literally, is our cushion. Healthy endothelium, healthy body, unhealthy endothelium, and lots of parts of your body start crying out for help.

For COVID, one of the things that we did, I started realizing that doctors and nurses were flailing in the emergency room and the intensive care unit shortly after the lockdown, because as a cases grew, and you saw this in Italy and Spain, they could diagnose the disease but there was no treatments, it was only support. Supportive care, which included the ventilator, which usually didn't work that well, led to a lot of bodies piling up. As I was watching bodies being piled up in ice-skating rinks in Madrid, it just made me realized how medieval medicine can be, our health systems can be basically incinerated with essentially a cough that brought civilization to its knees.

The only difference between medievalism and modern-day 21st century is the fact we've got some pretty good science. What I started to really feel compelled to do is to activate a research community that I know, we got a hold of autopsy tissue from people who died of COVID and we decided that we would just take 21st century technology and do a deep dive, and this is truly the bio-hacking into what actually happened to these people, so we can actually figure out what we could possibly do to save them.

Here's a couple things that we found. We found, of course, that the virus, which is a coronavirus, which is more related to the common cold than the influenza. So much misinformation out there. Originally, it was thought that people are say, "No, this is like a bad flu. No, this is actually like a deadly cold, more like." But the cold doesn't kill most people and the coronavirus, you get by inhaling it. It goes to your nose, most of the battle for most people actually, it's fought in your nose and your mucus. You got a good immune system, and you've got the super soldiers of the body that normally protect us, pretty much you end it right there in your nose.

But if it figures out how to sneak in in some people, not at all people, into your body, and by the way, it affects your smell glands, your olfactory bulb, and get sent your lungs, then it causes a pulmonary problem, a respiratory problem, a lung infection, and that's where all the action was, but

actually what I saw, you had action in the brain, you had action in the kidneys. In the heart, people were having a feeling like they had a heart attack, they go in, they get die shot into their coronary vessels and they were crystal clear, like it was no blockages, what was going on. Then you had the COVID toes, this big, beefy, red and inflamed toe. What connects all those things? To me, it's the endothelium. It's the blood vessels is what connects all these other unrelated organs. That's what we dove in to take a look at.

Dave:

We know that coronavirus is typically like endothelial layers, so the sinuses, the lining of the lungs, lining of the arteries, lining of the gut, coronaviruses live in all of those things when you get a cold depending on which variety, but those are the typical homes and that's why they've found it in those things, the renal tubes in the kidneys, similar tissues, they like to live there. The question is, are they what's causing the damage? Did you guys dig in to find out, "Okay, just because it's present doesn't mean it did it."

By the way, I'm going to promote a conspiracy theory about coronavirus, not whatever ... I'm sorry, unless you saw them do it, you don't know the hell who released it or if it was released or all that, that's not what I mean, but a medical conspiracy theory about maybe how medicine got it wrong, but first, tell me the evidence. How do we know that just because it's there, it did something bad?

William:

Yeah. First, you're absolutely right, coronavirus loves to live in these little cell linings in our body, in our cavities, but those are not endothelial cells, those are epithelial cells.

Dave:

Oh, geez, thank you. You are correct.

William:

They are close cousins.

Dave:

Similar, similar, yes.

William:

But they don't kiss.

Dave:

Thank you.

William:

It's actually very rare that you actually find a virus or bacteria invading an endothelial cell. How do we figure this out? We actually took people who were at the end stage, obviously, it's a crime scene investigation, CSI. We went down and did transmission electron microscopy. This is actually using electron microscope to resolve, at the cellular level, what we saw, and we actually saw for the first time viruses invading endothelial cells and filling them up like a gumball machine. When we saw that picture, we saw these viruses were destroying the membranes of the endothelial cell from the inside out. They

were literally like zombies getting in infecting and then basically pulverizing the membranes from the inside out.

Dave:

Can you actually look at live tissues with electron microscopy, though? I thought they had to be dead and fried to do that.

William:

Right, right. That's the thing. That's actually, you have tissue that's been fixed, so it's dead tissue versus living tissue. We haven't yet figured out how to do living microscopy at that level, although we're close to it. You're absolutely right, what you really want to be able to see is the actual crime taking place. We saw the aftermath of the home invasion so to speak.

Dave:

Did you see anything with red blood cells themselves? Did you look at those?

William:

We did. We didn't see much invasion in the red blood cells. We saw the viruses hovering around them flying like UFOs around them, but we didn't see them actually getting into the red blood cells. That'd be like malaria or some other [crosstalk 00:10:13] invading.

Dave:

The reason I'm asking is, I came across an intriguing set of three studies from three different mechanisms and in three different research groups that all said there is something going on with our hemoglobin. Are you familiar with that research?

William:

There's been so much research, tell me which ones you're looking at.

Dave:

These were of all groups that said that there is damage to the hemoglobin that is to the extent that it's releasing free iron. Essentially, it's shredding hemoglobin. One of them was, "Oh, here's the genetic propensity," another one was, "Here's what it's doing there," there are different mechanisms in different groups who apparently weren't talking to each other, and they all ... When you see three of those that all say the same thing, "Yeah, it's probably happening."

Then, I look at that, and I look at what's going on with these walking hypoxic people, so you get one of these little SPO2 meters like I got on my finger now if you're watching on YouTube. It's funny, there's people who walk around at 90% blood saturation, by the way, you probably need to go to the ICU, if you're 90 or a little bit less. I know about these things because I do intermittent hypoxic training, because I used to have actually pseudo-hypoxia issues throughout my body, thank you Lyme disease and toxic mold. I felt like, "Oh! I see this." In the symptoms of hypoxia or extensive blood clotting, problems with the endothelial layers specifically, kidney damage, you get the most hypoxia in the toes, COVID toes, damage to the heart, damage to the brain, and symptoms of free iron are damage to the lining of the arteries and damage very specifically to the lungs, where you see at the most where there's oxygen

plus iron. I'm thinking how much of this is hemoglobin and how much of this is actually just a direct attack on the lining of the pipes, so to speak?

William:

Yeah. I'll try to put it together for you as you know it.

Dave:

Yeah, please.

William:

We're actually trying to dissect the part, a disaster, a natural disaster in slow motion. I'm telling you, I'm giving you a picture what we know today.

Dave:

It's cool.

William:

I actually think it'll actually help make sense of all this. Here's what we saw. We saw the virus invading the endothelial cells, the vascular cells, the lining of blood vessels and shredding them from the inside out. The endothelial lining is incredibly important. It's actually the slippery surface that all of our blood cells actually tumble along as our heart pumps the leaders of blood through our body on every single minute. If you wind up having any disturbance of the lining of the smooth surface, slippery surface of the lining, think about the normal endothelium being like ice skating rink after the Zamboni machine ran over it, it's cleanly ice, smooth, slippery surface. You're going to go out there and you're going to skate like nobody else.

If you wind up having scuff enough the ice, that's damaged endothelium. Now, your skate gets caught and you start tripping and falling. That actually can start shredding red blood cells and causing blood clots. The more blood clot you have, the more shredding you have of the red blood cells, the more iron you start releasing. There's one more thing that we found.

Dave:

Okay. Before we get to the one thing, just to make sure I understand this, you're proposing that the damage to the lining of the lungs is causing damage to red blood cells and releasing free iron rather than things going on specifically with the red blood cells themselves.

William:

I can't exclude that.

Dave:

Okay.

William:

I think we don't know enough about this to be able to say it's one not the other.

Dave:

Okay, so you're proposing but you're not saying you know, but you're hypothesizing and going on what you've seen but not excluding other things.

William:

We're not excluding other things.

Dave:

Okay.

William:

I will tell you what we do now. When you actually damage the endothelium, and we found this out by looking at these lungs, the blood clots were forming right exactly where the damage endothelium is. This is very consistent with the pathology of what you would expect. Now, here's the other thing that we observed that was really unusual. Blood vessels, when they are blocked in that intermittent hypoxia situation that you talked about, they normally have a response, an emergency response.

Think about pulling a fire alarm in a building when you start seeing smoke coming down a hallway, that emergency alarm which sets off the alarm has blood vessels trying to divide so you can bypass blockages really, really quickly, this is a reaction. We call it a reactive form of angiogenesis. It's got a fancy name called in intussusception. Think about it as a single blood vessel, you're in a car driving down a singling tunnel and there's an emergency. The tunnel now needs to divide into two and you're driving down this tunnel. What it does is the tunnel drops a sheet rock from the ceiling to the floor and then it splits. Now you got from one vessel to two in an attempt to bypass.

Now, you're in the car, red blood cell trying to drive through that, you can't get through now, and so now you tumble through and you get caught up in the damage endothelium, now it is even more clotty. The second reason that blood clots were forming is intussusceptive reactive angiogenesis. This normally happens for a few minutes, we found this happening time and time again over vast sectors of the lung. Now, even though you have this reaction, you can't do the bypass, and this, we think also explains that happy hypoxia you are describing.

Happy hypoxia really means that people that shouldn't be sitting up talking on a cell phone or talking to the family member or talking to the doctor in the emergency room shouldn't be sitting up with the pulse, an oxygen saturation of 85, 80 even lower than that, they should be unconscious. What we think is happening-

Dave:

Are you seeing people at 80 now?

William:

Yeah, there's a-

Dave:

Good God. I'll take myself down to 80 by breathing air with no oxygen in it on purpose, but you're seriously loopy at 80. I can't imagine driving in that state.

William:

What we're saying is that these massive reactive angiogenic, clotty lungs are forming in different geographies of the lungs. Think about a lung like a cherry pie and you've cut it up into different segments, and now you're actually mashing different segments one at a time. You still got a little viable pie up until the last, last chunk it's smashed down, so we think that what's happening is that the remaining pieces of pie in the lung there are still oxygen are just hanging on keeping you conscious, able to do your thing and then suddenly you tip over when you get that last piece of pie smashed down, that's it you drop like a rock.

This is not something we see with H1N1, we didn't even see this with SARS1 or MERS. There's something very unusual about this. You've damaged, infected endothelium, damaged endothelium, you've got a reactive angiogenesis creating a more clotty thing and then, I'll tell you, the other thing we saw is massive inflammation, your immune system trying to clear out the virus in the infected endothelium. There has been this slightly inaccurate term thing, this is an autoimmune disease, you don't want a strong immunity. Actually, it's normal immunity trying to get rid of the virus that happens to be in your blood vessels in that single endothelial layer. It's doing its job, unfortunately your blood vessels are in the way, and so trashes the blood vessels now.

Now you've got a third reason to actually cause blood clot. As this is happening in the lung and starting to spread elsewhere in the body, we're thinking that this is the connecting piece between why we're seeing clots in the brain, inflammation in the heart, the COVID toe, the kidney damage, and yes, it's completely linked to hypoxia.

Dave:

There's another compound a lot of people don't know about that you'd probably think is some weird vegan supplement, vegf. What is it? Is it a part of this whole thing? Do we need to suppress it in people with COVID? Walk us through that.

William:

We actually looked exactly at vegf. Vegf sounds like a vegan thing. Tell you what it is. It stands for vascular endothelial growth factor. It is the natural fertilizer for the endothelium. Endothelium loves it. It's a miracle grow for endothelium actually. By the way, I was part of the team that helped to discover this back in the 80s. I know quite a lot about it.

Dave:

Thank you. It's been a long, long and detailed part of what's happened in my own biology. Your work actually helped me to be a successful biohacker. Mad respect.

William:

Listen. It's totally cool that we're talking about it after so many years. It's more relevant now. Here's what we found. We not only looked at the pictures of the virus infecting the endothelium. We not only looked at the actual evidence for the clot. We also dove down to look at the proteins in the genes and we found vegf was elevated up the yinyang.

Dave:

Like crazy, right? It would have to be.

William:

Like crazy.

Dave:

It would have to be.

William:

Because of hypoxia.

Dave:

It's what causes you to grow new blood vessels.

William:

That's exactly what's happening when you got all these damaged endothelium the blood clots the shredded endothelium and also the shredded blood cells. You got release of the iron, you got all kinds of problems mangled up into these tiny networks that of the gas exchange networks, and vegf, your body's natural fertilizer comes out. It's like an emergency distress call. "Please, we need more vessels, we need better blood flow, we need to clear up this gigantic catastrophe that's occurring, hypoxic catastrophe."

Unfortunately, this clotting forme nomenon, blood vessels can normally grow ones actually get around problems when it's really focal, but when you actually have large geography, think about a campfire you can put out compared to a forest fire, not so easy to put out. Campfires are like little bits of information, forest fires COVID-19. This is what we're actually seeing that's actually happening. We are now diving into the brain, the lung, the leg, the kidneys, the other organs trying to figure out what else is going on in other organs.

Dave:

A lot of anti-cancer drugs will lower vegf, because in cancer, the Western medicine approach is, "Hey, since cancer likes to grow new blood vessels, let's stop blood vessel growth throughout the body with drugs to "starve" the cancer. You could also just not give it sugar, but that's a different conversation. That's a little bit more in the keto world, and there are many, many other cancer things we'll talk about on another show, many other shows. but when it comes to this, should people be looking at any cancer drug that lowers angiogenesis if they're getting COVID? Have you guys looked at that?

William:

Yeah. I'll tell you there are clinical trials using anti-vegf, anti-angiogenic drugs for cancer that are actually being tried for COVID. I actually think that's the wrong way to go.

Dave:

Why?

William:

Because I think the blood vessels are good. I think the endothelium is good. I think it would be feeding the endothelium. In fact, I think we should actually be replenishing it and we need to do everything we can to actually coax the factors and the cells that rebuild the endothelium. I think we need to get the

general contractors of industry that would be coming out to help prepare what's going on at the same time the damage occurring. By the way, I also think, Dave, that after we get past COVID, like if you actually recover from COVID, one of the things you'll hear from people is how long it takes for them to get back to their normal lung function or muscle function.

Dave:

Yup.

William:

We think that's the residual trashing of the vasculature that is still slow to repair itself. I think that one of the things we need to do is to quickly do what we can to restore, replenish, rebuild, regenerate endothelium even after COVID. This thing isn't done with just the infection.

Dave:

I love it that you're saying that there's a couple of pieces of technology that I use at Upgrade labs that are very, very powerful for that that are changing vegf levels and nitric oxide levels and angiogenesis and all that. You can do it environmentally and certainly there's pharmaceutical things that could be really interesting. I think we're going to see a huge increase in research around the effects just like of intermittent fasting, intermittent hypoxia. As far as I can tell, we are the first recovery, and we invented that recovery clinic thing like that industry category, but we're the first people to make that widely publicly available. I'm pretty sure that this hypoxia thing is going to work and if not, there's probably some breathing exercises that will help, anything that induces hypoxia is going to raise vegf, right?

William:

Right. I'll tell you what's interesting. I'm also involved with wound healing and tissue repair, which is the next-door neighbor to regeneration. all you got to do is reach out and you'll touch regeneration. I've been very involved with those programs as well. Right now, in wound to healing clinics, people with chronic wounds, diabetes, [venus 00:23:20] plumbing problems or hardening of the arteries where their skin breaks down they got chronic wounds. If they have COVID they're being treated with hyperbaric oxygen, which actually, I'll get to in a second. It used to be thought that you're actually raising the oxygen and doing better for the body, and that does occur but is pretty transit.

What's actually happening with HBO is that between dives in the dive chamber, the hyperbaric chamber, you're creating relative hypoxia. In the chamber, oxygen happy, the moment you come out, you're relatively oxygen-starved. The longer you do this, the more you're resetting your body's expectation for good oxygen. When you come out of the chamber back to your normal life, you're relatively hypoxic. That is the trigger to a chain reaction in your endothelium to create more vegf and to stimulate stem cells to come out of your bone marrow and rebuild your endothelium.

Dave:

I sure hope that we haven't lost listeners on this. I'll just tell you guys, whether or not you have been exposed to COVID, whether you have any symptoms that are lingering afterwards, in fact, the odds are probably that you don't, that whole 80% of people don't notice they got it. But if you're someone who noticed you got it and has lingering symptoms, you are going to have to learn a lot about vegf and essentially how to restore your cardiovascular system. Funny enough, let's say, "Okay, you didn't get that. Are you over 50? Are you in one of the groups that's more likely to have cardiovascular issues

because of your genetics, your genetic heritage?" Certainly, it is not distributed evenly across people from different parts of the world.

You're going to have to own that because the big four killers, if you guys are not superhuman, it's cardiovascular disease, cancer, diabetes and Alzheimer's. Wait a minute, is diabetes a pre-existing risk factor for all of the other three? Yes it is. In fact, if you have diabetes, you're going to get one of the other three, which leads me to my question. Why do people who have diabetes keep getting sick and having all these problems? What's the link there, Dr. Lee?

William:

Endothelium that's disturbed is a hallmark of all those conditions that you actually just described.

Dave:

Do you mean high blood sugar fries your arteries? Is that what I just heard you say?

William:

Any frying of the arteries actually does a gigantic disservice. Diabetes is one of these tricky phenomenon because high sugar definitely will do it, and also the byproducts of diabetes, it's a metabolic disease, which means that pretty much all kinds of things get thrown out of your body as a site ... Think about cleaning up after a dinner party. You got a lot of stuff to clean up. It's a small dinner party and things are done orally, it's not too bad, it's an easy cleanup. If it's a big party with a lot of trashy food and all stuff, you got a ton of stuff to scrape off, and in diabetes, think about it like a trashy dinner party with tons of junk, tons of foods to throw away, it is a metabolic waste. Not only sugar but a lot of these other metabolic byproducts are also problematic for the endothelium. While it's over simplistic to say diabetics and endothelial disease, in fact it is.

Dave:

If you were invited to a dinner party that you had to attend and everyone there except for you had active COVID cases and you could eat either a whole bunch of popsicles made with sugar or a plate of French fries, which one would you eat?

William:

That's the "would you jump into a volcano or being eaten by shark." I could imagine, if I made the popsicle myself out of whole fruit-

Dave:

No, I'm talking like good old-fashioned artificial flavorings, corn syrup sugar all the-

William:

That's the dinner party I wouldn't be going to.

Dave:

It is indeed. The real question there is, "Okay, which is worse? Oxidative fried stuff or sugar during COVID?

William:

You could probably ... actually for COVID, I don't really know, we don't know yet, but I'll tell you, sugar is definitely going to be a problem for the endothelium.

Dave:

I feel like sugar would be the worst choice, and it's because sugar in the short term suppresses immune function by 50%, so you're more likely to get sick from it. Of course, there's arterial damage, but the arterial damage from the fried stuff might last longer, but it's not going to suppress your immunity as much even though it increases inflammation, I think. I wouldn't want to flip that coin either.

William:

Here's the thing. The sugar will also change, alter your microbiome, which then will lower your other defenses including your immune system. That's how I'm thinking about it. Whereas, you're right fried food, not good for you. It's a longer tail on that problem and you probably have to eat more of it. You can probably have a couple of fries, but a little sugar, it doesn't take much sugar to actually change your microbiome.

Dave:

That's a good point. If you're listening to this going, "Oh wait, what am I going to do?" Look, you really shouldn't eat either one of those the rest of the time, but if it's winter and there's all sorts of viruses going around and you're susceptible and you're already pre-diabetic, by the way, that's just marketing for diabetic, then you need to pay attention to both of those.

All right. Let's say someone's got COVID and they're saying, "I'm sorry, not feeling so good. I'm afraid my microcap layers, my lungs are basically dividing and dividing like Agent Smith in The Matrix, how's that for a visual image?

William:

Pretty good.

Dave:

Now, if they're doing that. Okay, you have the entire arsenal of Western and functional medicine at your fingertips and you're well-versed in both, you're one of those "real" doctors, who also has your "Eat to Beat Disease" and has written a meaningful book talking about what's going on here. Okay, everything is at your fingertips, knowing the hospitals are going stop you from getting vitamin C, IV, or anything else like that, What would you think about doing for yourself? It's okay to go out on a limb say I don't know but I think this is a 51% chance, no matter how much it cost, I'm going to do it. Go out on a limb a little bit. This is only for you, you're not recommending for patients, people listening to this, don't do what he says, this is what a doctor knows his own biology would do for himself.

William:

Right. If I weren't sick enough to go into the hospital, because you lose a lot of control of your [crosstalk 00:30:06].

Dave:

Okay, so pre-hospital. You're not in the hospital yet, you don't want to go. That's even better.

William:

How about this? I feel sick, I get tested, and I'm positive.

Dave:

There you go. Okay.

William:

Now, I'm going to stay at home and I'm going to try ... here's how I think what you mean by your challenge. What can I do to keep myself from getting into the hospital, from having to go to the hospital.

Dave:

There you go. That is really what I mean.

William:

Right. I can tell you because I've thought a great deal about this over the last couple of months. Number one, I would replete with supplementation the things, the factors that are critical for immunity. Vitamin D, vitamin C, vitamin B12, iron, those are like zinc, those are key things.

Dave:

Hold on, you just said iron. Are you going to get enough of that from your broken arteries?

William:

You want to get it before your broken arteries. I'll tell you, if you actually have good immunity, remember I told you the battle is fought in the nose. If you actually have a good strong immune system, your front gate, which is in your nose, your schnoz, ought to be able to tackle this as much as possible. You want to actually lower that as much as possible, but that's just supporting your immune system.

Secondly, you can actually break down all the gateway points that this virus actually is screwing up your body. The front door, that's where your IGA is, you can actually eat foods like mushrooms with beta glucan and vitamin D that'll up your IGA in your nose. You can actually have cranberry juice that will actually up regulate another member of your immune cells.

Dave:

Is that just d mannose the sugar? That's in there because cranberry juice is ... actually it's not that high, that's pomegranate, but cranberry juice, I guess, you'll just drink it straight, but is it mannose or something else that's doing it?

William:

It's actually the ellagitannins.

Dave:

Oh, okay. It's the red stuff, okay.

William:

The anthocyanins, right, the dyes that are actually upping this.

Dave:

Ellagic acid.

William:

Exactly. I'll tell you. If you think about your immune system as a group of super soldiers that are in your body and different troops, different special forces do different things, cranberries will actually up your defenses not only with the IGA but also the special cells called delta gamma T cells that are also the first responders in infections. What I think about to keep myself from getting sicker is actually to ramp up the front gate. You want to make sure ... if you lose control of the door, that's it, enemy comes pouring to your house. That's one of things I would think about.

Secondly is that if you got enemies in your house, you actually have to ramp up your super soldier, your T cells, and other types of cells there. What's interesting is they've actually studied things like Broccoli sprouts is interesting, can actually up your natural killer cells and your T cells. It was a really amazing study done at University of North Carolina, where they took young, healthy people getting just the flu vaccine and then they gave a group a placebo drink, and they give another group two cups of broccoli sprouts just puréed into a shake and gave them the drink. Just a cup a day, just a 2 cups of sprouts, and then they gave the flu vaccine.

What they found is that in the people who had the placebo drink, they had a normal immune response, but in the kids who actually one of having the broccoli drink, their natural killer cells amplified by 22 times. That's border magnitude-

Dave:

Sprouts plus the vaccine was better.

William:

Yeah.

Dave:

It might be better unless that was such an explosion of immune cells that it might've been too much if they would study that.

William:

Except that they never got sick and they actually measured the viral particles that were in the nose, and basically completely nuked all of viruses that were left in the nose of the people. Whereas, people that got the placebo, the virus hang around.

Dave:

Okay. Basically, broccoli sprouts, in general, are going to be good for you. Will a sprout extract work or do you have to actually take the sprout?

William:

Probably. No, no, I think a sprout extract will probably work.

Dave:

Okay. There are some enzyme-activated stuff that I wrote about, where it turns out there's an enzyme in there or you could deal a piece of radish with an extract and then the enzyme in the radish can activate the sprout stuff.

William:

This is the myrosinase, right?

Dave:

Yes, basically.

William:

Which, by the way, if you're actually having ... here's the thing about that, let me explain for your audience. Basically, the stuff that's good in broccoli sprouts and in broccoli is trapped inside the plant cell. It's so powerful it's locked-in in these secret pouches, and because plant cells are pretty hard, unlike human cells which are pretty soft, you need an enzyme to break it down so it's available, bioavailable for your body if you take it. If you actually put the sprouts in a blender or a purée or a bullet, you'll actually, essentially mechanically shear those cells and open them up. If you just actually eat it, you got to chew it. The chewing motion lets you release the enzymes that will then break down the cell wall to release the good stuff. These are the isothiocyanates or sulforaphanes. These are the chemical, the alphabet soup chemicals that actually will do the job on the immune system, the good job.

Dave:

If you cook the broccoli you don't get the benefits, right?

William:

Not the same way. In fact, you can destroy the benefits of you overcook it.

Dave:

All right. There's another thing that's interesting that I wanted to ask about. A lot of the functional medicine docs that I've been talking with about COVID, and I'm less stressed about it than a lot of people at the very beginning said, "I'm pretty sure we don't how many people actually are sick, so all these made up death numbers don't make sense," but with the last SARS we had they said it was going to be whatever 5% death rate or something. At the end of the day, it was .02%, so there was a 65x reduction two years after the virus and they actually could figure how many really had it. I'm thinking, "Well, given the history or track records from the WHO, CDC when they don't know the population percentage who has it, they make up these numbers and they get a lot of funding in panic. I was going to guess that it's going to be a 65x reduction, and some early insiders had 40, one of them said 40 times more people had it than they thought, another one said 80, might be around 60, that's it.

If you get it, this thing is worse than a cold, it's worse than the others SARS, there's no denying that. I'm just saying, "Okay, this is something that I'm less worried about but I've spent a lot of time like you so you get sucked into it because all of the doctor people that you know and you talk something about this, they talk about for three months, your brain gets engaged. Most of the people that I know and respect have said, "quercetin, quercetin, quercetin," and I've been recommending that. Quercetin lowers that vegf levels, which is really interesting. Is that the reason? Also, this green tea extract, which is another very common recommendation from the functional medicine side. Maybe if you have the

stuff and you take those things you're going to get a little bit less of this? Or is that just me making stuff up?

William:

Nope, you're actually saying the right thing, it's just that quercetin is much more complicated than just doing one molecule doing one thing. The other things that quercetin does, besides being a great antioxidant, is that it actually coaxes out your endothelial stem cells. Quercetin also helps to rebuild your endothelium. While it does inhibit vegf in a bad way, it actually coaxes out your bone marrow derived endothelial progenitor cells. It's like a wave and a flower in front of a beehive. Think about your beehive as your bone marrow with all the stem cells in it that had the capability of regenerating your endothelial lining. Quercetin is like the daisy you're waving outside of the across the street to the beehive, those bees will see it and they come flying out, and they just basically start to rebuild as well.

I think quercetin is actually ... and foods containing quercetin are actually a good bet, that's what I was going to say. That's the other thing that I would do to try to keep myself from getting to the hospital, is I would start eating foods that have quercetin. What's a great example of it? Capers is one of them.

Dave:

How many pounds of capers are you going to eat to get one quercetin tablet?

William:

You could eat a quercetin in a tablet, but the thing is I love tasty food, so you can-

Dave:

Capers are good but that's a lot of salt. How many capers can you tolerate?

William:

You don't need to actually eat all the same things and there's a ton of other foods with all these molecules. I think, one of the things, I guess, is I started out by saying supplementation to really shore up your immunity. Then actually having a diverse diet of things that you love that actually also help ramp up the super soldiers that actually are at the chokepoints that you can intercept the virus. By the way, you also want to clear the buyer side of the body, which is also an important thing that you want to be able to do.

Dave:

How do I do that?

William:

There's a bunch of things that you can actually do because natural killer cells can actually assist with that. It turns out that some of the natural killer cell substances, I will give you an odd one that is pretty cool most people don't know about this is oysters. Oysters actually contain a polypeptide polysaccharide protein and polysaccharide. It's not like going oysters on a half shell you just chuck an oysters and suck it down. This has been studied in Asia where you almost never go ... when you're in Asia, you very rarely see people in these fancy platters of oysters. Most of the time, they're cooking the oysters or if they're

not grade A oysters that are suitable for chucking and opening up, they cook them down and they cook them in the foods, they may come in oyster sauce.

What researchers done Asia, they've looked at these super-concentrated, boiled down, caramelized oysters, and they found that actually out of them comes peptides and polysaccharides that naturally exist within the oyster, and these actually enlarge the immune organs when you feed them to animals. They naturally get bigger thymus, they get a bigger spleen, they get their lymph system actually expands.

Dave:

That explains everything. Sorry, medical jokes, I couldn't help it.

William:

The expansion. What I always say is that this is one case where you can be sure that bigger is better because they actually studied it for cancer, but this is ... oyster extracts are one way to actually expand your immune system, your anti-cancer immunity.

Dave:

Oyster extracts are interesting. There is a whole market in China for very specific types of oyster extracts for erectile dysfunction. All right. You are now taking your quercetin, your vitamin D, vitamin C, eating quercetin-rich foods, eating oysters and eating broccoli or broccoli sprouts, and you're feeling like you've got this handled.

William:

I'd add some blueberries.

Dave:

Yeah, one of my favorites.

William:

Blueberry powder or fresh blueberries or frozen blueberries have been studied. What I think is really cool is that they've been studying young healthy people, because that's really where the action is at. Most medical research is aimed at studying throwing stuff, chemicals at sick people. What I think we really need to be able to do in the 21st century is we really step up into the present day and going to the future is really start studying the stuff throwing healthy stuff at healthy people to really see what we can actually do to enhance natural functions. Blueberry powder's been studied and we know that actually you enhance your immunity just by having a handful of blueberries pretty much every day.

We also know that when you drink blueberry like a blueberry smoothie before going into athletic activity, when you're working out you're actually building your immunity. You can actually cause a quick peak of your immunity and when you stop and you're recovering the immunity that you're having during workout plummets back down base and pretty quickly. But if you have blueberries before you work out, you get a tail of your immunity like it goes up with exercise, this is food plus exercise, makes total sense. Your immunity jacks up and then with blueberries, it stays up for a few days. You get a longer tail on the immunity from your exercise and your blueberries.

Dave:

I use several different kinds of blueberry powder and extracts in the formula that I made for Bulletproof called Polyphenomenal. I am a huge fan of those things, but I do worry a little bit about the sugar. Eating a lot of blueberries, I've noticed I'm wearing my continuous glucose monitor, you can see in effect from a couple of handfuls of blueberries, do you worry too much about that or it's worth it?

William:

Here's the thing. Added sugar has got no added value. Sugars that come in with fruits, they have their downsides, but you're actually getting this other stuff that come along with that as well. The scenario you gave me is that I want to try to fight the COVID, I would say from the research that I know, the good stuff in the blueberries outweighs some of the risk of the fructose that's actually in it. By the way, if you're going to actually eat, here's a great example for vitamin C. If you want to get vitamin C, you can get from a lot of different sources. Tomatoes got a ton of vitamin C, orange has a lot of vitamin C, orange got a lot more sugar in it. But a guava, for example, actually has a ton more vitamin C like nine times more vitamin C, but such got a lot less sugar than an orange. You have to balance the scale of which, what are you looking for, what else can it be found in, and how do you actually minimize the stuff you don't want.

Dave:

You're bringing up a really important point, which is one that you make in Eat to Beat Disease, your big book where you cover this thing. I struggle with this, people go, "Oh, you should eat bananas because they're power-packed with potassium," and you're like, "Actually, there's a lot of foods that have more potassium," but it's the same thing, you can say, "You should eat this bowl of cyanide because it's power-packed with potassium." They never look at the downside of anything. I'm not saying bananas are cyanide, I'm just saying that you look at the sum of the parts of a food and you say what's it going to do, but the idea that, "Oh, you should eat whole wheat because it has fiber." Yeah, but there's a lot of bad stuff in that lining that has a fiber and you can get fiber from green beans. I feel like that's almost missing from health literature when we dumb it down, so what you said there was really nuanced, like what else is in there. What are some other top vitamin C things that you would recommend that people eat?

William:

I think guava is one of the most highly-packed.

Dave:

Do you eat the seeds?

William:

I do. I do. I think cherry tomatoes are another way of actually getting a lot of punch like bang for the buck, because they tend to have lycopene for the small mass that they're in. You can get as much lycopene, for example, which is not vitamin C but it's another passenger in a tomato that's actually good for your prostate, for example.

Dave:

I take a ton of that stuff in pills because tomatoes are gross. By the way, not everyone agrees with that, it's probably like a lectin thing, either you like tomatoes or you don't.

William:

Also look. This is the thing that I wrote about Eat to Beat Disease. There are so many foods that have so many elements that are good for you, exactly as you are just saying. You get to pick your weapon in terms of what foods you're actually putting in your body. The weapons, most foods are actually double-edged swords. They've got some bad stuff, they got some good stuff, you have to navigate knowledgeably, minimize the things you don't want, maximize the thing you do want, mix it up so you're not just like going after one thing pounding it down your system. That's not how nature designed us, otherwise it would be like a fruit bat that only eats one kind of fruit. We're not that way.

Dave:

Like me as a kid, just pop tarts, nothing else.

William:

You're right.

Dave:

It's a fascinating way of thinking about, "Okay, during a pandemic, what would you do that's different?" The idea, you might not be able to get guava but you can certainly do a supplement if you have to. You could probably get some tomatoes, but you do your best, but perfection is not required, which I think is a really important thing.

William:

Dietary fiber for your microbiome is also really important because pretty much there's an air traffic control system, your gut bacteria in our intestines that really helps to air traffic control your immune system. Seventy percent of our immune system is actually in our gut not elsewhere. When I went to medical school, that's not what was taught. Now we know that pretty much gut bacteria and immune systems are like old college roommates with a thin wall, which is your gut, bacteria just knock on that wall and the immune system would hear it and basically respond to it.

Dave:

Okay. I, in the early days of the pandemic, said, "All right, let's look at the cytokines, IL-6 is the cytokine that's happening. I know a lot about IL-6 because it gets elevated in me on toxic mold, the documentary on toxic mold, and it's been a big part of my losing a hundred pounds. Here's 40 things including blueberries and of course, green tea extract. In fact, everything but oysters we've talked about lowers IL-6. If you want to stop the cytokine storm, it seems like you could take all bunch of that stuff and you're much less likely to get the overwhelming inflammation. What's the connection between your arterial lining and the cytokine storm?

William:

All right. When we dove down into these tissues of people who had died of COVID-19, we specifically looked at the cytokines. The general belief, the one that was in the media and actually most medical community thinks is, is that the cytokine storm is your immune system pretty much emptying all its luggage onto the bed. We showed that the virus actually manipulates the cytokines in very specific ways.

Dave:

Yes.

William:

This virus actually turns up certain cytokines and turns down certain cytokines. It turns on the ones that helps it grow and it turns down the ones that actually are harmful for it. It's a diabolical thing. It's more of ... it's not so much like this wildfire, which is how people think about cytokine storms, big information of lung, can't stop it, runaway freight train kind of inflammation. Now, this is more like a Bond villain, hiding in a volcano with a diabolical plot to take over the world.

Dave:

It's very interesting when you get deep into what bacteria, and apparently some viruses do, they don't just randomly wantonly kill stuff, there's a reason they do it. Some of the bacterial things like Bartonella, which the lime co-infection and the [inaudible 00:49:36] itself, they're causing cytokine storms because when they can blow up a cell, they eat the guts of the cell to grow more of themselves. They're doing it strategically, not to give you love handles or to make you feel bad. It's hard to imagine that a virus, it would evolve in bats and all that stuff, that was going to just spend it's genetic cycles, it's not really alive to have ATP and all that, but why would it do that if there wasn't an evolutionary benefit over time.

William:

Exactly. We don't understand it fully yet but I will tell you, Dave. The classic cytokine storm is basically like a guy going into a town square with an explosive vest blowing up everything. That's not what's happening.

Dave:

You can trigger that chemically, but you get very different cytokines. In fact, you can trigger with hypoxia and you get different cytokines. But if it's a thing and since you're center measuring the specific ones, you can know it's a smoking gun, it's like a fingerprint almost. In fact, I bet ... yeah, you could tell, this is COVID, just on which cytokines were in what ratio.

William:

if I could show you the data it looks exactly like a fingerprint. When you map out all the worlds and arches of actually what's actually happening with the cytokine, it's clearly there's a pattern. By the way, we also compared this with people who died of H1N1 from the first SARS and it's completely different. There's some overlap, but it is completely different.

Dave:

That is fascinating. One more question for you before we end the interview. I have been an outspoken proponent of micro dose nicotine, not smoking, not tobacco but nicotine itself as we age because of the 30, 35 years of research showing that it reduces Alzheimer's disease and increases chemical PGC1 alpha the same way exercise does, and encourages angiogenesis. We're talking 1mg in your 40s, 2mgs a day, that's a 20mg. Just like one little spray, a half little tablet here, a little bit of gum here, as well as it makes you feel good and you can write books and stuff, like it's good for the brain.

Some studies are saying people who smoke don't get sick, but other studies say, "Oh, nicotine increases number based your receptors and the spike proteins are going to come and get you, so two

questions for you. One, nicotine not smoking good, bad for your arterial lining or during coronavirus? Is the answer the same both times? Is it different sometimes? Would you start nicotine? They're hoarding it in France right now.

William:

Such a sophisticated, sharp question you're asking. I'll try to boil down what I know about it. By the way, nobody knows whether it's the right thing to do for coronavirus, but I'll tell you one thing. We started off this interview talking about the lining of your blood vessels, the endothelial cells. It turns out that one of the receptors, the cellular receptors on endothelial cells is called the nicotinic acid receptor. Endothelial cells love nicotine. By the way, this developed before cigarettes were developed.

Let's remember that, is that we evolved. From the time we dragged our knuckles on the ground until the time we listed about, before any singers we're invented, nicotinic acid receptors on endothelial, they actually respond to them, and in fact if you actually tickle the nicotinic acid receptor as we do during development, growing up in the womb, developing as a kid, exercising our muscles, those receptors are being stimulated and they help endothelial cells become active. Now, things get more murky and convoluted when you start mixing smoking in it.

Dave:

No, no. Smoking is bad.

William:

Smoking is bad. You are not talking about smoking.

Dave:

Yeah.

William:

I think so many people confuse smoking and nicotine as going hand-in-hand, but it is possible to separate nicotine. In fact, there is one camp of angiogenesis researchers that were actually exactly looking at nicotine or nicotine analogues for stimulating endothelial receptors, those nicotinic acid receptors, in order to make the endothelium more healthy. It's a really, really interesting thing. It also stimulates different ... you'd think smoking itself causes vasoconstriction. Nicotinic acid actually helps to control the expression or nitric oxide, which is a vasodilator. It's not quite as simple as black-and-white, good guy, bad guy connected, cigarettes therefore must be bad.

I really think that as we think about these triggers and signals in our bodies, we need to recognize, if our body is designed to handle it, it's probably designed it in a way that's got its own rheostat, its own volume switch. It knows how to actually turn on and turn up and turn it down, pretty hard to flood the system to kill it, unless you use pharmaceuticals, which then is really easy to write a prescription to kill something, but natural compounds and supplements can generally help the body coax those systems along.

Dave:

The scary thing with nicotine is that when it's extracted from tobacco it is a pharmaceutical compound, and it's ... a little vial of the stuff will kill you if you were to drink it, it's pretty potent. I do know there are studies that show very high doses of oral or smoke nicotine, they cause negative effects on blood flow in

the penis as in erectile dysfunction and hair loss. There's a dose-dependent curve here, but it sounds like you're saying the answer is it's complex. It might be good, it might be bad, but it's a complex system we don't really know.

William:

Actually, I'll try to simplify even more. There is something called the bell-shaped curve or a little bit does nothing, a little bit more starts to show an activity, more is better, more is better, then you get the optimal amount, and then after that, whatever that peak is, then you start losing the goodness until you get sometimes the badness. Think about these natural compounds as really a volume switch. If it's too low, you can't hear, you bring it to just the right amount, that's how the body works, these receptors, these stimulators. Then if we turn around too much, this is why I think when you really take a look at leveraging and enhancing how your body wants to work, you want to upgrade your body, you always want to figure out where that optimal setpoint is, because more isn't always more, sometimes more gets you less.

That's, I think, one of the important adjustments of thinking. There's a scientific term for it, it's called hormesis, and that describes a U-shaped curve, very important. I think, frankly, most people trained in the pharmaceutical world just don't, that's not even part of the vocabulary. Most people don't understand U-shaped curve, and yet so fundamental, it's basic biology. A little bit's not enough, too much is bad, you want to find that Goldilocks zone. Where's the ... the porridge is just right as opposed too hot or too cold.

Dave:

You're at home, I feel I'm not great, you might have COVID, maybe you tested positive. Do you use 1mg of nicotine or do you not use 1mg of nicotine? schedule.

William:

I don't know because I hadn't really thought about it until you brought it up, but now I'm going to actually think about it.

Dave:

All right. There's some interesting stuff coming out of France at first, and then I think in China they also found that, and you think people who smoke generally are unhealthy, but if you're smoking and diabetic, you're seriously in trouble, but if you're smoking and not diabetic, you might be more likely to get it but less likely to go to the hospital and have any other effects from it, who knows why.

William:

I will tell you, smoking does damage the endothelial lining for lots of reasons besides the nicotine. Those people are more likely, going to be more likely to have that injury from COVID, because they've already got compromised endothelium. The one thing that I can tell you that, if you smoke in this COVID-19 era, now is a good time to quit.

Dave:

Absolutely, well-said. Dr. Li, thanks for coming in and talking in detail. I think we shared everything that's understandable. If you listen to this show and you're saying I'm not quite sure I got that, all the transcripts are there on the blog. There's post about all this stuff. I would encourage you to read Dr. Li’s

book which is called "Eat to Beat Disease". Don't be perfect, just do a few more things to be more resilient. Don't eat so much sugar, don't eat the really bad junkie fats and things. If you just did that, you probably move the needle in a meaningful way. If you get a little bit higher up the curve, you will be better. But the fear of not being perfect, fear that you might've not Lysoled the edge of your mask or something, the fear is more dangerous than that little bit of hand sanitizer you forgot to smear. By now, hopefully, you've probably already forgotten about this because you realize we have much bigger, more expensive societal issues to deal with. Thanks, Dr. Li.

William:

My pleasure, Dave. Good to see you.