THE MODEL HEALTH SHOW

EPISODE 622

The Truth About Stem Cells & The Future of Precision Medicine

With Guest Dr. Robert Hariri

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SHAWN STEVENSON: Welcome to The Model Health Show. This is fitness and nutrition expert Shawn Stevenson, and I'm so grateful for you tuning in with me today. I'm so excited about this episode. We're talking about really what's at the forefront of science, of longevity, of healing from injuries, of reversing autoimmune conditions, of being able to help our bodies to defend themselves against infectious diseases, the list goes on and on and on, and it's looking into the world of stem cells. And we have on somebody who is a pioneer in this space, one of the people who's really brought his discovery forth of pluripotent stem cells, which these are stem cells that can essentially become anything that the body needs versus a totipotent stem cell; if we're talking about the inception of an egg being fertilized, a totipotent stem cell, you can effectively take that and create a whole person out of a totipotent stem cell. But pluripotent stem cells can become anything the body needs essentially, while we have adult stem cells as well that are more specialized and this vast array, this spectrum of capabilities, we're really going to dive in.

He's going to deconstruct what stem cells are at their core and some of the remarkable innovations that are happening, and also just the stories because our special guest is also the co-author of Life Force with Tony Robbins, who's been on this show, which was such a wonderful experience and Tony's insights was really sparked by our special guest, and so to have him here is really, really special. Now, before we get to our special guest, of course, I'm always looking at, what can we do to stack conditions in our favor, even if we're talking about this conversation around stem cells?

As you know, our bodies have these endogenous stem cells that are utilized to heal, whether it's an infection, whether it's our skin, whether it is healing from an injury, we have this internal supply, but now we know that there are things that we can do nutritionally that can support our body in a healthy, robust production of stem cells and it's triggering something called stem cell genesis. In fact, there's a food that has been utilized for thousands of years that has now had a resurgence in science, thanks in large part to a lot of studies that are being done by researchers at NASA, literal rocket scientists, looking at the profound nutrition available in this food called spirulina.

And this is a study, this was published in PLOS One, the Public Library Of Science One, and the title of the study is Spirulina Promotes Stem Cell Genesis and Protects against Lipopolysaccharide-Induced Declines in Neural Stem Cell Proliferation. So the researchers have indicated, via animal models, that this particular food, again, been utilized for thousands of years, is one of the rare foods ever discovered that can stimulate the production of new stem

cells, stem cell genesis and also prevent, protect the body potentially against degradation of our cells.

That combination is something really, really special. But with spirulina, it's not one of those normalized foods in our culture today. Nobody's like, "Hey, can you pass me the spirulina?" We don't really have that in our normal lexicon, but when I say thousands of years, I'm talking about dating back to the Aztecs. And that's just on one side of the planet. Also on the other side, we've got countries far away, like civilizations in Africa, like the country Chad, where we see spirulina has been a staple food for centuries. And again, it's getting this resurgence, but it's not one of those foods that's readily accessible nor isn't anybody out here saying that spirulina is just delicious. But what if we could take spirulina and combine it with other super foods like chlorella? Spirulina is the most protein dense food ever discovered. If we're talking about gram for gram, it's 71% protein by weight, whereas chlorella is about 50% protein by weight.

So, it's right up there in that top five. And chlorella, this is a double-blind placebo-controlled study published in the journal Clinical and Experimental Hypertension, found that chlorella was able to normalize blood pressure of human test subjects with hypertension. Pretty cool stuff. And of course, these rare nutrients that are found in these super algaes like spirulina, like chlorella, like lutein and zeaxanthin; these are two carotenoids that are proven to protect our eyes and lower the risk of macular degeneration. Listen, I don't know if you're aware of this, but eye problems are on the rise and you can probably guess why, it's staring at our devices all the time. All right? So, what if we had nutritional insurance, real health insurance that can protect our bodies as we evolve, co-evolve, co-mingle with these new things that we're exposed to?

This is another reason to stack conditions in our favor. So, chlorella combined with spirulina, these are two of the highlighted ingredients in the Organifi Green Juice formula. Go to organifi.com/model. That's O-R-G-A-N-I-F-I.com/model. You get 20% off all of their incredible formulas. Again, huge fan of the Green Juice, cold temperature processed, all organic ingredients. So doing things the right way, in a formula that actually tastes good. It tastes refreshing and it invites in spirulina versus it just kind of being on the periphery of modern human culture. So, it's one of those things that's an easy on-ramp for folks to get this real powerful nutrition into their bodies. Go to organifi.com/model for 20% off. Now let's get to the Apple Podcasts review of the week.

ITUNES REVIEW: Another five-star review titled "This podcast is what we need right now" by Pharm KMJ. "I've been listening to Shawn for about a year, and every episode is packed with useful, insightful information delivered with such passion for humanity. I'm a pharmacist who wants to put herself out of business. I think the key to health is within reach of us and not at

the bottom of a pill bottle. The way Shawn translates complicated information for the average person is remarkable. I look forward to new episodes each week."

SHAWN STEVENSON: Wow, that is just remarkable. Thank you so much for sharing your voice and your experience. I appreciate that so very much. If you had to do so, please pop over to Apple Podcasts and leave a review for The Model Health Show. And on that note, let's get to our special guest and topic of the day.

Our guest today is Robert Harari, MD, PhD. Dr. Bob Harari is an accomplished surgeon, biomedical scientist, and also a very, very successful entrepreneur in the space of biomedicine and aerospace. He's the chairperson, founder, and CEO of Celularity Inc., one of the world's leading human cellular therapeutics companies, and Dr. Harari has pioneered the use of stem cells to treat a range of life-threatening human diseases and continues today to make transformative contributions in the fields of immuno-oncology and cell therapeutics, along with tissue engineering and functional regeneration.

In addition, he's also an adjunct professor of neurosurgery and a member of the board of overseers of the Weill Cornell Medical College. He completed his undergraduate training at Columbia University School of Engineering and Applied Sciences, and Columbia College, and he received his MD and PhD degrees from Cornell University. Now, this is just a smidgen of the experience that Dr. Bob Harari has. Truly, he's one of the most fascinating and intelligent and empowering people in the space today of health and wellness. Let's jump into this conversation with the one and only Dr. Bob Harari. We've got a living legend here in The Model Health Show Studio. Bob, so good to see you.

DR. ROBERT HARIRI: Shawn, thank you so much for having me, a big fan and excited to get a chance to speak with you.

SHAWN STEVENSON: Awesome, awesome. Well, I want to start by talking about stem cells. Alright, I didn't tell you this, but about 10 years ago, I did a presentation at my alma mater at University of Missouri St. Louis, talking about stem cells, talking about totipotent, pluripotent and all these things. Now, I'm sitting with the guy who really helped to bring this information out in a big way, so I'm really excited. Can you start by talking about what stem cells are and some of the roles they play in our bodies?

DR. BOB HARARI: Certainly. So, we recognized many, many, many years ago, studying embryology, which is the science of understanding how we go from a single cell into this complicated multi-trillion cell organism, it's all driven by a process of differentiation and specialization. So let me give you the kind of the background on that. A stem cell is the original cell that is created after fertilization of the egg by a sperm. That cell, in its totipotent form you

just mentioned, has the ability to go all the way through to producing a full human being or any species, a full organism in that species. That process of going from that single cell involves cellular division, where one cell makes two and then each one of those dividing steps gives rise to more stem cells and more copies of itself that are differentiated.

Differentiation should be thought of as the process of a cell going from a kind of a versatile form to a more specialized form. So, as you know, in your body, you've got brain cells, you've got heart cells, cells in your bone, etcetera, they all take on different roles. Those roles are governed and dictated by the genetic information in that cell that's being called upon. Now, we have lots and lots of genes in our cells. If you think about your DNA, your chromosomes as your biological software, that software is designed to run every program in your body, but it doesn't have to run every program in your body if it's a brain cell, it only has to run the program that produces all of the necessary chemicals to function as a brain cell, likewise any other organ system.

So, stem cells are the unique source material that give rise to all these specialized cell types. Now that's obviously really important in development from a fertilized egg to a human being, but it's increasingly important as we get older, because if you think about it, nature's repair kit actually is comprised of these stem cells. They take on residence in your different organs and tissues, and remain what we call quiescent, quiet. And then when they're called upon, they traffic to the site that requires them, like an injury, for example. And then they go through a process of maturation and specialization. So, a stem cell from your bone marrow that winds up in your liver after you have a liver injury will actually know where it is and will actually mature into a functioning liver cell.

And so, think of stem cells as your master boot disk. Okay? So, remember when you get your computer and you get that first copy of Microsoft Office or whatnot and you insert it in there, it will install all of the software for every aspect of that particular program, but in many cases, you only use part of it. Same thing with stem cells. If your stem cell is the master boot disk, when you reinstall that software, only the software that's necessary for the purpose you put it in there will actually be called upon.

SHAWN STEVENSON: That's so fascinating, the intelligence there. So, you mentioned the genetic information, but what about the environment? Doesn't the environment shape what a stem cell can be as well?

DR. BOB HARARI: You know, that's a really great question, and you obviously know a lot more biology than the average person. That's one of the things which is really, really kind of intriguing. It turns out that resident in every cell is that master program. As you live, some of these cells actually undergo changes, those changes which we now call epigenetic mean that

your environment is influencing the way your DNA is read. Okay? We think that there are ways to potentially control that. It does, in fact, have an association with changes that may be the reason behind the degenerative diseases and the illnesses we accumulate as we age.

And in fact, there are scientists out there, experts who are developing aging clocks based upon those epigenetic changes. But the way you have to really think about this is if your software gets corrupted, let's say that you go from the stem cell to a mature bone cell and during your lifetime, that bone cell is being changed by these epigenetic events, if you need that cell to repair your bone, in some cases, it winds up being eliminated and a new undifferentiated cell starts to become bone, and it has all of that intact, uncorrupted software. And so, at the end of the day, it's no different than if you put a program in your computer and it gets glitchy, the best way to do it is to remove the bad software and put a new copy of the software in. That's the way I look at what stem cells can do for us.

SHAWN STEVENSON: Wow, yeah, so you're speaking of this transition from exclusively endogenous production of stem cells, storage of stem cells, to exogenous, so being able to use stem cells as a treatment. So, your work has really been pioneering the use of placental stem cells. Can you talk a little bit about that? Because again, I really think that, and you know this as well, that the public's perception of this is a little bit skewed because of misnomers and mis-ideas but also, this has been valued for thousands of years. If you look back at ancient civilizations, they understood that there was something really remarkable about the placenta, but we just kind of made it a throwaway product and it's such a vital part of humanity.

DR. BOB HARARI: Shawn, you're so on target. So, here's the reality. When stem cells first emerged, they emerged around the area of bone marrow transplantation because scientists figured out, if you have a certain type of blood cancer, that blood cancer originates in your bone marrow, your bone marrow is filled with stem cells that give rise to white blood cells, red blood cells, platelets. When that software gets corrupted and the cells aren't doing their job, oncologists, cancer doctors and hematologists figured out you could eradicate the bad bone marrow. You could literally kill it off, it's called the process of ablation and then you could inject back stem cells that were a match between the donor of those stem cells and the recipient, and they would take up residence, they would engraft in the bone marrow, and now the bone marrow that's being produced is without that original disease.

That's how it all started. So, if you think about it, you said, you said the keywords here. We have our own endogenous population of stem cells that are educable and that can be driven to do things based upon lots of different signals, but if they're malfunctioning for some reason, if that software is corrupted, why not just take them out and replace them? Well, it was the challenge of replacing that was really the genesis of many companies today in the field of

cellular medicine. But for replacement approaches to work, you need to have a one-size-fits-all cell.

What I mean by that, we can't do this to any scale with any efficiency if we're limited to doing this when you have to match a donor to a recipient. So, let's go back in history to have... This all originated with what we're doing with placenta. So, I was a relatively young surgeon at Cornell, New York Hospital-Cornell Medical Center in New York, and my specialty and the area I focused on was head and spinal cord injury. I became intrigued when stem cells first started being published about, and I said, well, could this tool be something that could be used to repair the brain or spinal cord after these injuries?

The challenge was, there were no stem cell products out there, the entire stem cell world revolved around tiny little laboratories in hospitals and medical centers that were doing the work sort of in a bespoke model, like a cottage industry, if you will. And that, although it showed we could deliver these products and they work in patients, it had no scaling potential, it clearly wasn't something to use for everybody. So, I give my oldest daughter credit for this. When she was in utero, and I was... At that time, I was doing my work, my rotation through the surgical ICU, I ran down to the labor and delivery suite to see the first ultrasound, first trimester ultrasound of my first child, and it dawned on me for the first time that although she was a peanut-sized embryo, the placenta was already a fairly large organ.

Now in medical school, we were taught that the placenta was a vascular interface between the mother and the developing fetus. If that was the case... I'm an engineer by undergraduate training. If that was the case, they should grow at the same rate. The fact that the placenta grew first suggested to me, it had a role in governing the embryogenesis, the development of the embryo and ultimately the fetus. And if that was the case, why? So had a little bit of background in stem cells, a little bit of background in cell biology, background in surgery, I said, well, maybe the placenta actually is a life support system or a supply system for this rapidly developing new human being?

So, I started literally getting placentas from the labor and delivery floor, taking them to the laboratory, and taking them apart, and almost immediately, I was convinced that the placenta is actually a bioreactor. And what I mean by that is it's a factory, it is where stem cells expand and propagate. It's where they actually go through some of the steps of maturation and specialization called differentiation and then they traffic into the developing fetus and become part of that emerging human being.

Now, interestingly, my colleague, Peter Diamandis, who, with Tony Robbins and I, we put this book Life Force together, Peter said something which I thought was very, very relevant. He said, "You know, the placenta could be thought of as nature's 3D printer. It 3D prints the human

being," and arguably, it's a pretty good, good description. So, knowing that stem cells had the potential to be a clinical tool we could use to enhance and improve the health of individuals but very concerned that if we didn't figure out a way to productize them, to produce them to scale, quality, reliability, and clearly, with economics that are consistent with the healthcare system, stem cells would go the way of organ transplantation.

We know it works, but it's only used in a tiny fraction of the opportunities. So, I had the epiphany of watching my daughter's first in utero ultrasound, realized that the placenta was important, found that there were stem cells propagating in the placenta, and I said, well, wait a second, how could this get even better? Well, the way it gets better is this: The placenta is nature's professional universal donor tissue. What I mean by that is that every placenta can fit in any recipient. Nature, by design, figured out a way that the placenta acts like it is completely capable of being tolerated by any recipient.

And if you think about it, right, mom contributes 50% of the DNA to the developing fetus. So, she's an imperfect match, she carries the fetus and placenta for nine months, there's no immunologic conflict. Consider this, in surrogate pregnancy, the moms not even related to the fetus or placenta, so there's no match, she carries it for nine months, no immunologic conflict. That was the aha moment where I said, well, wait a second, placentas are waste materials, we're throwing them away, we're incinerating them. What if we were to find that we could collect these, isolate the cells that are one-size-fits-all and create that product, if you will, that could fit the emerging field of regenerative medicine? And that's what has built our company today, Celularity, we're the world's leader in placental-derived cells and other materials for therapeutic purposes, but we're basically like a waste management company, we're taking stuff out of the biohazard waste bag and turning into useful clinical products.

SHAWN STEVENSON: Yeah, that is... It's beautiful and sad at the same time because as I mentioned, this is dating back thousands of years. There was an ingrained cultural value of the placenta. Our ancestors knew there was something special about it. And today it's kind of being re-energized. Now let's talk about some of the specific things that this can do in the body if you could actually share this story. Tony talked about it in the book. And so, how did you guys get connected and how can we utilize stem cells? Because I want to talk about healing injuries and all the way to immunotherapies. So, let's talk about injuries first, let's talk about Tony's injury.

DR. BOB HARARI: Absolutely, I got to add one anecdote, you mentioned... 'Cause you love history as I love history, you mentioned the fact that in ancient literature, ancient recordings, we see that the placenta was valued. I'll tell you a funny little story. When I first discovered placental stem cells, I remember looking at everything I could find about this and I found that the Nazca Indians, which is this prehistoric tribe in South America, associated with alien

visitation, etcetera, etcetera, in their stone carvings, they actually document the use of the placenta in order to enable a transplant of an organ. That blew me away, and fortunately, the patent office didn't consider that prior art.

SHAWN STEVENSON: Right.

DR. BOB HARARI: Or I would have never gotten the intellectual property coverage but getting to your question. So, I was very fortunate to meet Tony at a time when Tony was really working through some of his own personal challenges. You so beautifully described what you went through with your back... Your degenerative disc disease and your back problems, and how it really, it limited your life so much. And you had the courage and the insight to find a way around that.

Now, Tony is, first of all, one of the most remarkable human beings on the planet, a gift to all of us. He works and has the physical performance of an Olympic athlete, and if you ever go to one of his events and you see the 6'8", 270-pound professional athlete, moving and jumping and running and so on, you realize that he is putting tremendous stress on his body. The consequence of that is that he had certain degenerated joint systems: Shoulders, knees, spine, and he was really being counseled that his only alternative was to go and have joint replacement surgery.

And Tony knows everybody, and everybody loves Tony. He got a lot of really, really, what I would say was current advice. But there were not a lot of people saying that number one, joint replacement surgery is irreversible, we are at a state of development of that technology, which is good, but it's not necessarily the ideal form of that technology, but if you have an opportunity to delay that replacement surgery, buy yourself time or find an alternative, why not give that a shot? So, the problem is that there aren't approved technologies for using regenerative strategies like stem cells to treat these disorders and so, there are clinics in certain jurisdictions that allow it, that are deploying them. And so, Tony made the decision, with a great deal of due diligence, he made the decision to go to a clinic of a long-standing colleague of mine and started his stem cell treatment with stem cells derived from newborn tissue, that tissue was the umbilical cord itself.

And I remember the experience, Tony's first treatment was relatively benign, uneventful, no bad effects and no profound benefits, but as he was counseled, I said, "Look, Tony, just like nature repairs you, it doesn't prepare you in one shot, it repairs you over time in an iterative process." And so, Tony made the proper choice of continuing his treatment regimens and he slowly but profoundly saw benefits and improvement, so much so that he returned to his very high level of activity, even beyond. And when we studied him, we saw that as a consequence of these treatments, not only did his pain resolve and not only did his function improve, but it

actually led him to a new level of performance. And so, as a poster child for regenerative therapy, you can't get anything bigger and better than that.

SHAWN STEVENSON: So remarkable. Such a great story. So that's as far as injuries is concerned and that's just one instance of countless stories like this. Let's talk about... I love this when I was looking at one of your talks. You call this nature's immunomodulator. Let's talk about that, because the immune system is obviously top of mind for a lot of people today.

DR. BOB HARARI: It's interesting, but people don't recognize that you have another intelligence system in your body. It is the immune system. And I call it an intelligence system because it is constantly collecting data about your biology and creating responses to that, whether it's inflammation, inflammatory responses, responses to infectious diseases or whatnot. The immune system, though, is also a source of problems for us. Let's face it, what are the annual sales of anti-inflammatories, non-steroidals like Advil, Motrin, aspirin, etcetera? Astronomical. The range of prescribed drugs that control inflammation are enormous. So, inflammation, which is what I would call is the Blitzkrieg of the immune system, is designed to respond to injury and disease with, in many cases, a very aggressive, in some cases, destructive series of events that clean out what caused the problem.

So, if you tear a muscle, the trafficking and infusion of cells into that injury are designed to clean up the dead cells and the debris, and then set up the environment for repair. But nature and in evolution has figured out that in some cases, you can wait for that repair to occur, but in some cases, you cannot. So, one of the things inflammations does is create pain. And you know what pain does? It stops you from using the part that's not working or is damaged. Right? So, it's a process called splinting.

So, if I tear my bicep muscle, I'm going to hold that extremity and that muscle immobile for a long period of time. That allows the next process which is the repair process to take place. But there's a battle, there's a battle between repair, functional repair, and scarring, okay? Scarring is intended to prevent you from reinjuring the problem. So, if you think about it, a scar is designed to tie back the damaged muscle, but it doesn't give you the same quality of tissue you had before. Now, regenerative strategies which use stem cells and other types of products, are designed to accelerate, and enhance your body's natural inflammatory and repair process to limit inflammation and to stimulate true regeneration. Now, we know that at different times in our lives, we're better at healing than we are as we get older. That is in large part due, we believe, to a profound change in the population of stem cells available to effectuate those repairs.

So, what's the obvious thing? The obvious thing is, well, if stem cells are good and give you the right kind of repair process, why not just administer them therapeutically in order to augment a person's own response? So that was very much part of the early strategy in regenerative medicine, to use these tools for those purposes. Where we are today is we recognize you can actually get very granular, and you can tune the effects. And so, you said immunomodulation. So, immunomodulation is sort of like having a throttle on your immune system, okay? Now, the first inclination after injury is go full throttle, but that might not always be the best thing. So, if you can throttle back inflammation, okay, get the benefits of inflammation without stimulating so much of the destructive parts of the inflammatory process, you might set the stage for a much better long-term repair. And so that's one of the, I think, most exciting missions of cellular medicine, is to be able to do that.

SHAWN STEVENSON: Yeah, yeah, powerful, so powerful. Because even with his current condition that's still on everybody's mind, there is a cytokine storm and overreaction of the immune system. We want an appropriate reaction. And if you think about the population that was hit the hardest, if we're talking about age, it was folks who were elderly and the outer expression of that is immunosenescence, but what's happening from your research is that we have an issue with stem cells, that's the core, versus the outer thing is the immune system isn't able to perform like it used to. And so, this is my question, could this have been and potentially be an effective treatment for things like infectious diseases?

DR. BOB HARARI: So, I can't tell you how much I want to see our two-year experience with COVID as a stimulus for introducing new approaches to treating these diseases. Now, let's look at the bottom line here. Humanity has faced infectious threats far worse than COVID throughout our history. And you have to think of these events as selection forces. What they're doing is, just like you said, they're selecting out the vulnerable part of the population, and it's inevitable that that process leads to the next generation having certain greater resistance to those diseases. But the bottom line here is that we've known a lot about the type of virus that causes COVID-19, it's called the coronavirus, and there have been outbreaks of coronavirus in the past that taught us what we're up against. So let me put it in this kind of context.

And I often said, COVID-19, as terrible as it is for families who are facing it, it's a dress rehearsal for a really bad pandemic, okay? A pandemic with an agent that has a much higher lethality, and it affects everybody, not just the elderly and the ill, but affects everybody equally. But when you actually do the work and you go back and you look at the previous Coronavirus outbreaks, there was an original SARS outbreak. SARS stands for... This is a form of adult Respiratory Distress Syndrome. What we found with the original SARS outbreak, which is a sister virus to COVID-19, we found that the people who did poorly, and this was data published by Chinese scientists after the eruption, when you look at people who did poorly, they had one

common denominator, the common denominator was their immune systems weren't functioning properly. You said immunosenescence, you are right on target.

Our immune system is just as subject to the accumulated damage that occurs from everything from being exposed to UV radiation, to chemicals, etcetera, etcetera. That immunosenescence means that the two different parts of your immune system don't function optimally. So let me divide it up for you. We have an innate immune system, this is the system that's kind of pre-programmed to provide defense against a variety of threats, and that pre-program system has cells like natural killer cells and other immune cells that are ready immediately to respond to threats. Now interestingly, another observation that I think is one of the hallmarks of what we've done at our enterprise, is we recognized that although one in every thousand pregnant women has some form of cancer during pregnancy, the incidence of malignant transfer from a mother to a developing fetus is essentially non-existent.

It doesn't happen to any appreciable level. In fact, it's... There are limited, what I would call case reports of it, but there's something that is protecting the developing fetus from that malignant transfer. In addition, babies, developing babies, a fetus, is in a relatively sterile environment in the womb, so you know that the amniotic sac encases the developing fetus and the fetus is bathed in amniotic fluid, and that is all relatively sterile, but at the instance of birth, this human being is exposed to the ambient environment, all of the pathogens that are out there: Viruses, fungal materials, bacteria, yet postnatal infectious disease mortality is essentially zero. So, we were intrigued, what is in this defense system? And it was our discovery, probably a decade ago, that the placenta has a unique cell called a natural killer cell and that cell is pre-programmed to go after certain signals of diseased or threatening material.

These signals are called stress antigens, and interestingly enough, virally infected cells express stress antigens, cancer cells express stress antigens and interestingly enough, senescent cells, old dying cells, express these stress antigens. So, your natural killer cell system is there to clean all this up. So, we theorized that, well, if the Chinese study in original SARS said that patients who do poorly have a defective immune system and we have access to immune cells that could supplement or augment this system, could that be a therapeutic strategy? And in fact, we actually tested that.

So, we do know that natural killer cells are very effective approach to treating infectious diseases. And we are working in that direction. We actually treated some COVID patients in our clinical trial that the FDA permitted using placental natural killer cells in the disease. And it's our objective to get better and better at immunotherapy to get beyond infectious diseases, but also use it to do therapies for cancer, therapies for acquired abnormalities. And the one that I like... 'Cause I'm... 64 is my next birthday, I am destined to find a way to use whatever I can as a senolytic approach to clean out my old senescent cells in an effort to maintain health.

SHAWN STEVENSON: Yeah. Oh man, this is so fascinating, so fascinating. We've got a quick break coming up, we'll be right back.

If you want a sure-fire way to damage your microbiome, then look no further than that dirty S word, sugar. Data published in Advances in Nutrition uncovered that excess sugar creates a clear pro-inflammatory environment in our gut. There's even recent data published by scientists at the University of Texas Southwestern Medical Center showing that mice who were fed diets high in sugar developed worst colitis, this pro-inflammatory, very, very detrimental inflammatory bowel disease. When the researchers examined their large intestine, they found that more of the bacteria that can damage the gut's protective mucus layer was driven by the increase in sugar consumption.

Another study cited in Science Translational Medicine describes how sugar is likely making negative alterations to our gut bacteria. Again, having healthy robust amounts of probiotic friendly flora controlling our system and keeping in check the opportunistic pathogenic bacteria is key for all manner of health and wellness, from helping to reduce our risk of diabetes and obesity, to reducing our risk of autoimmune conditions. As it stands right now, the average American consumes about 100 pounds of sugar annually, mostly in the form of added sugars.

But what can we do to pivot from this? In fact. There's a sweetener that not only doesn't damage our gut health, it actually improves it. A recent study published in Food Quality and Safety found that in addition to having natural antibacterial effects against pathogenic bacteria, raw honey is able to improve overall gut microbial balance. How sweet it is when we're talking about the benefits of honey, long renowned for its anti-microbial impact? We're talking about the external applications, but it has these internal applications as well.

But the key here is making sure that your honey is not coming along with pesticides and heavy metals, and all these other things that are common in bee products today. We want to make sure that we're dedicated to sustainable beekeeping as well. And this is why my honey that I utilize, it's in my cabinet right now, is B.Powered Superfood Honey from Beekeeper's Naturals. Go to beekeepersnaturals.com/model, you get 25% off taken off automatically at checkout. That's B-E-E-K-E-E-P-E-R-Snaturals.com/model for 25% off. They do third party testing for over 70-plus pesticide residues or heavy metals and negative bacteria, like E. Coli and salmonella to make sure that you're not getting any nefarious things along with your healing delicious Superfood Honey. Again, go to beekeepersnaturals.com/model for 25% off. Now, back to the show.

Alright, so we've got injuries. We've got infectious diseases. Right now, in the United States, some of the latest numbers, we've got some in the ballpark of 25 million at minimum, to upwards of maybe 50 million folks have an autoimmune condition currently, and the number just continues to grow. Something is seriously off here. And we could talk about all the conditions that can foster something like that, of course, but there are a lot of people who are suffering. Particularly when I was doing clinical work, Crohn's disease was really, really tough. Just the quality of life for folks, it's just a big stressor, and there is a viable solution here. It's not even just on the horizon, it's here now. So, can you talk about autoimmune conditions and in particular, let's talk a little bit about Crohn's.

DR. BOB HARARI: I'm so glad that you're bringing this up because like you, I also fear that there's something underlying the increase in the incidence of these autoimmune diseases. Now, for the audience, an autoimmune disease is one where, for some reason, your immune system, which may previously not have identified your own tissues as foreign, suddenly identify them as foreign. There's a lot of theories behind that, right. Some of the theories are that the underlying genetics programming changes and now the cells are expressing molecules that they didn't previously. Another is that during our lifetime, we're exposed to different viruses, bacteria, etcetera, and our immune system, even without us knowing, is making antibodies, and responding immunologically to those novel molecules that are found under threat.

Sometimes those molecules are close enough molecularly to a molecule on our own body that our immune system suddenly says, "Wait a second, I never saw that here before. I got to clean that out." And so, in Crohn's disease, for example, the cells that make up the lining of the gut, the intestinal lining, become targeted by the immune system. And that targeting creates very aggressive destructive inflammatory changes to clean out these cells that are expressing that auto-reactive antigen or molecule.

And in the process of cleaning, it out, it creates highly destructive damage to the intestinal lining. Now, you said it right, man, it is a horrible disease to have to face because you become a slave to your pain and need for access to restrooms and privacy. And in knowing many patients who suffer from this disease, I can tell you that it is something you wouldn't want to wish on your worst enemy. The fact is that we have made some interesting observations along the way. Again, sometimes you got to keep your eyes open, that autoimmune diseases like Crohn's, like multiple sclerosis, in some cases, certain forms of arthritis, these autoimmune diseases, regardless of their increasing prevalence, uniquely change in women who get pregnant.

So, let's talk about Crohn for a second. If a woman has Crohn's disease and she's trying to manage it with the variety of prescribed medicines, if she becomes pregnant, she'll often begin to experience pretty profound improvements. In fact, some that even take her to a full

remission from the disease. That has been best seen and described in multiple sclerosis. A wonderful New England Journal article about 10 years ago followed 300 women with MS, multiple sclerosis, who, during their pregnancy experienced really clinically profound improvements and remissions, even so much so that besides their symptoms getting better, even the lesions in their brains went away. So that said, "Wait a second, what is it about the placental environment during pregnancy that might be contributing to these remissions?" So, we, again, looked very carefully and we theorized that maybe the presence of placental cells, even just straight placental stem cells, might have enough immune modulating activity to suppress the autoimmune disease and improve the symptoms.

And we actually ran a number of clinical studies, and I can tell you that in the last study, which was a placebo-controlled randomized double-blinded phase two study, we saw very compelling evidence of activity. In fact, at a year after treatment, patients had improvements that were 43% better than the placebo control, just with simple intravenous infusions of these placental cells. Now, it's our intent to continue to pursue that and drive it all the way through to regulatory approval, but what it says to me is that we have tools that are at our disposal today that could profoundly change the way we manage these disorders without having to introduce small molecules or biologic drugs.

And again, I'm very biased, but cellular therapy is intrinsically safe. And you mentioned probably in ancient history, cell therapy was part of the tribal doctor's regimen, but we know today that cell therapy, in virtually any of its forms, is a very, very good safety profile. That being said, diseases like Crohn's, which is so horrible, why not give people something that can tamp down, control their immune system and potentially even stimulate the regenerative process after the disease?

SHAWN STEVENSON: The safety profile is what really excites me because EGS, Center for Ethics at Harvard, recently stated that about three million Americans are hospitalized from properly prescribed medication every year, and about 120,000 Americans die each year. And that's also combining some folks in Europe as well. But if we talk about the safety profile of conventional synthetic drugs, it's just not even remotely in the same ballpark. And I'm a huge proponent of prevention, of course, but when we get into a situation where we do need some help and we're in pain, or we're dealing with an issue, having access to something like this is so powerful. And it exists right now. So now we got to get into, why can't folks get access to this readily? What's going on, Bob? Talk about it.

DR. BOB HARARI: These are such huge questions that we could talk about for hours and hours and hours. I agree with you. Any port in a storm, the old adage, means that when things are bad, you can't limit yourself to the options you have available to address the problem. And the fact is, what you said before is profoundly true, a drug getting approved for use by the Food

and Drug Administration means that it met certain standards. It doesn't mean that it met certain standards across the board in anyone with that diagnosis. And arguably, depending upon whose statistics you look at, anywhere from, I would say, 50 to 75% of cancer patients with a specific diagnosis don't necessarily respond to the approved cancer drug for that indication. And in fact, the responses may be so variable that you can't even justify the application of the drug. And let's face it, I'm sure you know in your family and your friends, some people respond to one type of anti-inflammatory, they don't respond to another.

It's this unique sort of personalization of biology that doesn't necessarily get addressed with traditional therapeutics like pharmaceuticals and biologic agents. Not to say at all that they're not incredibly important in medicine, but when you prescribe drugs on the basis of the expected returns you get from the clinical trial experience, you cannot ignore when your patient doesn't respond or has a response outside of what's expected. You need to have other tools to bring into the equation that may in fact, give you better effects, although they might not even necessarily have been perfectly designed for that application.

When all is said and done, I think we're going to be seeing, in the next several years, some greater degrees of regulatory comfort with novel therapies like cellular medicine. The agency, the FDA is getting great expertise around this area. The person who runs the division of the FDA that developed cellular medicine is a brilliant, brilliant doctor, Dr. Peter Marks. And they recognized that the demand for these innovations is there, and they want to find ways to make it happen. Now, some countries are looking at things like what they call provisional approvals, where they say, "Okay, show me that the product has safety," and you can do that in normal volunteers, or relatively controlled small exposure, and then put it into practice while we're vigilant about collecting all the data. I actually like that approach. I actually like that. I think that that may give the power of making decisions back to the doctors.

Today, doctors are very handcuffed. You have to follow the accepted customary practical approaches to things in order to protect yourself as a practitioner, as a doctor. But some of the best outcomes in patients are when the experts treating them have enough experience that they can customize the treatment regimen and, in some cases, bring in very unconventional therapies into the mix. Not every drug that's approved out there for one disease is ineffective in other diseases. It's just a matter of using a deep level of knowledge to apply these tools in a strategy that an expert is comfortable with.

SHAWN STEVENSON: Yeah. That's what medicine really should be at its core, you know?

DR. BOB HARARI: Yeah.

SHAWN STEVENSON: Versus... You just mentioned, it's safe from a legal perspective, standard of care, and... But also at the same time, if you look at the results in our society, it's been largely ineffective, we just keep getting sicker and sicker.

DR. BOB HARARI: Right.

SHAWN STEVENSON: And I'm going to say the thing, Bob, I really feel that when we're talking about a treatment that can really put things into remission with such a high safety profile versus we have a system that really creates returning customers for drugs, I think that it's just not good business sense and I think that that's one of the reasons that this is getting a little bit held up. Maybe that's just me, but again, this information has been around for quite some time, and just the work that you're doing, just... I know that a lot of folks are going to feel so compelled, they're dealing with degenerative disc disease or autoimmune conditions, and they want to get a solution. And so, for Tony, hearing the story that he had to leave the country in order to get this treatment that changed his life, and really was the catalyst for writing this book. And I loved the way that Tony puts information together and also working with folks like yourself in a way that is consolidated, easy to understand. Also, he always is threading in this empowerment along the way.

DR. BOB HARARI: That's such a good point because look, at the end of the day, we live in a system that is very, very designed to protect us and to provide an acceptable level of safety. And agencies like the Food and Drug Administration have a very, very hard job in front of them. And part of the mandates of the FDA are, in fact, to ensure the safety of the public. That being said, we're in an era where the types of therapy tools we have are complicated. And the interactions of those therapy tools with the patient, as well as with the other drugs and other approaches that are being used, is complicated. And so, when I say that cellular medicine in our experience to date has an intrinsic level of safety, I base that upon decades and decades of use of stem cells in bone marrow transplantation, cord blood transplants, transfusion medicine.

We know that you can administer cells with a fairly high degree of comfort, as long as the cells meet a very high standard of quality and so on and so forth. Getting to the point that you now have as compelling a data set, around efficacy, effectiveness, that's another challenge and it's not always the limitations imposed by the scientific or regular community, sometimes it's just the nature of trying to bring in a brand-new complex tool into a profession which kind of runs on a prescribed approach all the time, and you mentioned it. When people go to their doctor, their doctor is going to want to apply the standard of care, because statistics say that if you have a broad population of people, if you use the standard, you're going to have the greatest probability of affecting the most people. However, we're at the turn now, I believe, where we

need to personalize medicine and it's actually one of the tenets of precision medicine, is to personalize it.

We're using tools like genomics, where we read your software and we use that software to detect what might work or what won't work on you. And then the other factor, which is incredibly important is that we want to be proactive rather than reactive. And you're a phenomenal champion because you did what everyone should do, which is become the master of your own health destiny, right? And Tony talks about it, where... Consider that today, with the information at our fingertips, we can all become extremely knowledgeable about our health, our biology. We can identify things which put us at risk, we can intervene and prevent those things from occurring, and we can... Most importantly, we can take some of the steps out that occur after we wind up having symptoms, because we're preventing those symptoms from occurring.

Shawn, my... I often joke that everything I do is so I can afford my jet fuel, you know? My life started out in aviation and it's a huge passion of mine, but aviation taught us something, right? Talk about two industries, aviation, and healthcare. Aviation has got the FAA, healthcare has got the FDA, right? What aviation did, which I really, really admire, is that they looked at every critical failure event and they did a root cause analysis so that those failure events wouldn't keep happening. If you go back in the history of aviation, every time there was an airplane accident, a crash or whatnot, the investigative team looked for the root cause, right? And by identifying the root cause, you can actually intervene, and you can say, "Wait a second, guys. I'll give you an example. Do you remember the Alaska Air crash in the Pacific, where the airplane... Something called the jackscrew, which controls the stabilizer in the tail broke, and the airplane lost its control, flipped over and unfortunately crashed in the ocean?"

When they identified the problem, every airplane was put on the ground and that jackscrew was inspected, and they adopted methods to inspect and replace the jackscrew well before its useful life was over. So, the process of intervening proactively and being vigilant, but also what I love is I love the maintenance programs which replaced mission-critical components before they fail, why don't we do that in healthcare? Right?

SHAWN STEVENSON: Yes. Yes.

DR. BOB HARARI: So, let's look for a second at what we're talking about, man. I mean, stem cells in our body are a mission-critical component. When they start going bad, and you can measure that, is there an approach where you simply replace them with nascent beautiful cells that don't have any of the problems and can that prevent you from developing some of the diseases and aberrancies we have? I think that approach, I'd love to see that deployed in healthcare.

SHAWN STEVENSON: Yeah. You just said it, well, you just mentioned the keyword here, the key phrase, root cause. And this is, for me, it just seems very logical to do versus we have a system right now currently that's obsessed with treatment, management of symptoms. And it just gets me thinking about, when I was 20 years old and getting that first prescription, when the physician told me that, "This is incurable, we're going to get you some medication to help you manage the pain." So, there was an option there. Celebrex was out and also Vioxx was on the market. I could have easily been put on Vioxx. They put me on Celebrex. So, this is to treat the symptom of pain. And at no point did we talk about or even consider the root cause of this degeneration happening in a child.

I'm 20 years old, and so I go from that medication to each physician I would go see, I'd get a new medication. But fortunately, and by the way, for folks that don't know the story, Vioxx ended up getting recalled after they made fortune and approximately 40,000 Americans died. This is documented, proven, and this was Merck's drug. And by the way, Merck is doing just fine today, multi-billion-dollar company. But... And at the end of the day, we're still treating a symptom of the pain, which it has its place, absolutely, especially in the acute situation, we'll become reliant on that symptoms treatment versus getting to the root cause which, within our bodies, we have this incredible fountain, potentially, that over time, the fountain's going to dry up. And we have accessibility here with something that in our society, for whatever crazy reason, we're throwing away the umbilical cord, we're throwing away the placenta. We have such a viable treatment with a high safety profile. And this is bringing me all to this point because you tied in this aviation story, and I want to talk about how you got into this field in the first place because you were flying before you got into medicine. Is that right?

DR. BOB HARARI: And again, the engineer in me, I've always loved the world of engineering because it's very much focused on identifying problems and coming up with solutions, right? And let's face it, there's nothing more anxiety-provoking than knowing you have a problem and not being equipped to create a solution. So, you said something which strikes home with me. So, our healthcare system in this country, which has always been considered to be the world leading system. Our healthcare system is sick. Okay? It's sick for lots of reasons. The vast majority of reasons in my mind are related to economics because in order for the healthcare system to even maintain a state of solvency, the practitioners are faced with an ever-increasing patient load, ever decreasing time, and ever-increasing burdens. These are medico-legal burdens, they're societal burdens, they're basically functional burdens that prevent doctors from really being able to devote the time and thought to every problem. And so, you hit the nail in the head, they look for the hallmark symptoms of a disorder and then they apply the standard of care.

Most often, that standard of care is about addressing symptoms that bring people to the hospital: Pain, profound loss of function, things like that. Now when you do that, in my mind,

it's palliative, right? It's not going and saying, well, I can address the pain acutely and give some relief, but while I'm doing that, I need to figure out why this pain is occurring, and I need to find some strategy that will reverse the root cause of the pain. Now, that's complicated, right? And let's face it, busy physicians, and practitioners, it's hard to do that. I think on average, the average physician sees 50 patients a day, right? I mean, that's... It's beyond anyone's ability to accommodate for that broad an array of problems that you have to distill down to a strategy.

SHAWN STEVENSON: It's quantity over quality, unfortunately.

DR. BOB HARARI: Unfortunately, that's what is. Yeah. Yeah, yeah. And look, you know, the best way to address that, in my opinion, is to put some of the power back in the hands of the patient. Right?

SHAWN STEVENSON: Makes sense.

DR. BOB HARARI: I mean, it's funny. These smartphones we carry around with us, right? Nobody went to school to use a smartphone. And let's face it, they're pretty damn complex. The average cellphone today has computing power and other types of technical capabilities that are orders of magnitude more sophisticated than we had in the first moon landing, right?

SHAWN STEVENSON: Right.

DR. BOB HARARI: The way we learn how to use this is to put the control in the hands of the user and allow them to navigate and figure out what works for them, what doesn't work for them. I use some applications on mine that you probably don't use on yours, you use some on yours I don't use. But over time, we figure out what's best for us. Part of what we did with our kind of ecosystem of experts, from Tony to Peter Diamandis to William Kapp and so on, is we said we can put some of the power back in the hands of the patient by giving them a system that they become a part of that first and foremost, baselines them. Okay?

Fountain Life, sort of the clinic organization that we created, is designed to give people an opportunity to use the most sophisticated tools to understand their molecular, physiologic, and anatomic biology. And when they understand that, okay? Most people are comforted because the vast majority realize, I've got a clean bill of health, here may be some of my vulnerabilities, I can intervene before I get sick. That's the name of the game. And we've learned in cancer, for example, if you identify cancer early, really early, virtually all cancers are very easily manageable. Stage zero cancer has a cure rate that is a multiple of what even our best therapeutic strategies can do. So, making an individual the chief executive officer of their own health is one of the philosophical reasons why Fountain Life was created.

And Fountain Life is committed to using the best tools for evaluating patients and then creating the best strategies, which by the way, these strategies are a living, dynamic system. We don't think that the strategy used today to treat disease X is necessarily what's going to be used a year from now, two years from now, but we are going to vigilantly monitor each approach in order to identify what works the best and then what works the best based upon certain predictors, like your genomics, like your biomarker levels in your bloodstream, etcetera. And then putting the power in the hands of the patient to go and control what they do to prevent or address any of their health issues.

SHAWN STEVENSON: It's so exciting. I'm so grateful for you. Can you let everybody know where they can get more information about Fountain Life?

DR. BOB HARARI: Absolutely. So, first and foremost, one of the great, great organizations that I've worked with to help get a lot of this messaging out, DLP Capital, is doing a remarkable health, wellness, and longevity conference in Puerto Rico, November 9th through the 13th, and I want everybody who's interested in this to go to that website, DLP Capital, and then look under the 'Events' section and then to... I would say, this is maybe one of the best vacation investments you can make to go there and actually see what's going on, I'll be there and a number of others, Fountain Life can be visited at their website, fountainlife.com. Celularity, the company that makes the therapeutics and is investing in all this, is C-E-L-U-L-A-R-I-T-Y.com. People say, "Hey, Bob, that's not how you spell cellularity." It's very intentional.

SHAWN STEVENSON: You know how to spell.

DR. BOB HARARI: I know how to spell. The reason is, Celularity was spun out of Celgene Corporation, C-E-L-G-E-N-E. Celgene Corporation's one of the great biopharmaceutical companies that was spun out of Celanese, C-E-L, a chemistry company. So, the... This is just... This is like keeping your father's last name, basically. So Celularity is the successor to Celgene cell therapy company, and we're very, very happy. We're excited about what we're doing. The tools are, I think, going to revolutionize a lot of the ways we manage disease. But like you, I believe that the first human to live to 150 is already walking on the planet. There's no reason why all of us can't aspire to live 100 and beyond, but with four important things, and these are my pre-requisites for why life extension matters. It only makes sense to add years to life if you can preserve high performance mobility, high performance cognition, you got to be able to think, right? High performance immunity, you got to defend yourself, and youthful aesthetics. Those four things make every year we add that much more valuable.

SHAWN STEVENSON: Yes. Yes. And that's a brighter future. And it's within reach. It's happening, it's happening now, and thanks in large part to folks like yourself. I just really do appreciate the work that you're doing. And man, I just can't wait to see what's next.

DR. BOB HARARI: You and me both. Hopefully we'll see it together.

SHAWN STEVENSON: Absolutely. Dr. Bob Hariri, everybody. Thank you so much for tuning in to the show today. I hope you got a lot of value out of this. This is one to share up. This conversation, this topic is so very important in our health, in wellness and evolution as a species. Truly, right now, we're in a position where it's normalized to carry a chronic and/or infectious disease, and have that be the end of our story, when we can shift this to make health normalized and have treatments that are truly sustainable and removing the cause of the issue instead of being so hyper-focused on a system that is treating the symptoms of disease and monetizing our collective sickness.

So of course, we want to stack conditions in our favor for prevention, but when treatments are truly necessary, this field of medicine can change the game. I appreciate you so very much for tuning into the show today. If you enjoyed this, please take a screenshot, and share this out with your friends and family on social media, you can tag me. I'm @shawnmodel, and of course, you can send this directly from the podcast app that you're listening on, and we're just getting warmed up. We've got some incredible master classes, world class guests coming up very, very soon. So, make sure to stay tuned. Take care, have an amazing day, and I'll talk with you soon.

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