

# **The Vitamin D Solution:**

## **A Special Interview with Dr. Michael Holick**

By Dr. Joseph Mercola

**JM: Dr. Joseph Mercola**

**MH: Dr. Michael Holick**

Introduction:

**JM:** Welcome, everyone. This is Dr. Mercola, and today I'm joined by Dr. Michael Holick, who is a leading researcher in vitamin D. You, of course, know about the importance of vitamin D. I was helpful and responsible for educating the masses on this. But that was in the early 2000s, because information became available in the literature because of the leading researchers and clinicians who had really done some pioneering research.

Dr. Holick is one of those people who really helped advance the understanding of the massive importance of vitamin D far and beyond its influence on bone metabolism. We're really honored and delighted to have him with us today. He's a double doctor; he's not only an M.D., but he's also a Ph.D. He's written a book, *The Vitamin D Solution*. He's based out of Boston and, I believe, works at the Harvard set of hospitals.

So, welcome and thank you for joining us today, Dr. Holick.

**MH:** It's my pleasure. Thank you for that kind introduction.

**JM:** I'm wondering if you could provide our viewers with a brief history of how you first became interested in vitamin D and what brought you to study it really carefully and then expand on its importance to human health.

**MH:** Well, I've really been blessed. I've been doing vitamin D research for more than 40 years. As a graduate student for my master's degree, I was responsible for identifying the major circulating form of vitamin D, 25-hydroxyvitamin D, that doctors typically measure now for vitamin D status in their patients. For my Ph.D., I identified the active form of vitamin D while working at Dr. DeLuca's laboratory. And then I went on and started to develop the concept...

**JM:** Is that the form the dihydroxy?

**MH:** Correction: 1,25-dihydroxyvitamin D. That's the active form of vitamin D. My roommate and I were the first to chemically make it. We were the first to give it to patients with kidney disease and bone disease. We then went on to ask the question: how do you make vitamin D in

your skin? Realized the importance of sunlight for overall health and well-being as it relates to vitamin D and introduced the concept of activated vitamin D that treats psoriasis.

I've been in the vitamin D field for more than 40 years. You would think that it would get boring after a while, but as you've just pointed out, it's getting actually more exciting as the years go on. It's been really a wonderful 40 years of experience.

**JM:** What stimulated your interest in this area? What caused you to look at vitamin D and not vitamin C or some other nutrient that might benefit human health?

**MH:** Yeah, you would think that I really carefully thought about this. But actually, I was a graduate student at the University of Wisconsin in the biochemistry department. Dr. DeLuca was looking for graduate students and took me on board. I had not a clue about vitamin D. In fact, I thought it would be a boring subject, only to find out that I was in the right place at the right time. Ever since, it stimulated my interest in pursuing all the biologic benefits of vitamin D.

**JM:** Is it fair to state that Dr. DeLuca may be one of the leading pioneers, early pioneers, even certainly preceding you? I mean, you were his graduate student.

**MH:** That's correct. Dr. DeLuca certainly made major contributions in the field of vitamin D, and he continues to do so today.

**JM:** Oh, he's still alive?

**MH:** He's still very productive.

**JM:** Oh, that's tremendous. I'm just happy to hear that. There are so many areas that we can go into. What areas would you like to focus on? I've got a lot of questions. But is there anything that you'd like to highlight that we could start the discussion with?

**MH:** Well, I think that just like the *The Vitamin D Solution* states, it's really a three-part process how to both prevent and treat vitamin D deficiency. I think that that will be a very good way to start out. Also, to talk about the worldwide epidemic of vitamin D deficiency and its health consequences for pregnant women, children, and adults, and some of the more recent research relating vitamin D deficiency with increased risk for many chronic illnesses.

**JM:** Okay. Why don't we, first of all, discuss the prevalence? But before we can discuss the prevalence, I think we need to talk about how we became aware of the enormous vitamin D deficiency epidemic that we have. Maybe you can review that. In my understanding, we really didn't have that appreciation until the assay for vitamin D, the 25-hydroxy, which is now being used universally to make that assessment. It really wasn't commercially available inexpensively until the late '90s. Prior to that, we were clueless as to how common this deficiency was. If you can give us your perspective on that, it would be terrific.

**MH:** Sure. You're right. Before the year 2000, very few doctors ever thought that anybody was vitamin D deficient. And then we began to realize around year 2000 that as more and more studies were being done, especially from the National Health and Nutrition Examination Survey, that vitamin deficiency was very common.

The CDC, for example, reported that 32 percent of children and adults throughout the United States that they evaluated were vitamin D deficient. From the National Health and Nutrition Examination Survey, children one to five years of age are 50 percent vitamin D deficient or insufficient, and 70 percent vitamin D deficient or insufficient are ages six to 11 years of age. We estimate that probably about 50 percent of the population is at risk of vitamin D deficiency and insufficiency.

**JM:** What standards are you using? Because there are some controversies as to what the cutoff limits are. Some people say that old standards were 20 nanograms per milliliter and up to 35 to 40. Some people like Dr. Chris Hollis suggested that 50 nanograms per milliliter may be the lower limits of sufficiency.

**MH:** Well, I think that everybody agrees. The Institute of Medicine, including the Endocrine Society, recommends at least 20 for bone health. But there's this area between about 21 and 30 that we consider to be an insufficient level. Most experts agree that if you're above 30 nanograms per milliliter, this is a healthy level to be at. Because of its variability in the assay, the recommendation from the Endocrine Society Clinical Practice Guidelines that looked at all the literature and made recommendations for prevention and treatment of vitamin D deficiency for doctors is 40 to 60 nanograms per milliliter.

There's a group down in San Diego, Grassroots Health, that has also been looking at this issue and also recommends 40 to 60 nanograms per milliliter as the ideal level.

**JM:** Yes. We've interviewed Carole Baggerly, who founded that group. I believe it's GrassrootsHealth.net. She's been a real strong advocate obviously. It saved her life and, in my understanding and information, she had come down with breast cancer. It's such a crucial element of the treatment of most malignant cancers and certainly breast and prostate cancer. So, that's good to know. Let's see, the other component that we wanted to review was the prevalence. Well, let's discuss the treatment.

**MH:** Sure. I think that first we may want to discuss that the Institute of Medicine in 2010 came out with its recommendations. They recommend for neonates or the first year of life: 400 units of vitamin D a day, every day; for children over one year of age: 600 units a day; for adults up to the age of 70: 600 units a day; and above 70: 800 units a day. They assumed that you're vitamin D sufficient, and therefore this amount will keep you sufficient.

But now that we're recognizing that vitamin D deficiency is very common, the Endocrine Society Clinical Practice Guidelines Committee recommends that, yes, neonates: 400 to 1,000 units a day; children one year of age and above: 600 to 1,000 units a day; and adults should be on 1,500 to 2,000 units a day. By doing so, you can finally maintain your blood levels of 25-hydroxyvitamin D above the 30-nanogram threshold that we all strive for.

I treat my patients, on average, with 3,000 units of vitamin D a day. It's been very effective. I've published a paper that over a six-year period of time, most of my patients on a 3,000-unit equivalent a day has between 40 and 60 nanograms per milliliter and there is no toxicity.

**JM:** Yes. I think that's an issue we need to discuss, too: the toxicity. It seems to be very little, below 10,000 units a day. It's a very rare occasion to go over that amount, of course. But there are other experts, specifically the groups that Carole Baggerly at Grassroots Health put together.

Her research shows that the average adult dose was closer to 8,000 units to get to the therapeutic level. It's a little bit different from what your experience is. I'm wondering if you can comment on that.

**MH:** Yeah, I think that, you know. Among their panel and what they're looking at is just what people are sending back in terms of the information that they're giving. They're giving various formulations of vitamin D. I think that the formulation may make a difference as well. Also, if you're obese, you need two to three times more vitamin D. That could be an issue as well. But for my patients who are at a normal weight, usually 3,000 to 4,000 units a day is adequate to maintain a healthy blood level of 25-hydroxyvitamin D.

[----- 10:00 -----]

I personally take 3,000 units a day. My blood level, on average, is about 55 nanograms per milliliter.

**JM:** Okay, now, again, you're in Boston, where I would say half the year it's almost physically impossible to get enough sun exposure, even if that was your life's goal to raise your vitamin D levels to therapeutic levels. I'm a firm believer... In fact, personally, I have not taken oral vitamin D for three or four years, yet my levels are in the 70 nanogram [range]. I believe the best way to get it is through sun exposure or a safe tanning bed.

I'm wondering if you can comment on your experience and review about the differences between the two and their benefits. Because to me it seems that, yes, I want to get my serum levels up, but there are probably other benefits from being exposed to sunshine on your skin, because there are a lot of wavelengths in there aside from UVB that may be beneficial to human health.

**MH:** You're right. I think that you're right. We had shown many years ago that during the winter time if you live above Atlanta, Georgia, you basically cannot make any vitamin D in your skin from about November through March. Obviously, you need to either take a supplement or, like you said, to use a tanning bed or an ultraviolet light that will produce vitamin D, like this pretty lamp, for example.

I typically recommend, if you're going to go out into the sun – yes, [expose your] arms, legs, abdomen, and back two to three times a week for about half the time it would take to get a mild sunburn followed by good sun protection. You're probably aware that we've recently developed an app, DMinder.Info, that you can actually use on your iPhones. It picks up exactly how much UV radiation is coming into your locale. We can tell you how many units of vitamin D you're making. When you make vitamin D in your skin...

**JM:** Excuse me. It does that through a variety of variables that you [inaudible 12:06]. There's not a sensor on that that's actually measuring UVB. It connects to the weather service, most of the cloud cover, your latitude, longitude, time of day, skin color, and age. It enters those and it makes a good guess, but it's not a direct sensor.

**MH:** Right. Exactly. Plus, you can be anywhere. You can be in India. You could be in China. You could be even in Brazil. You can be able to get some sense of how much vitamin D you're making. More importantly, it will also tell you when to get out of the sun, so that you don't get a sunburn.

What we do know is that when you make vitamin D in your skin, it lasts two to three times longer in your body. You also make additional photoproducts in your skin. There's some evidence that suggests that maybe these photoproducts have some unique biologic properties in the skin. Because we do know that sensible sun exposure decreases risk for malignant melanoma, and it could be that some of these photoproducts are helping in that process.

Beta-endorphin is certainly made in the skin during exposure to sunlight. That's probably the reason why people feel better when they're exposed to sunlight.

**JM:** There's another researcher who's also from the Boston area, Dr. Stephanie Seneff. I'm not sure if you've heard of her, but she's out of MIT. I've interviewed her a few times, and I'm actually going to be seeing her in a few weeks. She has a hypothesis – certainly not proven and some people disagree with her, but I'm wondering what your thoughts are – that one of the benefits of sun exposure versus oral vitamin D is it's a mediator of cholesterol sulfate through the skin. It can actually be a major form of supply of sulfate for human physiology. I'm wondering if you have any thoughts on that.

**MH:** Yeah. I think that a lot more research needs to be done because you make the precursor, 7-dehydrocholesterol, directly in the skin cell, and it's utilized in the skin cell. If you're not exposed to sunlight, that 7-dehydrocholesterol is then converted to cholesterol, and then it's part of your stratum corneum that accesses your water barrier on the surface of your skin. It's not very likely that the epidermis is playing any significant role in providing cholesterol, cholesterol sulfate, or anything else to the body in general because it's a bloodless tissue.

**JM:** Okay, well, good. Before we discuss the diseases, I was thinking maybe just to finish up on some of the therapeutic recommendations. If your circumstances don't allow you to either access the sun or a safe tanning bed, then you really only have one option if you want to raise your vitamin D, and that is to swallow it.

There, you have two options: (1) the regular vitamin D3, which is the kind of vitamin D that's most common, made typically from sheep lanolin that is relatively inexpensive and has really no major quality difference in almost any manufacturer. It's one of those unusual nutrients. Typically, for most supplements, there's a high-quality and there's low-quality. But there's not so much with vitamin D. Then the other form is the synthetic or artificial type, the one that you've done a lot of research with, which is (2) vitamin D2, typically the one that's given on a prescription basis, typically like 50,000 units. You would know the name. I don't know. I've never prescribed it.

I'm wondering if you could comment on the uses of those two. There's been some controversy on that, and you were on one end of the spectrum.

**MH:** Correct. I think that when you take vitamin D2 in physiologic doses... We've done studies in healthy adults giving 1,000 units of vitamin D2 or 1,000 units of vitamin D3. We even had one group that had 500 units of vitamin D2 and 500 units of vitamin D3 to see if there's any interaction. They all raised the blood levels identically. We believe that, at least at physiologic doses, it's perfectly fine. And you're correct.

**JM:** By blood levels, you mean 25-hydroxy D or 1, 25-dihydroxy?

**MH:** Actually both. We actually get both. It increases 25-hydroxyvitamin D, which, of course, is a measure for your vitamin D status. And then we did ask that question: how do you know that your kidneys can activate 25-hydroxy D2 as well? We have recently reported that, in fact, they do. Your blood levels of 25-hydroxy D and 1,25-dihydroxyvitamin D are the same whether you take vitamin D2 or vitamin D3.

The reason, by the way, that vitamin D2 is only available as a pharmaceutical as 50,000 units is that it predates the FDA. It's been grandfathered by the FDA. Nobody has ever gotten the approval as a pharmaceutical to use vitamin D3. But recently, supplement manufacturers now have approval from the FDA to provide at the pharmacies. Doctors can now order 50,000 units of vitamin D3.

**JM:** I was not aware of that. When did that become available?

**MH:** It's only in the past year or so that many of the pharmacies at hospitals and pharmacies in general are now providing 50,000 units of vitamin D3. It's a very nice way of giving vitamin D. You have to take it every day. People worry about, you know, "Can you remember?" So, you take 50,000 units once a week for eight weeks. That's how I treat vitamin D deficiency, followed by 50,000 units every two weeks or after forever to maintain vitamin D sufficiency.

If you're obese, you need probably two to three times more. If you're on Prednisone, anti-seizure medications, or AIDS medications that destroy vitamin D, you may need more vitamin D. There are various other issues, of course – malabsorption syndromes, where you have to worry about this as well. But in general, in my opinion, vitamin D2 is as effective as vitamin D3. That's why the mushroom industry now is starting to expose their mushrooms to ultraviolet light, because they can contain vitamin D2. It's a source of vitamin D naturally in the diet.

**JM:** Yeah, I neglected to mention that. That is another source. Because vitamin D3, in my understanding, you can only get it from animal products; it's in animal products only. If you irradiate vegetable material like mushrooms, you will get vitamin D2. The reason I made that distinction is that if you go into health food stores, you'll see supplements saying "vegetarian vitamin D." But if you look carefully it's not D3; it's D2.

**MH:** That's correct. For vegans, that's an important issue, of course.

**JM:** Yeah. Now, getting back to the high doses, first of all, what is the name of that vitamin D3 50,000-unit?

**MH:** It's called Drisdol. It's kind of the name. But you just simply order it as either ergocalciferol (which is vitamin D2) or simply write it as 50,000 units of vitamin D2.

**JM:** No, I'm talking about the D3 that you said was available starting last year.

**MH:** Oh, it's just different supplement manufacturers now are just providing it. You just order it as 50,000 units of vitamin D3. There's no name to it.

**JM:** What is the benefit, from your perspective, other than compliance, of giving it once a week at such a high dose as opposed to giving it regularly at lower doses on a daily basis?

**MH:** It turns out that vitamin D is very forgiving. As you know, it's fat-soluble. When you take vitamin D orally, or even when you're exposed to sunlight, a lot of it goes into your body fat and it's released back out again. My patients always ask, "What if I forget it one day? Can I take twice the next day?" The answer is yes.

[----- 20:00 -----]

What if I forget it for the week? I could take all seven doses a week. As a result, you could take it easily once a week or once every couple of weeks. For patients who are taking lots of different medications daily, they actually like the option of only having to take it twice a month, as opposed to having to worry about taking it every day. As you know, a lot of medications, you can't take with each other. Thyroid medication is a good example. As a result, patients actually do like it.

And I find that if I tell a patient to take a supplement, they'll do it for three, four, or five months, but they won't be compliant year after year. If you give them prescription: a) the pharmacy usually calls them to tell them to pick up their prescription on a monthly basis, and b) because they're getting it from their doctor as a prescription, they're more likely to follow that advice. From my experience, we find compliance to be incredibly good in terms of maintaining healthy vitamin D levels in patients on this prescription medication.

**JM:** I couldn't agree more. The power of the prescription pad to really influence a patient's behavior is really phenomenal. It's going to be far more important. It's likely to be successful if it's coming from a prescription.

But two concerns on that is the fact that vitamin D, to the best of my knowledge, doesn't interfere with any medications. I mean, some supplements do, but not vitamin D. There's no cross-reactivity there. It may be more difficult to actually take it once a week because if you're taking a medication like a high blood pressure pill like a statin drug and then you've got to take vitamin D every Sunday, if you miss it on Sunday, you're gone for a week. If you miss it one day, it's not a big deal. And then your blood levels are clearly going to be more consistent at lower doses over a more frequent interval.

It would seem to me that if you could prescribe it as a pill – I don't know... The other is the cost. Probably it's more expensive prescribed than it is to purchase over the counter as a supplement. You might be better off with a lower dose more frequently for a number of reasons. Not only because of a more consistent blood levels, but also if you forget, you only forget one day, not one week.

**MH:** Yeah. I tell my patients, "Look, even if you forget it for a week, you could take two the following week." It's that forgiving. You could take 100,000 units even once a month, it works just as well. I agree with you. I mean, it's certainly an option. There is no pharmaceutical, though, as 1,000 units or 2,000 units; it's only 50,000 units. You have to get it again as you would write it as a prescription as a supplement. It makes no sense. It's much more expensive. They should just go to their local pharmacy and buy the supplement.

**JM:** Okay, that makes sense. All right. I didn't realize that doses less than 50,000 are not available as a prescription. Okay. Why don't we discuss or maybe just kind of briefly review the primary purposes of vitamin D? From my perspective, it seems like the biggest impact is on

cancer. I mean, it's affecting almost one in two people. We've got essentially the equivalent of five to six airplanes crashing and killing people every single day in the United States alone to people dying from cancer.

The impact of vitamin D is that it could reduce that by up to 50 percent. And it's virtually free, you know. It's just insane not to take advantage of this. Let alone, all the metabolic disease like heart disease, diabetes, and Alzheimer's. But why don't you give us your take on that? Because I think it's just... There's a very few supplements that I recommend universally for almost everyone – and vitamin D is one of them. To me, it's recklessly irresponsible for human health not to address that and pay attention to it.

**MH:** I agree 100 percent. I usually recommend that vitamin D is critically important from birth until death. Just to give you a couple of examples: during pregnancy, we're now realizing that vitamin D deficiency is a major issue for the developing fetus. Pre-eclampsia, the most serious complication of pregnancy, is associated with vitamin D deficiency. Vitamin D is critically important for muscle function, which, of course, is important for birthing action. We showed a 400 percent reduced risk of women requiring a C-section if they simply were vitamin D sufficient at the time they gave birth.

We're now beginning to realize that in-utero vitamin D deficiency is more likely that the young children are going to have asthma and wheezing disorders. We're also now realizing that children who are vitamin D deficient are more likely to develop type 1 diabetes, multiple sclerosis later in life, rheumatoid arthritis, and Crohn's disease.

We're now also beginning to realize that, like you said, cancer is a big deal. A study done, for example, at the Nurses' Health Studies, showed that nurses that had the highest blood levels of 25-hydroxyvitamin D, averaged about 50 nanograms per milliliter, reduced their risk of developing breast cancer by as much as 50 percent.

A study done by Dr. Knight in Canada showed that when they called up women with breast cancer and said, "How much sun exposure did you have as a teenager and young adult?" Compared to women who didn't have breast cancer, it was amazing to find that women who had the most sun exposure as a teenager and young adult had almost a 70 percent reduced risk of developing breast cancer.

Studies have shown that if you improve your vitamin D status, it reduces risk of colorectal cancer, prostate cancer, and a whole host of other deadly cancers by 30 to 50 percent. You're correct. Cancer is a big deal. You need to realize that vitamin D is playing a very important role in helping to maintain cell growth and to help fight cancer when a cancer cell is developing in the body. Vitamin D has a very important role to play.

In terms of cardiovascular disease, we now recognize that vitamin D is very important in reducing risk of hypertension, also atherosclerotic heart disease, and then ultimately heart attack and stroke. A study done from the Framingham Heart Study showed that if you are vitamin D deficient, you have a 50 percent higher risk of having a heart attack. If you have a heart attack and you're vitamin D deficient, there's a 100 percent risk of dying of that heart attack.

We did a study with Dr. Dong in Georgia in teenage African-American boys and girls. We simply gave them 2,000 units of vitamin D a day for four months. We raised their blood levels



from 11 to 34 nanograms per milliliter on average. It was a significant reduction in the vascular stiffness, which is the prelude for both hypertension and heart disease.

Certainly, vitamin D is very important as an immune modulator, which is why we think it's so important in reducing risk of autoimmune diseases. But it also helps us fight infections. A study done in Japan, for example, showed that schoolchildren taking 1,200 units of vitamin D a day during the winter time reduced their risk of getting influenza A infection by about 40 percent.

**JM:** I'm glad you mentioned the important influence of vitamin D in improving immune function. As we're filming this interview or recording it (because we don't use film anymore; we use digital media), it's the fall. I'm not sure of your position on vaccination, specifically flu vaccinations, but I suspect you might be familiar with mine. I believe it's far more prudent, safer, less expensive, and most importantly, far more effective to optimize your vitamin D levels than go through the risks, potential serious risks, of exposing yourself or loved ones to a flu vaccine. Maybe you can comment based on your perspective.

**MH:** Well, I think you're right. We know that the immune cells use vitamin D and that they activate vitamin D. There's good evidence that it will help kill tuberculosis bacteria, for example, if you have adequate vitamin D on board. The macrophages will just chew it up and will kill it. We think that the immune system is primed with vitamin D in order to help fight infections.

That study did suggest in Japanese children that increasing vitamin D intake during the winter time markedly reduced the risk of influenza A infection. They demonstrated it by both nasal swabbing as well as with looking at the blood to be sure that they could demonstrate that, in fact, they did reduce this infection. I think it is important.

In terms of vaccines, it's debatable. I think you're right. Our hospital, for example, requires us to have a vaccine. If we don't, they force us to wear a mask wherever we go. So, you know, what to do? I definitely get a flu vaccine every year because that's a requirement of the hospital that I'm at, which is Boston University Medical Center.

**JM:** Yeah. Another artifact, which you never mentioned but I thought might be useful to discuss, is this conflict between a whole specialty of medicine, specifically the dermatologists who have pretty strong disagreements with this position, specifically as it relates to skin cancer, and who think you're recklessly irresponsible for advocating this.

[----- 30:00 -----]

Because of your position, I believe, you were removed from some academic position at the university, basically primarily motivated by the head of the department of dermatology. Maybe you can refine my description of what happened and give us your perspective on it.

**MH:** Sure. I came out in 2004 with a book, *The UV Advantage*. I was encouraging people to get some sensible sun exposure. I happen to be professor of dermatology because of the work I have been doing with active vitamin D to treat psoriasis. In fact, from the American Skin Association, I received their prestigious Psoriasis Research Achievement Award. As a result, I was in the department of dermatology, continuing to do psoriasis research.

But once I began recommending sensible sun exposure for vitamin D, which is kind of counter to what the American Academy of Dermatology's message was, I was asked to step down as professor of dermatology back in 2004.

**JM:** From your perspective, at Boston University, are they starting to get some common sense into their discipline and realize that this is just archaic? I'm sort of at a loss for a description or word for their behavior, but it's just not good.

**MH:** Yeah, I think...

**JM:** They're waking up.

**MH:** There are two ways to look at it, I guess. You know this much better than I do. I'm always asked that question, you know, how I must have felt really bad. Actually, not so, because the press picked up on it, even the *International Herald Tribune*. One of my colleagues was in Hungary, and he said I was on the first page, "BU Professor Fired Because of His Stand on Sensible Sun Exposure."

You can't buy that kind of publicity. In many ways, it was really good because it woke up a lot of people's eyes about the issue of sun exposure. Right now the American Academy of Dermatology still recommends: you should never be exposed to one direct ray of sunlight for your entire life.

**JM:** They haven't changed. They haven't changed their position.

**MH:** But in Australia, it's a different story. In Australia, they did a study in dermatologists, by the way, in the summer time. Eighty-seven percent were found to be vitamin D deficient. More than 40 percent of the population in Australia is now vitamin D deficient. The Australian College of Dermatologists, as well as the Cancer Council for Australia, now recommends some sensible sun exposure. It is starting to make a movement in the right direction.

I just came back from Brazil. More than 50 percent of Brazilians are vitamin D deficient. I met with the minister of health and I met with the governor of Sao Paulo, talking about some recommendations for sensible sun exposure and vitamin D supplementation for their population.

**JM:** You've been doing this a little longer than I have. But the longer I do it, the more obvious it becomes to me that moving back to simple basic strategies that our ancestors applied is really the foundation of staying healthy. I mean, there's just no one who could rationally argue that our ancestors weren't universally exposed to sunshine. They didn't hide from the sun. They're continuously exposed to it. How could they not believe that our genetics and our biochemistry are optimized to have that as part of improving our health? I just don't understand what perspective they're taking. It's just absolutely illogical.

**MH:** That's because they just think about skin cancer. There are two pieces of information that I think is probably worthwhile noting. So, yes, most non-melanoma skin cancers occur on excessively exposed areas like your face or the top of your hands. But most melanomas occur on the least sun-exposed areas. Occupational sun exposure decreases your risk for melanoma. Even though everybody always talks about deadly melanoma and relates it to sun exposure, you have to really put this all into perspective.

**JM:** Yes, indeed. That's an important distinction. There are basically two types of skin cancer: the regular skin cancer, the basal and squamous cell cancers (which are, for the most part, almost always benign and virtually no one dies from these) and the melanomas. Your risk of developing these benign cancers increases relatively much, but your risk of developing the other one decreases.

**MH:** Right. That's why I recommend [exposing your] arms, legs, abdomen, and back rather than your face, because it's the least sun-exposed in terms of long-term. You're less likely to develop even a non-melanoma skin cancer. A study was done, by the way, in Maasai warriors who are outside every day. That really gives us an insight where we should all be with our blood levels of 25-hydroxy D. They were found to be around 50 nanograms per milliliter.

**JM:** Yeah, that's right. I try to keep mine above 50 for sure. Usually, I'm successful in doing that, except it becomes a challenge in December, because even in Florida, there's not a lot of sun in December again.

**MH:** Right.

**JM:** I mean, there's sun, but there's not enough UVB. I wasn't more specific than what I meant to say. Another area that most people aren't aware of is the fact that glass is a relatively recent innovation. It has not been around for that long, certainly not centuries. When it was available, it was very expensive. It's now pretty common to have glass everywhere.

Many people feel that when they're getting sunlight through a glass window – car window, office window, or home window – they're going to be producing vitamin D on their skin. But the point I'd like to make is that almost all glass selectively filters out UVB (which produces the vitamin D) and it doesn't filter out UVA at all, which actually increases the risk of cancer. One of the worse things you can do to improve your health is to get sun exposure through a glass. I'm wondering if my perspective is distorted on that.

**MH:** No, it's perfect. You're absolutely right. You cannot make any vitamin D when you're exposed through glass. Yes, you're getting blasted by UVA, which penetrates deeply into your skin, causing wrinkling, increasing risk for melanoma, as well as probably skin cancer. Also, what's curious and what we've shown is that if you're exposed to sunlight, like at 8:00 in the morning (which is what also has been recommended) or late in the afternoon, you're actually getting blasted again by UVA radiation and no UVB. You can't make vitamin D until about 10:00 in the morning until about 3:00 in the afternoon.

**JM:** Yeah, it's just crazy because the recommendations for safe sun exposure are the ones that will not give you vitamin D.

**MH:** Exactly.

**JM:** Here's another important nugget that many people may not appreciate: as we're filming this, it's the time between spring and fall and essentially we're in daylight saving time in the United States. At daylight saving time, the peak sun exposure is not noon – it's 1:00. If you want to get your maximum sun exposure, you go around 1:00. After that, you have to go to 12:00. Just because we changed the clock, it doesn't mean we have to compensate for that.

**MH:** Absolutely right.

**JM:** The other thing that I wanted to mention is your take on, I guess, keeping your skin cosmetically elegant. Of course, we are both strong advocates of sun exposure. But your face, which is the most important cosmetic component or element of your body, is a relatively small surface area. I mean, it's really the one that most people, the only part of their skin, that they expose.

But if you protect your face and expose your chest, back, legs, and arms, you don't really have to worry about vitamin D. It would seem wise when improving your exposure cosmetically to protect your face. I personally use a cap that puts a shade around my eyes and my nose. I do that just to protect my skin, because the skin is very thin in your face and highly sensitive to these photoaging effects of UVA. I'm wondering if you've developed any hints over the decades that you've been involved with this therapy.

**MH:** There's no question about it. If you put a sunscreen on with a sun protection factor of 30, it reduces your ability to make vitamin D in your skin by about 95 to 98 percent. But I always recommend sun protection on your face. Often, a broad-brimmed hat is by far even a better way of doing it rather than having to put a chemical on your face, if you don't have to. But it's certainly important to protect your face.

Also, there's this concept out there that if you're exposed to sunlight, you shouldn't take a bath sooner after because you could wash the vitamin D off. It turns out that's probably not correct. Because the vitamin D that you're making is in the living cells in your epidermis, and you can't really wash it off. It's not an issue. People can easily go out to the sun, enjoy themselves, and then go back in.

[----- 40:00 -----]

They can take a shower, and they'll still have the vitamin D safely in their skin.

**JM:** Yes. I know that. Dr. Cannell is the person who promoted that. He disagrees with it. It's his take on it. We have enormous respect for Dr. Cannell and his efforts and actions to really help educate people in this area, because he's really seeking to educate people about this. But his focus is educational interventions on vitamin D. Unfortunately, he believes in the power of vaccine. I am unable to convince him of the challenge on that issue yet.

I guess that summarizes most of my questions that I wanted to dialogue with you. But I'm wondering if you have any other items that you'd like to highlight or emphasize as we conclude.

**MH:** Sure. One of the things that often happen in the winter time is that people feel more tired. They also have aches and pains in their bones and muscles. They often are misdiagnosed as having fibromyalgia or chronic fatigue syndrome. Many of these symptoms are classic signs of vitamin D deficiency osteomalacia, which is different from the vitamin D deficiency that causes osteoporosis in adults. What's happening is that the vitamin D deficiency causes a defect in putting calcium into the collagen matrix into the skeleton. As a result, patients have throbbing, aching bone pain.

If they take adequate calcium and vitamin D – I think we haven't really talked very much about calcium – they go hand in hand. I totally recommend getting your calcium from your diet if you can. But if you can't, certainly a 1,000 milligrams of calcium a day split into 500 milligrams twice a day with meals is really a good way to get your calcium. And having adequate vitamin D will help maintain your bone health as well as muscle function.

Often, elders have muscle weakness. They have a difficult time getting from a sitting to standing position. That's classic for proximal muscle weakness associated with vitamin D deficiency. Many of my patients do incredibly well by just simply correcting their calcium and vitamin D deficiency.

**JM:** Yeah. The reason you mentioned that, of course, is for merely a century or longer, really the only known action of vitamin D was to improve calcium absorption. They're intimately associated and connected. But if you optimize your vitamin D, then you should improve calcium absorption. You may not need a supplement. I personally am not a big fan of calcium supplementation and don't recommend it.

I think that magnesium, if you're going to take a mineral, may be far more important because like vitamin D, it's somewhat of an epidemic of deficiency. It's somewhat difficult to get in your diet even if you're having lots of green vegetables. And if you're taking antibiotics... Today we ran an article about fluoroquinolones, which just devastates your collagen. There are lots of serious side effects from fluoroquinolones.

**MH:** Yup.

**JM:** It turns out it may be related to magnesium deficiency.

**MH:** Yeah, I agree with you. Magnesium is very important. It certainly helps you use the calcium in your body. I think they all go hand in hand. I mean, I think a good healthy diet, there's nothing quite like that.

**JM:** [Inaudible 43:27]

**MH:** Right. But the problem, of course, is that there's essentially no vitamin D in your diet, right? Like we said, there may be mushrooms that are exposed to sunlight. Salmon, if you take salmon, they only have 500 to 1,000 units in a serving. It's mainly wild-caught salmon. Farmed salmon essentially have no vitamin D. We showed that many years ago.

And then yes, some dairy and orange juice contains 100 units in a serving. But you would have to, even in the Institute of Medicine's recommendations, drink six glasses of orange juice or milk a day just to get 600 units of vitamin D. That's why basically throughout the United States, children and adults are at very high risk of vitamin D deficiency, because they're not getting sensible sun exposure as well taking a vitamin D supplement.

**JM:** Yeah. I'd also like to comment on your recommendation on the importance of vitamin D in the winter to address some of those myalgias and psychological symptoms. Of course, one of the most common ones is seasonal affective disorder or SAD, and that may be benefited by vitamin D.

But we know that even without vitamin D, just exposure to bright light, which is premium in the winter, of course, is magnificent at reversing those effects. Again, to me, it's providing solid evidence of the superiority of getting your vitamin D from sun exposure, because you not only get the vitamin D increased, but you get these psychological improvements that we know there's no expert who will dispute that. I mean, it's just so proven. [Inaudible 45:01] evidence that shows that. You know, I just think that.

And then the other comment, too, you know, if we talk about tanning beds, is the safety, which is a critical component. And then you talked about the sun lamps from Sperti. As I was first investigating this in the early 2000s, I was intrigued by that and actually contacted Sperti through some of my people, and I got one. It's such a small device. It really only casts like a foot.

Because the FDA has required to shut it off after 10 minutes and it takes 10 minutes to take the thing back on because of the mechanics involved, it becomes almost impossible to get a therapeutic level of vitamin D with enough UVB exposure. I suppose a tanning bed, which exposes essentially one whole side (or both sides if you have a bed) of your body, seems to be a lot more of an efficient way to do that.

**MH:** Yeah. The real issue, of course, is that for a person who may not be able to afford a tanning bed, this might be an alternative. I have a lot of patients actually who have used it. What they'll do is they'll expose their abdomen and back or their thighs. It works reasonably well. As you know, it's been kind of redesigned. It has fluorescent tubes now, so that you don't have to shut it off for 10 minutes and turn it back on.

**JM:** I didn't realize that.

**MH:** Yeah. There continues to be improvements. What I recommend for people who are going to go to a tanning bed is to protect your face, right? And then to go in for half the time recommended for tanning. Make sure that tanning bed is putting out UVB radiation. I just had a patient today who told me that she was getting exposed to very intense UVA, because they were telling her that this will help her make vitamin D – it will not. UVA will definitely damage your skin. I always recommend to always go to a tanning bed that has UVB half the time recommended for tanning and always protect your face.

**JM:** Yeah. In fact, there are tanning beds that do not tan you because they make no UVA and they just make UVB. It's not as popular, but if you're only doing to for health perspective, it is an option, a UVB tanning bed.

**MH:** Most tanning beds, what they do is they have a small component, usually three to five percent, maybe up to six percent, UVB. The rest is UVA and visible radiation. Those fluorescent tubes kind of somewhat mimic sunlight to some degree.

**JM:** Yeah, and there are tanning beds that have up to 10 percent UVB, which is definitely the amount of normal sunlight, and make less UVA than normal sunlight. Theoretically, at least safer than sunlight.

**MH:** Right.

**JM:** Yeah, all right. It's been a delight. Do you have any other final comments you'd like to mention?

**MH:** Well, just one other: we did a study recently, because we asked a simple question; how does your body really know your vitamin D status? Ultimately, it's probably your genes that know. We did a study in healthy adults. We gave them 2,000 units of vitamin D a day for a few months. We got the white blood cells and looked at broad-gene expression of over 22,500 genes. Long story short...

**JM:** Is that the entire genome?

**MH:** Pardon?

**JM:** Is that the entire genome?

**MH:** Yes, that's correct. Yup. So, we've got the white blood cells at the beginning and at the end of the study. We identified 291 genes that were influenced just by increasing your vitamin D intake. These genes control up to 80 different metabolic processes, from improving DNA repair to having effect on autoxidation (which is, of course, a big deal for aging, cancer, and the like), also for your immune system, as well as for a lot of other processes.

We think that it really is important for people to be aware of their vitamin D status. We don't recommend broad screening because it's just too expensive, but rather to take a supplement and to get some sensible sun exposure. The combination of the two should guarantee sufficiency. But if you're obese, if you're on medications that affect vitamin D metabolism, or if you have malabsorption syndromes, then you may need a lot more vitamin D and you need to be followed with a 25-hydroxyvitamin D.

Needless to say, if you want to get some more information, *The Vitamin D Solution*, which came out in 2010 and which I wrote, really kind of gives you a very broad overview about all the health benefits of vitamin D, as well as at the end [there are] question and answers about lots of things that people ask about. Just one example is that it's been suggested that if you increase your vitamin D intake and you have kidney stones, it's going to make that risk even higher. The answer is that it's not correct. You will not increase your risk for kidney stones if you increase your vitamin D intake.

I want to thank you very much for the opportunity to share my thoughts about vitamin D with your audience.

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You've just been a wonderful host. Have a delightful day.

**JM:** All right. Well, thank you very much and keep up the good work.

**MH:** Thank you. Take care. Bye.