

Introduction/Conclusion: Naomi Hirsch, Environmental Health Sciences Center

Host: Steve Lawson, Linus Pauling Institute

Guest: Dr. Michael Holick, Boston University

[THEME MUSIC]

HIRSCH: Welcome to LPI on Health, a podcast series to inform you about the recent micronutrient research and events coming out of the Linus Pauling Institute at Oregon State University. For more information, visit our website at <http://lpi.oregonstate.edu>.

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LAWSON: Hi, this is Steve Lawson with LPI. I had the pleasure of speaking with Dr. Michael Holick at our recent Diet and Optimum Health conference in Portland, Oregon. Dr. Holick is the recipient of the 5th Linus Pauling Institute Prize for Health Research, which was awarded on May 15, 2009 in Portland.

Dr. Holick earned his doctorate and medical degrees at the University of Wisconsin, Madison and is currently a professor of medicine, physiology, and biophysics at Boston University Medical Center. He was the first scientist to isolate the biologically active form of vitamin D and has been instrumental in advocating increased vitamin D intake to help prevent cancer, heart disease, and infectious diseases.

We know that vitamin D's vitamin activity is to prevent rickets. What other health effects does vitamin D have?

HOLICK: Well, we're now recognizing that vitamin D may be important for overall health and well-being. Not only does it prevent osteoporosis in older people and reduce their risk of fracture, but may reduce risk of many autoimmune diseases like type 1 diabetes, multiple sclerosis, rheumatoid arthritis, reduce risk of heart disease, reduce risk of stroke, reduce risk of type 2 diabetes, and may be even very important for reducing risk of infectious diseases like upper respiratory tract infections in both children and adults alike.

LAWSON: Is that a direct vitamin D activity in the anti-infectious disease angle, or is that because vitamin D contributes to the synthesis of other proteins or anti-bacterial molecules in the body?

HOLICK: We're now recognizing that most immune cells in the body have a vitamin D receptor, which means that they need vitamin D to fully function. And we're now recognizing that the immune cells that gobble up infectious diseases like pneumonia infectives is controlled in part by vitamin D.

LAWSON: That's very interesting. How prevalent is vitamin D deficiency in the United States and the rest of the world?

HOLICK: Well, we think that vitamin D deficiency is maybe the most common nutritional deficiency in the world. We estimate upwards of 1-1.5 billion people in the world are at risk for vitamin D deficiency and insufficiency.

LAWSON: Is that because they're not consuming foods that are rich sources of vitamin or that their sun exposure is insufficient or are other factors at work?

HOLICK: The major problem is that people have thought that if you have a well-balanced, healthy diet, that you're getting all the nutrients that you need for maximum health. There are essentially no foods that contain vitamin D naturally. It's mainly salmon or cod liver oil, but otherwise, it's not available in the diet. There are some foods fortified with vitamin D like dairy products and also even orange juice, but the amount that's there is so small relative to what your body needs. You cannot get enough from your diet, and in fact, we've always depended on sun for our vitamin D requirements. And for the past forty years, unchallenged have the dermatology societies telling people to avoid all direct sun exposure. In my opinion, this has caused a worldwide pandemic of vitamin D deficiency.

LAWSON: Is there any difference between vitamin D found in food and the vitamin D that's synthesized in skin on sun exposure?

HOLICK: When you're exposed to sunlight, it's the precursor of cholesterol in your skin that absorbs the sunlight and is made into vitamin D. And it lasts in the body about 2 to 3 weeks. The vitamin D that's found in food can be vitamin D3, which is what you make in your skin, but it's handled by the body a little bit differently. Its life span is only 1 to 2 weeks. So when you make it in your skin, it actually lasts longer. We also know that there is another form of vitamin D called vitamin D2, which comes from yeast and is often used in food supplements and can be as effective as vitamin D3 in foods. But like I said, there's so little in foods that you cannot get it from your diet to satisfy your body's requirement.

LAWSON: When laboratory tests are done to determine vitamin D status in blood, what are they measuring?

HOLICK: There are two vitamin D tests, and we tell physicians that there's only one vitamin D test that they should use to determine a patient's vitamin D status. It's called 25-hydroxy-vitamin D. It's the major circulating form of vitamin D. The active form of vitamin D, known as 1,25-dihydroxy-vitamin D, that often the doctors want to order, tells you nothing about the person's vitamin D status. It's often normal or even elevated in a patient with vitamin D deficiency. So patients should request, if the doctor's not doing it, a 25-hydroxy-vitamin D test.

LAWSON: Do other micronutrients in the diet or that might be taken supplementally affect vitamin D metabolism or activity in the body?

HOLICK: That's an excellent question. Also, I'm asked, "Do you have to take vitamin D on a full stomach, or on an empty stomach? Do you need to take it with fat?" And the answer is no. Vitamin D is very forgiving. So you can take it on an empty stomach, full stomach, with fat, no fat, doesn't make any difference. You can take it in a powdered form, capsule form, tablet form, doesn't make any difference. We also know that most micronutrients and macronutrients don't interfere with vitamin D at all. So you can take it with your multivitamin or with other supplements. It doesn't make any difference. Vitamin D will not interfere with them and they will not interfere with vitamin D.

LAWSON: What factors influence vitamin D synthesis in the skin?

HOLICK: The major factors are latitude, time of day, season of the year, and degree of skin pigmentation. I'll give you just a couple of examples. If you live above Atlanta, Georgia, you cannot make sufficient vitamin D in your skin or actually no vitamin D in your skin from the months of November to February. We also know that early in the morning and late afternoon, you also can't make vitamin D in your skin. And it all has to do with the angle of the sun because the vitamin D producing rays are efficiently absorbed by the ozone and if the sun's rays are coming in at an angle, it has to go through much more ozone and never gets to the earth's surface.

If you are a person with skin color, increased melanin in your skin, it's a very effective sunscreen. In fact, it can reduce a person's ability by as much as 90-95% to produce vitamin D in their skin. That's why African Americans and people of color are at much higher risk.

We also know that if you wear sunscreen, which is often what parents are encouraged to do for their children and for themselves, a sunscreen with an SPF of 30 will absorb 99% of the vitamin D producing rays, will never permit it to get into the skin. Thus an SFP of 30 reduces your ability to make vitamin D in your skin by 99%.

LAWSON: So how do you feel about the trade off between increased risk for skin cancer with respect to vitamin D status and sunscreen use?

HOLICK: Well, I think just like anything else in life, it's moderation. And that's what I typically teach. That is, you go out and expose maybe arms and legs a couple of times a week, maybe 5 up to 15 minutes, depending time of day, season of the year, latitude, and degree of skin pigmentation. Don't worry about your face. It's only 9% of your body's surface. It's not making very much vitamin D. It's most sun exposed so always wear sun protection on your face. And then after that 10 or 15 minutes,

then topically apply a sunscreen. This way you can take advantage of the beneficial effect, prevent the damaging effects due to excessive sun exposure.

LAWSON: But in the winter, it seems that the advice is for most people in the United States who live north of Atlanta, Georgia for instance, that taking vitamin D as a supplement might be an added benefit or form of insurance against vitamin D deficiency.

HOLICK: Well, it turns out that mother nature cleverly designed the system so that if you're actually getting enough sun exposure in the spring, summer and fall, you build it up in your body fat and you release it in the wintertime. The problem is if you're obese, the body fat likes the vitamin D so much that it won't let it back out. So actually obese people are more prone to vitamin D deficiency and need even 2 to 3 times more vitamin D to satisfy their body requirement.

But for me personally, because we believe that vitamin D is so important for reducing risk for common cancers and autoimmune diseases and many of these other chronic illness that we talked about. I like to cycle, so I'm out cycling with sun protection on my face, not on arms and legs, in the morning from about 10 until 12. And I also take 2000 IUs of vitamin D a day. And I drink 2 to 3 glasses of milk a day. On average, I'm getting about 2700 IUs of vitamin D a day.

We think that both children and adults not getting any sun exposure or minimum exposure need, at a minimum, 1000 and probably 2000 IU of vitamin D a day. And so if you're going to say, "Should we stop in the summer and go take it in the winter?", you won't remember to do that. So I personally take it year round, 2000 IU supplement and I recommend to all of my patients, family and friends to do the same.

LAWSON: What are the current official recommendations for vitamin D, the DRIs, and are there special populations that should be especially concerned about vitamin D intake?

HOLICK: The adequate intake recommendations made by the Institute of Medicine back in 1997, and I was on that committee, it was for 200 IUs for all children and adults up to the age of 50, 400 IUs for adults 50-70, and 600 IUs for 70 and above. Before 1997, there was very little information about vitamin D and all its health benefits.

We now recognize that those recommendations are totally inadequate and that you need to take, like I said, at least 1000, probably up to 2000 IUs of vitamin D a day. This is for both children and adults alike. Even now, the American Academy of Pediatrics has come out with a recommendation that as soon as a child is born, they should be put on 400 IUs of vitamin D for their first year of life and in fact kept on it for several years thereafter.

Pregnant women, it had been recommended since they're within that young age group, should only take 200 IUs a day. And their obstetricians are thinking that since they're on a prenatal vitamin that has 400 IUs that they're getting more than enough. So we did a study of pregnant women at our hospital. We found that pregnant women taking 600 IUs of vitamin D a day at the time they gave birth, 76% of moms and 81% of newborns were vitamin D deficient. So I recommend that all pregnant women increase their vitamin D, take their prenatal vitamin, drink their milk and take their calcium with vitamin D, and take an additional 1000 IU supplement of vitamin D a day. Why? We now know that if you're vitamin D deficient during pregnancy, you have a higher risk of developing pre-eclampsia, which is a very serious complication in pregnancy, and also increases your risk of having a Caesarian section when you're giving birth because muscle function is also associated with your vitamin D status.

LAWSON: When will the Food and Nutrition Board of the Institute of Medicine tackle the Dietary Reference Intakes for vitamin D?

HOLICK: My understanding is that the task force has in fact been empanelled. They've already met and they're going to have a viewing and recommendations in August and I believe that their plan is to have the public recommendations out some time next year, presumably in the first or second part of the year.

LAWSON: What's the current status of the clinical intervention trials and also the observational studies with vitamin D?

HOLICK: Most of the observational studies have suggested that if you're taking at least 1000 to 2000 IUs of vitamin D a day, you're getting a blood level of above 30 ng/ml, reduce risk of colorectal cancer by as much as 50%, reduce risk of breast cancer by as much as 50-60%, reduce risk of ovarian cancer and a whole host of other cancers by about the same amount.

We also know that if you increase your vitamin D intake, you're more likely to live longer. There are data that suggest that you're less likely to die of a heart attack or just die in general if you have vitamin D on board. There's also a study from the Framingham Heart Study showing that men and women that had the highest intake of vitamin D were less likely to have a heart attack.

So there are many different reasons for why people should be aware of their vitamin D status and increase their vitamin D intake.

And one last comment about this. There was a study done in Long Island where they gave women 2000 IUs a day for a year, and found that those women reduced their risk of developing upper respiratory tract infections by 90%.

LAWSON: That's very dramatic.

HOLICK: Well, not only is it dramatic, but especially now with the flu season and the concern about swine flu, we believe that one of the reasons for why flu occurs at the end of the winter is in part because you're vitamin D deficient.

LAWSON: That's very interesting. I know there's a political aspect to the adoption of health recommendations for vitamins. It's always been a long and controversial issue. What challenges have you yourself faced in trying to educate people about the value of vitamin D?

HOLICK: Well there are a couple of issues. First, the physicians have been taught in medical school that vitamin D is potentially very toxic. It's fat soluble, so you have to be very concerned about how much you take. There's 100 IU in a glass of skim milk, so when I'm recommending 1000 to 2000 IUs, eyebrows are raised immediately saying that this guy Holick is going to cause you to become vitamin D intoxicated.

But in fact, vitamin D intoxication is the rarest medical condition in the world. We know that you have to take more than 10,000 IUs a day before you have to worry about.

LAWSON: What are the symptoms of that condition?

HOLICK: Well, the symptoms are very general and that's part of the problem. Blood calcium is very high, so people are more thirsty. They have to urinate more frequently. They can feel depressed. They can get constipation. So it's not that easy to detect. But like I said, it's a very rare condition.

The other issue I'm confronted with is that I'm out there recommending that parents should be putting their children outside to have some sun exposure that is unprotected because it's the major source of vitamin D, and in fact that all humans on this earth should be getting some unprotected sun exposure because it's the major source of vitamin D. And the problem, of course, is that the dermatology communities have been for 40 years unchallenged telling you never to be exposed to direct sunlight. And in fact, because of my recommendation and coming out with a book, *The UV Advantage*, I was actually fired because I used to be a professor of dermatology for my work in demonstrating that active vitamin D is effective in treating psoriasis.

So I think that there is a lot of controversy, but the data out there are so impressive that now there is overwhelming evidence now for people to begin to think about increasing their vitamin D intake.

LAWSON: Thank you very much for sharing your views with us this afternoon, Dr. Holick.

HOLICK: It's my pleasure and I'm really thrilled to be this year's Linus Pauling Prize winner. I'm just awestruck to be in the same vein and being recognized as Linus Pauling who was such a strong promoter of vitamin C and using nutrients for health. I'm really overwhelmed by that. I think that if he was alive today, there is no question he would be out there promoting sensible sun exposure as good medicine and encouraging people to increase their vitamin D intake.

LAWSON: I agree with you. Thank you very much.

HOLICK: My pleasure!

[THEME MUSIC]

HIRSCH: Thanks for tuning in. This podcast was produced in collaboration with the Environmental Health Sciences Center with funding from the National Institute of Environmental Health Sciences.

On behalf of everyone at the Linus Pauling Institute, we wish you optimum health. Have an awesome day!

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