

## A Special Interview with Dr. Kate Rheume-Bleue

By Dr. Joseph Mercola

**DM: Dr. Joseph Mercola**

**KB: Dr. Kate Rheume-Bleue**

### Introduction:

**DM:** Hello, this is Dr. Mercola, and today I'm joined by Dr. Kate Rheume-Bleue, who is a naturopathic physician. She's the author of *Vitamin K2 and the Calcium Paradox*, which is a phenomenal book about one of the most important vitamins that we know of, which is vitamin K2. It's the best book I've read on this highly underappreciated topic. I'm just delighted to have her here today to share her insights on this really important area. She comes today from Canada. So, thank you for joining us today.

**KB:** Thanks. I'm glad to be here.

**DM:** Well, tell us a bit about your training, and how you first became interested in vitamin K2.

**KB:** Well, I'm a naturopathic doctor, which in Canada (the area I'm in) is a licensed primary care physician, but, of course, with a keen interest in nutrition.

**DM:** Do you have the ability to write prescriptions, too? Not that I would suggest that you do that, but... There's about five or six states in the United States or maybe more (maybe 10) that naturopathic physicians are licensed in and have prescription privileges.

**KB:** In the province of British Columbia, actually we have prescribing rights, but I'm in Ontario. We don't have that yet.

**DM:** Okay.

**KB:** We still do, you know, order and interpret blood tests.

**DM:** Okay.

**KB:** Make diagnoses, can recommend treatments, and prescribe treatments – not prescription drugs just yet.

**DM:** And you went to the Canadian College?

**KB:** Yeah, Canadian College of Naturopathic Medicine. I graduated from there. I did my residency at that college and spent some time on faculty there.

**DM:** Yeah. That's a bit of an anomaly. Because I had a relationship with a woman who went to one of the authentic grad schools, you know, the five or six.

**KB:** Yeah.

**DM:** Is it six in North America?

**KB:** Yes.

**DM:** Six?

**KB:** Yeah, five or six.

**DM:** Yeah. That actually get the four-year credit degree.

**KB:** Right.

**DM:** I actually spoke at that college in Canada once.

**KB:** Oh, yeah?

**DM:** But the most I would mention was that Canadians would graduate from that school.

**KB:** Primarily, and then Boucher Institute in Vancouver is also accredited now.

**DM:** Oh, okay.

**KB:** So, there are two.

**DM:** There's a newer one.

**KB:** Yeah.

**DM:** I didn't realize that. Okay. So, how did you transition into your interest about vitamin K2?

**KB:** I tuned in to the emerging research about K2 early in 2007. Not long before, I had read *Nutrition and Physical Degeneration* by Weston A. Price. When I learned about vitamin K2, I thought, "Hey, you know what? I'm sure Price talked all about this in his book." I went to the book, looked through it, and didn't find any reference to vitamin K2. I was really stumped

A little bit later in 2007, I read a brilliant article by Chris Masterjohn that links vitamin K2 to Prices' work on Activator X. Once I realized that link, you know, the light bulb went on about how important this nutrient is, and how overlooked it's been for so long. It really provides the missing piece to the puzzle of so many health conditions, and yet it was being completely overlooked, despite the overwhelming amounts of modern-day research.

I figured somebody will be writing a book about it soon. I waited a little while, and nobody did. That's when I realized that I needed to do that, because people need to know this information.

**DM:** Terrific. I'm glad you did. That's why as I mentioned earlier, it's really probably – well, it is the best book I've ever read on it. I haven't exhaustively reviewed the others, but I suspect it is the best book ever written on this really important topic. Can you really describe what vitamin K is for our viewers?

**KB:** Sure. Vitamin K is actually a group of fat-soluble vitamins. Of the two main ones, most people are familiar with vitamin K1. When they say "vitamin K," they're referring to K1, which is found in green leafy vegetables and is very easy to get in the diet.

**DM:** And this is actually (excuse me for interrupting) what we really see in the literature or in the newspapers. They hardly ever differentiate between vitamin K1 and K2. They just say "vitamin K" – no number attached to it.

**KB:** Exactly. And that's created a lot of confusion. It's one of the reasons why this big important issue was overlooked and still creates confusion when we learn about this nutrient. K1 found in green leafy vegetables, easy to get in the diet, and exclusively participates in blood clotting. That's its only role in our health.

K2 is very different. It comes from different food sources, and its role in the body is in moving calcium around. Specifically, it will guide calcium into the bones and teeth, where we want it to be. And it will get calcium out to prevent the deposition and even remove calcium from areas where we don't want it to be, like soft tissues and arteries, for example, where calcium can cause hardening of the arteries.

K2 is really critical for keeping our bones strong and our arteries clear. Those are majorly important health concerns, and K2 is a very important nutrient for those health concerns.

**DM:** The other vitamin that we think of with calcium, of course, is vitamin D. Can you comment on the interaction between vitamin D and vitamin K2?

**KB:** This is another really interesting story, because we've heard so much about vitamin D and the importance of vitamin D for our health. And a lot of people are taking vitamin D. Yet vitamin D and K2 partner up together. A lot of the health benefits that you want from vitamin D, really, you need to have K2 to with it for that to work.

When you take vitamin D, your body creates more of these vitamin K2-dependent proteins, the proteins that will move the calcium around. They have a lot of potential health benefits. But until the K2 comes in to activate those proteins, those benefits aren't realized.

So, really, by taking vitamin D, you're creating an increased demand for K2. And vitamin D and K2 work together to strengthen our bones and improve our heart health.

**DM:** Yeah, it's really the cement, the important part of the cement that integrates the calcium into the bone matrix.

**KB:** That's right. You know, for so long, we've been told to take, say, calcium for osteoporosis – calcium, calcium, and more calcium – and vitamin D with that, which we

know is helpful. But then, more studies are coming out showing that increased calcium intake is causing more heart attacks and strokes.

That created a lot of confusion around whether calcium is safe or not. And really, that's the wrong question to be asking, because we'll never properly understand the health benefits of calcium or vitamin D, unless we take into consideration K2. That's what keeps the calcium in its right place.

**DM:** Now, it just occurred to me that many people watching this may not really understand what a naturopathic physician is. Maybe if you can just comment on that, and then after you explain that, comment on a naturopathic physician's perspective on the sources of calcium: supplement versus food.

**KB:** Sure. Well, a naturopathic physician, first of all, at least in my jurisdiction, certainly is a primary care physician. Somebody who would be a first point of contact for your health concerns, who can listen to your health history, give you a thorough physical exam, order and interpret blood tests if necessary, and rather than prescribing a pharmaceutical medication (so rarely those are indicated and do come in handy), can treat your concerns with dietary changes, nutritional supplements, and other natural treatments that work with the body.

The most important distinguishing factor for a naturopathic physician is that we try to look at the underlying causes of your health concerns rather than just treating symptoms.

This is where considering calcium... You know, the recommendation for people to take calcium has become very popular. Everybody is taking calcium and vitamin D. Every doctor – even conventional medical doctors and even the ones who won't recommend multivitamins – will tell their patients to take calcium and vitamin D. Yet this has been a bit oversimplified.

First of all, studies are showing that calcium from supplements seem to pose a greater risk for hardening of the arteries, heart attack, and stroke than calcium from diet. But that being said, we have to keep in mind that heart disease – heart attacks and stroke – is the number one killer of both men and women, whether you're taking calcium supplements or not. We have to understand that calcium can get into the wrong places in all of us.

There certainly are lots of different sources of calcium that we can consider, and that gets into quite a lengthy debate. But really, the most important concern is, "How do we keep calcium in the right place?" I'm not focusing so much on the calcium, but the other nutrients like D and K2 that make calcium safe and effective.

**DM:** Wait, if someone felt, for whatever reason, that they were calcium-deficient, what would be your recommendation to them? Would it be to consider calcium supplement or to seek to find food sources of calcium?

**KB:** First, to look at food sources and look at increasing calcium intake through their food sources. It just so happens that a lot of the very high calcium foods that we would

consider – like cheese, for example – are often very high in vitamin K2. That's important, because I think nature has given us these nutrients together, so they work optimally. That is definitely the first course of action.

And there are some cases in which calcium supplements are indicated. For individuals, for example, who may have osteopenia, osteoporosis, or some kind of bone loss, who find a hard time maintaining adequate calcium intake just through their diet, then therapeutically, calcium supplements do have their place and can be useful, as long as they're taken with the proper balance and nutrients. Magnesium's a big one, and of course, D and K2.

**DM:** Yes. Magnesium seems to be the other stealth nutrient. Sort of the appropriate analogy relative to vitamin K2 to vitamin D, magnesium would be to calcium.

**KB:** Yes.

**DM:** There's an emerging popularity of it and appreciation. But for the most part, most of the focus seems to be on calcium when it comes to bone health.

**KB:** Yeah. It has. That's another area where certainly these calcium and heart health studies had shortcomings, because none of them took into account magnesium intake.

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

We know that magnesium deficiency is common. And when you have magnesium deficiency, or you're lacking in magnesium, and you take calcium, that can exacerbate those problems. Certainly, magnesium complements K2 in a number of ways. Magnesium lowers blood pressure, and blood pressure is an important component of heart disease. Really, there are number of ways in which magnesium is also underappreciated as an important part of good health and complements K2.

**DM:** Dairy foods and vegetables seem to be reasonably good sources of calcium for most people and other minerals, of course. Potassium would be another key, which frequently gets confused with vitamin K, because they both have the letter "K." "K" is the chemical symbol for potassium.

**KB:** Yes. I didn't think about that at all before I wrote the book, and then I kept getting that question. But you're right. People ask about potassium because of the chemical symbol "K," but they're really very different.

**DM:** No relationship at all.

**KB:** Yeah.

**DM:** The dairy and the vegetables are good sources of calcium. What would be good sources of magnesium?

**KB:** Magnesium's a little more tricky. Sea vegetables are a good one, you know – kelp, dulse, nori – those things, but we know that they're not that common in people's diets. Vegetables can be a good source. Grains and whole grains are typically good sources

of magnesium. But they need to be prepared properly, because as you know, whole grains can contain phytates and anti-nutrients that will ultimately block our absorption of magnesium if they're not prepared properly.

That's a situation where a magnesium supplement for therapeutic purposes can come in very useful for people to get enough magnesium to, say, lower their blood pressure, replenish their stores, that kind of thing.

**DM:** Yeah. You may not realize, but my first book that I wrote was *No Grain Diet*. Wait, I've revised my position. I don't think grain should be avoided by everyone. I think there probably is some good benefit from it. But the majority of people seem to benefit from lowering their amounts of grain.

**KB:** I agree. I agree. This whole concept of "whole grain" has gotten far out of control, and then "multigrain." The tricky thing with the grain is that it's just not being prepared properly. Certainly in my book, I say, "If you're not going through the step to prepare it properly, you probably shouldn't be eating it at all."

**DM:** Yeah. I mean, you probably know that in 1960, 10 percent of the population of the United States was obese – 10 percent. The recent projections are in 2030, literally 70 years later, it's going to be 50 percent – 500 percent increase. I think a large variable that contributes to that was this increase in the grains, carbohydrates, and the sugars.

**KB:** Yeah, I agree 100 percent.

**DM:** But grains do serve a role. I believe they are a part of...Used appropriately, you know, the right levels can be a part of a very healthy diet. But still, as you just mentioned, magnesium is a very difficult mineral to acquire. I mean, I think vegetables are useful, because magnesium seems to be an integral component of chlorophyll.

**KB:** Yes.

**DM:** I mean, magnesium ions substitute for iron. Chlorophyll and hemoglobin are pretty similar.

**KB:** Right.

**DM:** But I still don't think it's in large concentrations. It's certainly bioavailable in vegetables –in chlorophyll. But if one wanted to augment or increase the amount of magnesium therapeutically, because most likely they're in a magnesium-deficient state, do you have any recommendations for magnesium supplements?

**KB:** You know, I've seen good results with fairly simple magnesium citrates, even for lowering blood pressure. To speak to your point about it being challenging to get, we have to also keep in mind we like the idea of being able to get all of our nutrients from food. But we're also living under very stressful times, unnaturally stressful times, which really depletes our nutrients far more than we can often recover just through diet.

A magnesium supplement like magnesium citrate, I've seen good results with those for replenishing magnesium stores.

**DM:** Okay. Yeah, the downside of taking magnesium as a supplement – it could be an upside for some people – is that it tends to loosen your stools. It basically serves as a laxative, so you have to be careful. Whereas calcium has a reverse effect: it's constipating.

**KB:** Right. Yeah.

**DM:** Magnesium citrate, of all the supplements, seems to be one that has much less of an impact on the bowel habits. Are you familiar with magnesium threonate?

**KB:** I don't have much professional experience with that, because it has become more popular since I had took a leave from my practice for having a baby, writing a book, and whatnot. But I know that's one that you have done more work with, right?

**DM:** Well, it just seems to be an emerging one that's emerging well.

**KB:** Yeah.

**DM:** Primarily, because of its ability to penetrate cellular membranes – the mitochondrial membranes. It's some really fascinating material in its ability to not only restore magnesium levels, but improve energy levels, and actually have some impact on aging.

**KB:** Yeah. I'm going to definitely check that out further.

**DM:** For study and research.

**KB:** For the next edition of the book.

**DM:** You've differentiated between vitamin K1 and K2. I'm wondering if you can give us an idea of what our needs are, and what the typical person might be consuming in their diet.

**KB:** Well, the optimal amounts of vitamin K2 are just being established, and we're still sort of refining that. But it seems like around 180 to 200 micrograms of vitamin K2 should be enough to activate all of our body's K2-dependent proteins to get the calcium where it needs to be and get it out of the places where it shouldn't be. The most recent clinical trials used around those amounts of K2.

The average person is getting a lot less than that. That's for sure. In the North American diet, you can see as little as maybe 10 percent of that or less. Certainly, not near enough to be able to optimize bone density and improve heart health.

**DM:** Okay. It gets even a little trickier, because not only is there a difference between vitamin K1 and vitamin K2 (which you just mentioned), but then K2 subdivides into a whole variety of other different sublevels of K2.

**KB:** That's right.

**DM:** Why don't you address that for a moment?

**KB:** That's right. It does get a little bit technical, but this is very important for people to understand that there are different types of vitamin K2. The two big categories of vitamin K2 that you'll find are something called MK-4, which is menaquinone-4 and which can be found in butter, egg yolks, and animal-based foods. That's a short-chain form of vitamin K2.

And then there are longer-chain forms that we find from fermented foods. There's a variety of these long-chain forms. The most common one that you'll see is MK-7 or menaquinone-7. This is the one I tend to tell people to look for in supplements, because in a supplement form, the MK4 products that you will find on the shelf are actually synthetic. They are not derived from natural, say, animal-source foods. Those are synthetic, which does create some confusion. Whereas, the MK7 – these long-chain, natural bacterial-derived vitamin K2 – is from a fermentation process. That seems to offer a number of advantages.

The long-chain form MK-7 stays in the body longer. It has a longer half-life, which means you can just take it once a day in very convenient dosing. That's the form used in the most current clinical trials on bone density and heart health. That long-chain form is really very useful and practical.

**DM:** When it's compiled or processed into a supplement, do you know a bit about that process? Is it just specifically extracting the MK-7? Or are there other forms that are in there, too, like MK-9, MK-11, or MK-13?

**KB:** You are getting primarily MK-7, because typically these are being extracted from sources. MK-7 is typically extracted from natto bean, and the actual natto product has about 90 percent MK-7 to start with. Really, you're getting essentially just MK-7. You may have varied trace amounts of the other types of menaquinones (the technical term for vitamin K2). Whereas cheeses, for example Gouda and brie (which are very high in vitamin K2), those will have a whole range of different types of vitamin K2.

**DM:** Well, it's just like vitamin C. You can certainly take the extract of ascorbic acid and take it in high doses in supplement. But you know, the longstanding question has been, "Is that as useful or valuable as the food-extracted source, where you have all these other ancillary micronutrients?"

**KB:** Right.

**DM:** That support the bioflavonoids particularly.

**KB:** Right. You can say the same exactly with the vitamin E, the various tocopherols...

**DM:** Sure.

**KB:** And the numbers of nutrients like that.

**DM:** Tocotrienols.

**KB:** Yeah.



**DM:** The alpha, gamma, and delta. I was thinking that it would be a similar situation here with vitamin K2 that the whole balance in the range – not just extracting the MK-7 – would be beneficial. Because there would probably be some supporting role of all the other versions or forms.

**KB:** That's likely the case. Certainly, the clinical trials are only using an extract typically of just the one form. But you know, as Mother Nature provides us with them in a whole package of all these different ones, they likely work together.

**DM:** As you mentioned, the average person is probably only getting 10 percent of their vitamin K2 requirement, predisposing them.

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First of all, let's get into that. What does this fact mean? What does that translate to?

**KB:** Good point. Right.

**DM:** The fact that people are only taking 10 percent of what... There are recently appreciated understanding of what their optimum needs are.

**KB:** Right. This ultimately leaves us at risk for osteoporosis, heart disease, heart attack, and stroke, as well as a number of cancers. I talked about vitamin K2 moving calcium around the body. Its other main role is to activate proteins that control cell growth. That means K2 has a very important role to play in cancer protection.

When we're lacking K2, we're at much greater risk for osteoporosis, heart disease, and cancer. And these are three concerns that used to be relatively rare. Over the last 100 years, as we've changed the way we produced our food and the way we eat, they have become very common. The lack of K2 is playing a really big role there.

**DM:** Is there any connection to neurodegenerative diseases like Alzheimer's?

**KB:** Oh, definitely. Yeah. There's a fair amount of research on that. I think that's the area of research around vitamin K2 that has the most potential, or maybe is lacking and more work needs to be done. But neurodegenerative diseases like Alzheimer's, even multiple sclerosis, and a number of other neurological concerns.

**DM:** Okay. It's really important that you pay attention to this nutrient, because there's a bulk of emerging research that's supporting this very strongly, probably every bit as much as vitamin D. But vitamin D, of course, has received much of the attention clinically. And I believe that's partially related to the fact that in the late 90s, there was a commercial assay to test for vitamin D that became available. Because for a hundred years, we know it was connected to rickets, and that was about it.

**KB:** Right.

**DM:** But as we've developed an inexpensive assay to test for it and be kept commercially available, then the interest in it sort of exploded. The parallel of that,

however, with vitamin K2 specifically, is that there's still, to this day, no assay. It's basically a research tool...

**KB:** Right.

**DM:** Which probably explains why there's such a lack of appreciation of this: there's just not a logistical infrastructure to make it easy to research on this.

**KB:** Exactly. It does speak to the challenge of K2, because a lot of concerns of K2 are so internal, right? You can't look at somebody and see that they have bone density problems, or they're on the road to heart disease.

**DM:** Just like vitamin D.

**KB:** Exactly. And so much of heart disease goes undetected – even with all the technology – until a heart attack strikes. That's where we really like to have a test to say, "Okay, this is to show I'm absolutely deficient in vitamin K2." And yet the best tests are just not available through clinicians. They really are, as you said, research tools that are being used in academic settings, and they're not available and out there yet.

That being said, research has shown that the majority of adults are, in fact, deficient in this nutrient. By deficient, I mean, that they don't have enough K2 to keep calcium in its right place at all times, increasing our risk for osteoporosis, heart disease, and cancer.

**DM:** And brain disease.

**KB:** Brain disease and a number of other health concerns. I mean, any kind of inappropriate calcification – kidney stones, heel spurs, or even small things – where calcium shouldn't be. And yet without that test, people remain doubtful.

I know that's coming. It wasn't too long ago that we didn't have the test for vitamin D, and now we do. But in the meantime, we really can't afford to wait until we have that test to start getting the K2 back into our diets.

**DM:** Terrific. One of the important principles that you alluded to – I think it's a pretty profound principle in naturopathic medicine – is that really most disease progresses to the point, on average, where they're typically 80 percent on the way there before they had the first symptom. And in some diseases, it's 100 percent.

**KB:** Yeah.

**DM:** Like a heart attack.

**KB:** Yeah.

**DM:** You could have a fatal heart attack, have no symptoms at all, and then you're dead. So, that is really crucial to understand this process that exists. I'm wondering if you could comment – or if you've seen in your review of the literature in K2 – about the prevalence.

You said the majority of people have this. I'm wondering if you can get more specific, because at least the initial research may have changed since the attention has been focused on vitamin D. But with 85 percent of the people that did not have therapeutic levels of vitamin D... And this was even obscured, too, because what is the therapeutic level? What is an optimal level?

**KB:** Right.

**DM:** Because most of the initial research prior to the 90s was focusing on, you know, above 20 nanograms primarily.

**KB:** Right. Which is so low.

**DM:** I don't know which one they're using nanograms or...

**KB:** Yes, nanograms.

**DM:** You know, because your review is a different standard for the index.

**KB:** Yeah.

**DM:** But now we know it's over 50.

**KB:** Right.

**DM:** You know, literally two to three times higher than the original.

**KB:** Right.

**DM:** I'm wondering if there's a comparable specific statement with respect to the number of people, the specific percentage. Is it just sort of the generic majority? Or is it a more specific model?

**KB:** Right now it's generic majority. But you know, looking at the studies, we're seeing an overwhelming majority of people who are deficient in K2, so 80 percent and plus simply don't have all of their K2 proteins activated. That is critical. It's not surprising, given the amount of heart disease, osteoporosis, cancer, and diabetes as well that's implicated.

**DM:** All right. So, pretty similar to vitamin D?

**KB:** Very much so.

**DM:** There's another similarity. It's that they're both fat-soluble vitamins.

**KB:** Yes. That's right. That's an important similarity, because these really are the foundation of our health. They allow us – these fat-soluble vitamins – to make use of all of the other nutrients that we get into our bodies. And that's important.

Even when you talked about the debate on what is an optimal range of vitamin D – and that still continues. How much of vitamin D should you be taking? I do speak about that

in the book, because ultimately, the answer to that question is: it depends. It depends to a certain extent on your K2.

We see a lot of health benefits of vitamin D, where D is healthy and helpful to a certain point. After which point, we see harm with it. Where that point is depends a lot on how much K2 you have on your body. The more vitamin D you take, the greater demand you create in your body for K2, and the greater potential you stand to get from taking K2. They really do work together in so many ways.

**DM:** Yeah. I'm a big fan of getting the majority, if not all of your vitamin D, from exposing your skin to sunlight. And then secondarily, if that's not available, especially for Canadians and most people in North America...

**KB:** Right.

**DM:** (Northern North America) would be, you know, safe tanning beds, because it's the closest approximation. But clearly, that's not going to be available to everyone, so we have to make a concession and swallow a pill.

**KB:** Yeah.

**DM:** But I haven't taken oral vitamin D for years. This is a really important point. I'm wondering if you can expand on it, because it's really crucial. It's something that we don't emphasize enough. I would like to start doing that on a really consistent basis just to warn people the dangers of taking oral vitamin D without the vitamin K2.

I'm wondering if you could give some parameters and guidelines on how to frame it, and what people should be thinking of before they make this decision to swallow oral vitamin D.

**KB:** That's a really good point, because there are so many people on the vitamin-D-mega-dose bandwagon, taking more and more of vitamin D. And it could absolutely be causing harm if you are lacking the K2 to complete the job to get the calcium where it's supposed to be.

We know the symptoms. We don't see symptoms of vitamin D toxicity very often. But when we do, those symptoms are inappropriate calcification. That's the symptom of vitamin D toxicity. And that is actually a lack of vitamin K2 that will cause that. K2 protects you against that toxicity quite simply.

When we talk about nutrients together, we like to hear about ratios and optimal ratios. That hasn't been perfectly elucidated. But I would say for every 1,000 International Units of vitamin D you're taking, you should look at at least 100 micrograms of K2, if not, you know, the 150 to 200 range or something like that to try to even up.

**DM:** That's a pretty large dose, because we worked with Carole Baggerly from Grassroots Health. She's done a study, where she's analyzed the level of oral vitamin D supplementation that's required to reach the therapeutic level, above 50 nanograms per milliliter. She found that it was about 8,000 units.

So, you had previously stated that the typical dose for someone's K2 would be about 150 micrograms to 200 micrograms. If they are taking 8,000, would they have to take a gram? Or a milligram – I'm sorry – of vitamin K2?

**KB:** Eight hundred to...

**DM:** That's a lot of vitamin K2 as a supplement.

**KB:** It is. Yes. That's right. My earlier recommendation was not taking into account people who were doing high dose of vitamin D supplementation. That's where it gets a little bit more technical. It seems that for the average person, around 200 to 280 micrograms will activate your K2 proteins and do a lot of good for your bones and your heart. If you're taking high levels of vitamin D or, you know, 8,000 International Units, that kind of thing, then I would recommend taking more K2.

**DM:** Okay. As high as a milligram?

**KB:** Yeah, as high as a milligram. Again, this is where we need to do a little bit more testing.

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

**DM:** There will be a thousand micrograms, for those that can do the math.

**KB:** Yeah. That's right.

**DM:** Okay.

**KB:** But you need to be doing a little bit more... We need to do a little bit more study on that particular aspect of their duration between those two [inaudible 30:17].

**DM:** Okay. Let's talk about toxicity, because that's the counter side effect.

**KB:** Oh, right. Okay.

**DM:** Because a lot of the supplements we recommend like astaxanthin or ubiquinol, essentially there are no known toxicities of it. Well, ubiquinol for sure, but maybe very large doses of astaxanthin. But what are the toxicities of a large dose of vitamin K2?

**KB:** That's the really good news. K2 has no toxicity. There is no known toxic effect. This is something that we see again and again in the literature. That's surprising for people to hear, because we're used to – with fat-soluble vitamins – their being potential for toxicity.

The reason why K2 doesn't have potential toxic effect is that all that K2 does is activate K2 proteins. It will activate all the K2 proteins it finds. And if they're all activated and you take extra K2, it simply won't do that. That's why we don't see a potential for toxicity the way we do with vitamin A or D.

That's the really good news about K2 – and why you don't necessarily need to wait for a test, because we know a lot of good health benefits and no downside. It's a good thing for you to be taking.

**DM:** Yeah. I spoke to Dr. Vermeer, who's like one of the leading researchers in this.

**KB:** Yes.

**DM:** He was really adamant about that it had no known toxicity at any doses.

**KB:** Right.

**DM:** Just getting back to the interconnection with vitamin D, it would seem that the reason for the increased need for vitamin K2 (when you're taking high dose of vitamin D), is that vitamin D somehow stimulates or activates these vitamin K2 proteins.

**KB:** Exactly.

**DM:** So, the protein goes unactivated by vitamin K2. There's more of them, that's why you need more vitamin K2.

**KB:** Exactly. By taking D, you're essentially creating a greater demand in your body for K2. You take D at high doses for a long time and don't have the K2? That's when you're going to start to see problems. Or at the very least, you'll be missing out on a lot of the benefits that you want from your D.

**DM:** Now, this is a really important part, maybe one of the most important parts of the interview. Because of the fact that there is no vitamin K2 test, let's create one empirically. What type of quiz would you give a person to know that if their answer to these questions...

**KB:** Right.

**DM:** Is "No," then the likelihood of them being vitamin K2 deficient is very, very high? Considering 85 percent of the people watching this are K2-deficient. I'm sure we're both in agreement.

**KB:** Yes.

**DM:** That the ideal way to get your vitamin K2 is not through a supplement.

**KB:** Yeah.

**DM:** It's through food.

**KB:** Yes.

**DM:** And that's the way we're designed to do it. Why don't you see if you can take a stab at answering that question to give people a tool or resource, so that they can identify if they're at risk?

**KB:** Right. Well, there are two ways you can identify this. You can go through a long list of health concerns and symptoms, you know – osteoporosis, heart disease, diabetes, and all of these things. If you have any of those concerns, then you are likely K2-deficient, because they're all connected to K2.

**DM:** Like you're saying, you actually have these conditions?

**KB:** You have these conditions.

**DM:** Not just worried about it.

**KB:** That's right. But for the people who don't have those conditions yet (because those can go silently progressing for many years), it's very simple.

Do you eat grass-fed foods? Do your eggs, butter, and dairy products come from animals that are grazed on pasture? If not, then you're probably low in vitamin K2. Do you eat certain types of special fermented foods? Natto (it's a fermented Japanese soybean food) is the highest food in vitamin K2, which virtually nobody is eating here in North America, but certainly in some areas of Japan. Or high amounts of goose liver pâté, brie cheese, or Gouda – these sound like unusual foods, but they are the cornerstones of certain European (very heart-healthy European) diets.

First of all, an important thing to mention when it comes to cheese (because this becomes an area of confusion), because cheese is a bacterial derived form of vitamin K2, it actually doesn't matter if the cheese came from grass-fed milk. That would be nice, but it's not the grass-fed milk that went into the cheese. It's the bacteria making the cheese, which means it doesn't matter if you're importing your brie from France or getting it domestically. Brie cheese. the bacteria that makes brie cheese. will make vitamin K2.

**DM:** Is that one that's specifically high in K2?

**KB:** That's one that's specifically high. Brie and Gouda are two cheeses that are quite specifically high.

**DM:** What's the concentration per ounce typically?

**KB:** You're looking at about 75 micrograms per ounce.

**DM:** Okay.

**KB:** Or something like that.

**DM:** So, you need three ounces.

**KB:** Three ounces.

**DM:** A day.

**KB:** That's a fair amount of cheese.

**DM:** Yeah. Not significant.

**KB:** Right. That's right. That's a fair amount of cheese. And you know, as much as you love cheese, it's still hard to eat that much of it.

**DM:** And that's the high-concentration cheese, because most of the other cheeses are lower, right?

**KB:** That's right. Most of the other cheeses are lower. Now, the research also did mention a curd cheese, but I'm trying to discern in North America what that means. Because there's a number of different types of cheeses that would fall into that category. It still takes a fair amount of cheese to get this, but the benefits are substantial.

In the population-based studies that show that K2 levels will decrease their risk of heart disease and prostate cancer, it was actually cheese consumption that was the major determinant of that K2 intake.

**DM:** Interesting.

**KB:** It was cheese intake that was protecting those individuals from heart disease and prostate cancer.

**DM:** Very interesting.

**KB:** Yeah.

**DM:** My guess is that... Certainly both of us are not fans of pasteurized dairy. But if you were to consume pasteurized dairy, does that affect the K2 levels? Or is it immune to pasteurization?

**KB:** That's a question that keeps coming up and has not been examined. Certainly, K2 is affected somewhat by heat. It's not obliterated by heat, but it's somewhat. But frankly, it just hasn't been studied yet, so we don't know whether pasteurization affects that. Fortunately, since the bacteria for culturing or making cheese are added afterwards, if the milk was pasteurized before, again with cheese you're safe.

**DM:** It won't matter.

**KB:** With grass-fed milk, we don't know. Yeah.

**DM:** Okay. How about some of the common commercially used cheeses like cottage cheese or American cheese?

**KB:** Right.

**DM:** American cheese.

**KB:** God, American.

**DM:** Colby.



**KB:** Cottage cheese could very well fall into the category of this curd cheese.

**DM:** Curd.

**KB:** That was considered to be very high in vitamin K2. But I didn't mention it in the book, because I want to make sure I was recommending people to eat the right types of cheese before we say specifically which ones.

Cheddar did make the list of having some K2 in there, but you'd have to probably eat about a pound of cheddar a day to get a therapeutic amount there. So, those are the big ones that have been tested. There hasn't been extensive testing done.

**DM:** We know all that fat would increase your risk of heart disease, so I wouldn't recommend that.

**KB:** Oh, right. Fortunately, the K2 protects from that.

**DM:** Oh, I was just kidding.

**KB:** Yeah, I know. But this goes back to the whole idea of the French diet.

**DM:** But Dr. Vermeer wasn't, when I interviewed him.

**KB:** Oh, really?

**DM:** Yeah. He liked warned against eating cheese for heart disease.

**KB:** No.

**DM:** Yes. He just... That's the problem with some of this research.

**KB:** But that's the whole point. Oh, no.

**DM:** They become so myopic. They just know about their little area of research, and they don't see the bigger picture.

**KB:** Yeah. Because the bigger picture is you don't have to be concerned about the fact of the K2 in there.

**DM:** Right.

**KB:** Not to mention the fact that the whole sat fat thing has been quite thoroughly debunked in medical literature.

**DM:** Right. Which is the more appropriate.

**KB:** It just hasn't made it into the media.

**DM:** Sure.

**KB:** Oh, that's disappointing. So, it speaks to the whole idea of healthy European diets. What we used to consider the French paradox, the supposed contradiction between

their high intake of saturated fat and creamy rich foods and low risk of heart disease. Well, it turns out that goose liver pâté, brie cheese, butter, and egg yolks are some of the highest foods in vitamin K2 when they're produced properly. There really was no paradox. The French were simply happily stuffing themselves with this nutrient that would clear out their arteries.

**DM:** Yeah. And there's another interesting observation, too, that this French paradox was referred to the regular consumption of alcohol, which has ethanol in it. It turns out that there is a regular source that we get, a methyl alcohol or wood alcohol, primarily through processed foods and even healthy foods like vegetable juice, fruit juice, or any decayed foods.

Those bacteria, those putrefying bacteria, will convert the methanol that's normally present in food and make it available as methyl alcohol, which is a very pernicious toxic poison that converts very rapidly into formaldehyde once it hits the alcohol dehydrogenation.

Methyl alcohol just permeates in 15 minutes just about every place in your body, but specifically in the brain. It can accelerate diseases like cardiovascular diseases, diabetes, Alzheimer's, and autoimmune diseases. The interesting point in here, the reason I mentioned this (with respect to the French paradox), is that if we have small amounts of alcohol on a regular basis (it's believed that our intestinal bacteria can produce this), the ethyl alcohol will preferentially activate the alcohol dehydrogenase.

**KB:** Right.

**DM:** Allowing the methyl alcohol to be excreted through the urine, lungs, or the sweat, so it's not toxic. That may be another reason for the explanation...

**KB:** Right.

**DM:** of the French paradox.

**KB:** I love it.

**DM:** Which is not widely known. Because the typical explanation, of course, is the bioflavonoids and the lots of the...

**KB:** The resveratrol. Yeah.

**DM:** Yeah, polyphenols and resveratrol. That's another interesting point.

**KB:** Interesting.

**DM:** But the K2 is, you know, it's probably not one specific issue.

**KB:** Sure. Right.

**DM:** But it's this combination, which goes back to one of my earlier comments, to endorse the RAP principle, which was to Replicate Ancestral Practices.

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

**KB:** Yeah.

**DM:** The closer we get to reproducing those lifestyle patterns of what our ancestors did, the closer we're going to be able to optimize our genes and our biochemistry to push us toward health which we're designed to be and to stay away from disease. It's just where our body wants to be.

**KB:** And basically, if you don't have either grass-fed foods or these certain fermented foods in your diet, then you can pretty much be guaranteed that you are K2-deficient.

**DM:** Yeah. I just wanted to thank you for reviewing that. That's a really great way to help identify if you're deficient for this. I'd like to expand on that, that we had done some initial research, because there's just not really a lot of studies published on this. But fermented vegetables, which are one of my new passions, primarily for supplying all these beneficial bacteria back into our gut. It wasn't previously known until we did this.

We just sent out samples of the high-quality fermented vegetables (with organic vegetables to start with) in a very specific starter culture, not just the bacteria that are naturally indigenous to the vegetables before or while they're grown. We augmented it somewhat. And with that process, we were able to show that in a typical serving of about two to three ounces of fermented vegetables – that's a really high amount. Most people starting fermented vegetables should not go that high. It should start like half a teaspoon.

**KB:** Yeah.

**DM:** It takes a while to go up that level. But that's a reasonable level. I had frequently doubled that. But in that type of dose, you can expect to find 10 trillion beneficial bacteria – 10 trillion. I mean, which is enormous. That's the equivalent of one whole bottle of a high-potency probiotic supplement, a whole bottle of a hundred.

But in addition to that... Here's what's really exciting. The vitamin K2 we found and analyzed... Actually, we did some initially with our initial starter strains, and then we augmented it with special strains that are known to produce or increase vitamin K2. We found 500 micrograms of vitamin K2 in a two- to three-ounce of serving.

**KB:** Very big range.

**DM:** Well into and beyond what you would need normally.

**KB:** Right.

**DM:** And even into the range where you want to consider taking supplemental vitamin K2 if you're taking supplemental vitamin D.

**KB:** And I think that experiment really speaks to the fact that all cultures traditionally would have had fermented foods and that would have provided them with K2 to keep

them healthy. And your point that you're using a special culture – because it really is the bacteria that make the K2.

And not every bacterium makes K2. For example, most yogurts have almost no vitamin K2. Certain types of cheeses are very high in K2, and others are not. It really depends on the specific bacteria. You can't assume that any fermented food will be high in K2, but some fermented foods are very high in K2.

**DM:** Yes, indeed. That's a very good point. I'm wondering if you could expand and summarize some of the science behind the mechanism for vitamin K2 and its interaction with heart disease, because of the calcium connection that you referenced earlier.

**KB:** Sure. What blew me away about K2 was the amount of research about so many different health concerns that was already out there, and yet people weren't talking about it. It wasn't making it into the media and hadn't been compiled. Heart health is one of those areas.

There are multiple levels of scientific evidence for vitamin K2 and heart health. There are epidemiological studies, population-based studies that show that people who have higher amounts of K2 in their diet have lower levels of heart disease. It makes a significant difference and a large significant difference. There's a population-based study showing K2 intake lowers the risk of heart disease, as well as prostate cancer and death from heart attack.

And then there are in vivo studies or animal-based studies, where they look at animals with calcification in the arteries, administering vitamin K2, and seeing a reduction in that calcification in the arteries of up to 50 percent reduction in hardening of the arteries in these animal-based studies.

Then we have clinical trials. There's a big one that was just completed this summer. The results will be published very soon, but they've already shared some of the preliminary results showing excellent effect of vitamin K2 on essentially reversing heart disease.

**DM:** I see. Can you go into some of the science and the proteins that are involved with that?

**KB:** Sure. To keep it simple, you can think of two major sets of vitamin K2-dependent proteins in the body that move calcium around. We have osteocalcin. This is a vitamin K2-dependent protein that will take calcium from our diet and guide it into our bones and teeth. When we, for example, take vitamin D, that boosts our production of osteocalcin. The osteocalcin remains inactive and useless until the K2 comes in and activates it.

There's another protein whose job is to take calcium out of the places that we don't want it. This is called MGP or matrix gla protein. This, again, will circulate in the body not doing anything until K2 comes in and activates the MGP. It will cause that to go find calcium in arteries, heart valves, and all kinds of soft tissues, and remove the calcium from those areas, effectively reducing hardening of the arteries and reducing your risk of heart attack.

**DM:** So, these two key proteins – activated osteocalcin and MGP – are really the key ways the benefits of vitamin K2 are mediated?

**KB:** That's right.

**DM:** It's been a while since I've looked at the studies, but do the researchers use these two proteins to assay these proteins within the bloodwork of people to identify if in fact they're K2-deficient?

**KB:** That's right. Those are essentially the markers: how much of those proteins are activated or not. When you're looking at this MGP (the protein that removes calcium from your arteries), you can essentially see how much of it do you have circulating in your bloodstream. And of that circulating, of the protein that's there, how much of it is active and actively taking calcium out of your arteries, and how much of it is inactive. That will tell you if you have enough K2 or how much K2 you have to make that happen.

**DM:** Calcium always gets a bad rep for hardened arteries and the plaque where it's deposited in. And it's this MGP protein, I think, that's believed now to be responsible for removing the calcium from the plaque.

**KB:** That's right.

**DM:** And if it's deficient, then you're going to be more likely to set up a condition to where it's deposited.

**KB:** That's right. This is so important, because for so long when it comes to heart disease, the focus has been on cholesterol, cholesterol. Yet we know of individuals who have absolutely normal cholesterol levels and then have a great big heart attack, possibly fatal heart attack. That is because whether cholesterol is high or low, what's important is do you have plaque building up in your arteries (calcification of the arteries)?

I do certainly talk about that in the book, keeping cholesterol in its place and understanding when it's important, when it's not, and when really you need to be concerned about what heart disease is. It's this buildup of plaque, and K2 will activate the protein that will just take that calcium plaque out of there.

**DM:** Have you seen vitamin K2 being used therapeutically to actually reverse this process?

**KB:** Oh, definitely. Yeah.

**DM:** Maybe you can comment on that.

**KB:** Certainly, yes. For example in chapter four of the book, I do include a case that was contributed by a cardiologist who has used vitamin D and K2 together in his practice to remove calcifications. In this particular case, it was a calcification on a heart valve, which typically would be considered to be something that would need surgery to correct and to be able to restore that to essentially a normal healthy heart valve. You

can actually remove these calcifications through diet and through therapeutic use of these nutrients.

**DM:** I had previously belonged to an organization called ACAM, which is the American College for Advancement in Medicine. They popularized a treatment called EDTA chelation, where they inject this intravenously or sometimes it could be taken orally to chelate the calcium out of the plaques for people with severe coronary disease or arterial calcification. It certainly is useful for many people, but it's relatively expensive, and it's a certainly inconvenient process that requires 40 to 50 intravenous treatments of an hour, few hours, or so.

My objection to that strategy, even though I did it for a while, was that there wasn't a strong emphasis on changing the diet and doing these natural therapies.

**KB:** Right.

**DM:** Which are really treating the foundational cause of the problem.

**KB:** Right.

**DM:** If you don't treat the cause, you're going to come right back.

**KB:** Right.

**DM:** This would seem to be a far... It's certainly at least an adjunctive therapy, if not really an effective alternative in treating people.

**KB:** Yeah. I mean, this is essentially nutritional chelation, if you will. That sounds incredible. Even to say that there's a vitamin that can move calcium from your arteries sounds incredible. But that's only because we think of heart disease – we call it “the silent killer” – that it's just going to sneak up on us. It's going to get us or it's not. We don't know if it is or if it isn't.

But in fact, the body has always had ways to deal with calcium. We've had to deal with calcium since we have evolved and as long as human beings have been alive. It shouldn't be a surprise that the body does have a system to get it out of where it's not supposed to be.

It's just dependent on certain nutrients, and K2 is the big one. As long as the body has enough of this nutrient, it will keep the arteries clear.

**DM:** Terrific. Well, thank you for expanding on the mechanism with heart disease. Is it a similar mechanism with some of these other illnesses like cancer or brain disease?

**KB:** It's a somewhat different mechanism when it comes to cancer.

[-----50:00-----]

There's actually a third protein that vitamin K2 activates that controls cell growth and cell proliferation, which is called GAS6. This vitamin K2-dependent protein seems to

play an important role in, again, controlling whether cells are differentiating properly or growing out of control, which is what makes it very important in cancer protection.

Prostate cancer is a big one. We've seen a lot of research about that. But leukemia, breasts, or almost any kind of cancer you can imagine.

That was really what shocked me. It's the amount of research that was there about vitamin K2 and a variety of cancers – big cancer killers like lung cancer. Lung and prostate cancer are the two bigger cancer killers of men, and vitamin K2 plays a very important role in fighting those.

**DM:** It really should be an integral strategy for any approach to decrease or even treat cancer. I mean, it's just crazy not to.

**KB:** Yeah.

**DM:** Has your research (the ones you've read) differentiated between the effects of K2 to treat the cancer versus preventing it?

**KB:** Yes. There are two bodies of research, quite a bit of research on K2, to treat cancer. Leukemia's the big one that keeps coming up that seems to be the biggest body of evidence, but there are other cancers that were implicated in terms of K2 and treatment. And then for prevention, that's where we see, again, the big cancer killers like lung and prostate cancer in terms of K2 and cancer prevention.

**DM:** Now, sometimes when you're treating the disease, the dose recommendations change, because you actually have an aberrated situation. Would that be the case for someone with cancer? Would they need a higher dose than 200 micrograms, or they need something like a thousand or 2,000 micrograms?

**KB:** That's possible. Now, when it comes to cancer, the majority of cancer treatments and clinical trials have used (because it's older research) a synthetic form of vitamin K2, so we see...

**DM:** The MK-4?

**KB:** The MK-4. But 45 milligrams of MK-4.

**DM:** Maybe you could comment on that. What the doctors were recommending was MK-7.

**KB:** Oh, yeah. You're right. All this time we've been talking about vitamin K2 doses in micrograms.

**DM:** Right.

**KB:** So, 200 micrograms, it's an extremely small amount of this nutrient. That applies to the long forms, the MK-7 forms. MK-4, because it's a shorter form, it leaves the body more quickly. It actually is required in much higher amounts. We're talking about

milligram doses. Forty-five milligrams is typical. Forty-five milligrams is 45,000 micrograms.

**DM:** Forty-five thousand.

**KB:** That is a much higher dose, and usually that needs to be a divided dose three times a day, because it leaves the body so quickly. There is a big difference when we're talking about dosage in terms of the MK-4 versus the MK-7.

**DM:** Interesting.

**KB:** Yeah.

**DM:** It sounds to me like since almost all the initial research was done with the synthetic and most likely by inferior form of supplementation, we don't even know yet the extent of the range of the benefits of the beneficial natural form, the MK-7.

**KB:** We don't. You know, I liken this MK-4 - MK-7 – the synthetic to natural – like vitamin D2 to D3. There was so much initial research on vitamin D2. As it was in synthetic form, it makes it easier to be produced in the laboratory. There was so much research focused on it. Over time, we realized that D3 or the natural form is superior.

It will be the same way with vitamin K2. There was a lot of initial research on MK-4 (the synthetic form), but as time goes on we realized that the natural MK-7 form is just superior, and there will be much more research being done on that.

**DM:** But what's your gut feeling? Do you think that if someone was suffering with a cancer now... I mean, in some subgroups, the number one cause of death is cancer. It affects a lot of people who are watching this or someone that they know really well. Would it seem wise to take a higher dose?

**KB:** Yes.

**DM:** And what would the dose be? Because it's not toxic, the only thing that's going to be a problem here is really the cost of it. But again, we encourage people to get this naturally through food, not through supplementation.

**KB:** Yeah. My sense is certainly for people who already have a health concern, something like a cancer. You have to consider the body's needs for K2 on a daily basis for your bone and heart health, and then additional K2 to activate the proteins to get the cancer under control. You're looking at a higher amount. Be that a thousand or 2,000 micrograms. I have had people contact me who have taken 12 times what I recommended in the book and actually had phenomenal...

**DM:** Which is 200 micrograms?

**KB:** Two hundred micrograms. Actually, in the book I recommend 120 micrograms, but I've since increased my recommendations to around the 200-microgram mark based on the most current research. But I had people who, for whatever reason, misinterpreted that, were taking 12 times that, and got phenomenally good results – much better



health results than expected. These are just a few cases, but it's promising that higher doses are beneficial.

**DM:** What would likely be the mechanism in the cancer? When you're increasing the amount of vitamin D, you increase these proteins that need to have vitamin K2 activated. Is cancer producing some other type of protein that needs K2 to address it or to suppress it? Or what's the mechanism?

**KB:** Pretty much. We see cancerous cells producing certainly the one mechanism that we know. And we know that there are probably a few different ones. There is this GAS6 protein, K2-dependent. When it is activated, it will control cell differentiation, as well as suggest or encourage apoptosis. That's programmed cell death. Essentially, when the K2 is present, these proteins encourage cancer cells to either differentiate into normal healthy cells or just simply die.

**DM:** If a cancer is present already, it's producing more of these GAS6 proteins?

**KB:** That's right. Which is interesting, because it suggests that the cancer you know, when looking for cancer treatments, that the cancer itself contains and is producing the proteins needed to treat it.

**DM:** You know, we were just reflecting on this the other day at lunch with some of my staff members. I think we are approaching the 40<sup>th</sup> anniversary of the War on Cancer developed by President Nixon in the '70s or 41 years ago, I believe. It was '71 when he started it. We directed large amounts of resources both financially and some of the best scientists that we have. It's been nothing but an abysmal failure.

**KB:** Yes.

**DM:** It was nothing but failure.

**KB:** Quite a bit, yeah.

**DM:** I mean, overall, the death rates from cancer have not changed. They have not changed. Yet we fail to ignore the powerful evidence of something basic and simple as vitamin K2, which is almost free.

**KB:** Well, this may be the problem. It's almost free, it's natural, and you can't patent it. Yet this is how human beings would have always fought cancer, heart disease, and osteoporosis.

**DM:** Yeah.

**KB:** But yeah, not a lot of money to be made in natural substances.

**DM:** The other important fat-soluble vitamin that we know that has a profound benefit, at least from epidemiological research, is the vitamin D.

**KB:** Right.

**DM:** We've talked about the connection with calcium and vitamin K2. But with respect to cancer, is there some specific synergy with vitamin D and K2?

**KB:** That is an area that seems to be lacking in terms of the research. Whenever I see really any beneficial studies on vitamin D (there are so many of them). now I wonder, you know, to what extent is K2 involved. That's an area that the synergy between vitamin D and K2 with regard to cancer needs to be investigated further.

**DM:** Are there any other health benefits that you can expand on with vitamin K2?

**KB:** There are so many other health benefits. K2 has been shown to be involved in improving insulin sensitivities. So, diabetes, which is another major epidemic, it's very important here. Boosting fertility, primarily for men. We know there's a very specific mechanism by which K2 helps boost fertility. A number of other concerns...

**DM:** So, it might be good for vegetarians who are taking high amounts of soy?

**KB:** Oh, absolutely.

**DM:** Or genetically modified foods?

**KB:** Oh, definitely. That would be a big one. Something that I really hope comes out of the book... If one thing comes out of the book, it would be an understanding of the importance of vitamin K2 for women who are trying to conceive, who are pregnant, and growing healthy children.

K2 plays a very important role throughout pregnancy (for the development of teeth for both primary and adult teeth, the development of proper facial form, healthy facial form, as well as strong bones), then again throughout childhood to prevent cavities, and through adolescence as the skeleton is growing. Really, it's so important for pregnancy, childhood, and young adulthood, this nutrient.

**DM:** Are the requirements any higher in pregnancy, especially the third trimester?

**KB:** That hasn't been investigated. We know in the first trimester, we need K2 for the development of primary teeth; second trimester, for the development of adult teeth and the face. And then we know that in the third trimester, women's K2 levels tend to drop. There's an additional drain on the system there. So, really it's just as important. Perhaps it's even more important to make sure women are getting a lot of K2 during that third trimester of pregnancy, and then again while breastfeeding.

**DM:** Especially in light of the fact of virtually no toxicity, it would seem reasonable to recommend double or maybe even triple the amount just to be safe in the third trimester?

**KB:** Very much so. I just had a baby, and I tripled my K2 intake.

**DM:** Are you saying "triple?"

**KB:** I tripled my K2 intake throughout the pregnancy. Yeah.

**DM:** Okay, throughout the pregnancy.

**KB:** Yes.

**DM:** I got to say this. Sorry. But if you're going to only focus on one small section, the third trimester is the most important. Because frequently, first trimester...I mean, the requirements aren't going to be much more, because you're talking about a baby that's only two grams.

**KB:** That's right.

**DM:** And you may not even be aware of it until two months into the pregnancy, you know, almost out of your first trimester.

**KB:** That's right. This was a combination of increasing K2-rich foods as well as supplements, because during that time you really don't want to take any chances. You want to make sure you're getting that intake every day. Yeah, I tripled it really throughout the pregnancy.

**DM:** Did you have natto?

**KB:** I tried very hard to have natto and didn't work out that well.

**DM:** Yeah, of course, it's fermented soy. It may have some problems with its smell, but the fermentation process should eliminate most of that. But it is a challenge.

**KB:** It's a real challenge.

**DM:** From the odor to the texture, it's a big challenge.

**KB:** That's it.

**DM:** I did consume it for a while. It's relatively inexpensive and easy to find in Asian food stores, but not in a regular commercial stores.

**KB:** And you don't need much.

**DM:** Yeah.

**KB:** I mean, studies show...

**DM:** What are the concentrations? I mean, was it like half a teaspoon or something?

**KB:** Well, a typical serving of natto, as you know, is about an ounce or an ounce and a half.

**DM:** Yeah. But you don't need that whole serving.

**KB:** You don't need that whole serving.

[----- 1:00:00 -----]

That ounce and a half would contain about 400 micrograms to 500 micrograms of vitamin K2.

**DM:** Is that in a whole ounce? I thought it's a little higher than that.

**KB:** It would be a thousand micrograms or 1,100 micrograms for four ounces, as I recall.

**DM:** Oh, I didn't realize that.

**KB:** Yeah.

**DM:** Interesting. The fermented vegetables may be higher in concentrations.

**KB:** They may be. Yeah.

**DM:** Than natto. Oh, my gosh. I didn't realize. I thought it was... For some reason, my memory of natto concentration was far more concentrated than I thought it was.

**KB:** No. It was 1.100 micrograms for. I think. that was in four ounces.

**DM:** Yeah.

**KB:** No. that was three ounces – 1.100 micrograms for three ounces. That works out about 350 for that little serving.

**DM:** Okay. So, it's still probably higher, maybe twice as high.

**KB:** Uh-huh.

**DM:** But pretty comparable and a lot more palatable. Probably more beneficial, because natto has one specific bacterial strain in there that produces the K2, but the fermented vegetables have a whole wider variety.

**KB:** That's right. It's important to mention – again, we're back to certain bacteria will make K2 and others don't. Natto has K2. Miso and tempeh. those other fermented soy foods. don't have K2. That's important for people to keep in mind, if they are consuming those foods.

**DM:** Here's an important question and one that is probably not well-researched. But it's my understanding that, as you mentioned, the bacteria produce the vitamin K2. If we have an optimized gut flora, won't those bacteria in our gut produce vitamin K2?

**KB:** Not so much for human beings.

**DM:** Oh, they don't.

**KB:** For whatever reason, humans are not efficient converters of K2. We don't make our own. Herbivores – cows, chickens, pigs, and all those creatures – they do convert grass and green leafy vegetables (the K1 in there) to K2. That's why grass-fed animals have

higher content of K2 in their diets. Humans do a little bit, but not enough to meet our needs.

**DM:** Okay. Even in an optimized gut flora?

**KB:** Even in an optimized gut flora, it seems that it's not enough to meet our needs.

**DM:** Interesting.

**KB:** You can't. There have been a lot of studies looking at having a high intake of K1 and how this affects your K2 levels. It's almost impossible and very, very difficult to get enough K2 just by having a high K1 intake. It's almost impossible to do.

**DM:** Okay.

**KB:** And actually, something very interesting I learned is that even our primate ancestors couldn't do this. For example, chimpanzees, these creatures, they would have gotten preformed K2 from insects primarily and other food sources. They also could not make this conversion by just having vegetables.

**DM:** Interesting.

**KB:** Yeah.

**DM:** Well, let's just comment back on perhaps the ideal and optimal form, which would be fermented vegetables, the easiest. Cheeses would also work, too. But many people have problems with dairy. There's some controversy in dairy, too.

**KB:** Right.

**DM:** But I don't think there's any controversy in fermented vegetables.

**KB:** No.

**DM:** I mean, no one's going to disagree this is a phenomenal superfood. I'm just wondering if you can comment on historical patterns of our ancestors with respect to... I mean, refrigeration is a relatively recent innovation.

**KB:** Yes.

**DM:** A hundred years old?

**KB:** And it hasn't been our friend in the health department.

**DM:** I'm sorry?

**KB:** It hasn't been our friend in the health department (refrigeration), because it has forsaken our fermentation processes – the fridge, right?

**DM:** Oh, right. Absolutely. I thought it was the legal, the health department of refrigerators.

**KB:** Oh, no.

**DM:** No.

**KB:** Yeah.

**DM:** In health areas, there's no question.

**KB:** Yeah.

**DM:** I haven't studied this. But it would be my guess that our ancestors for many generations back, obviously if they lived in non-subtropical or tropical environments, they couldn't grow vegetables year-round or fruits to consume. They had it stored in some way. Otherwise, they're going to go for months or perhaps the majority of the year depending on where they live without these foods. How did they preserve those foods, so that they were usable? It was obviously fermentation. But how long have they been doing that for?

**KB:** Well, that is probably a very long time, a lot longer than we might think. This would be, as you said, a traditional way to preserve foods throughout the year. Those foods, in addition to being able to preserve them, the fermentation process would increase the availability of specific key nutrients. It's likely that all healthy cultures have had fermented foods that provided them with vitamin K2, for example, to maintain their health. And this is certainly what Weston A. Price showed in his work.

**DM:** Sure.

**KB:** To have these foods in the diet, in addition to grass-fed foods. But these fermented foods would provide a source of these nutrients year-round.

**DM:** Yeah. You know, one of the guiding principles I use to evaluate new approaches, therapies, or evidence that's published in the research that contradicts what we know to be healthy is to follow the principle of what I call RAP, which is the replicate ancestral practices.

**KB:** Yes.

**DM:** Which is really a big part of what naturopathic medicine's all about.

**KB:** Yeah.

**DM:** If we can just reproduce in our life the patterns, process, the strategies, and lifestyles that our ancestors did, more than likely we're going to activate the genes and the biochemistry that's going to push us toward health and away from disease just spontaneously, because that's what our bodies are designed to be.

That's one of the reasons I'm so fond and passionate about vitamin K2, because it's one of this RAP principles that has basically been ignored and underappreciated.

**KB:** Yeah, I agree. That's my rule of thumb for evaluating any new study that comes out, especially ones that seem particularly suspicious. I think, "Well, could people have

traditionally done this? Could they have gotten the benefits of these foods?" You hear about unusual supplements that come from very exotic sources that people just wouldn't traditionally have eaten. That's a great rule of thumb, and K2 does certainly follow that principle.

**DM:** Maybe we can comment on some of the other fat-soluble vitamins and how they interact with K2. That would be vitamin A and vitamin E.

**KB:** Yeah. I do devote a whole chapter in my book to the relationship between vitamins A, D, and K2 in particular, as well as information with vitamin E. Because as much as we love to hear about the great super nutrient vitamin K2, it doesn't work alone. No nutrient works alone. There really is an important relationship between those three nutrients in particular. We've heard so much about vitamin D, and it's really the darling of the media industry for good reasons.

And yet on the flip side, we hear it seems there's nothing but bad press about vitamin A. It has been really demonized and vilified quite unrightly. There is a relationship between A, D, and K2. You really do need all of these nutrients to work together.

Essentially, when you take vitamin A and D together in the diet, they will upregulate the production of certain K2-dependent proteins. You really do need those together to make it work. They also do help move calcium around the body.

So, vitamin D helps us absorb calcium. K2 then takes it and puts it into where it's supposed to be and takes it out. When K2 takes calcium out of arteries, for example, vitamin A helps guide the calcium out of the body. You actually need that whole cycle and that balance of nutrients to make sure the calcium's where it should go.

**DM:** Are there any general guidelines you could offer with respect to knowing if you're consuming enough vitamin A? And vitamin A is a little similar to vitamin K2 or K.

**KB:** Yes.

**DM:** Because there's no A1.

**KB:** That's right.

**DM:** Or there's no A2.

**KB:** Yeah.

**DM:** Or AK7.

**KB:** Yeah, that's right. Yeah, that makes it very much easier. This is another nutrient in which our intake has really declined. You know, the nutritional practice of having liver once a week, for example, or forcing your kids to eat liver once a week, people don't do that anymore. The consumption of liver a week...

**DM:** Is that the highest concentration source?

**KB:** Absolutely the highest concentration source. That has really declined. Sometimes that's because the sources we can have for liver... You know, we obviously want this to be from a clean-sourced animal – again, out on a pasture. That will be a clean food.

**DM:** Not exposed to toxic pesticides or...

**KB:** Right. Or, you know, factory farming or feedlot, that's not going to be as clean an organ, because that's a major organ of detoxification. But our consumption of liver has gone down – and cod liver oil. Those two foods used to be just a regular part of the diet. Whether you liked it or not, you have those. They provided vitamin A on a regular basis. We just don't have those anymore.

I do speak to the fact that you can't rely on vegetable sources – beta-carotene, for example – to provide your vitamin A. There are a lot of problems with the conversion, and you can't guarantee.

**DM:** Would that conversion challenge be present in most of the population, because we're not healthy? Or if you're a healthy person, that conversion isn't an issue, and you can get a significant portion of your vitamin A from plant sources if you're healthy?

**KB:** If you are very healthy. Even then, studies have shown that individuals who are looking to get optimal vitamin A levels from just eating beta-carotene may be lacking a portion. Up to 50 percent of those individuals may just not be getting enough of the vitamin A that they need.

**DM:** It's an interesting point. I just like to expand on that for a moment, because there's frequent confusion, just like in the vitamin K world that we talked about, between vitamin A and beta-carotene. I see it almost regularly in the media, where the mistake is made. I think it's legal to do this on the label.

**KB:** It is.

**DM:** That if a plant food has beta-carotene, they classify it as vitamin A.

**KB:** Yes.

**DM:** They make the assumption that that conversion has already taken place, when it's not true.

**KB:** Carrots.

**DM:** Yeah, carrots, a classic example. Right.

**KB:** Carrots are listed as having 100 percent daily intake of vitamin A, and carrots don't contain any vitamin A.

**DM:** None. Zero.

**KB:** Yeah.

[----- 1:10:00 -----]



**DM:** When we're talking about vitamin A, we're not talking of beta-carotene. We're talking about preformed retinol.

**KB:** Retinol. Yes. Yeah, preformed retinol, because that is the only way you can guarantee you are getting the vitamin A that you need to activate your DNA to produce the proteins to have all the other health benefits that you want. So, we would find this in sources like cod liver oil, liver, and these traditional foods that contain high level of vitamin A.

**DM:** Now, large numbers of people watching this are not going to be too interested in doing that.

**KB:** Right.

**DM:** Especially if you're a vegetarian. But that's kind of a warning: if you've chosen, for whatever reason, to remove all animal foods from your diet (really that would be a vegan), you're at risk for this – developing this vitamin A deficiency. You may be confused to thinking that you're not, because you're getting all these beta-carotene. You're getting loads of beta-carotene, because that's what the plant kingdom is notorious for. What it's really noted for is the high levels of beta-carotene. And it's very helpful.

Natural beta-carotene is phenomenally helpful. We should all have it. This is not saying that we shouldn't eat vegetables. But it really stresses the importance of these animal foods, as this is really the only way you're going to get preformed retinol. If a person isn't too fond of cod liver oil or liver – healthy liver from a pastured organic animal – what are the other sources?

**KB:** Well, if you...

**DM:** Like would butter be one, or eggs?

**KB:** Butter can be one. Eggs certainly would have some vitamin A in them, and butter – not really high amounts. It would be a real challenge, if you weren't eating those foods, to eat enough of the other foods. And certainly, again, this would apply to vegans, to eat enough of the other foods to get vitamin A levels.

**DM:** What type of levels of vitamin A would you need? Is it 10,000 a day? How much butter would you have to have to meet the level?

**KB:** Right. To a certain extent, that depends on how your butter is produced. I can't recall off the top of my head the vitamin A content of butter, because it wasn't high enough to really make it to the list of high in vitamin A foods in my book.

**DM:** Oh, okay. It's not even one of the top ones.

**KB:** It's not one of the top ones.

**DM:** What are the top 10?

**KB:** Yeah. Cod liver oil and various types of liver, those are really the high ones.

**DM:** That's it?

**KB:** That's really it. Yeah.

**DM:** We didn't get another answer. It's just that. It's pretty much cod liver oil is all you might need.

**KB:** That's pretty much it. Yeah.

**DM:** Okay.

**KB:** Yeah.

**DM:** If those aren't appealing to you, then it may make sense to do a supplemental form?

**KB:** And then actually fortified dairy products. These are vitamin A-fortified.

**DM:** But that's still a supplement.

**KB:** It is still essentially a supplement.

**DM:** Yeah, that's a supplement.

**KB:** There's no difference.

**DM:** So, you're just taking your supplement. It's like taking chocolate milk?

**KB:** Pretty much. Yeah. That's really the only other one that made the list.

**DM:** If someone wanted to supplement with retinol, what would the dose be?

**KB:** This gets us back to what is an optimal ratio between all these nutrients. I think that you're looking at approximately an equal ratio of vitamin A to D.

**DM:** So, 8,000 units or so?

**KB:** Yes. Yeah.

**DM:** Which isn't very much, because you don't need those high doses.

**KB:** It's not much.

**DM:** Maybe you can comment, too, especially since you just finished your pregnancy, on the toxic effects of vitamin A. Because normally, at least for many, many years, it was warned that pregnant women should never be on vitamin A because of the dangers there. If you could expand on that, which has to do with some studies that were done, I believe, in beta-carotene.

**KB:** That's right. The toxicity and the concerns around vitamin A toxicity have been very much overblown. Actually, the [inaudible 2:13:46] turns around toxicity for vitamin A in

pregnancy, in particular, did not pertain to natural vitamin A. We've not actually seen toxicity with natural vitamin A in pregnancy in either supplements or foods ever. This came out through the studies on Accutane, which is a synthetic form isomer of vitamin A and which was highly toxic to pregnant women.

**DM:** Yeah. It's one of the few drugs (maybe one of the only ones that I know of, but probably there are a few others), that has this category X.

**KB:** Yes. Yeah.

**DM:** I don't think you can prescribe it, unless the woman actually has a pregnancy test.

**KB:** That's right.

**DM:** And proven to not be pregnant.

**KB:** That's right. On the blister pack of the medication, every area where you pop out the blister, has a picture of a pregnant woman with a line and a symbol... like, they're not taking any risks. Because it was so toxic. But based on that, they essentially discounted any kind of vitamin A for all pregnant women, which was really very much overdone. Vitamin A toxicity has never been seen in pregnant women with supplementation or foods.

Yet now pregnant women are actually being told to avoid vitamin A altogether, just based on those studies for Accutane. That really is quite detrimental. It is absolutely possible to have a subclinical lack of vitamin A, which can ultimately affect organ development that can have lifelong health consequences. You're at a greater risk for a lack of vitamin A in pregnancy that you are for vitamin A toxicity.

**DM:** Now, if you're taking larger amounts of vitamin D, you very clearly mentioned that we should increase our dose of vitamin K2 and vitamin A at least to therapeutic levels. Would there be a similar recommendation for vitamin E? Because it's an oil-soluble vitamin. Does there seem to be a connection there?

**KB:** Not so much. Vitamin E, of the fat-soluble vitamins, it's quite different from the other fat-soluble vitamins. It's primarily found in plant-based foods versus animal-based foods. That's different. Although we do find vitamin E in animal-based foods, again in grass-fed animal-based foods that will have much higher levels of vitamin E.

But it's probably... I call it the wildcard, because it's the fat-soluble vitamin about which we know the least. It has some antioxidant effects, but it also may seem to affect the hypothalamus, pituitary HPA axis for fertility. But really, there's a lot more that we need to know about vitamin E. It doesn't seem to participate directly with the vitamin A, D, and K – you know, triangle there.

**DM:** Perfect. Now, my understanding as I look at this area before not with respect to vitamin D, but just vitamin E supplementation therapeutically, is that the vast majority – over 95 percent of the supplements – are just wrong, because they're using simply one specific isomer, the d-alpha-tocopherol. That's it.

**KB:** Yes.

**DM:** At a high dose, 400 units.

**KB:** Right.

**DM:** Or higher.

**KB:** Right.

**DM:** A thousand units or 2,000 units.

**KB:** Yeah.

**DM:** Which is just bizarre and counterproductive.

**KB:** And it's not the form of vitamin E you would get from foods.

**DM:** Yeah.

**KB:** At all.

**DM:** No.

**KB:** Yeah.

**DM:** It may even be the receiving version that they used, not even d-alpha. It might be the receiving alpha tocopherol. So, you know, my review is I suggest you may only need 50 units, but you have to have the gamma, alpha, delta tocopherols and the tocotrienols, which may be even more important. The whole balance of the nutrients, that when we're talking about vitamin E, we're talking not just d-alpha-tocopherol.

**KB:** That's right.

**DM:** That's an important distinction. Are there comments or points that we didn't review or address that you'd like to focus on?

**KB:** Well, maybe something that we didn't address directly, but certainly indirectly, that really is so important. I think that readers of my book will learn that the story of vitamin K is about so much more than just a nutrient or even just nutrition. It really encompasses what we have lost to the industrialization of our food, and what we stand to gain by getting back the old-fashioned ways of farming and eating.

**DM:** A very important principle, because not only we get vitamin K2, but you avoid all the other garbage that's put in the processed foods and obtain the other valuables in nutrition that are being removed.

You know, I've studied health and medicine for many decades now. The more you study it, the simpler it becomes. It really boils down to a few basic principles if you want to stay healthy. People are regularly commenting and asking questions on our site about

“How do you treat this really exotic or unusually bizarre condition?” It all comes down to the basic. You’ve got to do the basics first.

Yes, there’s going to be some important fine tweaks and customizations, but you’ve got to do the basics. The basics are just what we’ve discussed. Vitamin K2 is a really recently appreciated and important part of those basics. It should be the foundation.

**KB:** It is. It really is one of the foundations for health and as important as vitamin D, yet it was overlooked for so long.

**DM:** Yeah.

**KB:** That’s because of the fact that we can’t always wait for science to identify these nutrients and test them before we go ahead and identify them.

**DM:** As someone who has studied it really carefully and you know obviously very passionate about in the definitive book on the topic, my take-home summary for this and recommendation is to continue to reinforce what I’ve been recommending for over a year now, which is to increase your fermented vegetables to two to three ounces a day, making sure they’re fermented with the strains that’s going to produce high-quality vitamin K2.

Not only are you going to get K2 for free, but you will get – maybe even more importantly, the integration of the beneficial bacteria into our health – all the micronutrients they produce.

**KB:** Right.

**DM:** Interaction, symbiosis, and the synergies.

**KB:** Right.

**DM:** Are profound...

[----- 1:20:00 -----]

We don’t even know the tip of the iceberg.

**KB:** Yes.

**DM:** That’s my understanding.

**KB:** Interesting.

**DM:** My guess on this.

**KB:** Yeah. No doubt there are cofactors involved there that improve the bioavailability and everything.

**DM:** I want to thank you very much for your interest in writing this book and helping us understand about this really important topic that most people are relatively clueless

about largely is the result of the lack of research, which goes back to the fact that we don't have this simple test.

So, if you're not eating these fermented vegetables or this natto, then you better start doing it soon. But if you still don't want to do it, then you have to seriously consider getting a vitamin K2 supplement. The better ones would be the natural version, which should be MK-7, not MK-4.

**KB:** That's right.

**DM:** Okay. Well, thank you for joining us.

**KB:** Thank you.

*[END]*