Video Transcript:
How to Reverse Cavities and Restore Brain and Heart Health with Vitamin K2

Will:
Ok, folks, welcome back. We have the honor today of having on interview with us Kiran Krishnan. He is a researcher and a consultant who has been researching vitamin K2 for what, the past 15 years, Kiran? Is that correct?

Kiran:
Yeah, yup, just about. It seems like a long time. It makes me feel old, but it has been 15 years.

Will:
Right on. Hey, thanks for joining us here and sharing your expertise on K2 with us.

Kiran:
You're welcome.

Will:
So, you've been involved with producing formulas for various companies (if I understand correctly) who manufacture and sell K2 supplements.

Why is K2 so critically important to our health?

Kiran:
So that's uh—that's a great question (and one that most people really don't have a good handle on).

You know, you hear a lot about vitamin K2, but when we really break it down, we really start to understand some of the incredibly important functions that it performs in the body that you can't get from anything else.

And that's really a big, big part of it is that it's known as an 'essential nutrient' for that reason, right? So, any essential nutrient is one that performs a unique function that you can't get from other nutrient sources. And so it's an essential nutrient.

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One of the key things that it does is activates the use of minerals (things like calcium, magnesium) and—and really kind of directs these important minerals in the right way by—by facilitating different proteins.

And when I say that, there are a number of proteins that your body produces, some that take calcium, for example, and remove it from the arteries and put it on the bone.

And that seems like a simple thing, but that's an incredibly important act because when you remove calcium from the arteries, you're reducing or eliminating the risk for heart disease, and then you're putting it on the bone, where it's supposed to go—you're improving your outcome for osteoporosis.

Heart disease and osteoporosis affect well over 100 million people a year in the United States alone, you know? So this simple nutrient is the only thing in your diet that can actually do that. So it's extremely critical.

And the other part of it is our body doesn't make any of it.

You know, there are certain vitamins that our body can make, and the bacteria within our gut can make or our body can convert certain forms of vitamins so this—to the active form, but in the case of vitamin K2-7 especially, (the form of it that's found in the rest of the tissue) our body can't make any of it.

We actually need to get it from our diet, and it's quite unfortunate that the western diet—the normal western diet has virtually no vitamin K2 in it at all.

Will:
Right.

Kiran:
You know, we only get vitamin K2 from foods that are not consumed in the western world, so it becomes extremely important to supplement.

Let me point out a couple other uses for it.

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So, heart disease: the Rotterdam study—it was a 4,800-patient study over 10 years—showed that even a minimal intake of vitamin K2 at 45 micrograms a day reduced cardiovascular mortality by 50%.

Will:
Wow.

Kiran:
Now there's nothing in the natural or pharmaceutical world that can do that.

It reduced all-cause mortality in that 10-year period by 25%.

So the people that just took K2, not only did they die of heart disease by half the amount, but they died like 25% less in general; all-cause mortality.

So, then the other studies that have been done that have really kind of emphasized what the all-cause mortality effect is, well [inaudible] University has done a number of studies on diabetes, for example.

Vitamin K2 drastically reduces your risk for developing type 2 diabetes. It reduces risk of cancer.

The Heidelberg cohort study, which is over 18,000 patients studied (it's a huge study) with prostate cancer, for example, showed that vitamin K2 reduces the risk of prostate cancer by 30—35%.

Will:
Wow.

Kiran:
You know, there's been a number of studies on breast cancer and other gastric cancers. You know, so it just plays such a big role in virtually every chronic disease that plagues the western population.

Will:
Wow

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Kiran:
And some would even say that there's a direct correlation between the deficiency that we have in vitamin K2 as a society and the prevalence of the diseases that are a result of vitamin K2 deficiency.

Will:
Right.

Kiran:
You know, for example (I always like to use this example), statin drugs.

You know, statin drugs are the number one prescribed drugs for heart disease, right?

And if you would think that statin drugs really help with heart disease, as the amount of statin prescriptions go up, the incidence rate for cardiovascular disease should go down. Right?

That just makes basic sense. I think even a 5th grader would understand that.

But when you look at the graphs, they both kind of go up equally.

So, as statin drugs are being produc—uh, prescribed more and more heavily to more and more people, incidence rate of cardiovascular disease continues to go up.

A study published in 2015 showed that one of the functions of statin drugs is it actually interferes with vitamin K2 recycling in the arteries.

Will:
Oh yeah.

Kiran:
So it actually interferes with K2 function. Which means, you know, that possibly statins could be actually increasing the risk of heart disease.

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And of course you're not getting any K2, so you're going to calcify your arteries and things like that.

So, it's incredibly important, and we've discovered some other applications for it as well, which I'm sure we'll talk about.

Will:
Yeah, yeah. Wow. Ok, we're—we're going to dive in deep today, folks. This is going to be really, really awesome, and Kiran's going to help clarify a lot of misconceptions that our culture has around K2, I think.

Um, so—

Kiran:
Yeah.

Will:
—you talked a little bit about, you know, calcium deposition as well as removing calcium.

Are you willing to go into the whole al—osteocalcin and matrix GLA protein? Go into a little more detail about this and how K2 in particular functions in these way.

Kiran:
Yeah, so that's, um, you know, that's something that's really important to understand.

So, our bodies produce these proteins in inactive form. These are the important proteins. They have something called a 'glutamic acid residue', which means that these proteins are made up of amino acids (you know, and most people kind of know that—that proteins are made up of single units called 'amino acids').

One of these amino acids (or multiple of them, depending on the protein) is an amino acid called 'glutamic acid'.

Now, glutamic acid has a very special little "nodule" on it, if you will, that vitamin K2 can activate—it's attracted to and can activate.

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So, let's take osteocalcin, for example.

Osteocalcin is a protein that's produced by something called 'osteoblastic cells'. Osteoblastic cells are the cells that actually build bone.

I know the word 'blastic' sounds like they're blasting things, but it's actually the opposite. The osteoblastic cells are the ones that build bone; osteo*clastic* cells are the ones that break down bone.

So blastic cells actually release osteocalcin as a protein that's responsible for grabbing calcium and actually sticking it on the bone. That's how you actually form your bone matrix.

Now, what happens is they do release osteocalcin in its inactive form, and part of what, um, stimulates a release of osteocalcin is vitamin D.

So that's how vitamin D actually helps with osteoporosis is it stimulates osteoblastic cells to release osteocalcin.

Now osteocalcin is released, it's hanging around, it's waiting to be activated. The only thing that can activate it is vitamin K2.

Will:
Right.

Kiran:
So vitamin K2 has to come along and do something called a 'carboxylation reaction' that essentially changes that little nodule—that residue—on the glutamic acid and makes it have an affinity for calcium. And it grabs calcium and then takes it to the bone and puts it on the bone.

So, that's essentially the role of vitamin K2.

Now, one thing that a lot of people don't realize is excessive amounts of vitamin D will actually lead to further vitamin K deficiency. And part of the reason is

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because—imagine if you're taking 10 [or] 50 thousand IUs of vitamin D regularly—what you're doing is releasing a lot of this osteocalcin, for example. And as the osteocalcin is released, K2 has to come along and activate it.

Once K2 activates osteocalcin, it renews one or two times, but then it's done; it can't work it any more.

So once you've used up all your K2, you continue to release more osteocalcin. That actually forces more and more vitamin K2 to be utilized, and then you end up in deficiency if you're not taking in enough.

That's why there's something called 'hypervitaminosis D'—that's the toxicity of vitamin D, which leads to soft tissue calcification, because you deprive yourself of vitamin K2.

Same thing with MGP—it's a protein that's released by the cells in your arteries, and they actually release it as a way of removing calcium from arteries.

And—and then of course, hopefully it gets to the bone at that point. MGP is another one of those proteins like glutamic acid that requires vitamin K2 to activate it.

Um, you know, and what's interesting is when you start seeing calcification in the—in the arteries, you know, it actually starts to look like bone. You actually get bone cells being formed in the arteries.

So you actually get the honeycomb structure—

Will:
Wow

Kiran:
—of bone. So what K2 does is prevents bone being produced in your arteries.

And that's how it gets into it.

So, they've identified, I think so far maybe 13 vitamin K dependent proteins. These are proteins that function in different parts of the body—some in the brain, some in the

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neurons—that all require vitamin K2 in order to activate them and make them functional.

Will:
Wow. Thir—now, this is the research that's been fairly recently done, I imagine, because K2 was such kind of a...a...a thief in a sense, like it was hidden for so long, it seems like.

Kiran:
That's a good way to say it, because it was hidden actually behind K1.

Will:
Right.

Kiran:
Right? So there's two forms of vitamin K: K1 and K2.

K1 is called 'phylloquinone'. It comes from leafy green vegetables. It functions primarily in the liver for the blood coagulation cascade.

K1 was the first one discovered, and it was discovered, you know, well before vitamin K2 was. And for the most part, people kind of ignore K2 because they figure, "vitamin K is vitamin K".

Will:
Right.

Kiran:
And no one really, you know, paid as much attention to the functionality of vitamin K2 outside of K1. And that's why it really was kind of hidden, li—as you mentioned.

Will:
Right, right. Wow.

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And—and so research has determined—has recognized 13 different proteins that are vitamin K2 dependent, and that's obviously—the body is still such a mystery that that's not the end of the story there for sure. I mean, that's amazing.

Kiran:
Absolutely not, and in fact we've made some interesting discoveries of what vitamin K2 does, or what *else* it does in the body, um, that we can talk about as well.

Will:
Definitely. Right on.

Ok, so what about the role of K2 specifically in oral health? What does your research show there?

Kiran:
You know, that's extremely important. One of the biggest parts of oral health with having healthy teeth is having healthy bones.

Will:
Sure.

Kiran:
Your teeth have to have a strong foundation into your—you know, being imbedded into your gums. And as the bones erode, it actually weakens everything about your teeth and your oral structure.

So, vitamin K2 has actually been shown to improve the bone deposition in your tooth as well.

Um, and so it plays a big role.

Now the other part of it is with kids, you know, we're seeing now in the western population everybody has to get their wisdom teeth pulled, right? And that's because they don't fit their wisdom teeth in their jaws anymore. And that's a really strange thing because, you know, why have we evolved these tiny jaws that don't fit all the teeth we're supposed to have, right?

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Um, so it's great money for, you know, dentists and periodontists, but, um, at the end of the day it doesn't really make nutritional or evolutionary sense.

And that was what, you know, the work of the famous dentist who discovered vitamin K2 really discovered.

Will:
Right, Dr. Weston Price, yeah?

Kiran:
Dr. Weston Price, yeah. And we have the Weston Price institute that tries to further some of that work.

But what he discovered, really (and he never really figured out that it was K2—he called it 'activator X', I believe. He found that it was something in the high fat foods), yeah, what he found is that certain indigenous tribes that had high doses of this activator X, which was K2, actually formed really good, strong, wide jaws that could actually fit all their teeth.

Will:
Right.

Kiran:
And had, you know, no periodontal issues over the course of their lifetime because they had very strong bones that didn't degrade so fast, great enamel—all of these things, and that was how vitamin K2 really came to fruition was through a lot of the work that he did. And he's a dentist.

Will:
Right.

Kiran:
You know, so it was really popularized by a very well-known dentist. So it plays a huge role.

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Will:
Absolutely. We're really familiar with Weston Price's work, which is why we're here learning more about it from you.

So, let me pause here for a moment and just catch our community up with something.

Kiran just made a really important jump that I want to clarify: we, um—vitamin K2 is important for preventing tooth decay and actually reversing tooth decay, but it's *also* important for gum disease because gum disease and periodontal disease ultimately is a breakdown in the jaw bone, right?

It's a loss in the bone structure in the jaw brought on by these periodontal pathogens.

So I think you're right on the mark with that, that it affects not just tooth decay, but tooth decay *and* gum disease.

Kiran:
Absolutely, yeah. And, you know, it's basically osteoporosis in the mouth.

Will:
Yeah.

Kiran:
You know, it's what's happening to our bones as we age as well, with hip fractures and femur fractures and things like that that really debilitate people and cause a lot of problems and cost. It's the same thing happening in the mouth, and a lot of it is associated with vitamin K2 deficiency.

Now, I'm going to give you a great example of that.

People who are celiac—you know, full-blown celiac, they have enteropathy, meaning their intestinal tracts are damaged with a lot of inflammation—celiac people present at a much higher rate than normal populations with tooth decay and gum disease and brittle teeth.

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And the reason for that is celiac people cannot absorb fat-soluble vitamins. And they—so which means that they tend to have a really severe deficiency in both vitamin K and D.

And A and E as well, for that matter. But the deficiency in K causes them to have much more profound issues with their oral health.

And the same thing happens to their bone health as well—they tend to have higher degrees of osteoporosis, cardiovascular disease, and that's because their gut lining is so inflamed, they can't actually absorb fat-soluble vitamins well.

Will:
Wow.

Kiran:
But that's a great example of deficiency in vitamin K and vitamin K absorption actually leads to all these phenotypes, starting with the teeth and then moving down the rest of the body.

Will:
Right, right. Wow, super well put. Huh, huh.

Now you've got me spinning there, because we've been writing more about leaky gut recently, and…um.

So, chronic inflammation of the small intestine would lead to malabsorption not just, well, of everything, but what you're referring to is the fat-soluble vitamins.

So what's a person to do in that situation, I mean—

Kiran:
Yeah, especially of fat-soluble vitamins.

Will:
Is there another way to get it into the system?

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Kiran:
Well, so for vitamin D, the fortunate thing is our body can make vitamin D. So for vitamin D, you want to make sure you're eating enough good fats and getting enough sun exposure.

Will:
Right.

Kiran:
Of course, 15, 20 minutes in the sun will convert enough of the good cholesterol into vitamin D.

For vitamin K2, you really want to take very, very high doses so you absorb some of it.

And you also then, at that point, you know—when we get to a point where you're not absorbing the fat-soluble vitamins well, you really have to start looking at "how do I fix my gut lining?" first.

Will:
Right.

Kiran:
You know, because that's a symptom of an even bigger problem.

Because, I think as you know since you've been looking at leaky gut, leaky gut and inflammation is the onset of virtually every chronic disease we are familiar with, right: heart disease, diabetes, Alzheimer's, autoimmunity (which is—the prevalence of which is going through the roof).

Will:
Yup.

Kiran:
So it becomes extremely important to fix that lining and start regenerating your intestinal tract, if you will.

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We work, for example, with spore-based bacteria, which I don't know if you're familiar with, but we just completed a human clinical trial at the University of North Texas that showed that this probiotic in particular can heal leaky gut within 30 days.

Will:
Wow.

Kiran:
Totally sealed up the gut.

And other studies have shown that it actually increases the [inaudible] of the microvilli (those are the little finger-like projections that give the small bowel its surface area—that's important for absorption).

Will:
Yup.

Kiran:
And then other compounds that have been shown to really help with the inflammation is things like colostrum, lactoferrin, curcumin, L-glutamine—these are all things that people should really start looking at taking to improve the absorption of these fat-soluble nutrients for the health of their mouth, for the health of their brains, eyesight, everything.

You know everything up here [indicates head] is determined by what's to be absorbed down here [indicates gut].

Will:
Right, absolutely. It's fascinating that here we are having a conversation between a K2 researcher and somebody who focuses on oral health, and we're talking about the gut because—

Kiran:
Right.

Will:

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—I mean, Hippocrates was right, you know? All disease does begin in the gut.

Kiran:
Yeah, he said death sits in the bowel and bad digestion is the root of all disease or all evil or something like that.

Will:
Yeah, yeah.

Kiran:
In 400 BC he said that!

Will:
Yeah, yeah.

Kiran:
And the crazy thing about it is—you know, Hippocrates is the father of medicine—of modern medicine, right? So every doctor that has graduated from medical school takes the Hippocratic oath—

Will:
Right.

Kiran:
—for that reason: because it's named after Hippocrates.

But it takes a lot to get your average medical doctor to focus on the gut when they're talking about other peripheral issues.

So, it's really important the work that people like you do to get this kind of information out there, I think. It's tremendously important for like just the well-being of society.

Will:
Yeah. And thankfully we're all—you, know, I mean the whole uprising of functional medicine is really stepping up to bat here, it seems like.

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Kiran:
Yeah.

Will:
Yeah.

Kiran:
Absolutely.

Will:
So how common from your research is K2 deficiency in the modern world?

Kiran:
[Inaudible] studies have shown that it is the vast majority of people in the modern world are clinically—are *sub*clinically deficient.

And 'subclinically' means when you are physically deficient you actually have active disease that has to be managed. They haven't made those—you know your mainstream medical community—hasn't made that direct correlation to deficiency in vitamin K and heart disease and all that.

So they don't call heart disease 'a deficiency in vitamin K2' (yet).

Will:
Right.

Kiran:
Right? But there's plenty of research that's coming out for that. So they say you are subclinically deficient in the nutrient.

But the vast majority—more than 90% of the western population—is subclinically deficient in vitamin K2.

It's virtually impossible to find a regular westerner that has adequate intake of vitamin K2. And part of that is because of where vitamin K2 comes from.

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You know, we know that the main sources are from meat—from organ meat itself—nobody's eating organ meats. Nobody eats the liver and the pancreas of the animal, and even if you did, the types of animals that we breed in these factory farms are probably not going to give you a whole lot vitamin K because they're not feeding on the right things either, and they're not very healthy animals to begin with.

The second part is that it comes from certain types of fermented foods, like the fermented food 'natto' in Japan, which is probably the richest natural source of vitamin K2.

There are other fermented food versions of that in Korea, in China as well. And then fermented cheeses in northern Europe. Um, you know, so that's really the source.

And then of course your gut bacteria, if you have the right types of bacteria, will produce vitamin K2 for you as well.

But what we're starting to see is that a lot of the vitamin K2 that's produced by the bacteria in your gut is actually utilized by that bacteria and other bacteria in the gut as well.

Will:
Mm.

Kiran:
You know, which actually kind of led us to some of the other discoveries of what else vitamin K2 does in the body.

Because we started looking at, you know, "Why do bacteria produce so much K2—they don't have bones, they don't have arteries—"

Will:
Right.

Kiran:
"—what are they doing with vitamin K2?"

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And so it really kind of was enlightening to do that research and figure out what exactly they're doing with vitamin K2.

Will:
Well, let's stay with that—what is your findings on that? I'm curious.

Kiran:
Well, so bacteria you know, if people had [inaudible] you would understand that our mitochondria (our mitochondria is the powerhouse of our cells—that's the little organ that uses all the ATP that keeps the cell alive) the mitochondria is actually bacteria.

You know, the idea has been that single-cell organisms like bacteria made an envelope with the membrane and, you know, made multicellular organisms.

So bacteria are essentially one little, um, you know, energy-producing machine.

Bacteria use vitamin K as part of something called the 'electron transport chain'.

Will:
Okay.

Kiran:
The electron transport chain is part of the energy-generating machinery that spits out ATP.

Now, in humans, we're very familiar with the electron transport chain because we use CoQ10 for that reason.

Will:
Right.

Kiran:
You know, CoQ10 is known to help with heart disease and all that because it actually increases the energy output of each cell, because it sits inside that mitochondria and helps your cell produce more energy.

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Now, what we found is that vitamin K2-7 act—fits inside the human cell in the same way, and actually even better than CoQ10, produces even more energy on a cellular level.

Will:
Oh.

Kiran:
So it actually keeps your cells' mitochondria functioning at the optimum level, producing enough energy for that cell to be metabolically active and healthy.

So, you know, that's important because of something called 'mitochondrial theory of aging' (and I was just at a conference—a medical conference—this weekend).

There were—one of the days had about seven talks. Four of those talks focused on mitochondrial medicine.

Will:
Hm.

Kiran:
And the reason is because we're starting to understand more and more now that a lot of disease—the progression of a lot of disease, including the progression of aging—comes from dysfunctional mitochondria.

Will:
Right.

Kiran:
So what happens over time, right, so you've got your cell—it's got the mitochondria in there, it's cranking out energy all the time, it's using oxygen and it's cranking out energy.

When it does that, it produces something called 'reactive oxygen species'.

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These reactive oxygen species are fairly toxic to the cell. So as that starts to build up over time, the cells' mitochondria start to shut down and get poisoned (really, essentially). And they start to shut down.

So your cells end up having less and less number of mitochondria. Eventually, the cell itself dies. Eventually the tissue that makes up that cell dies. And then you start getting degenerative diseases.

That's what happens in aging, you know.

There was a study published that took tissue samples of a 90-year-old and tissue samples of a 5-year-old and compared them, and found that the only measurable difference they could find between those two tissues is the number and functioning of the mitochondria.

Will:
Mm.

Kiran:
The 90-year-old had more than 95% of his mitochondria damaged and not functioning optimally. The 5-year-old had 100% functioning mitochondria.

Will:
Oh.

Kiran:
You know, that's why a 5-year-old can run around like a mad person all day long with boundless energy, right? And a 90-year-old finds it really hard to get out of bed in the morning. It's because of that energy—that cellular energy, or the destruction of cellular energy.

So, vitamin K2 now becomes probably one of the most important anti-aging nutrients because not only does it improve mitochondrial function (increases the ability of the cell to make energy), but it also has been shown to rescue dead and dying mitochondria.

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Will:
Wow.

Kiran:
So cells that are aging, right—cells that are dying slowly—it seems to be able to rescue it.

Now, that was shown by a Belgian researcher actually that totally supported the work that we did, which was fantastic for us. But he showed in a Parkinson's model that you can actually use vitamin K2 and reverse the symptomatology of the disease, and Parkinson's is one of the many neurodegenerative diseases, you know, along with things like ALS (Lou Gehrig's disease), and of course, even simple neuropathies (people that get the nerve—the tingling/the numbness in the tips of the fingers, the restless leg).

All of those are neurodegenerative diseases, including Alzheimer's, senile dementia—what they've shown is vitamin K2 can reverse those neurons and bring them back to health, and really slow the progression of it. That's one of the main new things we discovered.

Will:
[Laughs]

Wow. Ok, so, as the cell ages (as the mitochondria ages), it builds up waste around it that begins to implode that mitochondria and the cell and the tissue from that. And so vitamin K2 helps to remo—helps the mitochondria to refire well and remove the waste, I presume, too.

Kiran:
Yeah. Exactly. It re—re-energizes the mitochondria, it allows it to function the way it's supposed to.

Now, it's also important to add things like glutathione and peroxidase—those are your body's natural antioxidants on a cellular level—

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Will:
Sure.

Kiran:
—to actually remove those free—free radicals.

Will:
Sure.

Kiran:
But yeah, vitamin K2 seems to do that better than anything else—

Will:
Wow.

Kiran:
—and especially the ability to rescue already-dying mitochondria.

You know, because what that tells us is people with degenerative diseases (and that can include everything in your gums, in your—any tissue in your body, right?

Will:
Sure.

Kiran:
—every tissue has mitochondria, and that's how the cells stay alive).

Presumably, we should be able to rescue a lot of that degeneration by taking this nutrient that we don't get any of in our daily diet.

Will:
Wow. Right, right. Excellent, excellent.

So let's shift gears a little bit and talk about risks (if there are any) of taking too much K2. Obviously, you can take too much vitamin D—you've mentioned that. We can take too much vitamin A. What about K2—what's the research say there?

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Kiran:
So that's really interesting. Now, we've done a lot of toxicity studies on K2. We've actually published a few toxicity studies on K2. We've never found an LD50.

If you're familiar with LD50, basically what that stands for is, "lethal dose 50". That's the safety threshold of virtually any compound.

What you do is you feed, you know, surrogate animals with it—rats, mice, or whatever. You feed them a certain dose of the product.

You try to feed them a dose that will end up actually killing them. And then you feed them a dose that gives real, you know, horrible side effects, or maybe it ends up killing them. And then you go half that dose as the maximum ceiling. Right?

Will:
Ok.

Kiran:
So that's called 'LD50'.

Now, we've done a number of studies where we can't harm an animal by giving it any more K2. We've given what would be the equivalent of almost 800 [or] 900 fold what the recommended daily allowance is for humans without any side effects.

I mean, the real only side effect we've seen is some loose stools—some diarrhea on the animals, which, you know, is understandable if you give them 800 times anything—

Will:
Right.

Kiran:
—even water.

And so, we have not found a toxicity for vitamin K2.

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The only people that should be cautious and should, you know, make some measurements to talk to their doctors are the people who are on certain blood thinners, like warfarin or coumadin.

Will:
Right.

Kiran:
Even then it's actually a benefit, but people can be measuring their INR and their doctors can be very sensitive about it, so I would recommend people to talk to their doctors if they're on coumadin or warfarin.

Other than that, there's no upper limit that we've found on vitamin K2.

That being said, I will say that we haven't found much more benefit going beyond 330, 340 micrograms a day, either.

Will:
Ok.

Kiran:
You know, so there's no—at this point, there's no reason to take 800, 900 micrograms.

Will:
Right.

Kiran:
You know, who's to say that we won't discover something down the road that shows that it does have other benefits?

But so far the science doesn't back up the need for higher than 320 micrograms. When it does, we'll increase the dose in our product.

Will:
Sure, sure. Wow. Ok. So, no upper limit, but there's a diminishing return, like you mentioned. It's a linear return until you get up to that 320, 360 micrograms.

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Kiran:
Yeah.

Will:
So, I guess we should probably tackle the differences in doses between MK-4 and MK-7 and talk about that so we can get the differences between milligrams and micrograms and all that, too.

Kiran:
Sure.

Will:
Can you help us with that?

Kiran:
Yeah, so MK-4 obviously is a version of K2.

It's got 4 subunits rather than 7. And that actually changes its functionality quite a bit.

Four subunits makes it much more unstable both in the body and also in the outside environment. And that's why when MK-4—for example, MK-4 has a very short half life, something like three and a half hours. Meaning around three and a half hours, half the dose that you take is basically gone.

Versus K2-7 has got about a 72-hour half life, so much longer. So it hangs around much longer, it's much more stable, it's a good way of building up high serum levels of vitamin K2.

K-4 is a very reactive, high functioning version, but your body can actually convert K2 into K-4.

Will:
Oh, ok.

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Kiran:
So, K2 seems to be more like the storage form of the vitamin, and then should some part of the body need K-4, your body will convert the K-2 to K-4 and then use it more rapidly.

Now, because MK-4 as a product is much more unstable and the half life is much shorter, you have to dose it in the milligram range.

There's been a lot of studies on MK-4 in Japan, especially because it's a prescription drug there and has been for a while, but they dose it in the thousands of milligrams—in many cases it's an injectable.

Will:
Wow.

Kiran:
So it doesn't have to go through your gastric system; they put it right into your circulatory system.

Or, in the hospitals, they might do an IV drip of K2-4 instead.

And so, K2-4 really is not a great supplement, you know, it's um—because it's got such a short half life, stability is really poor, and there's no natural source of K2-4.

So again, any K2-4 you take, you're taking a synthetic version.

Will:
Mm.

Kiran:
You know, there's no—nobody is making a natural K2-4. And so, anyone that's offering K2-4 is offering a synthetic version. That synthetic version has the same issues as synthetic K2-7.

Will:
Right.

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Kiran:
So you're always better off just taking the natural form, what nature intends, and getting your K2 levels up that way.

Will:
Right, right. Tremendous.

Um, ok, are there simple ways for—you mentioned that by and large, the huge predominance of us are deficient in K2.

Are there simple ways for a viewer who is watching this right now to better identify if they need more K2? I mean it's a—I think it's a safe guess that that's the case, but, you know, what if a person is eating really well?

Kiran:
Yeah, so, you know, unfortunately there isn't a great standard—standardized test for vitamin K2 deficiency. Although, some labs—so if you really want to know what your vitamin K2 status is, you can actually go to your doctor and ask them for something called an osteocalcin—'undercarboxylated osteocalcin test'.

So they test all the different fragments of osteocalcin, and I believe LabCorp offers it, Quest offers it—it's not a standard test unless doctors know about it or even think about it, but if you ask your doctor, it might surprise them and they might look and actually find the test.

So that's a—it's a decent way of looking at your vitamin K2 status. And it'll give you some idea.

Now, the other way to understand it is, you have to think about, you know, when was the last time you ate a fermented cheese or fermented soybean, and then when was the last time you ate organ meat?

If you haven't eaten any of those things in any religious fashion, you are almost definitely deficient in vitamin K2.

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Will:
Right, right.

And so the undercarboxylated osteocalcin would simply be showing how much need there is. We're not carboxylated, which is what the K2 is going to do in the body, correct (for the osteocalcin)?

Kiran:
Exactly, yep. Yeah, well said.

And that'll show you that, but it won't show you what your levels are. You know, now people are used to seeing what their levels of vitamin D are—they want to get to this 57, 58 (whatever it may be), they're now at 22.

You don't have a measure of that in vitamin K2, so you're safer to presume that you need it and you're deficient in it because that's what the data supports.

Will:
Right. I think that if a person says, "Ok, let's see...I'm getting tooth decay—"

Kiran:
Right.

Will:
"—then I need it."

I think that's probably a fairly safe bet, I mean as I reflect on the research of Weston Price, he found some indigenous cultures had one cavity in 100 skulls. So that's one cavity in 3200 teeth. That's a lot of—

Kiran:
Right, yeah.

Will:
—that's a lot of K2 dependency there. Wow.

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Kiran:
Absolutely. You know, [inaudible] for myself I mean, I actually grew up in India and moved to the States just before high school—so around the age of 14, 15.

I'm forty-[inaudible] now. I've never had a cavity in my life. And I've gone to the dentist maybe twice in my whole life.

Will:
Right.

Kiran:
And every time I go to the dentist, they're like, "Uh, just come back in like 3 years."

Will:
[Laughs]

Kiran:
And, you know, part of it—and you know the last time I went to the dentist it was actually kind of funny because my wife persuaded me to go. She's like, "You've got to go to the dentist, it's been like 10 years."

I'm like, "Alright, fine, I'll go."

And I went to the dentist, and they had it all prepared—they're like, "Oh, this guy's coming in who hasn't been to the dentist in ten years, doesn't floss..." and all that.

Will:
Right.

Kiran:
And I think they had like the troops ready to extract teeth and fill in holes and all that.

Will:
Right.

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Kiran:
And they did x-rays and checks, and they're like, "Looks like you had your teeth cleaned last week."

Will:
[Laughs]

Kiran:
You know, "The bone structures are really big", you know, "and there's no sign of any cavity."

Will:
Right.

Kiran:
They're like, "How often do you floss?" and I'm like, "I—I don't floss," you know (which, you should floss—I'm advocating flossing).

But I'm just saying I don't, you know, floss because we used to eat a lot of ghee—

Will:
Right.

Kiran:
—and ghee has K2 in it. And I've been taking high doses of K2 for the last 15 years.

Will:
Right.

Kiran:
Um, you know? And so, and—fortunately for me growing up, we ate a lot of ghee and all that stuff from cows—from grass-fed cows, so we had a good amount of K2.

So I have all of my wisdom teeth, too. I never had, uh, teeth pulled.

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Will:
Right.

Kiran:
Um, they all fit in my mouth, so you know, enough jaw structure, and so does everyone in my family.

Nobody in my family—none of my siblings, my parents—nobody's ever had any wisdom teeth or anything pulled. Everyone's teeth fit in their mouth.

Will:
Right.

Kiran:
Part of that I think is the consumption of that ghee and the butter and getting adequate K2.

Will:
Absolutely, absolutely.

We have some friends who are from India, and the husband of the couple confided in me one day, kind of embarrassed he said—because he knew our business.

He said, "I've got to tell you—I didn't brush my teeth until I was in college."

Kiran:
[Laughs]

Will:
And he's got a gorgeous dental arch. I look at him and I'm like, "God!", you know?

But really if we look at it and we step back and say, "Ok, when—when did our ancestors lose it?"

And you grew up, you know, on a traditional diet. I mean, I don't know your background in particular, like whether you guys were living truly indigenously, but, you

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know, you had a traditional background there that—so that heritage was still intact, so you have—your generation has deviated less—

Kiran:
Yeah.

Will:
—and you haven't lost the genetic momentum.

Kiran:
Exactly, yeah.

And that's true, I mean, you know, for the first half of my life, we ate, you know, fresh foods that we got every day from the market that day.

We didn't have grocery stores; we didn't have—I don't think we even had a refrigerator, for the most part. But we ate milk that came from the cow, like the guy would actually come to our house that morning, milk the cow right there, you know, and then my grandma would boil the milk to sanitize it and sterilize it, and then take the milk fat from the top and make butter and ghee and things like that with it.

Will:
Yup.

Kiran:
So yeah, it was very much a—what we would consider to be an awesome, indigenous-type of existence.

Will:
Yeah.

Kiran:
It has to be [inaudible]. Like you said, the amount of deviation from the way we evolved correlates very closely to the types of long-term, chronic issues we have—

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Will:
Yeah.

Kiran:
—everything from the mouth on down.

Will:
Yeah, truly. Truly.

You know, back to our friends, they moved to the States, they had kids, they raised them on a western diet, and they go to dentists and have cavities now.

Kiran:
Yeah, exactly. It's crazy.

Will:
So not any surprise.

So you shared with us some exciting new discoveries your team has been making. Will you go into that with us here?

Kiran:
Yeah, so the, um, the mitochondria discovery was one—was a big one. So we now know vitamin K2 is absolutely critical as an anti-aging compound.

The other one that I finished the clinical trial on at University of North Texas is on something called 'cardiac output'.

And if people aren't familiar, cardiac output is basically how much blood your heart can pump in a given minute, right? And cardiac output is measured by heart rate times stroke volume.

'Stroke volume' is every time your heart beats, what is the volume of blood that's coming out? And stroke volume determines many different things.

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So, for example, when you exercise, the reason your heart rate goes up is because as your muscles demand more oxygen and more nutrients, your blood—your heart reaches its maximal stroke output, right, so—uh, stroke volume, sorry. So it reaches the maximum that it can't increase the volume anymore. So now the heart has to beat just faster in order to get more blood out.

Will:
Right.

Kiran:
So, what we were able to show (and this came from the mitochondria side) is the highest concentration of mitochondria in the body is in the heart. And the heart is a muscle that's rapidly moving and functioning your entire life, from the very first second onwards.

And the heart is one that also goes through a lot of stress as we go through life and we intoxicate ourselves with different things and we actually have stress and we exercise and do all these things, the heart goes through a lot of stress.

And so, what we presumed (or what we hypothesized) was that if vitamin K2 improves the function of cells and improves the mitochondria, we should be able to improve the function of the heart itself as a muscle.

Will:
Sure.

Kiran:
So we did a study—an 8-week study—with a dose of 320 micrograms a day to look at whether or not we're improving the efficiency of the heart, in terms of how much blood it's pumping.

And so what we found is that after 8 weeks, we saw an average increase of 14% of increase volume of blood every time the heart beats. Let's put that into perspective.

Will:
Wow.

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Kiran:
What that actually means—let's say you were sitting on a couch for 24 hours at resting heart rate. That's 900 liters of more oxygen-rich blood pumping through your body in a single day.

Will:
Wow.

Kiran:
900 liters—that's a lot of blood. And that blood carries nutrients, carries oxygen to all the tissues in the body. So it oxygenates everything.

So if you're an athlete and you want to run faster and better [inaudible] ability, that's what you need.

If you're someone who is getting older and body is breaking down and degenerating, what you need is some more blood.

The other thing that happens with age besides the mitochondria side, is cardiac output starts to go down automatically. As your heart gets weaker and weaker and weaker, you actually start pumping less and less blood. And with less blood, less tissues get oxygen and nutrients, so the tissues die faster.

So it's kind of this, you know, continuous circle that perpetuates itself into this decline physically, and that matters with everything. You know, your brain needs all that oxygen—

Will:
Sure.

Kiran:
—your brain needs all those nutrients. Your face, your jaw, your teeth, and everything else [inaudible].

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So, we found this significant benefit of vitamin K2 of just sitting around and pumping more blood through your body.

You know, the researchers—

Will:
14%. Wow.

Kiran:
14% at resting heart rate. At elevated heart rate (so, when we put people through exercise regimens)—

Will:
Sure.

Kiran:
—we found that it goes as high as 24%.

Will:
Wow.

Kiran:
You know, that means take example a 10k. If you've got two people that run a 10k in one hour, you know, let's say they're an average runner so they're running a 10k in an hour.

Person A who is taking adequate amounts of K2 will pump about 60 liters more oxygen and blood through their body in that single run than person B. Which means person A can do that same 10k run at the same pace, at a much lower heart rate.

Will:
Sure.

Kiran:
You know, and feel much more relaxed.

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And so, that's quite a significant finding because there's not a whole lot out there in the natural or prescription world that can start to increase cardiac output again—

Will:
Right.

Kiran:
—which is something that declines with age.

You know, so I'm actually—I was invited to London next week at a big anti-aging conference in Europe where I'm speaking on the subject itself as really kind of the next new important anti-aging nutrient.

Will:
Wow, that's huge!

Kiran:
Yeah, it's enormous. I mean, when you really think about the gravity of it—you know, what it does for your body (such a simple nutrient, but it does so many vast things)—and then the discovery that it does these things is tremendous in terms of how it can impact people's lives.

Will:
Right. Wow, wow. That's huge.

Ok, so, any other gems you want to share with us, Kiran, before I let you go?

Kiran:
Yeah, you know, um… A few different things: if you're taking vitamin K2 as a supplement, always take it with food. Vitamin K2 is of course absorbed better in the presence of fat, like most of the fat-soluble vitamins.

It's never too late to start taking your vitamin K2. If you're 65, 70 years old, you've already had osteoporosis—maybe you have a hip fracture already, you know, and you're dealing with degraded teeth and bone structure in your mouth—it's never too late.

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Will:
Totally.

Kiran:
You can always start reversing some of those effects.

And so I always tell people the beauty of a lot of these issues, these chronic diseases / chronic degenerative issues, is it doesn't have to progress that way. You can always arrest it—slow it down to some degree or in some cases even reverse it—with just giving your body the right nutrients, giving your body the right situation.

Um, you know, and that's really what our focus is here. And that's why we love working with people like you, because we can do the research and we can, you know, develop the discoveries and all that, but we can't get it out to the masses without working with people like you who give it out to the masses.

So, um, I want to thank you for the opportunity.

Will:
Oh, absolutely. I've learned so much here about not just K2 and oral health, obviously, but geez. I'm thrilled about this. I haven't gotten some of your product yet, and I *have* to now.

Kiran:
Well yeah, we've got to send some to you. I think you'll feel the difference.

You're probably—living in paradise, you're probably a fairly active person, and so you know, if you go out there and do any type of activity, after about a month of taking that dose, you'll start to feel a difference.

You know, the run you used to do that used to take you 40 minutes at a certain heart rate and you're sweating and you're exhausted, will now take you about 36 minutes, 37 minutes, and you'll feel much more relaxed. Like [inaudible].

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That's why we have a number of professional teams that are taking it, a lot of professional athletes, cyclists and all that. You'll feel a tremendous difference, so I'm excited for you to try it.

Will:
Yeah. So where can viewers learn more from you?

Kiran:
There's a number of places where I have—actually, if you YouTube my name, Kiran Krishnan, which is spelled K-I-R-A-N K-R-I-S-H-N-A-N, especially if you YouTube that [inaudible], you'll find a lot of presentations of mine that people have put up, some from [inaudible] conferences or [inaudible] conferences.

I do a lot of webinars like this

[Inaudible] where I do a whole microbiome series, so just a lot of free learning out there through our probiotics site called GoMegaSpore.com. I have a number of—a lot of write-ups there and research papers and things like that.

So they can find a lot about that. But somehow I've never posted anything on YouTube, but apparently I've got a lot of videos on there. So it all ends up on there and that's a great place to find things that I've done.

Will:
Perfect, perfect. Kiran, thank you so much for your time. It's been—

Kiran:
You're welcome! Thank you for having me.

Will:
Absolutely.

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