

Speaking Science Podcast

Episode: Food and Nutrition: Supplements

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HOSTS

Rachel Morris, Ph.D. MLT(ASCP)

Alyssa Preiser, Ph.D.

GUEST

Neal Fortin, Director, MSU Institute for Food Laws & Regulations

www.iflr.msu.edu

Transcript

Alyssa Preiser Welcome back to speaking science where we translate the science that affects your daily life. I'm Alyssa Preiser.

Rachel Morris And I'm Rachel Morris. We're in the middle of our series investigating what we eat. And this week, we're talking with Neil Fortin, the director of the Institute for Food Laws and Regulations here at Michigan State. Thank you for joining us.

Neal Fortin Thanks for having me.

Rachel We'd love to start with definitions just because we find that sometimes we use words that people don't use the same way we do. So one of the things that we like to do is just make sure everyone's on the same page at the beginning. So would you give us a definition for dietary supplement?

Neal Sure. Traditionally, the vernacular, the common day speech term for dietary supplements, was just the essential nutrients such as vitamins and minerals. However, Congress gave us a doozy of a broad definition under the law. *A dietary supplement is something that supplements the diet, which is a great circular definition, and really doesn't tell you anything at all. But we have three exclusions. What a dietary supplement is not, is actually more defined in the law than what it is. It cannot be a traditional food, it cannot be a complete meal, and it cannot be a*

tobacco product. Other than that, it can be pretty much anything, as long as it supplements the diet.

Rachel Wow. So the exemptions are the definition. That's an interesting approach.

Neal Yeah. And that's what Congress intended, because they wanted this to be an incredibly broad definition because they were concerned that FDA might try to narrow it or exclude things from it, and they wanted it to be wide open.

Alyssa So why are these things that commonly get added to food, like one of the examples I can think of is vitamin D milk or something like that? Is it because we usually don't get enough of these things? Because we're trying to make them extra healthy? Why do they usually get put in what we eat?

Neal *Well, we have fortification, and then we have dietary supplements. When something is put in a food, it's regulated differently as an ingredient than when it's in a pill or separate as a supplement.* When vitamin D is in milk as an ingredient, it has a different regulatory system which is much stricter than when it is in pill form as a dietary supplement.

Traditionally, those supplements and fortifications are to improve deficiencies in our diet. For example, people weren't getting enough sunlight in northern climates to produce vitamin D on their own, so we supplement or fortify foods with vitamin D to prevent rickets. A lot of the supplementations came about during the Great Depression when people didn't get a varied diet. For example, we had a lot of people eating mostly corn, and they were getting things like Pellagra and Beriberi. Vitamin B supplements was one of the great public health achievements of the last century, where it eliminated completely those deficiency diseases. So, the supplements of the essential vitamins and minerals, the traditional supplements, were for deficiencies in the diet. The other ingredients are the things that are everything else - the herbs, the metabolites, amino acids, the extracts, and any other substance - you want to put it as a dietary supplement. They're taken for perceived health benefits. For example, someone might take chondroitin for their joints, and the purpose that they're taking it for is not to provide essential nutrients, but it's a belief that this may provide some functional benefit to their joints.

Rachel So I think you've already sort of answered this question, but so some of them might be strictly necessary due to dietary inability to get out or do the inability to get things in the diet, but others are not necessary. So someone could have a complete diet without supplements.

Neal Correct, every expert body of nutritionists and dietitians has looked at this and said there's no dietary supplement they would recommend for the general population. Most people can get all the essential nutrients they need from a varied and healthy diet. There are some exceptions. If you're a strict vegan, there's no reliable B12 source in all-vegetable sources. So, there are some exceptions, but generally, most people do not need essential nutrients as a supplement. And actually, I should even say that most of the research that you have on the positive effects of nutrition come from dietary patterns, not from supplementation. For example, a number of

years ago, there were quite a number of research articles correlating diets high in leafy vegetables and a lower incidence of cancer. Well, then the hypothesis came about, perhaps it's the beta carotene or the vitamin E that's high in these vegetables that's causing this reduced incidence. So, studies were done on these, and it was kind of shocking to a lot of people because one of the things that came out of that was some of the unknown risks of these supplements. Smokers that took beta carotene supplements significantly increased their risk of lung cancer, and it was so extreme that one of the studies was cancelled. So, it highlights one of the potential risks of a supplement. It highlights that most of the beneficial effects that we see from diet studies - we don't know what they are - so, it's better to eat the healthy diet. There are potential risks of these supplements. There are other risks like nutrient interactions, like if you take too much zinc supplement, you can get a copper deficiency. *The important thing to take away is that there is no such thing as a "completely safe" dietary supplement. Some are incredibly low risk, but others are riskier, and the varied diet is still the most important source of your nutrition. My mother was right, eat my vegetables.*

Rachel Interesting how the longer you live, even the more science you do, it turns out your mom was right about a lot of things.

Alyssa So going off of that a little I was doing some reading, getting ready for this. And there's a study from 2015 that came out that showed that about 20,000 ER visits in the US a year came from dietary supplement related causes. Some of that was heart disease, cardiac symptoms, some of that was people just choking on them. There were a lot of other very interesting ones that caused these ER trips. But when someone is thinking about taking supplements for health reasons, and they're like, okay, this might be good for me to take. What's one way they can think about doing this safely? Because like you said, there's a lot of things that we just don't always know about, that can cause these unintended effects.

Neal Well, first, I guess, look at what the potential benefit might be for the product you're taking, because one of the dilemmas is that this category is so broad, and the range of risk is very broad. So the risk of taking vitamin C has very minimal, smaller risk taking very high amounts. But other things, like Kava, are dangerous. So, you have a very broad range of risk, and some things have better elements of proof. I often recommend people go to the NIH website. There's an [Office of Dietary Supplements](#). And they have a great database of all the scientific research in English on the research on dietary supplements. So, if you're wondering if ginkgo biloba helps memory, you can go there and see the studies and what the science actually says. The other thing I would warn, about the ER visits you're talking about, most of those are from the category of diet/weight loss supplements/diet aids, those tend to be in the riskier category. We've had quite a few deaths and we've had other problems like liver damage, where people end up getting having to have liver transplants because of taking these. And most of them do not have any evidence of any effectiveness at all. *One of the more horrible examples was Ephedra, there was no evidence, none at all, of it being safe for or effective for weight loss. Yet it was commonly sold for weight loss and it took FDA seven years, and I think 16,000 complaints and over 200 people dying before they had enough evidence to take it off the market.* So that's I guess the thing to remember about weight loss supplements: some categories are riskier, have less proof.

If you're taking a diet aid or weight loss aid, it's a lot riskier than taking something like cherry juice concentrate. So, think about what type of risk there might be and what type of benefit you might get. And I think it's also important remember that these are very different regulatory systems. Just because it's regulated by FDA doesn't mean it's regulated the same as a food ingredient or a drug. *There is no requirement that dietary supplements are to be proven safe before being put on the market. That's not true with food ingredients or drugs, there's no requirement that the claims for benefits have to be proven. That's not true with drugs. It was a Congressional decision to make this a more open market, which, depending on what your philosophy is, it's good or bad. If you believe in allowing consumer freedom of choice, "buyer beware but let us have the choice," then you will like this scheme of regulation under dietary supplements. But you have to remember that it is "buyer beware," it's not the same as a food ingredient, it's not the same as a drug, it hasn't been proven to be safe, it hasn't been proven to be effective, you have to do your own research.* If you don't like a "buyer beware," you'll hate the system, because it's really making our population a population of guinea pigs, and it takes deaths and serious reactions for FDA to have the evidence to get this off the market. Sometimes people forget that *who has a burden of proof of safety or risk makes a tremendous difference in the marketplace. It's the difference of 200 people dying from Ephedra before FDA can get it off the market, versus having to prove it safe first, and then you don't have the deaths.*

Rachel So there's no effectiveness that needs to be proven or safety that needs to be proven. And on all the supplement bottles you sort of see that little disclaimer, right? The FDA does not judge this to be safer, effective. So what about marketing? Are there any marketing limitations for these things?

Neal Well, *there are there are limits on the labeling and on the marketing and the Federal Trade Commission regulates advertising, but again, the burden of proof is on the FTC or the FDA to prove that it's false. So because the burden has shifted, it creates this dilemma - it will allow a lot of shady stuff to go on before they can take action - that it has to get to be pretty egregious before the agencies can step in with enough evidence to stop something.* There have been a number of big campaigns by FTC and FDA against some of these the weight loss aids because there's been so many problems in that category. There are some things too, that FDA can look at and see that it's clearly false. A lot of the things that say they're going to cure cancer, that are clearly false that they can they can confidently go to court and say that this is false. But an awful lot of stuff is in between. *I think sometimes people get confused because it is against the law for a supplement manufacturer to make a false claim. But it's the FDA and FTC's burden to prove that it is false.* And it really brings us back. We had this situation with food before 1906, and we had with drugs too, before 1938, and lots of problems and lots of people died.

Rachel So maybe this is a little outside of your area of expertise, but this is a huge market. And one of the things that I hear a lot from non-scientist, family members and other people that I come across is that, "well, these supplements are the real deal cure, because they're not run by the drug companies and the drug companies are really the problem." But they're more highly regulated. So what's the market share? How does that work?

Neal The market share is either a success story or a disaster depending on your philosophy. *If you believe in consumer freedom and “buyer beware/take your chances,” then it is a success story. Congress wanted to foster and encourage this market, and that is fine for cherry juice concentrate and garlic extract and things like that, but the category is so broad. But again, it is a belief-based value system of “let consumers choose” vs. government regulating it for safety. I also think of it as a value of belief vs. science, because frankly it is expensive to prove that these things are safe, it is expensive to prove that a novel substance is effective, it will shrink the market. So it’s a value judgement, do I want science or do I want consumer freedom with “buyer beware?” I try to be neutral on it but the thing that bothers me is when people don’t realize it’s “buyer beware.” That was a choice, and you have to look at it as “buyer beware.”*

I like to point out to my students that natural doesn't mean it's safe or safer. The most toxic poison known to mankind is natural. One ounce of botulinum toxin will kill 50 million people. The fastest acting poison known to mankind is natural, cyanide. The most toxic cancer-causing substance known to man, aflatoxin mold, is natural. So *natural doesn't mean that it's safer*. I don't know how Congress thought they should lump this all together, but they did. *So remember, a supplement could be anything, anything to supplement the diet. It isn't just the natural herbs and other botanicals, it's anything.*

Alyssa So circling back to something we mentioned earlier. There are some specific groups that should be thinking about supplements. And you mentioned one, if you're a vegetarian, making sure you get enough B 12. Are there other groups of people who in general should maybe talk to their doctor or think about supplements, we don't have to get into the nitty gritty of exactly what they should be taking, but if you fall into these categories, it's maybe something to think about.

Neal Sure, women who may become pregnant. That one's easy, because it's folic acid. They should look at either having a diet high in folic acid or taking supplements. Pregnant women, because they're eating for two, nursing mothers because they're feeding two, there could be needs beyond the normal diet. Strict vegans, some people with food allergies, or intolerances or GI issues like inflammatory bowel syndrome, they may not be absorbing things as well, they may need a supplement in that sense. Senior citizens often don't absorb B12 as well. Those are really the five main groups. Some of the other categories get more narrow. It could also be for those whose diets have changed. If you're being sent into combat, you may be on a restricted diet, and you may need supplements because you're not getting very many calories, or getting much food either, but are more narrow things.

Rachel So we're talking about absorption and I think that goes to one of the things that Alyssa brought up and that was a big bang theory clip where Sheldon and Penny are grocery shopping right? And she's picking on a multivitamin and of course he tells her that while there's some merit to the multivitamin your body can only use so much and then it's going to go to waste and so that's the thing I would love to hear your address you know because I do I teach this I'm coming up on this in my pathology class you know some of these you know, vitamins and how much is too much and how much can you use? But you know, what is especially where these are not regulated? And you can pretty much read anything you want about them on the internet.

Would you speak to Sheldon point a little bit there, and say, you know, can too much be too much? Is it a waste?

Neal It's funny because that clip, I had heard that back many, many years ago before the show, someone told me they could actually smell it in the urinal. The water-soluble vitamins like vitamin C and the B vitamins do pass through our systems very quickly. We don't store those up (well, we do store B 12), but the water water-soluble do tend to go through our system quickly. The one good thing about that is they're relatively safe, it's harder to get toxic doses or bad levels, though there can be some problems with the B vitamins, with getting imbalanced. The fat soluble vitamins however, do build up in the body and they can cause harm. The A, D and E all can have toxic levels. *The National Academy of Sciences has given maximum levels you should take of those. Congress has prohibited FDA from enforcing a limit on the amount of vitamins. So again, it's "buyer beware" how much you're getting.* At the Smithsonian Institute, they actually have a 10,000 year old set of bones of an Inuit person who died because they ate too much fat soluble vitamins from eating the liver of the polar bears. The bones broke, because one of the things you're going to have happen is you get brittle bones, you have calcium loss from your bones when you get too much of the fat-soluble vitamins. So, this is another one of the risks, and it's not safe to just do anything you want to do, it really is "buyer beware." You can look up the recommend daily allowances, and if you're getting a lot over that you should be concerned. You can also look up the maximum levels the Institute of Medicine recommends too.

Rachel Yeah, the first thing I start out with in my class is, you know, you can't eat too much polar bear liver! And we can't even get polar bears, right? They're in danger. Yeah. So that is what I lead with when I talk about vitamin A.

Neal That's great. That's great.

Alyssa So one of the things you're talking about is different resources that you've been bringing up. I mean, we talked about that NIH dietary supplements page. Are there any other resources you would recommend, if people want to learn more about this or look up some things like the limits, trusted places they can go?

Neal FDA's website is actually pretty good also, and they have a number of consumer related things on there, in addition to the technical stuff. At the NIH Office of Dietary Supplements has more than just the database, they have a lot of things written for consumers also and it's really a friendly site to go to. So those are the two main ones that I would recommend.

Alyssa I go to the NIH site a lot when I want to look into this stuff, because I have a lot of friends and relatives that are interested, or I've even have physicians recommend or talk about some things, so that's where I like to go, it's pretty easy to find what you're looking for.

Neal And I guess I could add, even though doctors don't tend to be trained in things like supplements, and neither do pharmacists, tell them what you're taking, because there are drug interactions with some of these supplements too, and there can be problems that way also.

They're not so much a resource and telling you if Kava is dangerous, but they're a good resource on "will this interfere with the drugs I'm taking?"

Rachel Absolutely. Well, thank you so much for talking with us, and to our listeners, this is really fun and educational. You can find the resources that we're talking about on our website, and you can find our episodes on the same website www.speakingscience.com or listen to our episodes on iTunes, Stitcher, Google Play or Spotify. And we do have an important announcement that we should make at the end of this podcast. My co-host, Alyssa Preiser, has successfully defended her dissertation and is now Dr. Preiser. I thought it was very important that we have that recorded for all time on speaking side. So, congratulations, Alyssa.

Alyssa Thanks, Rachel.

Congratulations. Thanks again for being with us.

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Edited by Andrea Besley, MSU IFLR

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