

>> Okay, like I just mentioned, the B vitamins function as coenzymes and they help enzymes function. They – like I said, they help you get energy, or ATP, from your food. So, this is from your book, showing carbs, fats, and proteins, and you can see that these pathways in your body, this happens in your cell, in the mitochondria, if you recall from chapter 3. The end result, you digest and absorb these foods, and you extract energy, or ATP, from the foods for your cells to function. And you can see all the steps that require B vitamins here's B6, here's the thiamine, pantothenic acid, niacin, biotin. There's more B's, more B's, here as well, here, here, here. You can see all these steps and if you're like the typical American, you're deficient in these B vitamins, your – it could be one reason why you're tired or fatigued and having to drink coffee and energy drinks is you're not getting or extracting the energy from your foods because you're missing in these vitamins. So, it's very important to note that you can get the B vitamins from your food but also, you can take a supplement. So, again, if you're deficient, it can cause fatigue, long term – it can also increase your risk for many diseases, like cancer and heart disease. Alcoholics, because they urinate a lot from the alcohol, they usually urinate out their B vitamins. And when you eat a lot of the processed grains, like white bread, and rice, and all that, crackers, cookies, cakes, these – all the processing and refining has stripped out the outer layer of the grains that has all the B vitamins, okay? Sometimes, like white bread, you'll see they fortified or added back some of the B vitamins, but they don't add them all back, and they certainly don't add back the fiber, otherwise they wouldn't have taken it all out to begin with. Okay, let's start – like I said, the B vitamins, there's several B vitamins. We'll go through them one by one. Some of them have special functions but they all function as a coenzyme. So, B1 is also called thiamine, and we see a deficiency in cultures where white rice is consumed a lot. Remember that it helps you release energy from your foods, from carbs particularly. Again, I won't go through the food sources, I'll let you look at that yourselves. B2, also again, a coenzyme, helps you get energy from your food, and a deficiency can cause lots of problems, inflammation of your mouth and tongue – I'll show you a picture that – dermatitis, which is a skin rash, cracking around the corners of your mouth, eye problems, sensitivity to the sun, confusion. So, you know, a lot of people get different symptoms. How do you know it's not because you're deficient in a vitamin? That's why it's a good idea to just take a good multivitamin mineral supplement. [Inaudible] fissures in your tongue or cracks at your mouth, there's lots of causes, but one of which could be a B2 deficiency. Here's your sources. B3, or niacin, again, have a lot of functions in your body, so it can create a lot of different symptoms if you're deficient. So, it helps you release energy from your foods. Some alternative doctors use high doses of this vitamin to help increase your HDL cholesterol to good cholesterol. I don't advise doing this without being supervised by someone who knows what they're doing because you can get a lot of side effects from taking high doses of B3. These are our sources. B5, or pantothenic acid, again, helps you get energy from your foods. And you can see you can buy B vitamins supplements, always take it with food. Take – if you take these on an empty stomach, it can make you nauseous. B-50 means there's 50 milligrams of each of

the B vitamins but it's a complex, so it has B1, B2, B3, B5, etcetera. So, it's just a good thing to take, take it with a meal. Here's some sources, again, egg yolks are a great source, sunflower seeds. Biotin, some of you may be familiar with biotin. Some people take it because it's good for your hair growth and it does a lot of other things. It helps you metabolize your fats and carbs, it helps you synthesize your glucose, breakdown amino acids. And again, a deficiency can cause all kinds of problems, inflammation of your skin, here again, changes of your tongue and lips. If you – it can affect your appetite, cause nausea, vomiting, certain types of anemia, depression, muscle pain, weakness, and poor growth. Again, egg yolks, huge source of biotin. And you know, speaking of hair growth, some women tell me that when they were taking a prenatal vitamin, their hair and their nails were stronger and it's not the prenatal, it's the fact that you were taking vitamins and minerals that you normally don't take. And so, most people, they take the prenatal while they're pregnant and then they stop taking it, and now they're deficient again in the vitamins and minerals. So, again, my suggestion is everyone should take a multivitamin mineral supplement. You know, we'll talk more about that in a little bit. So, vitamin B6, once again, helps as a coenzyme, lots of different problems if you are deficient, like depression, because they help make brain chemicals, skin problems, irritation of the nerves, helps your immune system, helps with protein metabolism. It helps you make neurotransmitters. Neurotransmitters are brain chemicals, like serotonin and dopamine. So, if you're deficient in the B vitamins, particularly B6, it can affect your brain chemicals, leading to depression, or anxiety, and other things. We also need it to make hemoglobin and white blood cells. Some of you might be familiar with carpal tunnel syndrome, that is an irritation of the nerves in the wrist, B6 has been shown to help with that. It's good for any nerve condition. It has been shown to be helpful for nausea during pregnancy, so that's something to think about. Here's your sources. Now folate is an important vitamin. It helps you form and keep your DNA healthy and its efficiency, which you need to know for the quiz – oh, speaking of the quiz, please know vitamin B6 for carpal tunnel syndrome that we just went over. But folate is important, and please know this for the quiz again, to help prevent neural tube defects. This is a birth defect involving the spinal cord. Neural tube defects can take the form of either spina bifida or anencephaly. An anencephaly child is born without brain tissue, a skull but no brain tissue. Spina bifida, I'll show you pictures of that. Here is spina bifida and I'll explain why that happens. So, it's a birth defect and what happens is, here's your spine. The bones that you feel in your back, that's that point, that's what you feel. Here is your vertebrae and here's your spinal cord. Now when you're pregnant, within that first month, this part of the bones in your spine have to close together, like it did here. And if you're deficient in folate, it may not close all the way. And as you can see, it remains open, it allows the spinal material to come out of the body, like you see here. These spinal – this spinal material, these nerves control your legs and the organs in this area, like the intestines and the kidney. Sometimes this damage can be surgically repaired, sometimes not, depends on how bad it is. And the way to prevent this is to have enough folate. And one difference between a prenatal

vitamin and a multivitamin is a prenatal has extra folate. It also usually has a little bit extra iron and sometimes calcium, and that's the only difference really. There's also a link between folate and preventing cancer, another reason to take it. It helps also make brain chemicals, neurotransmitters, which can help with depression, by helping make more serotonin, which is your feel-good brain chemical. So, if you're deficient, you may not be making as much serotonin as would be best. They – nowadays, food manufacturers have been adding folate to foods, fortifying foods to help prevent the neural tube defect. But keep in mind too that when you heat the food, it destroys up to 90% of the folate, so cooking is what we're talking about. Now I normally don't ask and test for the RDAs but folate, I do, since it's so important. All of us need 400 micrograms a day, but 600 micrograms a day, if you're in childbearing years, meaning you are able to get pregnant. So, if you're 12-years-old, 14-years-old, whatever age you are and you're having a menstrual cycle, you're able to get pregnant, you should be taking 600, because as we all know, if you have unprotected sex, you can get pregnant even when you are not planning. And the problem is, the first six weeks – the first four weeks actually of being pregnant is when that spinal cord develops and if you don't realize you're pregnant during that time and you're folate deficient, you're at risk of having a child with a neural tube defect. Actually, they'd like you to start supplementing with folate about six weeks before you conceive, before you actually have intercourse trying to get pregnant because it takes that much time to build it up in your body. And keep in mind if you've been on birth control pills, birth control pills decrease your absorption of folate, so once you get off it and try to get pregnant, wait about six weeks and in that time period, take folate daily to try to build your stores back up. And like this says here, that neural tube closes within the first 28 days of pregnancy and that's why it's so important if you're having sex – I'm just going to be straight forward – you should be taking 600 micrograms of folate. B12, a very important vitamin, it doesn't absorb very easily, and you need to know this for the quiz. It requires something called intrinsic factor, which is made in the stomach and goes then to the small intestine where we absorb our nutrients. And this is where we absorb our B12. So, when you eat food with B12 or you take a supplement, it has to bind with intrinsic factor in the small intestine to be absorbed. What happens is we – as we get older, we make less intrinsic factor, so you absorb less of the B12. And if you're taking antacid, antacid is also – I mean – I'm sorry. Stomach acid is also needed to absorb B12. So, if you're taking an antacid, you might be deficient or as – again, as you get older, after the age of 30, as we get older, we produce less and less acid. And here is what – here's your stomach and here's the intrinsic factor that you need to bind to the B12, which is right here. So, this must bind to this, like this right here, in order to go through the villi and be absorbed. Why do we need B12? It helps convert folate to its active form, so we need to help folate function, like we just talked about. We also need B12 to maintain your myelin sheath, this is the insulation around all the nerves in your body. And if you're deficient in B12, the myelin sheath can break down and that can cause something called pernicious anemia, and that's where you get tingling and numbness in your arms and legs.

It can cause fatigue, and weakness, muscle weakness, possibly a sore tongue, and other symptoms. There's other conditions that also can produce this, so it's a matter of being tested if you have these symptoms to see if this is why you have it. Vegans and vegetarians are at risk for being B12 deficient because B12 is only found in animal products. So, it's not a great idea to be a vegan or vegetarian while you're pregnant because you can then be deficient in B12 and your baby can have diminished brain growth. It can degenerate – the spinal cord can be degenerated and poor intellectual development, so that's something to think about, if you're going to become pregnant and you're vegan or vegetarian. Here's the myelin sheath, you can see this is the nerve, okay? Worry about that. the sources again, only in animal products or fortified cereals, meaning they add it to cereals. If you're over the age of 50, you definitely need to supplement, as I talked about earlier, your absorption will go down as you get older. We also see deficiency in vegans because the only source is animal product. Okay, I will continue this lecture in the next segment.