>> Hi, everyone. This is Chapter 5 on lipids. Quite a large chapter, but very, very important, as you'll see as we go through the material, as far as your health is concerned. So we've talked about carbs and they are made up of carbon, hydrogen, and oxygen, and lipids as well. We separate fats and oils by: Are they solid at room temperature? That would be a fat. Oils are liquid. Okay, this is what we're going to talk about in this chapter. We're going to talk about fatty acids, triglycerides, we'll skip over phospholipids, we'll talk about cholesterol, and then the fat-soluble vitamins we will talk about in Chapter 8. Now, the structure of a fatty acid, I'm not going to test you on this, but it's interesting to know how the namings came up for – like how did they come up with omega-3 fats versus omega-6 fats versus saturated fat and so forth. So again, it's hard without a board to write this, but a fatty acid is made up of a whole long chain of carbon atoms, and each carbon is surrounded by a hydrogen molecule. At one end, there's what's called an "alpha" or acidic group. At the other end is an omega group, hence omega-3, omega-6. So it's just a bunch of carbons surrounded by hydrogens, okay? And then the carbons are connected by a bond, so each carbon has either a single bond or a double bond, and again, that influences the name of the type of fat. As we go through, I'll show you. Now, the first fat we'll talk about is saturated fats. Saturated fats have a bad name. Everyone thinks, oh, the bad fats, they increase our risk for heart disease, but it depends on the type of saturated fat, and of course, within reason. You don't want to make up most of your diet fat – a diet of saturated fat. But saturated fats in and of themselves we have a need for, but what you should know is that saturated fats, they're all single bonds between the carbons, no double bonds. So every carbon is surrounded by a hydrogen atom, surrounded or fully saturated by a hydrogen atom. They are solid at room temperature. If you think of butter, butter is solid at room temperature, coconut oil is solid at room temperature, all the animal fats, like the meat on a piece of – fat on a piece of red meat, that's solid at room temperature. Now, coconut oil I just want to mention. Years ago, there was a lot of talk that coconut oil was bad for us because it was loaded with saturated fat, but if you Google "coconut oil" and do your own research on it, nowadays, at least the last several years, there's so much research now on the health benefits of coconut oil. It's been shown to have antibacterial properties, antiviral, antifungal. They now actually make capsules with an ingredient of coconut oil for those benefits. It also helps with your memory, for brain health. They've used it with Alzheimer's patients with great success. It actually is heart-healthy. It's been shown to lower the LDL, the bad cholesterol, and raise the healthy HDL, or good cholesterol. So it's very healthy for us, actually. That fat on that piece of meat, that is saturated fat, solid at room temperature. Again, you don't want to go crazy. This is not something that you want to gulp down. Also, think about all the toxins and pesticides that the animal was exposed to usually accumulate in the fat tissue, so eating the fat, you're going to be getting more of that. Now, there's unsaturated fats. So remember, saturated fats are fully surrounded by a hydrogen. In unsaturated fats, there's a few hydrogens missing. We have monounsaturated fat and polyunsaturated fat. Monounsaturated, "mono" means "one," so there is one double bond in

the structure. Polyunsaturated has two or more double bonds. Both of these are liquid at room temperature and they both have different health benefits or maybe not so good for us, so we'll go through that. Here is a perfect example. This is a saturated fat. You can see here all the carbons are single bonds. Don't count that. That's part of the acidic group. Fully surrounded by the hydrogen atoms. The monounsaturated fat has – "mono" means "one" – one double bond and it has two less hydrogens. A polyunsaturated fat is two more double bonds. Now, this is an omega-3 fat. This is an omega-6. Omega-3, because the first double bond right here came from the one, two, third carbon over from the omega or methyl end. The first double bond is three carbons over, so it's called an omega-3 fat, and then one, two, three, four, five, six carbons over, that's an omega-6 fat, and the monounsaturated fat is also called "omega-9" because it is nine carbons over. You don't need to know this for the quiz. I just think it's interesting to know how the name came up. But I will mention that the more double bonds, like in these – this makes it more liquid and more unstable at room temperature. So omega-3, anything with omega-3 or omega-6 fats can go rancid very easily. Okay, trans fats, these are not very healthy for us, and we'll talk more about these. This is more of a manmade type of fat where in nature you'll notice – let me go back here, when you have the double bond, the hydrogen is on the same side, we see here, and with the trans fat, they transfer one of the hydrogens to the opposite side of the double bond and that changes the whole structure of the oil and it has a different consistency, and I'll go through that more in a minute. And call this trans fat "hydrogenated fat" or a "partially hydrogenated fat." You need to look at the ingredients of your foods and see: Does it list partially hydrogenated soybean oil, peanut oil, whatever kind of oil it is, is it a partially hydrogenated fat or hydrogenated fat that is the same thing as a trans fat? Again, they remove – they move the hydrogen over to the opposite side of the double bond. It is now more solid. So think again, margarine, it's not as liquid as a vegetable oil, but it's not as solid as butter. They use these fats in food manufacturing because it gives a longer shelf life. It also changes the texture of the food. And if you look at the ingredients of crackers and pastries, pie crusts, different bakery items, of course, margarine, shortening, these all use hydrogenated fats to give a certain texture and increase shelf life. Look at peanut butter, Skippy peanut butter, unless it's the natural kind, the Skippy peanut butter has hydrogenated fats in it so that it spreads easily and the oils don't separate and you can keep it unrefrigerated; whereas, a natural peanut butter doesn't have the hydrogenated fats, the oil separates until you store it in, and you must keep it refrigerated or it will spoil. But people don't like the natural peanut butter as much, some people, anyway, because it doesn't spread as nicely as the one with the hydrogenated fats, but the hydrogenated fats are not so healthy for us, and you can see how on the Skippy label they put "peanuts" and they added "sugar." Why, I don't know. We need sugar, we need it sweetened, hydrogenated vegetable oil, in this case, cottonseed, soybean, or rapeseed oil, all three of these are GMO-type oils. So on top of them being GMO, they're also hydrogenated. If you get the natural peanut butter, it's just got peanuts and salt, much healthier. Okay, because

trans fats are not healthy, Dietary Guidelines for Americans says to limit your intake to less than 1% of your calories a day. What does that mean, 1%? Well, for instance, a doughnut has 3.2 grams, which is going to be more than 1% of your calories, and French fries, a large serving has almost seven grams. But you can see anything fried, the chips, the crackers, the pie crust, like I said, fried chicken, all this stuff usually has – is fried in hydrogenated oil. Again, it gives a longer shelf life. They can use the oil over and over again without it going bad, but these are very unhealthy for us. A different texture it gives as well. More hydrogenated fats in the doughnuts. Well, here you've got the typical American breakfast, toast, butter, jelly, eggs, sausage patty, home fries, bacon. The only thing – really, the healthiest part is what here? The eggs, of course, right? Bacon, the problem with bacon is it has a lot of nitrates, nitrites. These are cancer-causing preservatives. This, the home fries are usually fried in some type of vegetable oil, which when you heat the vegetable oils, they oxidize and turn harmful. Sausage patty usually, again, has nitrates. This looks like white bread; of course, lots of sugar, sugar. Okay, so the trans fats, please star this slide if you've got the notes here. This is definitely going to be on the test. They're bad for us because they increase the bad cholesterol in your blood, the LDL, which we'll go through, and they decrease the healthy, or the HDL cholesterol. They're really bad for our heart health. They add plaque to our arteries and increase the risk of heart disease, among other health problems. So in 2006, it became a law to put trans fats on a food label. The problem is that you can put – the manufacturer can put up to half a gram of a trans fat per serving and still say "zero trans fat." So something can have less than half a gram per serving, and let's say a bag of chips has four servings, technically, it's got quite a bit of trans fats. So it's misleading. You really need to look at the ingredient list. Again, more of the foods that have – usually made with hydrogenated oils. Like I said, pie crust, crackers, croissants, biscuits, cookies, cakes, doughnuts, anything fried, French fries, and so forth, potato chips. Now let's talk about essential fats, EFAs. They're also called omega-3s and omega-6s. These are called "essential" because our body cannot make them and it's essential that we take them in our diet. The omega-3 fats, these are the healthiest – one of the healthiest fats you can eat. Again, I showed you why I came up with that name, but what you need to know for your health and also for the quiz: What foods have omega-3 fats? Well, any fish or fish oil product. You can buy fish oil supplements or omega-3 supplements. Flaxseeds have a lot of omega-3s. Walnuts have a lot of omega-3 fats, chia seeds. Soybean and canola oil also have a lot of omega-3s. The reason I have these in parentheses is I don't recommend eating – using these oils because they're GMO oils. Keep in mind that most processed foods, anything in a box, package, or if you eat out in restaurants, they use soybean and/or canola oil, cottonseed oil. Restaurants use these to fry in because they're cheaper, but they're, again, quite unhealthy. But the omega-3 fats are very healthy. We'll see why in a minute. But, again, fish, fish oil, flaxseeds, walnuts, chia seeds, hemp seeds as well. You see all the different foods here that have it. These have barely any flavor. Trader Joe's sells it. You can Google these. Very, very healthy way to get extra omega-3 fats. Why do

we need them? And please know this for the quiz. They help decrease blood clotting. When you get a blood clot, you can get a heart attack or a stroke. Omega-3 fats help lower your risk of getting a blood clot, and this can happen at any age. Research shows that eating fish twice a week will lower your risk for a heart attack, so that's a good reason to either eat fish or one of those foods I showed you or take an omega-3 supplement. I mean, nowadays they even put it in dog and cat food. It also decreases inflammation in your body. Inflammation increases risk of pretty much every chronic disease including cancer and diabetes, Alzheimer's. Omega-3 fats can help with mild cases of depression. It is very healthy for your brain. Remember, your brain is about 60% fat. And American Heart Association recommends two servings of fish a week, two three-ounce servings. I believe that was on a test. Also, if you have already cardiovascular disease, you already have high blood pressure or high triglycerides plaster on your blood, then they recommend taking a supplement, omega-3 supplement, one gram a day. The reason you want a supplement and not eat fish is the fish has, of course, mercury and other heavy metals which are unhealthy; whereas, a good quality omega-3 supplement will have taken out, just pulled out those heavy metals and should state so on the bottle. So I'm going to end this part here and we'll continue with part two.