



Managing Inflammation with Dietary Fats and Other Nutrients

Transcript

Hello and welcome to the Institute of Nutritional Endocrinology's presentation on *Managing Inflammation with Dietary Fats and Other Nutrients*. I am Dr. Ritamarie Loscalzo. I am excited to be here to talk to you about the importance of fats and managing inflammation. As you know, inflammation is an underlying cause of just about every disease condition there is, at least every disease with an '*itis*': *colitis*, *gastritis*, *encephalitis*, *arthritis*, *myositis*, and there are many more.

Inflammation underlies all of them. Inflammation also underlies conditions like heart disease, cancer, diabetes, high blood pressure, strokes, and a whole lot more. It is really important for you, as you are working with clients, to understand how the inflammation gets managed. It is very manageable using nutrition with a particular emphasis on fats.

I just want to take fats out of the doghouse because there is a lot of bad press about fats: that we should not be eating fats, that fats are bad for us; when in reality it is the quality of the fat, and somewhat the quantity, but not as much quantity as quality. Quality is the most important. In our previous introduction to fats, we learned about how the fats are structured, what they do in the body, and that we *really* need them.

Eliminating fats completely from your diet is a *huge mistake*. You might see some clients that come in that have been on an extremely low-fat diet for a long time because they read that it was good for them, or they took it to an extreme. You will find they have lots of different problems that we will talk about more.

Before I begin, just make sure that all of the information that I am sharing is not intended as medical advice, and when you share it with your clients it is not intended as medical advice. It is intended as education to help them bring their nutrition and their lifestyle into balance so that it fully supports their health. If anybody is on medication (or you are on medication), before you start messing around with things, make sure that they speak to their doctor.



Let's talk about the **healthy benefits of omega-3 fats**. As a review: omega-3 fats are one of the most important for our health. It is an essential fatty acid, at least one of them, that the body cannot make and needs to take it in from the outside: from nutrition. Without that fat you are missing some functions; so you cannot go on a fully, no-fat diet. Let's talk about some of the areas where fats are important. We will review them. Improving heart health, and we will tie these in to inflammation. One of the reasons it improves heart health is because fats are important for the management of inflammation.

Inflammation happens within the arteries and blood vessels. People think 'it is cholesterol', 'it is bad', and 'cholesterol is what causes heart disease'. In fact, it is the inflammation in the arteries that attracts the cholesterol to the area to heal it. But then the cholesterol gets stuck there because of the damage, and then the arteries become less flexible, oftentimes because of insulin resistance. So omega-3 fats are very important in the heart health.

They are also important for reducing hypertension. There is a lot of press and research on using essential fats, omega-3 fats in particular, for helping people to keep their blood pressure at the right level. It is also important for autoimmune diseases. Autoimmune diseases have an inflammatory component, a huge inflammatory component, because your immune system is actually attacking part of the body.

Having the right balance of fats is one of the important components of managing people with autoimmune disease. Of course we keep talking about reducing inflammation and that is in things like arthritis. People come in and have the chronic arthritis and think there is nothing they can do about it. They think it is old age. They think whatever, when in fact it can be managed quite nicely with the management of fats and other nutrients as well. It reduces depression. Fats have an important role in brain chemistry. In particular, DHA is very important in brain chemistry.

Improved vision. There is an inflammatory component to vision loss and cataracts. Fat has a big role in managing eye health. In cancer prevention and support, if a person has cancer. We are not in a position to be treating cancer, but we will be there counseling and coaching our clients that have cancer or that want to prevent cancer because they are at high-risk, because they previously had cancer, or their family members have had cancer. That balance is critical for that. It's very, very important.



Finally, it reduces the risk of osteoporosis. People don't realize how important that is in terms of bone health. We talk about calcium but we really don't realize the role of vitamin D in bone health; and vitamin D is very dependent on fats since it is a fat-soluble vitamin.

Now let's talk about some of the juicy stuff. Let's look at some **biochemical pathways** and you know how I like to geek out on biochemical pathways. I really feel that it is an important piece of your understanding, so that as you are explaining things to your clients you can show them a simplified version of this diagram. I will show you later on in the presentation some of the ones I use. You want them to understand how these things are actually processed in the body. You know that we have essential fats. They are **omega-3 and omega-6**. We talk about what that means, what the omega means, and what the positioning of those double bonds are. Let's talk about how we get them, what the sources are. We will go into more of this later, but now we will give you an overview of some of that, and **how they get converted into inflammatory prostaglandins and other eicosanoids**.

On the omega-3 side (which is on the left on this diagram), we have good food sources: flax, hemp, walnuts, and chia. On the omega-6 side we have just about every vegetable oil and animal fats. We will have some linoleic acid. What happens if your body is going to need to elongate these: to go from a 16-carbon fat to a 20- or 22-carbon fat to be really useful in the body. The way it does that is via an enzyme called delta-6-desaturase.

It would be really nice if that enzyme was really efficient and could convert all of the linoleic and the alpha-linolenic acid that comes in, into gamma-linolenic and EPA and DHA, but that is not the case because the delta-6-desaturase enzyme is very sensitive. We are going to talk about what kind of things disrupt that, and what kind of things you can help your clients to do to support that.

The next stage on the omega-3 side is something we don't really talk about very much, is the stearidonic acid, which is still an 18-carbon (but it is a 4 double bond... You don't need to get into all of that). Then there are a bunch of steps where the dotted lines are in between. Then from those intermediates down to eicosapentaenoic acid is delta-5-desaturase enzyme.

The other side, on the omega-6 side, we go from linoleic acid, which is our food source and one we cannot make (an essential fatty acid) and that gets converted into GLA (gamma-linolenic acid).



But because the delta-6-desaturase enzyme is so sensitive, a lot of times it is warranted that you have your client take a GLA supplement, because they are not making enough of it. That is an important piece to understand.

You can actually supplement them with borage oil, or evening primrose oil, or black currant oil, or hemp seeds which also have a fair amount of GLA. On the other side you've got hemp and black currant and seafood, which actually contains some of this stearidonic acid. If you can get food sources of those intermediates, that is going to help with the production of EPA and DHA, as long as the factors that influence those enzymes are intact. We will look at what those are in just a bit.

The GLA goes to DGLA, dihomo-gamma-linolenic acid, which is a 20-carbon fat. That one is the one where it can go both ways. The omega-6 side we go down to providing the positive eicosanoids, the prostaglandin of the 3 series (PG3), which are anti-inflammatory. On the omega-6 side, you can go down to the PG1 series, which are anti-inflammatory, but there is a choice that can happen there and you can also have a conversion go down to arachidonic acid.

There are a lot of factors that influence that. One is the quantity, the sheer quantity of omega-6 in the diet. Many people have so much omega-6 that they just push down through that pathway. Some people think, well if enough of the delta-6-desaturase is converting it, which apparently it does, it gets pushed down to DGLA and then arachidonic acid *more than* it would board the PG1 when you have an abundance there.

Arachidonic acid is found in animal fats. It is found in meat, dairy, and eggs. Very few foods in the plant kingdom have arachidonic acid. The one exception is peanuts. DGLA is high in mother's milk but not many of us are doing mother's milk and your clients don't really have access to that as a food source nor would they want to.

This gives you an overview and we will be going into a little bit more overview, I don't want to say detail. I provided you with some extra reading materials that will give you more detail if you want to go there.

The **Eicosanoids** are hormones or hormone-like compounds. In some literature they call them hormones, in others they call them hormone-like compounds. They have a very potent action on the body. There are a bunch of different categories of eicosanoids.



The three that you are going to hear about the most with regard to inflammation are **prostaglandins**, **thromboxanes**, and **leukotrienes**. The prostaglandins have three series, the one's, two's, and three's. The *one's* and *three's* are *anti-inflammatory*. The *two's* are *inflammatory*. Thromboxanes and leukotrienes are very, very potent and it is related to the COX, the cyclo-oxygenase, enzymes that provide those.

We have anti-inflammatory medications that people might be on called COX-2 inhibitors. Those are inhibitions of the creation of these thromboxanes, leukotrienes and prostaglandins series two. COX-2 inhibitors will prevent the production there and that is the class of medication that is often used. We are not going to go into the rest of them. They are just there for your edification and there is an article that goes into more detail if you would like the more advanced stuff.

This is another closer look at the **Gamma-Linolenic Acid (GLA)**, which has a very important function in and of itself, gets converted into *DiHomo-Gamma-Linolenic Acid* (DGLA).

The desirable pathway would be from DGLA down to *Prostaglandin E1*, which is the really good anti-inflammatory hormone-like substance. The toxic pathway is for it to be transformed by *Delta-5-Desaturase* down to *Arachidonic Acid*. Apparently Delta-5-Desaturase can be inhibited by sesame seed; the lignans in sesame seed. The arachidonic is transformed by the COX-2 enzyme into *Prostaglandin E2* which is a dangerous pro-inflammatory. Some of those medications that are relatively new on the market, not around as long as Tylenol and aspirin, that is where they affect the pathway. They decrease the level of COX-2. Those are probably your safest anti-inflammatory medications.

The other pathway that arachidonic acid can take is via the *5-lipoxygenase* enzyme that takes it down to the *Leukotriene B4*. That is an extremely dangerous pro-inflammatory and tissue destroying agent. It is even more dangerous than the prostaglandins. What we will see shortly is how various medications work; that a lot of the non-steroidal anti-inflammatory (NSAIDs) medications do not touch the leukotrienes side of the pathway.

Let's take a look at the **delta-6-desaturase** enzyme as well as some of its inhibitors. The conversion from ALA, the essential fatty acid alpha linolenic acid, to EPA and DHA. It is estimated to be as low as 2% and as high as 8% with an average of 3.8%, although one study did measure it at 36% in females.



A lot of this has to do with the nutritional status of the person because of all the nutrients that are required to do the conversion. The nutrients that are required to do that conversion are the ones that you are going to see most likely to be deficient in people who are eating more of the standard American, or Canadian, or Mexican, more the standard diet; people who are not that health-conscious. That is going to be most of the people that you are going to see. So you have a lot of work to do here.

Just as a reminder where that delta-6-desaturase enzyme sits, it is in the conversion of linoleic and alpha-linolenic acid, down to their elongated states. Let's look at some of the things that can get in the way of that. I just wanted to mention that there is a note at the bottom, 'less efficient in babies and the elderly'. When babies are born their delta-6-desaturase enzymes are not working all that well, and as we age it tends to go down, it goes down quite substantially as we age. That is something to keep in consideration in addition to some of the other things.

Trans fats like margarine, shortening, hydrogenated fats, they are going to mess up the action of the delta-6-desaturase. In addition to them having their own dangerous effects on the body, one of the dangerous effects is that they inhibit the elongation of your omega-3 fats, and your omega-6s as well.

If you have too much of the omega-6 fats, that actually can have a negative feedback to the delta-6-desaturase enzyme and inhibit that. Also an excess of olive oil, oleic acid, can actually inhibit the delta-6-desaturase enzyme and that is not talked about all that much. It is an important factor to consider especially if you are dealing with clients who have autoimmune diseases or who have inflammatory processes going on.

Then there is sugar. Sugar is huge in the disruption of delta-6-desaturase in addition to all of the other havoc it plays in the body. Sugar also inhibits macrophage activity and it helps to feed cancer cells which have a lack of insulin receptors on the walls. There are a lot of ways that sugar gets into the, it is a culprit in our poor health.

Caffeine is another thing that affects the Delta-6-desaturase and there are a lot of folks that say, yes it is okay to drink coffee as long as it does not have all of the fungals and there are all of these newfangled coffee but the truth of the matter is caffeine itself in the coffee is going to inhibit the Delta-6-desaturase. It is going to have an inflammatory effect on the body, as well as alcohol. Again, people will propose, oh yes, alcohol is okay. It is very good. It is beneficial to have alcohol because it does have quite a number of antioxidants.



But there are ways to get the antioxidants that are in alcohol, in other ways. I do not think it is worth the risk in addition to liver problems and brain cell destruction; alcohol is inhibiting the Delta-6-desaturase enzyme.

Same thing with food additives. We always talk about eating whole foods, real food. This is one of the other pieces that you can throw in as ammunition with your clients.

You can say look, you've got inflammation, you've got pain, and these foods are inhibiting your body's ability to control and manage that inflammation. Let's just get off them for a while and see how you do.

Protein deficiency is another one. I see a lot, not so much that people are not eating enough protein but because of some of the other things that they are doing like the sugar, caffeine, alcohol, food additives, gluten, their gut is messed up and they are not absorbing their protein efficiently. Their stomach acid may be quite low. Deficiencies of things like biotin, zinc, magnesium, and the vitamins: E, B3, B12, B6. That may not be an exhaustive list but the other the nutrients that are important for the Delta-6-desaturase to be functioning properly and again these are very deficient in our population.

Zinc is one of the most deficient and magnesium as well, deficient minerals in the whole world really. Vitamins, especially the B & E vitamins are very low because people are refining their foods and they are eating a lot of refined carbohydrates, breads, and pastas, which are deficient in these nutrients. B12 of course, we used to be able to deal with it in the soil because we get it from the soil and we get the organisms that create it I should say. There is no B12 in the soil but there are organisms that create it. But now we are so germ phobic that everything is washed, triple washed, and quadruple washed so we don't get the dirt. We can get more B12 in your system and you can encourage your clients to grow a garden and not wash their veggies when they take it out, just dust it off.

Smoking is big time. Smoking affects everything. Most people know that by now but you may get a few people in there who are still smoking.

Let's talk about **things that can improve Delta-6-desaturase**. (Avoid eating those things that hurt it is the starting point.) Foods that improve it are coconut oil, the lauric acid in the coconut oil. Of course I am a big fan of eating whole foods so whole coconut or coconut cream made into a peanut butter type consistency is a great source of *lauric acid* that helps to improve it.



It also has another acid calls the *myristic acid* which is another one that helps with this conversion. The nutrient biotin is very important. Vitamin E, vitamin C, the B vitamins; B12, B2, B6, B3, they are all the B vitamins that are important. Zinc, magnesium, these are important things that you have got to make sure your client has. When we do fatty acid testing, which we will look at a little bit now but in a lot more detail when we get to the functional testing part, you are going to find that a lot of people are deficient in fatty acids. You are going to find that a lot of people are eating Chia seeds and hemp seeds and thinking that they are doing well, but not eating fish and not taking fish oils, they are very low in the EPA/DHA even though they are off the charts in their alpha-linolenic acid. The reason for that is a deficiency of cofactors for Delta-6-desaturase or things in their diet that are inhibiting Delta-6-desaturase. It is really important for you to focus on these things. When I do the tests are people I can see and I say wow, you eat a lot of Chia seeds or hemp seeds, don't you? They say yes, I do. But why are you not converting? You are missing some B vitamins, you are missing some of the other nutrients. Then we talk about ways that they can get them.

That is a summary, and you have a bigger chart of that as well that puts all of the nutrients in their places and resources of the various ones.

How much omega-3 do we really need? Again, a lot of controversy, a lot of debate. A lot of people say you have to eat fish in order to get your omega-3's. In fact they do not. I have seen it happen. It just takes a little more effort to do it from plant sources but it is doable because one of the plant sources that have EPA/DHA is algae.

There are a lot of supplements on the market that come from algae that are concentrated algae oil with the EPA and DHA in it. If you have someone who is deficient and they are not taking algae, they are not eating purslane, which is a good source of it as well, then they are not going to be getting enough if they are just relying of the conversion and they are not really meticulous about their diet.

Here is the way to do it. The recommended daily allowance of ALA is about 2.2 grams. It's going to vary based on a person's size and weight but approximately 2.2 grams. That is it a fair amount but it is going to be converted at a very low efficiency rate. Remember that it is only going to be converted at 10% and you've got 2.2 grams, if you take 10% of that you are down 0.22 grams of EPA/DHA, which is actually lower than the requirements recommended by the Heart Association of 0.65 grams. Actually one of them is saying 800 milligrams, which is 0.8 grams approximately.



If you look in the range of 650 to 800 milligrams of combined, then you are going to be in that range but really these studies have shown that about 2 grams is what is needed if you have heart disease or heart disease risk.

Since the conversion is very low it takes about 10 times the amount of ALA to convert to EPA/DHA, I would say if you are a vegan or don't eat fish or take fish oil, if you add in extra 6.5 grams of ALA to the diet that can do it. That is not as hard as it may seem. A Chia seed contains per tablespoon of Chia seed you get about 2 1/2 so you can do this with 2 to 4 tablespoons of Chia or some combination of other omega-3's. It is not that hard to do but you do have to be conscientious about it and adding the coconut improves the conversion. It is said to improve it tenfold but you do not know exactly what is happening in people so you really have to look at signs and symptoms. Even if they look like they are getting plenty but have signs and symptoms of fatty acid deficiency, it is a good idea to supplement.

Let's look at some of the conditions, not just necessarily habits but look at conditions that decrease or inhibit the Delta-6-desaturase. One is diabetes. High sugars and high insulin levels in type II diabetics can be affecting and decreasing the effectiveness of the Delta-6-desaturase. Poor pituitary function has been shown to have an effect. Low thyroid function has been shown to have an effect. Of course cancer, cancer has an effect on everything and that has an effect on the Delta-6-desaturase enzymes.

Let's look at a chart and talk about the **omega-6:3 ratios** because they are so important; it's very important for your client to have these in balance in order **to manage inflammation**. This is just a short list of seed so you can get a comparison. If you look at flax seeds, they have 1.8 grams per ounce of omega-3, and 0.4 grams per ounce of omega-6. That puts our ratio of omega 6:3 at a whopping, beautiful 0.2. Good job.

Hemp seeds are a good source of omega-3's. They have 2.8 grams per ounce, which is more than the flax but they also have 8.4 grams of the Omega-6 so their ratio is 3, which is not bad but it is not as good. The thing is there is a lot of omega-3 in there so if you are to balance the hemp seeds with other high sources, like combine hemp seeds with chia seeds. Make a Chia seed porridge and put hemp seeds in it. One of my favorites is to combine Chia seeds, hemp seeds, and coconut to help with the conversion and get a really hefty dose of my omega-3s. Chia seeds are similar to flax although they have more omega-3 per ounce. They have five grams per ounce compared to 1.8 for flax seeds so that is why my one of choice is Chia but you want variety so you can do variety.



I have a pudding recipe where I also grind flax seeds into it. I don't do that all of the time. I am not a big fan of the gooeyness of the flax seeds but that is fine. Chia seeds have 1.6g of the omega-3 the ratio of omega 6:3 is 0.3, a little bit higher than the flax and still amazingly good but it does have more omega-3 per ounce, so you are actually going to reach the quota more easily. If a person is having two ounces of Chia seeds a day, you can feel very comfortable with the person getting enough omega-3's.

Pumpkin seeds on the other hand are often called a good source of omega-3, but really an ounce of pumpkin seeds only has 0.1 grams of omega-3 and a whopping 5.4 of Omega-6. That puts the ratio of omega 6:3 at 107.8, which is not good. Not to say do not eat pumpkin seeds but to make sure that you are eating them in conjunction with something that has a lot.

If you are eating an ounce of pumpkin seeds and you have it with an ounce of Chia you are going to bring that ratio down tremendously because they've got you got an equal amount of 6-3 so you might have 1.8:1 ratio so it is just a matter of combining them properly. It is not a matter of throwing out any of these foods but helping your clients to see. I have given you a chart, and I have given you the Excel version of that chart, and you can share that with your clients; the PDF version of that they would have to do by hand. The Excel version does all of this plus I have included some really nicely balanced high omega-3 recipes in that spreadsheet.

And sunflower seeds. Not quite as high as pumpkin. They are often considered a good source but they are not good sources of omega-3, but they are just fine to have in conjunction with good sources of omega-3. For omega 6/3 ratios: poppy seeds were 96, sesame 67, and sunflower 85. If you look at salmon, which is pure EPA/DHA, it has a lot less of omega-3. Three ounces of *salmon* is going to put you at 0.25 of EPA and 0.948 of DHA, which only comes out at a little more than a gram of total omega-3, but they are *already elongated* so it is a reasonable amount. But if you can get the Delta-6-desaturase enzymes working effectively then people don't have to worry about getting fish, which is a high source of lead and other contaminants.

In the spreadsheets that I have given you, you can actually go and put these numbers in. It will calculate your ratio for the whole day or for however you choose to use it. This is a comparison, for graphic sake so you can see it really clearly. The brown is oleic acid so a lot of these have a fair amount of oleic acid. The purple is the alpha-linolenic acid, which as you can see is in the walnut, hemp, flax and canola and they do not have Chia on here.



A little bit in soybeans so I would not say soybeans is a good source. You've got the yellowish, which is the linoleic, which is the omega-6, and then you have some saturated fat, and you have oleic which is a monounsaturated fat.

If you look at these you can see that almonds and hazelnuts do not have a large amount of omega-6s, but they also do not have any significant amount of your omega-3, the purple is the omega-3. If you balance them with high omega-3 foods you can see that if you balance it with flax or Chia or hemp you can get some balance, but it is really about balance and using the flowchart, the spreadsheet, with some foods yourself so you get comfortable with it, so you can share that with her clients.

Let's look at a marker, which is a really good **inflammation marker**. The only way you can get this is by doing an essential fatty acid test. There is a number of ways you can do it. You can do it by doing a skin prick test called the *blood spot fatty acid*. It is the most inexpensive way to do it and Metametrix does it and then they give you these ratios. Another way to do it is the whole blood test. You get your blood drawn and they can actually test for a lot more. The blood spots fatty acid just tests for the omega-3's and 6's and EFA's. They do not go into a lot of the more elongated pathways or the saturated fats or anything like that.

The optimal ratio is going to be between 1.5 and 3 of AA/EPA, which is different from the omega-3 and 6 in our diet. This is actually when you do the test. Arachidonic acid is the AA. EPA is Eicosapentaenoic acid. In order to keep good balance of inflammation the optimum ratio would be between 1.5 and 3. So 1.5:1, or up to 3:1 AA/EPA. That is an important point to know. It is considered "unwell" to have a ratio of 10. I see it all the time when I run the fatty acid test. You will too when he starts to run those tests. When you run those tests and you get a real good picture on paper of what their fat status is, it is amazing how much more compliant people will be. Anything exceeding 15 is a high level of inflammation. Oftentimes people with MS or autoimmune diseases are going to be in that range. The average American serum AA/EPA is 11. This means they are unwell. The average American is unwell and we know that. That is why we do what we do, isn't it?

People with chronic illness and disease typically have scores about 15, so yes, definitely those high numbers. I am just going to review a couple of **paths** that **GLA can follow in the body**. That was the omega-6, the good part of the omega-6. I think that we did go over this before but to just reiterate, the GLA can go to the DGLA. DGLA is the one that can go either way. It goes both ways.



You can go down the positive side to prostaglandin E1 which is anti-inflammatory, or it can go down the negative side and be transformed by Delta-5-Desaturase into arachidonic acid which then gets transformed by the COX-2 enzyme into prostaglandin E2 (PGE2) or by the 5-lipoxygenase into leukotriene B4. Pro-inflammatory, very potent. You are going to see this over and over again. I cannot stress this enough. I want this pathway imprinted into your brain.

We will look briefly at **how the fatty acid test works**. It will show you, it shows you all of the details at the top, and at the bottom it will show you the AA/EPA ratio. If the person is in omega-3 dominance then it is going to be less than 2.1, which isn't bad as long as this does not go below 1:1 or 1. Low risk but still, the risk of inflammation but little is between 2.2 and eight. Risk of inflammation that is mild is 8.1 to 13, moderate 13 to 30, and high above 30. This is from Dr. Barry Sear's work as well as other scientists in various labs.

[35:38] The index of omega-3 fatty acids is high at 0.67, intermediate at 0.67-1.4 and low at greater than 1.4 (the index of omega-3 Fatty Acids is the 'EPA+DHA' percentage of the total). This is what the blood spot fatty acid test looks like. You see there are several categories. To the omega-3s, the omega-6s. You have the food sources of alpha-linolenic and linoleic. Those are the ones that you find the most common when eating food and then you've got your dihomogamma-linolenic. Here's the thing. When you read this you can tell what is going on.

This person is relatively low in alpha-linolenic acid, very low in DHA, and moderately low in EPA. The EPA is higher than the alpha-linolenic so I would suspect that this person might be taking some fish oil or some pure EPA in very small quantities, but maybe not. I would also suspect that this person is not eating a whole lot of flax, Chia, hemp seeds, or walnuts because they are very low in omega-3s. On the other hand let's look at their omega-6 side. Their omega-6 (linoleic acid) is much higher than their alpha-linolenic. Their GLA is low, which implies to me that the Delta-6-desaturase enzymes might not be working properly. That is the reason why I said maybe this person is actually taking EPA because if the enzyme is working, if it is sluggish, the Delta-6-desaturase can cause that. But we do not know, so we ask questions.

This is what it would trigger for me to ask those questions. The DGLA is not too dissimilar to the gamma-linolenic acid, and the arachidonic acid is low, so this person is probably not eating a lot of animal products. It is very rare to have low arachidonic acid if you are eating a lot of animal products.



They have low enzyme function, so we have to look at cofactors. Down below you can see the AA/EPA, the ratios I really look at are the AA/EPA, and the index of omega-3 fats which is EPA + DHA percentage of the total.

Some **sources of preformed GLA** which is remember the omega six side but that is important for hormone balance and some other things so we want to be able to make enough of that or take it in foods. Hemp is 2-4% GLA. Evening Primrose oil is 7% GLA. Blackcurrant seed oil is 15%, and borage oil is the best source at 23%.

If you are looking to take a supplement or recommend a supplement to your people the most economical is going to be borage. There may be some things that evening primrose provides that the others don't. That is where all the bio-individuality comes in.

The mast cell membrane that is where all of this action happens, the arachidonic acid cascade is in the cell membranes of mast cells which can explode and create inflammation. You can see the arachidonic goes down to the thromboxanes and the leukotrienes. This is the inflammatory cascade. You've got your enzymes, you've got inflammation happening it is down at the bottom, the little fires. What we want to do is strengthen your force of firefighters. When the omega-6s go down the DGLA to prostaglandin one (PGE1) then you get more firefighters. When the omega-3s go down to the PGE3's you get more firefighters. Let's take a look at **what happens when people take medications**.

When people take medications the two most commonly prescribed anti-inflammatories would be steroids, and NSAIDs—Non-Steroidal Anti-Inflammatory Drugs. You can see where they interrupt the pathway. The bad part about this is that they both *interrupt the conversion* from your alpha-linolenic and your linoleic down to EPA/DHA, so they are cutting it off. They are decreasing your ability to make that so they are disrupting that by affecting the Delta-6-desaturase and the conversion.

The actually just turn it off. The steroids will also be a little bit more potent because they interrupt the arachidonic acid production. What is happening here is the NSAIDs will affect the thromboxanes which are the less potent of the inflammatory and they won't affect the leukotrienes. You need the steroids to come in and disrupt the pathway further up. Here's good old nutrition. Let's go ahead and build up our firefighters instead of killing our firefighters. The nutritional modulation. We already have our food forms, we already know what those are. We do not have to go through those but you support the Delta-6-desaturase; you do it in two ways.



You give people access, you teach them to use flax, Chia, hemp, and walnut, and make sure that they take some coconut with it if they want to enhance that conversion. Then you look at their diet and see what they are missing. You look to see what kind of refined foods they are eating. Are they low in zinc? Do they have zinc deficiency signs? You can do a zinc tally test to see. Magnesium is very commonly low unless people are juicing and doing lots of smoothies. Also a lot of people are low in their minerals because their stomach acid is low, which we will cover in the digestive module.

You have B3, B6, B12, vitamin C, vitamin E, zinc, magnesium, biotin; all of these things need to be intact. If they are you are going to get more effective conversion and utilization of the Delta-6-desaturase enzyme, which is going to help with inflammation. The other thing that disrupts the conversion from the actual food forms, so if somebody is eating some fats in the meats that gets converted into arachidonic acid or are present in the meat, the vitamin E and curcumin can actually help to decrease that conversion.

The PGE1 actually displaces arachidonic acid; the more of that you have the less arachidonic acid you are going to have and you want to decrease it. Your firefighters are putting things out. You have lipoxygenase and cyclo-oxygenase enzymes and the things that help to decrease the conversions are bioflavonoids, ginger, vitamin E, and of course EPA, zinc, and selenium, although selenium does not really have an effect on the thromboxane side but the zinc and the EPA and the Vitamin E, ginger and bioflavonoids do. You can see that this is a chart that I would print. What I used to do when I saw a lot of people face-to-face is I would have a little booklet and I would have this in there, and I would give them a copy to take home and just circle items. I would explain it to them in a very simplistic way so that they understood how their choices are affecting their pain, how their choices are affecting the inflammation in the autoimmune disease, and it really hits home when people understand how things work.

Finally in summary of the anti-inflammatory side and the pro-inflammatory side, we want to be like a teeter-totter and have a balance because you need inflammation. You constantly cut yourself, you've got mosquito bites, they get inflamed, you have to have inflammation but it is a matter of being able to balance it and turn it off when it is no longer needed. When your fat balance is off you are not going to be able to turn it off, so this is what you teach people. The foods that are anti-inflammatory are the essential fatty acids, your fish oils, vitamin E, bioflavonoids, the vitamin/mineral co-factors that we talked about, and a lot of fruits and vegetables supply this, seeds and sprouts, and I would even add to that fermented foods.



On the pro-inflammatory side we have red meat and eggs, they are high in arachidonic acid. Dairy and eggs again, high in arachidonic acid. Peanuts, high in arachidonic acids. The processed foods and oils, remember the arachidonic acid, alcohol and coffee inhibits the Delta-6-desaturase enzyme. You can see how the dietary choices and what you are teaching your clients to do is going to make a huge difference.

You've got to support your cleanup crew and add additional anti-inflammatory support. Whatever of these you do, great, and what ever of these you do not do, if they need it you can refer out but there are a lot of stuff that you can do to provide additional inflammatory support in the way of acupuncture, homeopathic, botanicals, bodywork, manipulation, exercises, physical therapy, and so much more.

This concludes our summary of how the body manages inflammation using the fats in the diet. This gives you a lot of information and input on how you can help your clients decrease inflammation, increase healing, and feel so much better. So check out the resources in the advanced topics area and that will give you some information about some more advanced ways. There are some articles and papers that go into a lot more detail about the chemistry. You've got enough to be really clinically useful, more than most people know. Thank you. This is Dr. Ritamarie. We will see you on the next video.