Managing Inflammation with Dietary Fats and Other Nutrients

Understanding the impact of poor fat choices will help you choose your fats wisely. This document is intended to accompany the ***Managing Inflammation with Dietary Fats and Other Nutrients*** video, audio, and slides in the foundational nutrition module.

You Need the Right Fats at the Cellular Level

Fats are an important part of your cell membranes. The fats you eat today become your cell membranes tomorrow.

When you have a healthy balance of fats in your cell membranes, magic happens. All the needed nutrients flow nicely into your cells, providing just what each cell needs for optimal functioning. Equally important is that all the cellular debris flows out of the cells, which reduces the toxic load and allows your cells to function as they should.

When your fats are balanced, your body can:

- produce the right mix of chemicals to control pain and inflammation
- keep your hormones balanced
- keep your blood sugar steady
- help you make the right mix of neurotransmitters to keep your brain chemistry balanced
- keep your mood and focus happy and alert

How are Fats Related to Pain and Inflammation?

Arachidonic acid is a type of Omega-6 fat that is at the heart of your body's inflammation producing mechanisms. (See the basic "What You Need to Know" lesson for a description of Omega-3 and Omega-6 fats.)

While arachidonic acid (AA), an Omega-6 fat, is very inflammatory, eicosapentaenoic acid (EPA) is anti-inflammatory. When evaluating fat status, we look at the ratio between AA and EPA in order to determine how prone you are to inflammation.

Inflammation is at the heart of all disease. The suffix "-itis" means "inflammation." Any disease that ends in "-itis" involves inflammation. You can probably sit there and name off ten or twelve of them: arthritis, conjunctivitis, gastritis, colitis, etc.

Arachidonic acid is found in meats, poultry, milk, eggs, and peanuts. Very few plant-based foods have arachidonic acid. Peanuts are by far the highest plant source of AA. So, if you love peanut butter, try a different nut or seed butter instead. These days, you can get almond, cashew, hemp, walnut, pecan, and others.

EPA is found in fish and in marine algae, especially the brown species of blue-green algae (because that's where the fish get it). It's found very little in land plants. You'll see traces of it in some greens, especially the wild ones. Purslane has, by far, the highest EPA content of all land vegetables.

Purslane is a wild plant that grows in some areas and not others, but you can cultivate it in little pots in your house or your garden. It's a great source of EPA and a super addition to your smoothies. To find purslane seeds and plant them in your garden, visit the link below: http://www.seedsofchange.org

Learning How Pain and Inflammation Work in Your Body

Included in the ***Managing Inflammation with Dietary Fats and other Nutrients*** video and slides with this lesson is a set of flowcharts that show you the cascade of reactions that occur in inflammation. Your dietary fats play a role in keeping inflammation under control.

The first chart is called ***"Mast Cell Membranes"***, and depicts a high level overview of the inflammatory cascade as it sits in the cell membranes. Mast cells are part of your immune system and are responsible for histamine production, as in allergies, and also in the parts of your immune system that fight off invaders. Inflammation is essential to effective immune system function. The problem occurs when there are too many inflammatory fats, and not enough anti-inflammatory fats, and when your body's ability to "turn off" inflammation is impaired.

The next chart is called ***"Inflammatory Cascade"***. About 1/3 of the way down the page in the middle of the diagram is a point called "Membrane Phospholipids." These are referring to dietary phospholipids found in foods containing arachidonic acid. Arachidonic acid is very inflammatory, and it is the precursor to those big, bad chemicals depicted by the fire. These are called leukotrienes and thromboxanes. The names of the enzymes that catalyze the conversions from fats to inflammatory chemicals are those that end in "-ase". There's no need to memorize these unless you plan to become a biochemist, but they are included for completeness.

Arachidonic acid is found in significant amounts in any kind of flesh food, with the exception of fish. It's also high in eggs, dairy products, and peanuts. Arachidonic acid is not bad on its own. It has important functions. However, there is no need to ingest it, as your body can make arachidonic acid whenever it needs to from the dietary Omega-6 fats found in plant foods. These will be shown on one of the upcoming flow charts.

Let's go up to the top of the ***"Inflammatory Cascade"*** page (use your PDF slide copies for the instructions that follow). On the left-hand side where it says "Linoleic Acid," write "Omega-6." On the right-hand side where it says "Alpha-Linolenic Acid," write "Omega-3." Most people have heard of Omega-3 and Omega-6 fats because they're in the news all the time. It's not just in nutritional textbooks and research articles anymore – it's all over the place. *"Did you get your Omega 3s today?"* The balance of those fats is so important because they play a primary role in managing inflammation.

As the ***"Inflammatory Cascade"*** chart shows, linoleic acid gets converted into GLA, DGLA, and then PGE-1. Do you see the fireman? He's putting out the fire. If you look down at the leukotrienes and thromboxane, you'll see the little flames coming up off of them. That's the fire; that's inflammation. If you have a good balance of Omega-3 and Omega-6 fatty acids, you've got lots of these little firemen coming in with their hoses and putting out the inflammation. That's what you want. You bring in all the chemicals your body needs to heal the area, and then put out the fire.

On the Standard American Diet (SAD), which is high in processed foods, animal products and processed vegetable fats, you get a lot of arachidonic acid and you don't get enough alpha-linoleic acid (ALA) and EPA on the Omega-3 side. We'll discuss how to balance the fatty acid cascade in a bit.

But first, let's turn to the chart labeled, ***"Drug Modulation"***. Down toward the bottom of the page, you'll see we've got the fire again. You see the thromboxanes on one side and the leukotrienes on the other side. If you take non-steroidal anti-inflammatory drugs (NSAID) like Aleve, Naproxen, Tylenol or Aspirin, they prevent the conversion of arachidonic acid into inflammation. Basically, they stop the fire. But these medications don't do anything for the other side of the pathway - the stronger, more serious inflammatory leukotrienes.

If you have a mild inflammation involving just thromboxanes and you take non-steroidal anti-inflammatories, you feel better, but the relief is short-lived.

If you look at the chart, you see the NSAIDs again between alpha-linolenic acid and linoleic acid. NSAIDs also prevent your body from converting dietary fats into EPA and creating "firefighters". This means that while NSAIDs do put out part of the fire of inflammation, they do so at the expense of disabling your body's own anti-inflammatory mechanisms. This means you become completely dependent on the drug to manage the inflammation. As soon as you stop taking it, the inflammation comes back, because you've killed off your firefighters. It's not really a good long-term solution, even though there are a lot of people taking these medications on a daily basis.

Steroids, on the other hand, are the big cannons. Notice where they sit on the ***"Drug Modulation"*** chart. They prevent the conversion of food-derived membrane phospholipids to arachidonic acid, and thus interrupt the production of both kinds of inflammatory chemicals, thromboxanes and leukotrienes.

On the downside, the big cannons (steroids) affect everything. They turn off the good guys — they kill the firefighters—while they put out the fires. If you have a big old fire burning (like an autoimmune disease that causes inflammation in your lungs, your joints, your kidney, or any of a dozen or more tissues in your body) steroids are prescribed to "put out the fire". The steroids do a pretty good job of putting out the inflammatory fire, but again, it's a short-lived solution because they kill off all your natural firefighters. As soon as you stop taking them, all your inflammation comes back and your natural defenses no longer work for you.

Natural Solutions for Inflammation

So, is there a better solution for controlling inflammation? The good news is that you can control it with natural substances – food, herbs, and nutrients.

Let's look at the next chart, ***"Nutritional Modulation"***. This chart shows the various foods, herbs, and supplements that can help your body to reduce inflammation without the use of drugs. The "main ingredients" are the dietary fats you consume. The primary anti-inflammatory agents are the Omega-3 fats.

At the top of the flowchart on the right is Alpha Linolenic Acid (ALA). The foods that are highest in ALA are in the yellow box: flax seeds, chia seeds, hemp seeds and walnuts. These are converted, with the help of the enzyme delta-6-desaturase (center) to EPA, the primary anti-inflammatory fatty acid.

In order to convert ALA to EPA, you need sufficient quantities of the co-enzymes that delta-6-desaturase needs to catalyze (meaning to spark and speed up) the conversion. These nutrients are listed in the green box at the center towards the top.

Nutrients Needed for Conversion:

- Vitamin B3
- Vitamin B6
- Vitamin B2
- Vitamin C
- Vitamin E
- Zinc
- Magnesium
- Biotin

When these nutrients are present in sufficient quantities, ALA (Alpha-Linolenic Acid) gets converted to EPA (Eicosapentaenoic) which displaces AA (Arachidonic Acid) and thus decreases inflammation by strengthening your body's own firefighters. EPA is also present pre-formed in fish and algae.

Omega-6 and Omega-3 fatty acids need to be in balance. Studies vary in recommendation as to the dietary ratio (between 1:1 and 4:1). If you target for somewhere in that range, you should be in good balance. Of course, you can always test and check. If your inflammatory symptoms don't improve at a higher ratio in the range, then increase your Omega-3 intake and observe what happens.

As we discussed earlier, the Standard American Diet, which is high in processed foods, animal products and processed vegetable fats, contains a lot of Omega-6 fat in the form of arachidonic acid (AA) and linoleic acid (LA) and not enough alpha-linoleic acid (ALA) and EPA on the Omega-3 side. If you get more Omega-6 fats than your ideal ratio, the extra Omega-6s get converted into arachidonic acid and promote inflammation.

On the other hand, if you look on the Omega-3 side, alpha-linoleic acid (ALA) gets converted to EPA and EPA actually displaces arachidonic acid. It pushes it aside. So not only does EPA help by producing "firemen" to put out the fire, but it also helps by pushing arachidonic out of the way so it can't increase the inflammation. Therefore, insufficient EPA can contribute to inflammation.

Many health experts recommend supplementing with EPA, especially if you have an inflammatory process happening in your body.

It's a complex and well thought out process, don't you think?

How to Balance Omega-3 and Omega-6 Fats

You need to balance the Omega-3 and Omega-6 fatty acids in your diet and decrease arachidonic acid consumption.

How do you do that?

By limiting or eliminating meat, dairy, eggs and peanuts from your diet, you can get rid of any dietary sources of arachidonic acid (AA). You needn't worry about deficiency because your body can make AA if needed when you have enough of the Omega-6s fats (and most people have far too much Omega-6s already).

Dietary Omega-6 fats are abundant and include:

- sesame seeds
- sunflower seeds
- almonds
- pumpkin seeds
- Brazil nuts
- pecans
- vegetable oils like sunflower, safflower, soybean and corn

When you have enough of these Omega-6 fats (it's hard not to) your body will convert them to arachidonic acid (AA) whenever it needs to. We don't need to have extra hanging around to cause inflammation. If we have any fires going and we're bringing in more arachidonic acid via our food choices, it's just putting more flame into that fire. If you take away the dietary sources, you decrease a lot of that inflammation.

GLA Balance

GLA is important as an anti-inflammatory agent as well as in hormone balance, brain function, bone formation, and overall immune system function.

Because of nutrient imbalances, may people do not make enough GLA from dietary Omega-6 fats and need to take a GLA supplement in the form of borage, black currant or evening primrose oil.

Just like the conversion from Omega-3 dietary fat ALA to EPA, the AL to GLA conversion can be impaired by the same nutrient insufficiencies that affect the ALA to EPA conversion. Both conversions rely on the delta-6-desaturase enzyme and the nutrients listed above.

Excessive dietary ALA can trigger the conversion from GLA to DGLA, then to arachidonic acid, and thus increase inflammation.

How to Measure Your Fatty Acid Balance

The activity and health of your fatty acid cascade can be measured by a simple blood test. One of my favorites is called the **Blood Spot Fatty Acid** test. It is a simple test that can be done at home with a finger prick and a few drops of blood. The blood is collected onto a special card and mailed to the laboratory for analysis. The result is a report of all the fatty acids we've discussed and depicted on the flow charts.

Eating Your Pain Away

Making a daily choice to select Omega-3 rich fats – as well as eating a nutrient-dense, whole foods, high green diet – will ensure that you have the appropriate balance in your fatty acid cascade. The benefit of those dietary choices is that you can control inflammation without the use of potent pharmaceuticals with all their negative side effects.

Every time you eat chia seeds, flax seeds, hemp seeds, and walnuts and accompany them with nutrient-dense greens to supply the co-factors that catalyze the conversion to EPA and GLA, you're feeding your firefighters. That's good news. Those firefighters do good work and they deserve to be fed.

Sometimes, if the fatty acid anti-inflammatory cascade has been out of balance for a long time, you may need to supplement with the nutrients needed for conversion as well as pre-formed DHA and EPA from algae oil or fish oil to speed up the balance in the pathways and give you faster relief.

Running a Blood Spot Fatty Acid test after a few months of special attention to consuming sufficient quantities of Omega-3 rich foods and the vitamin and mineral co-factors will allow you to bring this system into balance and alter the expression of inflammatory disease.

Remember, if you don't have enough B vitamins, Vitamin C, and minerals you cannot convert the alpha-linoleic acid from flax, chia, hemp and walnut into the EPA, no matter how much you eat. This means you will be low in EPA and DHA, and your body will not be efficient at putting out the fire of inflammation and keeping your immune system and brain function optimal.

The foods most abundant in these vitamins and minerals are fresh fruits; vegetables; raw nuts and seeds; whole, non-gluten grains like quinoa, teff, amaranth and millet; and, especially, green leafy vegetables, wild greens, and sea vegetables.

The typical American diet of eggs and bacon with toast or bagels for breakfast; white bread sandwiches, burgers, or pizza for lunch; and steak, mashed potatoes, and canned green beans for dinner is highly inflammatory. Add dessert and the candy bars and cookies eaten for snacks, and you have a prescription or inflammatory disease.

Fruits; vegetables; whole, non-gluten, preferably sprouted grains; nuts; and legumes are anti-inflammatory with very few exceptions. But when we process those whole foods, they become inflammatory. Why? Because processing these foods robs them of their nutrition.

The French Word for Bread is "Pain".

When you say, *"What the heck? My joint pains aren't going to be affected by going out and having some pizza,"* or a bagel, or whatever, it's not true. They *are* being affected. Every time you make a choice that's inconsistent with the anti-inflammatory diet, if you have an ongoing condition, it's going to make it worse. Even if you don't feel it, it's making it worse on the inside.

Every time you eat something that's inflammatory, it's not just your joints but your blood vessels that are getting damaged. And it's unseen. If you have an autoimmune disease, eating inflammatory fats is furthering the destructive damage to the affected tissue, to your thyroid gland, and to the lining of your gut or the cells in your pancreas that make insulin. It's really important to really embrace the anti-inflammatory diet and stick to it as much as you possibly can.

One disease where the inflammation is not so obvious is cardiovascular disease, commonly called heart disease. You may think about cholesterol as being the culprit in heart disease, but the latest research shows that cholesterol is a symptom of out-of-control inflammation. Cholesterol is a very potent anti-inflammatory that our body creates to try to manage inflammation.

The unfortunate thing is that the inflammation in your blood vessels causes damage to the lining and puts you at risk of plaque buildup, stiffened arteries, and a heart attack or stroke as a result. Cholesterol is produced as your body's attempt to heal the damage; however, once the lining of your vessels is damaged – often by trans fats, oxidized fats, and other processed fats in your diet – the vessel lining becomes sticky. Once it's sticky, you can get a buildup of calcium and other minerals mixed with the fat, leading to clots that can block the vessels leading to your heart and brain. The result is a stroke or heart attack.

The Inflammation Fighting Power of Vitamin E and Curcumin

So looking at the ***"Nutritional Modulation"*** flowchart in more detail, you can see what foods, herbs and supplements are great adjuncts to proper fat balance to keep you healthy and decrease inflammation.

Between the "membrane phospholipids" and "arachidonic acid" labels, there's a little box that says "**Vitamin E and Curcumin**". Curcumin is the active ingredient in turmeric, which is a yellow herb spice that's used very heavily in Indian food. It's a wonderful herb. I can't say enough about turmeric. It has been found to be helpful in liver conditions, cancer, and all sorts of inflammatory diseases and autoimmune diseases. It's a wonderful spice. I highly recommend that you just get some turmeric and find ways to use it.

Turmeric and Vitamin E decrease the production of arachidonic acid, which means they help control inflammation. When you take Vitamin E and curcumin, or turmeric, it actually has similar effect to taking steroids, but without the side effects. Another herb that you could add that has steroidal effects is licorice root, but you need to be careful, as licorice root can raise your blood pressure if you take too much or if you are prone to high blood pressure. I did an experiment to see if this was true and managed to create hypertension in myself in under a month with overdosing. I tool 3 droppers of the tincture 3 times a day, so it was very excessive. Licorice is very safe in normal doses, as long as you don't already have high blood pressure.

If you look further down on the ***"Nutritional Modulation"*** chart, you'll see that there are ways to reduce inflammation with herbs and nutrients that inhibit the conversion between arachidonic acid and both leukotrienes and thromboxanes.

Recall that NSAID medications only interrupted the pathway to thromboxanes and left the more potent leukotriene fire burning. This means that nutritional intervention is more potent at calming inflammation than over the counter pain medication.

Foods that Fight Inflammation:

The nutrients and foods (listed in the orange boxes at the bottom of the ***"Nutritional Modulation"*** chart) are:

- Bioflavonoids, found in many fruits and vegetables
- Ginger
- Vitamin E
- Zinc
- Selenium
- EPA – derived from your Omega-3 dietary fats or taken as an algae derived or fish oil supplement

Your firefighters are really happy when you interrupt the inflammatory pathway using nutrients.

It all starts with the right choice of fats.

Summary

The last page of the flow chart packet provides a summary of methods to control inflammation with diet.

You'll notice a scale with anti-inflammatory on the left and pro-inflammatory on the right.

Choose Omega-3 rich chia seeds, flax seeds, help seeds and walnuts; add blue green algae or deep ocean fish (if desired, not required) for DHA and EPA; and eat lots of greens and sea vegetables for the vitamin and mineral cofactors.

Add turmeric and ginger to your food and extra Vitamin E as a supplement. Choose foods high in zinc, like pumpkin seeds, or supplement. Eat a couple of Brazil nuts every day for selenium or supplement.

Stay away from trans fats, hydrogenated fats, and any fats that have been heated (with the exception of olive oil and coconut, which can withstand higher heat than most fats without becoming oxidized and damaging your body). Hydrogenated fats are found in processed foods, margarine, and mayonnaise. Trans fats occur in all processed foods containing fats. Oxidation of fats occurs at temperatures above 118 degrees Fahrenheit.

So there's your prescription for using your dietary fats and whole foods to manage inflammation without medication. This method will also support rather than hinder your liver, immune system, digestion, hormones and brain function.

Fats are not to be avoided. They are your friends in the proper amounts and as in whole, fresh raw foods.