

The ABCs of Chronic Inflammation

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Don't think *YOU* have it? Think again. Most people who have *chronic* inflammation don't know it. There is a full spectrum of problems caused by chronic inflammation – from fatigue, hormone imbalance and reduced immunity, to osteoporosis, Alzheimer's heart disease and cancer.

Inflammation is typically thought of as a swelling, painful or otherwise uncomfortable situation – perhaps in your joints, sinus or intestine. But for most people, inflammation occurs without any symptoms. Inflammation is defined classically as a protective reaction by the body, in response to some physical or chemical injury. *Acute* inflammation is typically accompanied by pain, swelling, redness, and heat. A closer look at the area of inflammation reveals that the small blood vessels are dilated, which brings in more blood and warmth, and other fluid, which causes swelling of the area.

Many people are unaware that inflammation is a normal bodily function – more specifically, it's a healthy action when controlled. Without inflammation, we would not recover from a day at the office, a workout, or a walk to the mailbox. There are three important functions of inflammation. First, inflammation is the first step in the healing or repair process after some physical or chemical injury or stress, no matter how minor. Without it, even a small splinter in your finger could worsen and even result in death. Second, inflammation prevents the spread of damaged cells to other areas of the body that could cause secondary problems. A local infection, for example, can be contained due to the inflammatory response, instead of causing a body-wide infection. And third, inflammation rids the body of damaged and dead cells. This very important task is more than just an act of housecleaning.

This booklet describes inflammation simply and accurately, in relation to its role in health and disease, and how one can work with it to improve the natural course of inflammation. In other words, help your body heal itself, and correct and prevent a course that could lead to ill health and disease. This distinction is emphasized because many people think of inflammation as something to eliminate, typically through drugs or through the use of popular supplements.

Normally, the inflammatory-anti-inflammatory cycle is somewhat like an “on-off” switch: inflammation is turned on when needed for healing and repair (by inflammatory chemicals), then turned off when not needed (by anti-inflammatory chemicals).

For the purposes of discussion, we might best view inflammation as two separate conditions; *acute inflammation* is the body's initial response to a physical or chemical stress that requires healing and repair. *Chronic inflammation* is an abnormal condition that can cause or is associated with ill health and disease. When acute inflammation does not, or can not, complete its task, chronic inflammation results. This transition may take place due to continued physical or chemical stress, such as smoking, or infection. More often it's due to biochemical influences such as the imbalance of dietary fats, absence of specific substances that adversely effect our anti-inflammatory production, and specific nutrient problems. These issues are addressed throughout this booklet.

Acute Inflammation

Normal process
Healing & repair

Chronic Inflammation

Abnormal process
First stage of chronic disease

The acute inflammatory response to a physical or chemical stress can last up to three days, with the whole repair process taking up to six weeks. If inflammation from a given stress lasts beyond this timeframe, it may have a negative impact on our health, and is typically indicative of some imbalance – one that can be corrected through lifestyle.

Assessing Inflammation

For some people, the presence of inflammation is obvious. But most people with inflammation are not aware of it – the signs and symptoms may not be apparent. Therefore, some type of evaluation is important. Doctors taking a thorough history may ask the following questions. The symptom survey below may help guide you in determining the potential for inflammation.

Check the items that pertain to you:

- Eat in restaurants, take-out, prepared food daily?
- Diet high in dairy foods (milk, butter, cheese)?
- Consume corn, soy, safflower, peanut oils regularly?
- Consume margarine regularly?
- Diet low in fresh cold-water fish such as salmon, sardines?
- History of atherosclerosis, stroke or heart disease?
- History of osteoporosis?
- History of ulcer, or cancer?
- History of inflammation (“itis”) such as arthritis, colitis, tendonitis, etc.?
- Allergies, asthma or recurring infections?
- Chronic fatigue?
- Increased body fat?
- Anaerobic exercise – weight lifting, hard training or competition – weekly?
- Regular repetitive activity (jogging, cycling, walking, typing, etc.)?

Even if you indicate “yes” to one or two of the above items, it increases your chances of having inflammation. This can be confirmed with blood tests performed by your doctor. The following are common blood tests used for the assessment of inflammation.

1. The best test for inflammation is called C-reactive protein (CRP), which is measured from the blood. None of the other tests may be as accurate as the CRP, which can detect very low levels of inflammation. This test can also predict future risk of coronary heart disease and stroke even in healthy individuals.
2. The erythrocyte sedimentation rate (ESR) is a common blood test for inflammation. It can be performed when blood is taken for other tests, or with a finger prick.
3. The white blood cells may indicate inflammation. This test is part of the Complete Blood Count (CBC) commonly performed.

Body temperature is a general indicator of inflammation. However, it is not the best test as only more severe inflammation will elevate temperature.

The best suggestion is to have a CRP performed yearly. If it is not normal, a re-test every three to six months (once you start taking the appropriate supplements, making dietary changes, etc.) until it is normal is a good way to monitor the effectiveness of your program.

Causes of Inflammation

Different types of trauma or microtrauma, infections, and toxins can produce inflammation. Even excess body fat can produce inflammation. It results from the production of large quantities of proinflammatory chemicals such as cytokines and eicosanoids.

- Trauma, such as a fall, is a common cause of significant inflammation.
- Microtrauma, which includes such subtle actions as walking, typing and any repetitive motion, normally produces inflammation.
- Intense physical activity, such as anaerobic exercise – high intensity training, weight lifting and competition – also causes significant inflammation.
- Chemicals – food allergy, hay fever, handling or breathing harsh chemicals (cleaners, gasoline, etc.), air pollution and others can cause inflammation. Even cosmetics and toiletries.
- Infections also cause inflammation – from bacteria, virus, fungus, or yeast.
- Increased body fat can cause inflammation because fat cells produce inflammatory chemicals. This is especially serious in those who are obese.
- As discussed below, nutritional imbalances can cause chronic inflammation. This is especially true with dietary fats – herein lies the key to controlling inflammation from a dietary standpoint.

Functional Illness & Disease

There is a full spectrum of problems associated with chronic inflammation. These include functional problems such as fatigue, hormone imbalance and reduced immunity, and may be precursors to more severe conditions that lead to disease in many individuals.

Fatigue may be among the more common results of chronic inflammation. Other problems may include the following:

- Lowered immunity. This can result in frequent infections, including colds and flu, yeast and fungal infections such as Candida. Asthma, allergies and other problems may also be due to low immunity. These conditions further aggravate or cause more inflammation, maintaining a vicious cycle.
- Hormonal imbalance. This can include many aspects of the hormone system, especially the adrenal stress hormones, reducing ones ability to cope with stress. Sex hormones can also be adversely affected – estrogen, progesterone and testosterone balance – resulting in diminished sex drive and reproductive function. Reduced thyroid function can also result due to inhibition of thyroid-stimulating hormone.
- Nervous system imbalance. This includes increased activity of the sympathetic nervous system, potentially leading to increase tension, rising blood pressure, disturbed blood sugar, anxiety or depression, or other neurological problems.
- Digestive distress. Among the problems that result include poor digestion, gas formation, heartburn, and various inflammatory conditions. Poor absorption of nutrients can create a whole series of potential problems throughout the body.
- Chronic pain. Inflammation produces pain-stimulating chemicals throughout the body. Individuals with more body fat produce more inflammation and have a reduced pain threshold.

Chronic inflammation can effect many areas

- hormones
- immunity
- nervous system
- intestines
- stress coping
- pain threshold

A variety of disease states may be an end result of chronic inflammation. These include ulcers and cancer, atherosclerosis, stroke and heart disease, and even osteoporosis. In addition, the common diseases associated with inflammation have “itis” at the end of the name: arthritis (inflammation of the joints), colitis (inflammation of the colon), tendonitis (inflammation of a tendon), etc. Increased inflammation is also associated with chronic fatigue syndrome. It’s possible that research will find other cause-and-effect relationships with chronic inflammation.

Diet & Inflammation

Inflammation results from a series of complex chemical activities, and its discussion could fill hundreds of booklets. It’s presented here is a simplified version. A key focus is this: Many of the chemicals involved in both inflammation and anti-inflammation are heavily influenced by our diet.

There are three important items discussed here that can have a dramatic effect on reducing unwanted inflammation in your body:

1. Balance dietary fats.
2. Make sure you have all the nutrients to maintain the balanced fats.
3. Avoid specific foods and lifestyle factors that disturb the balance of fats.

The fats in our diet play a vital role in the inflammatory cycle – where inflammation is created to heal and recover a certain area, followed by the production of anti-inflammatory chemicals when the healing is completed. These three fats, labeled as A, B, and C, are important to balance if you're going to control inflammation.

A fats: these contain a high level of the essential omega-6 polyunsaturated vegetable oils. Included are corn, safflower, sunflower, peanut, cottonseed and soy oils.

B fats: these are mostly made up of saturated fats contained mostly in the fat of dairy products – from milk, butter, cheese, and cream. Lesser amounts are found in meats, egg yolks, and shellfish.

C fats: these contain a high level of the essential omega-3 polyunsaturated oils. Included are certain fish (salmon, mackerel and sardines), oils from linseed (flax), walnuts, pumpkin seeds, and beans. Some leafy vegetables contain small amount of C fats.

These three groups of fats are converted in the body to chemicals that are either inflammatory or anti-inflammatory. Most of these are called eicosanoids (pronounced, i-cos-an-oids). These chemicals have very powerful physiological effects: A and C fats have anti-inflammatory effects, and the B fats inflammatory effects.

Fats:	A	B	C
	↓	↓	↓
Effects:	anti-inflammatory	inflammatory	anti-inflammatory

A key concern is that some A fats can be converted to B fats. This happens when there are too many A fats in your diet. It means that potentially, many A fats will eventually turn to inflammatory chemicals, rather than to anti-inflammatory ones. When this happens, it's as if you are eating too many B fats.

This problem can be prevented by reducing your A fats so they're balanced with the B and C fats. The use of sesame seed oil, which contains a natural phytonutrient called sesamin, can also prevent A fats from converting to B fats. Like fish and linseed oils, this oil must also be uncooked and relatively fresh – so best taken in capsules.

One of the most important dietary factors to help control inflammation is to balance your fats. This is accomplished by eating approximately equal amounts of A, B and C fats (not necessarily at each and every meal, but over the course of a day, for example). This balance parallels the common recommendation of a 2:1 ratio of polyunsaturated (A and C fats) to saturated fat.

Scientists tell us that the diets of early humans had an optimal balance of fats, eating equal amount of omega-6 and omega-3. Today, however, people commonly eat 5, 10 or often 20 times the omega-6 fats – a problem that can lead to chronic inflammation.

Information about dietary balance to control inflammation is so well accepted that even academic textbooks refer to it. In the 23rd edition of Harper's Biochemistry, the authors state: “Since different groups of eicosanoids are synthesized from the essential fatty acids [i.e., A, B and C fats], the balance between the physiologic effects of the various eicosanoids may be manipulated by changing the fatty acid composition of the diet.”

One way of adjusting your diet is to use monounsaturated fats in place of all omega-6 fats in food preparation. Not only will this reduce the potential for inflammation by reducing the potential for conversion of A fats to B fats, but monounsaturated oils are high in omega-9 fats which can also, by itself, reduce inflammation. High monounsaturated oils include extra virgin olive, almond, and walnut. Avocados are also an excellent food high in these healthy fats.

It should be noted that most foods contain a mixture of A, B and C fats. For example, flax oil contains about 58% omega-3 and 14% omega-6, and walnut 50% omega-3 and 5% omega-6. Soy oil contains only 9% omega-3 and 50% omega-6, and safflower oil is mostly omega-6.

Nutrients to Maintain Fat Balance

Conversion of A and C fats to anti-inflammatory chemicals requires a number of important chemical steps, some of which require specific nutrients. It's important to obtain these nutrients through your diet. To assure you're accomplishing that task, it's best to perform a dietary analysis. If these nutrients are not in your diet, two things are important: first, make the necessary changes in your diet, such as adding specific foods that will give you the nutrients you're missing. Taking the specific nutrients you've been lacking through supplementation to assure your body has the nutrients right now.

Below is a list of some of the nutrients we know are necessary to help produce your natural anti-inflammatory chemicals, and some good food sources of these nutrients:

<u>Vitamins</u>	<u>Food Sources</u>
B6	fish, eggs, brown rice, oats, beans, avocado, walnuts
Niacinamide	meats, eggs, nuts, seeds
E (low dose)	raw green leafy vegetables, raw nuts
C	vegetables and fruits
 <u>Minerals</u>	
Magnesium	green vegetables, nuts, seeds, legumes
Zinc	meats, eggs, seafood

Omega-3 Supplements

Since most people no longer eat enough cold water fish, especially fresh salmon and sardines, it's important to supplement the diet with these anti-inflammatory precursors. The most important supplement for people with inflammation is fish oil – specifically, EPA. Depending on how much your fats are out of balance, an EPA dose of about 800 to 1,000 mg is typical. For many people, start with a smaller dose and gradually increase it. Many fish oil products sold today may be contaminated with toxic metals found in many ocean fish. To assure this is not the case, make sure the products states that it has been tested for potential contamination. A good indication the product is toxic-free is that it's also free of cholesterol as stated on the label (when the toxic chemical are removed, so goes the cholesterol).

When eating cold-water fish avoid overcooking it as heat will destroy the omega-3 fats. Raw fish, common Japanese restaurants (called sashimi), is ideal. Also, farm-raised fish has become common, but contains little, if any, omega-3 fats and should be avoided.

Other Key Dietary Factors

In addition to balancing fats and getting the right nutrients to make anti-inflammatory chemicals and prevent excess inflammation, other foods can perform the same function.

- Ginger is a powerful food that combats inflammation. This light brown root available in most grocery stores can be used raw in many foods, and is sometimes pickled – a common item in Japanese restaurants. Ginger can be used in salads, to make tea, or in many dishes for its pungent flavor. Developing a habit of using ginger regularly in your meals can be very helpful in controlling inflammation.

- Turmeric is a spice in the ginger family. Many people have it on their shelf but use it infrequently. It's used as a natural coloring agent, is a major ingredient in curry powder.

- Foods in the onion family can help reduce inflammation, especially garlic and onions. In our culture, garlic and onions are often avoided due to their odor after eating it. But both have great therapeutic benefits and should be part of your daily diet, even if it's just in your evening meal. Other foods in the onion family include shallots and chives.

- Inflammation is also produced from free radicals – chemicals produced in the body from oxidative stress. This reaction is much like the rusting of metal. Free radicals themselves contribute to ill health and disease, especially in the joints. Rancid fats, chemicals in our food, water and air, and other chemicals from cleaners, cosmetics and even our cars promote free radical production. Certain high dose supplements, such as iron and copper, can also produce dangerous free radicals. The body uses antioxidants to eliminate free radicals, obtaining most through the diet in the form of certain vitamins, minerals and phytonutrients. Fresh vegetables are the best source of antioxidants and phytonutrients. Be sure to eat 7, 8 or more servings of fresh vegetables daily.

- Consuming high amounts of carbohydrates in your diet can also lead to excess inflammation. Carbohydrates include sugar and sugar containing foods, like sweets and

other desserts. Also, pasta, bread, cereal, potatoes, rice, syrups, fruit juice, and foods with hidden sugars (ketchup, most peanut butter, and other foods) are very high in carbohydrates. If you want to reduce your inflammation, it's vital to moderate carbohydrate intake. This is accomplished in part by significantly reducing your sugar intake, and relying mostly on unrefined carbohydrates such as fruits, berries, brown rice, legumes, etc. (For more information on evaluating and adjusting your carbohydrate intake, see *In Fitness and In Health*). When reducing dietary carbohydrates, it typically results in an increased protein intake, which is also necessary to make your anti-inflammatory chemicals.

- One of the worse habits for those with inflammation is the consumption of *trans* fats. These include those with hydrogenated and partially hydrogenated oils. These fats block the production of anti-inflammatory chemicals. The most popular food containing these fats is margarine. In many cases, hydrogenated fats are listed on labels. But in some cases, they're not. For example, most peanut butter contains hydrogenated fats but does not list it on the label. Ingredients listed as 'natural peanut butter' does not, but an ingredient list that just states 'peanut butter' does contain hydrogenated or partially hydrogenated fats (and sugar).

- Other items that can promote inflammation include excess alcohol. While moderate amounts of wine can provide some very important phytonutrients, large amounts of any alcoholic beverage, especially the sweet ones, should be avoided.

An important lifestyle factor that contributes to inflammation is excess stress of any type. This can be in its physical, chemical or mental/emotion forms. Excess stress overproduces certain hormones that impair the production of anti-inflammatory hormones. In addition, the hormones testosterone and thyroxin in higher than normal levels can interfere with anti-inflammatory chemical production.

Anti-inflammatory Drugs

Nonsteroidal anti-inflammatory drugs (NSAIDs), including aspirin, are among the most commonly recommended and prescribed drugs in the world. They have three main effects: analgesic (reduces pain), anti-inflammatory, and antipyretic (reduces fever). Unfortunately, the side effects of these drugs include delayed healing because not only are the inflammatory chemicals reduced, but the body's natural anti-inflammatory chemicals as well. There are many other side effects described below. However, while many people take NSAIDs for inflammation, the doses of over-the-counter NSAIDs primarily produce analgesic and anti-pyretic effects but not anti-inflammatory ones. Achieving anti-inflammatory effects from NSAIDs requires twice the dose needed to produce analgesic effects. And, even in large doses NSAIDs can not eliminate all inflammation.

Common side effects of NSAIDs include gastric and duodenal ulcers in about half those who take them regularly, and gastrointestinal bleeding in most people. NSAIDs may also inhibit the repair process in many areas of the body, including bone fracture healing and even scar formation.

Other possible side effects of NSAIDs include:

- muscle dysfunction.
- joint/cartilage repair, especially in those with arthritis.
- kidney damage, especially in those who are dehydrated (a common problem).
- liver damage.
- headaches
- skin rash
- tinnitus (ringing in the ears)
- drowsiness.

In addition, NSAIDs, can interfere with normal sleep patterns, including suppression of melatonin and changes in body temperature. This is especially true of aspirin, acetaminophen, and ibuprofen. Reye's syndrome (a potentially fatal condition in children) has been associated with use of aspirin in conjunction with viral infections. Studies show that in people who take aspirin for pain, some continue to take it despite the fact that they do not obtain significant relief: In one study, almost half the patients who had osteoarthritis were able to stop their regular NSAIDs use without return of significant pain (and without other therapy). Another common drug, acetaminophen (such as Tylenol and Anacin 3) also has analgesic and antipyretic effects but does not have anti-inflammatory actions.

In Review

Here are some key items to consider to help prevent or reduce chronic inflammation:

Diet:

1. Balance your A, B, and C fats.
 - a. increase C fats (fish and fish oil supplements)
 - b. reduce A and B fats
 - c. use extra virgin olive oil (or coconut) in place of other vegetable oils
2. Remove foods that promote inflammation or prevent the production of anti-inflammatory chemicals.
 - a. hydrogenated and partially hydrogenated oils – margarine, peanut butter, etc.
 - b. sugar and other refined carbohydrates.
3. Eat more natural anti-inflammatory foods
 - a. ginger, turmeric, garlic and onions

Supplements:

1. Fish oil (EPA).
2. Take a ginger supplement if you don't eat ginger regularly (i.e., 4-5 days per week).
3. Take a raw sesame oil supplement daily to prevent A fats from converting to B fats.
4. Take a real food antioxidant supplement which will include phytonutrients.

Lifestyle:

1. Reduce your stress.
2. If you have chronic inflammation, avoid all anaerobic exercise – hard training, weight lifting, competition.

Conclusion

In the journal *Medical Hypotheses*, Broadhurst (1997) summarizes the issues addressed in this booklet by stating, “Natural whole foods contain fats as structural components, and have a balance of polyunsaturated fat, monounsaturated fat, and saturated fat. Since we are still a Paleolithic species, adapted to eating only wild foods, it is difficult to justify the consumption of anything other than an overall balance of [fats] in an evolutionary sense. No natural fats are intrinsically good or bad--it is the proportions that matter. Variety is recommended in dietary lipid structure, degree of saturation, and chain length. Pathological n-3/n-6 [omega-3/omega/6] polyunsaturated fat imbalance, obesity, and progressive glucose intolerance are consequences of adopting cereal grain based diets by both humans and livestock. Food processing and refining amplify these problems.”

For more information, see www.philmaffetone.com,
and read *In Fitness and In Health* by Dr. Phil Maffetone