

EAT FOR ENERGY



HOW TO BEAT FATIGUE, SUPERCHARGE YOUR
MITOCHONDRIA, AND UNLOCK ALL-DAY ENERGY

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BONUS CHAPTER:
Omega Ratios

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In “Chapter 6: Boosting Your Brain for Energy Performance” of *Eat For Energy*, we talked about the important role of consuming seafood and its constituent omega-3 fatty acids for brain health and energy levels. For those who don’t eat seafood, we also discussed supplemental options.

In this bonus chapter, we’re going to expand on that discussion by talking about omega fatty acids more broadly and clear up some of the confusion surrounding their role in health and disease.

When talking about dietary fat, there are three primary categories: saturated, monounsaturated, and polyunsaturated. Our focus is on the polyunsaturated fats, which are made up of mostly omega-3 or omega-6 fatty acids (*trans*- fatty acids are also polyunsaturated fats).

Omega-3 and omega-6 fats are not individual entities, but rather two families of structurally related fatty acids essential for maintaining cell membrane fluidity, communication between cells, gene expression, and the inflammatory cascade. They are, without a doubt, essential for optimal health and energy levels — both of them.

Yet, they are also some of the most controversial molecules in nutrition. You’ll find no shortage of articles praising or demonizing these fats, and navigating all the contradictory information can be challenging. As with most things, the truth is somewhere in the middle.

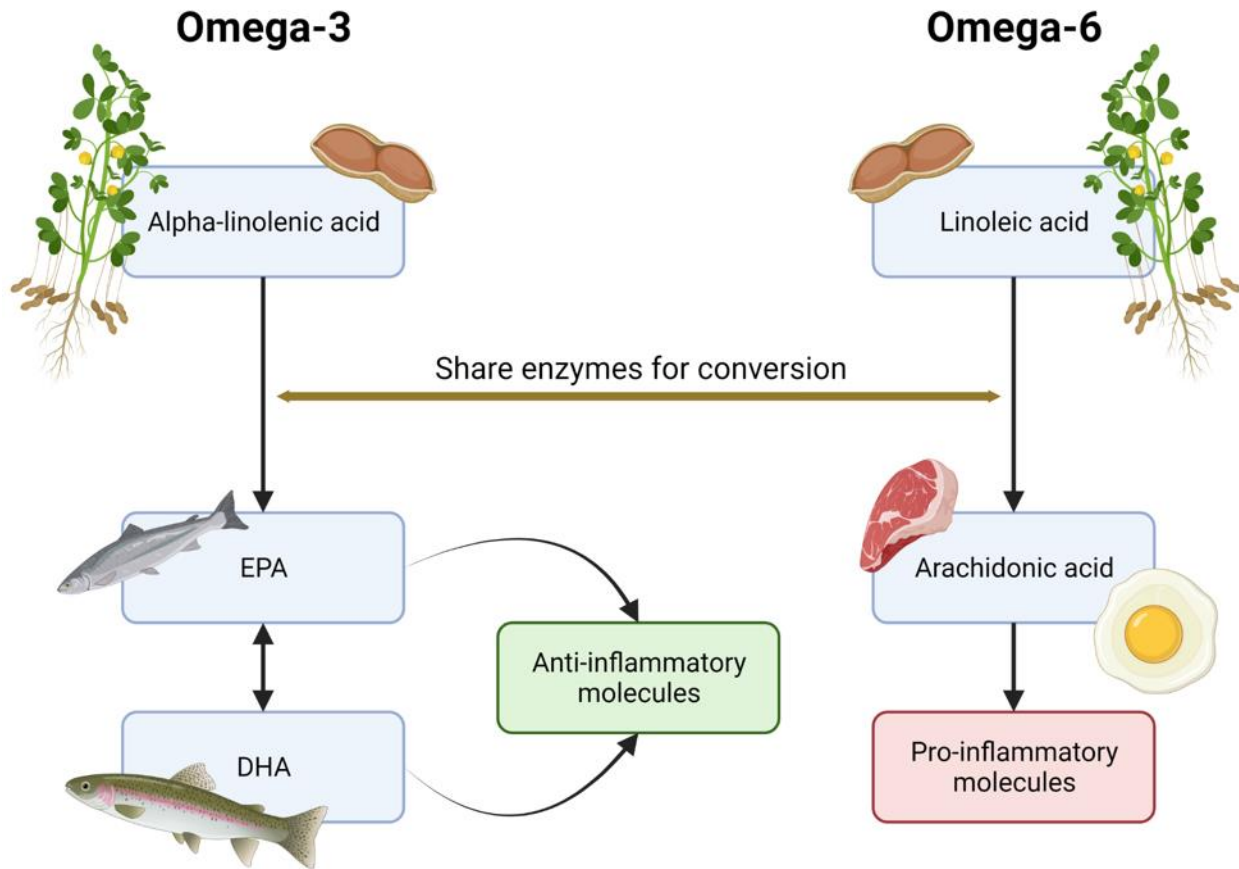
The Omega Relationship

To kick things off, let’s first take a look at how the omega families are related. This is one of the most important things to understand because it is fundamental in appreciating many of the claims made about these fatty acids and how they interact with our health and energy levels.

While there are several fatty acids within the omega-3 and omega-6 families, our concern is with just a handful of them:

- **Omega-3:** alpha-linolenic acid, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA)
- **Omega-6:** linoleic acid and arachidonic acid

I’ve done my best to simplify their relationship in the image below. There are two critical points that need emphasis.



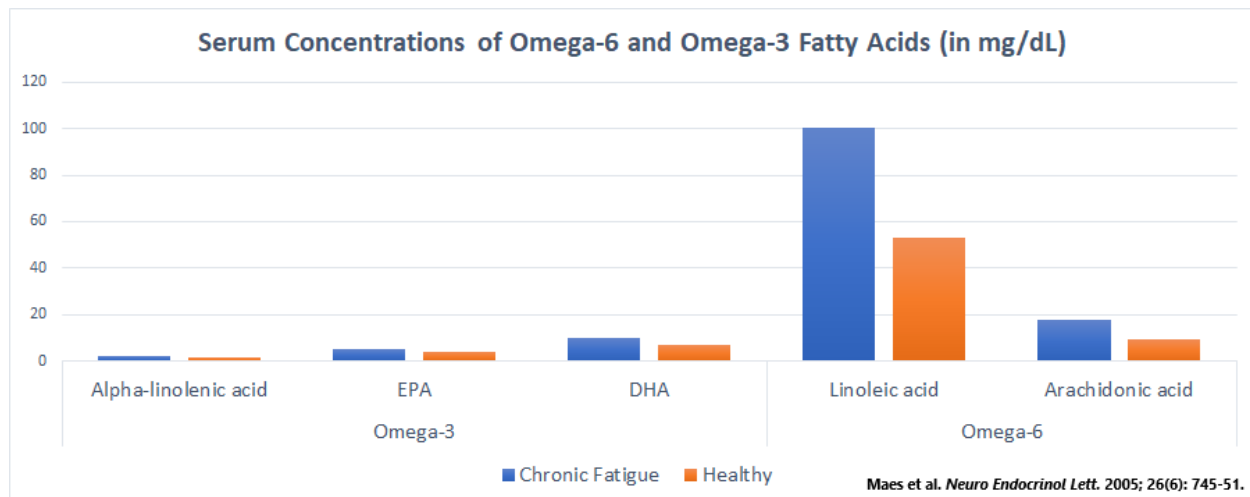
First, only the long-chain derivatives have a substantial biological role in the body, especially when it comes to inflammation. EPA and DHA are precursors to numerous anti-inflammatory molecules, whereas arachidonic acid is the precursor for many proinflammatory molecules.

Second, the conversion of the short-chain precursors, alpha-linolenic acid and linoleic acid, into their long-chained derivatives requires the same enzymes. This means that there is competition between the omega-3 and omega-6 families for enzymatic conversion and creation of the biologically important long-chained derivatives.

These two facts serve as the basis for all talking points related to keeping your omega-3 and omega-6 intakes in balance. Because of the vastly greater abundance of omega-6 fatty acids in the modern food supply, usually in the form of seed or vegetable oil, maintaining an appropriate balance often requires reducing omega-6 intake.

Modern humans of the Western world consume at least [ten times more](#) omega-6 than omega-3 fatty acids, compared to a ratio of [less than 3:1](#) throughout evolutionary history. You'll find no shortage of articles suggesting that a high ratio of omega-6 to omega-3 fatty acids in the diet contributes to chronic inflammation and related diseases, such as [obesity](#), [fatty liver](#), [cancers](#), and [cardiovascular diseases](#).

Chronic fatigue is no exception. Patients with chronic fatigue syndrome have a [significantly greater](#) serum omega-6 to omega-3 ratio than healthy adults due entirely to higher levels of omega-6 fatty acids, and the extent of this ratio directly correlates to fatigue severity.



In women with breast cancer, those eating a diet with the highest omega-6 to omega-3 ratio had [significantly greater](#) levels of systemic inflammation and fatigue than those with the lowest ratio.

However, the omega ratio isn't without limitations. It doesn't consider which specific fatty acids we are consuming, how much of these fatty acids we are consuming, what foods are supplying these fatty acids, or any genetic and health data about the person in question.

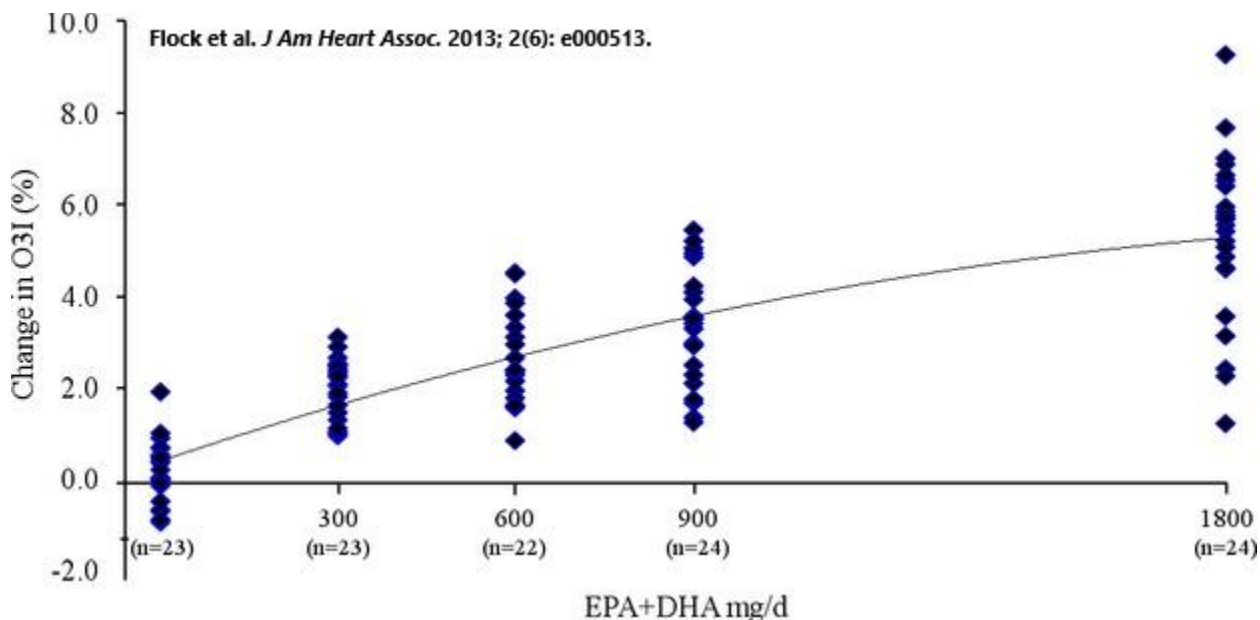
For these reasons, some researchers have proposed shifting focus away from the omega ratio and towards the amount of EPA and DHA present in cell membranes, giving what's called an [omega-3 index](#). While we don't believe the omega ratio should be abandoned, one of the best things you can do for our health and energy levels is consume adequate EPA and DHA.

Focus on EPA & DHA

Only EPA and DHA have anti-inflammatory activity within the body. You could easily create a beautiful omega ratio by eating a lot of alpha-linolenic acid, but it needs to be converted into EPA and DHA for it to work magic. And that's a tall order.

Conversion of alpha-linolenic acid is [consistently less than](#) 10% for EPA and less than 1% for DHA. Premenopausal women have a small advantage thanks to their elevated estrogen and progesterone levels, which roughly double conversion efficiency compared to men. There are also genetic polymorphisms that impact conversion efficiency, such as those involving fatty acid desaturases. But, as a general rule of thumb, conversion isn't very efficient.

This is clearly demonstrated in a [study](#) that supplemented healthy young men and women with different doses of EPA + DHA or a placebo containing alpha-linolenic acid. Notwithstanding the substantial variability in response to supplementation, only those receiving EPA + DHA reliably increased their omega-3 index, with a benefit seen after as little as 300 mg per day.



In [another study](#), healthy men and women were supplemented with 4.4 grams of alpha-linolenic acid, 2.2 grams of EPA, or 2.2 grams of DHA per day. Only EPA (+38) and DHA (+98%) increased the omega-3 index. Alpha-linolenic acid actually decreased it (-10%).

The inability of alpha-linolenic acid to satisfy our requirements for EPA and DHA is further demonstrated in studies evaluating inflammatory biomarkers. A [meta-analysis](#) of 63 randomized controlled trials found that supplementing with 500 to 4500 mg of EPA + DHA per day significantly lowered several biomarkers of inflammation in adults with chronic diseases, adults with autoimmune conditions, and healthy adults free of disease.

Comparatively, a [meta-analysis](#) of 25 randomized controlled trials reported that supplementing with 1 to 14 grams of alpha-linolenic acid per day did not significantly change these same inflammatory biomarkers in healthy adults or those with chronic diseases.

It's also worth mentioning that DHA is [more effective](#) than EPA at reducing inflammation, and also happens to be the omega-3 fatty acid that alpha-linolenic acid has the most difficulty converting to.

We know that inflammation plays a central role in chronic fatigue, and the anti-inflammatory effects of EPA + DHA explain why increases in serum EPA + DHA concentrations following regular supplementation [predict](#) improvements in overall fatigue, physical fatigue, and vigor among cancer patients.

Coming full-circle, if we focus on getting EPA and DHA from our diet, then we can improve our omega-3 index, reduce inflammation, and increase our energy levels. If we focus only on the ratio of omega-6 to omega-3 fatty acids, then we could see ratio improvements without ever touching EPA or DHA and lose out on all these benefits.

What About Our Excessive Omega-6 Intake?

All of this begs the question, what about the excessive intake of omega-6 fatty acids? It's not uncommon to find claims that a primary cause of many chronic diseases is the high omega-6 content of the Western diet, due primarily to a shift away from animal-based fats and towards vegetable and seed oils.

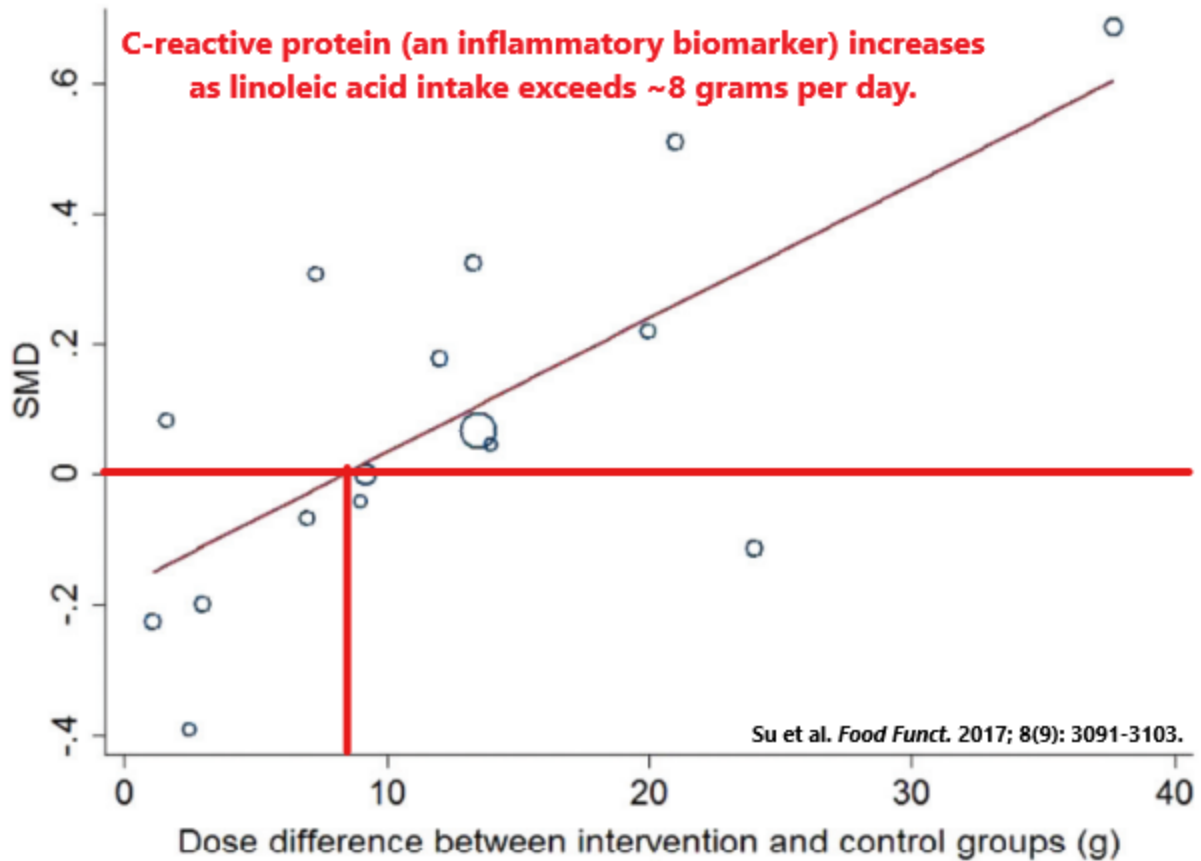
It's uncontroversial that the omega-6 content of the typical Western diet has [increased substantially](#) over the last hundred years, almost entirely in the form of linoleic acid from seed and vegetable oils (soy oil, in particular). Today, Americans [consume](#) 15 to 20 grams of linoleic acid per day on average!

Estimations of our Paleolithic diet put linoleic acid intake at anywhere from [5 to 20 grams](#) per day, meaning that more than half of modern Americans are consuming more than the maximum amount of omega-6 consumed throughout evolutionary history. That, and they are eating little to no omega-3 fatty acids, especially EPA and DHA.

The reason our ancestral omega-6 to omega-3 ratio was so low was not only because our ancestors were eating less omega-6 fatty acids, but also because they were eating more omega-3 fatty acids — 3 to 25 grams of alpha-linolenic acid and up to 2200 mg of EPA + DHA per day.

Another huge difference between modern humans and our ancestors is the source of omega-6 fatty acids. We evolved consuming whole-food plants, not isolated plant oils.

A [meta-analysis](#) of 30 randomized controlled trials found a dose-response relationship between increases in the inflammatory biomarker C-reactive protein (CRP) and the dose of linoleic acid consumed from seed and vegetable oils. Once you start eating more than ~8 grams of linoleic acid from these oils, found in about 1–2 tablespoons, inflammation starts increasing.



Conversely, interventions that have people add ounces of [nuts and seeds](#) to their diet, which are one of the most concentrated whole-food sources of omega-6 fatty acids, show either no effect or reductions on inflammation. They also happen to be [incredibly beneficial](#) to metabolic health, so it would make zero sense to shy away from them on the basis of their omega-6 content.

So, when it comes to omega-6 fatty acids, there is nuance involved. It's best if you simply avoid using seed and vegetable oils or eating foods that contain them in appreciable amounts, both because of their concentrated omega-6 content and the fact that they are incredibly vulnerable to rancidity when exposed to light, heat, and oxygen. But, no need to shy away from whole foods like nuts and seeds unless you are personally sensitive to them.

Summing Up

One of the primary drivers of chronic fatigue and disease is unabated low-grade inflammation that damages our mitochondria and changes our behavior towards a lethargic phenotype. Much of this inflammation is related to diet.

There is a fundamental role for omega-6 fatty acids in promoting inflammation and for omega-3 fatty acids in quelling it. We need the two to be in balance with one another to avoid problems, but also need to ensure that we are getting at least 500 mg of EPA and DHA every day.

The only time a ratio between omega-3 and omega-6 fats matters is when we are dealing with the short-chained fatty acids found in plants, linoleic acid and alpha-linolenic acid, because they compete for enzymes necessary for transforming into their biologically active forms. If we consume those biologically active forms in the diet, we avoid any competition entirely.

But, this doesn't mean that we should pop a couple pills of fish oil and then douse our food in oils rich in linoleic acid. Excessive intakes of omega-6 fatty acids from seed and vegetable oils increases inflammation, but omega-6 fatty acids from whole food sources like nuts and seeds don't seem to be problematic.

Again, and we can't emphasize this enough, omega-6 fatty acids are not inherently evil like many folks make them out to be. They aren't intrinsically unhealthy and shouldn't be actively avoided. Just make sure you are getting them from whole foods and obtaining at least 500 mg of EPA and DHA every day to maintain health and energy levels.