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Take Control of Your Health

'Superfuel' — Your Definitive Guide to Dietary Fats

Analysis by Dr. Joseph Mercola ✔ Fact Checked | July 01, 2023

STORY AT-A-GLANCE

- The book, "Superfuel: Ketogenic Keys to Unlock the Secrets of Good Fats, Bad Fats, and Great Health," delves into the science of dietary fats, providing specifics on how to discriminate between healthy and harmful ones
- The inner membrane of your mitochondria contains a component called cardiolipin, which needs to be saturated in the marine-based omega-3 fat docosahexaenoic acid (DHA) in order to function properly and prevent tumor formation
- The marine-based omega-3 fats DHA and EPA are not just fuel. These long-chained omega-3s are actually key structural elements of all cells, including your brain cells
- DHA is particularly crucial for your brain while EPA appears to be the most crucial component for your heart, and has been linked to a lower risk for heart disease
- The American Heart Association recommends consuming 5% to 10% of your calories as omega-6 and the Dietary Guidelines recommend consuming up to 27 grams of vegetable oils per day. Meanwhile, research shows that when you lower omega-6 from over 5% to about 3.5%, cardiovascular problems and mortality are reduced by a 70%

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Whereas my book "Fat for Fuel" details how to implement a cyclical ketogenic diet, my latest book, cowritten with James DiNicolantonio, Pharm.D., "Superfuel: Ketogenic Keys to Unlock the Secrets of Good Fats, Bad Fats, and Great Health," delves further into the

science of dietary fats, providing specifics on how to discriminate between healthy and harmful ones.

The importance of this cannot be overstated, as fats are truly an extraordinary fuel for your body and brain, yet unhealthy fats can do more harm than excess sugar.

Unfortunately, most doctors are still clueless about this, and the U.S. dietary guidelines are leading people in the complete opposite direction of health with regard to dietary fats. Hence, the incentive for writing "Superfuel."

Omega-3 — The Healthy Fat Most People Don't Get Enough Of

One of the most important fats in the human diet is marine-based omega-3. Unfortunately, in the past 100 years, our omega-6 intake has nearly tripled, largely due to misleading or outright incorrect marketing and government health campaigns, while our intake of omega-3 has decreased 10fold, causing a severe imbalance in our omega-3 to omega-6 ratio.

Ideally, you want to maintain a 4-to-1 ratio of omega-6 and omega-3 fats or less, which is nearly impossible if you're regularly eating processed foods or restaurant fare, as these are loaded with omega-6 from industrial vegetable oils like corn oil and canola oil.

While you clearly need some omega-6s, they need to be unprocessed (think whole, raw plant seeds and tree nuts), and that cannot be said for most commercial vegetable oils.

One of the most significant dangers of vegetable oils is that the damaged fats are integrated into your cell and mitochondrial membranes, and once these membranes are impaired, it sets the stage for all sorts of health problems.

As just one example, explained by DiNicolantonio, the inner membrane of your **mitochondria** contains a component called cardiolipin, which needs to be saturated in the omega-3 fat docosahexaenoic acid (DHA) in order to function properly.

The DHA in cardiolipin can be likened to a cellular alarm system with its oxidation triggering programmed cell death (apoptosis) by signaling caspase-3 when something goes wrong with the cell. However, if the cardiolipin is not saturated with DHA, it cannot signal caspase-3, and apoptosis does not occur. As a result, dysfunctional cells continue to grow and may turn into a cancer cell.

DHA Is Crucial for Your Brain; EPA for Your Heart

It's also crucial to realize that the marine-based omega-3 fats DHA and eicosapentaenoic acid (EPA) are not just fuel. These long-chained omega-3s are actually key structural elements of all cells, including your brain cells. If you don't have enough DHA and EPA, your body's ability to repair and maintain healthy cell structures is seriously impaired.

DHA is particularly crucial for your brain. Not only does it stimulate Nrf2[1] (a transcription factor that regulates cellular oxidation and reduction, and aids in detoxification), it also increases heme oxygenase 1[2] (a protein produced in response to oxidative stress) and upregulates antioxidant enzymes.

EPA, meanwhile, appears to be the most crucial component for your heart, and has been linked to a lower risk for heart disease. Also, a study[3] involving a highly-processed form of EPA found it lowered cardiovascular health risks by 25% compared to a placebo, which is typically the kind of reduction you see with the use of statins.

Perhaps one of the most important pieces of data from this trial is the dosage used. While most studies use doses around a single gram per day, the REDUCE-IT trial used a daily dose of 3 to 4 grams.

The strong beneficial effect seen at this higher dosage confirms and supports health predictions made in "Superfuel," where we note that most people need far higher dosages than commonly recommended (although the only way to be sure is to measure your omega-3 blood level).

As general guidance, however, you only need around 1 to 2 grams of omega-6 linoleic acid per day, ideally from plant seeds and tree nuts, whereas optimal levels of marine omega-3 fats are around 3 to 4 grams per day.

Krill Oil, Phospholipids and Your Brain

As you probably know, small fatty fish such as anchovies, sardines and mackerel are excellent sources of EPA and DHA. Unfortunately, industrial processing practices render most fish oils far from ideal. This is a topic we examine at greater depth in "Superfuel."

About half of all fish oil supplements also have problems with oxidation. When buying a fish oil supplement, I recommend looking for a product that tests the hydroperoxide levels, and has a level below 5%.

An alternative source that bypasses these quality problems is krill oil. Aside from being far less prone to oxidation (courtesy of natural astaxanthin, a powerful antioxidant with major health benefits of its own), the omega-3s in krill oil are also bound to phospholipids, and this gives krill oil distinct health advantages over fish oil, in which the DHA/EPA are bound to triglycerides.

Fatty acids such as DHA and EPA are water insoluble and therefore cannot be transported in their free form in your blood, which is primarily water. They must be packaged into lipoprotein vehicles such as phospholipids. This is primarily why the bioavailability of krill oil is so much higher than fish oil. When you consume fish oil, your liver has to attach it to phosphatidylcholine in order for it to be efficiently utilized by your body and brain.

Phospholipids are also one of the principal compounds in high-density lipoproteins (HDL), which you want more of, and by allowing your cells to maintain structural integrity, phospholipids help your cells function optimally.

Importantly, your brain cannot readily absorb DHA unless it's bound to phosphatidylcholine, and while krill oil contains phosphatidylcholine naturally, fish oil does not. As the name implies, phosphatidylcholine is composed partly of choline, the precursor for the vital neurotransmitter acetylcholine, which sends nerve signals to your brain, and choline itself is crucial for brain development, learning and memory.

These phospholipids are radically underappreciated and serve as one of the best dietary supplements of phosphatidylcholine, which is essential in detoxification for facilitating excretion out of the liver cells into the gallbladder for elimination in the intestine.

Phospholipid-Bound DHA May Be Ideal for Alzheimer's

Research[4] by Rhonda Patrick, Ph.D., also highlights the value of DHA bound to phospholipids, showing this form may actually reduce the risk of Alzheimer's disease in those with the apolipoprotein E4 (APOE4) gene, which is thought to be present in about one-quarter of the population and lowers the typical age of onset of this degenerative brain disorder.

Two hallmarks of Alzheimer's are amyloid beta plaques and tau tangles, both of which impair normal brain functioning. Alzheimer's patients also have reduced glucose transport into their brains, and this is one of the reasons why plaque and tangles form and accumulate in the first place.

According to Patrick,[5] DHA encourages your brain's uptake of glucose by regulating the structure and function of glucose transporters, proteins located at your blood-brain barrier.

Curiously, while eating DHA-rich fish has been shown to slow the progression of Alzheimer's in APOE4 carriers, taking fish oil has not demonstrated the same efficacy. According to Patrick, this variation in response appears to be related to the different ways in which the two forms of DHA are metabolized and ultimately transported into your brain.

When the triglyceride form of DHA is metabolized, most of it turns into nonesterified DHA, while the phospholipid form is metabolized primarily into DHA-lysophosphatidylcholine (DHA-lysoPC). While both of these forms can cross the blood-brain barrier to reach your brain, the phospholipid form does so far more efficiently.

According to Patrick, people with APOE4 have a faulty nonesterified DHA transport system, and this may be why they're at increased risk for Alzheimer's. The good news is that DHA-lysoPC can bypass the tight junctions, thereby improving DHA transport, and for those with one or two APOE4 variants, taking the phospholipid form of DHA may therefore lower their risk of Alzheimer's more effectively.

Vegetable Oils — A Bane to Health

While U.S. dietary guidelines still insist vegetable oils are your healthiest bet, this flies in the face of nutritional science, which clearly shows there are serious problems with these oils.

The American Heart Association (AHA) recommends you consume 5% to 10% of your calories as omega-6 from vegetable oils. Meanwhile, research[6] shows that when you lower omega-6 linoleic acid from over 5% to about 3.5%, cardiovascular problems and mortality are reduced by a whopping 70%. In summary, processed vegetable oils (polyunsaturated fat) harm health by:

Creating high amounts of oxidation products when used in cooking (as they are very susceptible to heat), including aldehydes, which are what causes oxidized low-density lipoprotein (LDL) associated with heart disease. Aldehydes also crosslink tau protein and create neurofibrillary tangles, thereby contributing to the development of neurodegenerative diseases.

Damaging the endothelium (the cells lining your blood vessels) and causing an increase in penetration of LDL and very low-density lipoprotein (VLDL) particles into the subendothelium. As noted by DiNicolantonio, these omega-6 seed oils are "literally transforming you from the inside-out, because these long-chain omegas get integrated in the cell membrane."

Damaging your mitochondria and DNA by making your cell membranes more permeable, allowing things to enter that shouldn't.

Making the cell membrane less fluid, which impacts hormone transporters in the cell membrane and slows your metabolic rate.

Inhibiting cardiolipin, an important component of the inner membrane of your mitochondria that needs to be saturated in DHA in order for it to function properly.

Cardiolipin can be likened to a cellular alarm system that triggers apoptosis (cell death) by signaling caspase-3 when something goes wrong with the cell. If the cardiolipin is not saturated with DHA, it cannot signal caspase-3, and hence apoptosis does not occur. As a result, dysfunctional cells are allowed to continue to grow, which can turn into a cancerous cell.

Inhibiting the removal of senescent cells, i.e., aged, damaged or crippled cells that have lost the ability to reproduce.

Stripping your liver of glutathione (which produces antioxidant enzymes), thereby lowering your antioxidant defenses.[7]

Inhibiting delta-6 desaturase (delta-6), an enzyme involved in the conversion of short-chained omega-3s to longer chained omega-3s in your liver.[8]

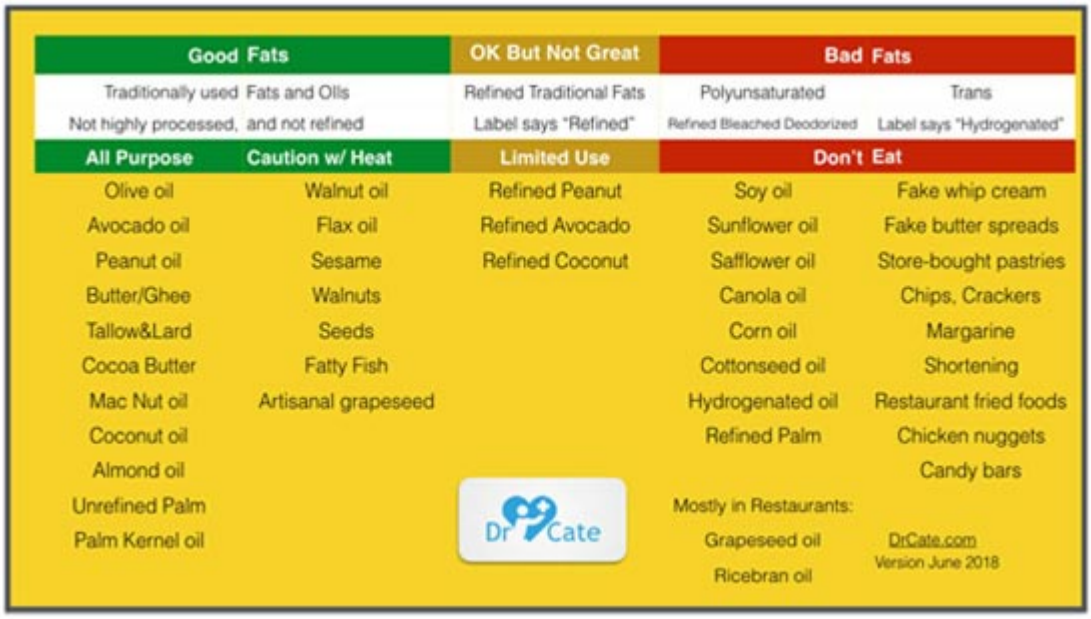
Exposing you to toxic 4-hydroxynonenal (4HNE), which forms during the processing of most vegetable oils, even if the oil is obtained from organic crops. 4HNE is highly toxic, especially to your gut bacteria, and consumption of 4HNE has been correlated with having an obesogenic balance of gut flora. It also causes DNA damage and instigates free radical cascades that damage your mitochondrial membranes.[9]

Exposing you to glyphosate residues, as most vegetable oils are made with genetically engineered crops. Glyphosate has been shown to disrupt the tight junctions in your gut and increase penetration of foreign invaders, especially heated proteins, which can cause allergies.

Take Control of Your Health by Eating the Right Kinds of Fats

This and much more is covered in "Superfuel: Ketogenic Keys to Unlock the Secrets of Good Fats, Bad Fats, and Great Health." The book can also be ordered from **Amazon** or **Barnes & Noble**. It's a great complement to "**Fat for Fuel**," and will help you clearly understand the benefits of these vitally important fats.

The following list from Dr. Cate Shanahan, author of "Deep Nutrition: Why Your Genes Need Traditional Food," also details some of the best and worst fats found in our modern diet.



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