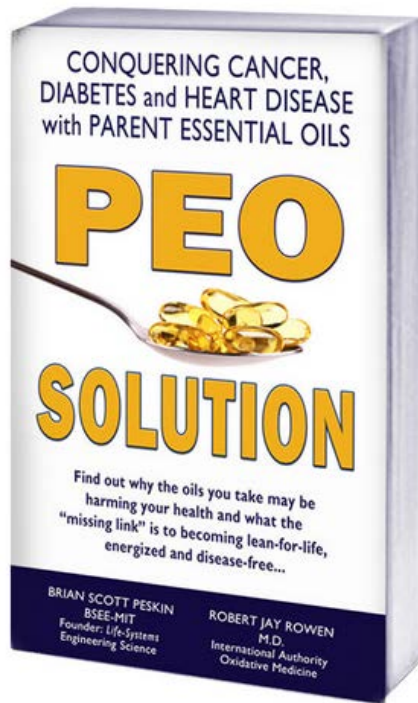


Chapter 8

The Danger of Processed/ Adulterated Fats



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Chapter 8

The Danger of Processed/ Adulterated Fats

“There is an epidemic of misunderstanding of oils in the role of human health. *The oft-repeated cliché that omega 6's are inflammatory and omega 3's are anti-inflammatory, dangerously misleads the public and physicians as well* into thinking that one just needs to take more of one and less of the other. What is missing, critically so, is the understanding that both are needed for human health and that getting them in their purest and unoxidized form has far-reaching effects for human health.

“This chapter gives physicians the detailed information we need to know as it is under-publicized. I have seen remarkable success in the nutritional treatment of lupus, psoriasis, and atopic dermatitis by including a PEO-based approach into my regimen. While most effective nutritional plans for these conditions often focus on an oil-free diet as one aspect of the plan and therefore by default eliminate oxidized sources of oil, I have found that **eliminating oxidized fats and incorporating natural unoxidized (unadulterated) sources of PEOs, especially in atopic dermatitis, speeds up the response to this nutritional approach dramatically.**

“Prof. Peskin and Dr. Rowen are doing a great service by bringing to the forefront the dangers of oxidized fats and battling the nutritional cliché mentioned above that has taken root in both patient and medical circles.”

– Jonathan Carp, MD

Dermatologist (USA)

Chapter 6 detailed the critical importance of PEOs. While this chapter is shorter in pages, it is not shorter in content – detailing the dangers of *adulterating* PEOs by routine food processing. This danger is much greater than we are led to believe. Consequently, this topic too, is essential to your full understanding of PEOs.

**Adulteration of Parent omega-6 is the primary
#1 cause of America’s health demise**

The *processing is ubiquitous* – in all foods, both prepared and in restaurants – from fast food to fine dining. **Unless the food is certified “organic/unprocessed” there will be PEO adulteration.** In addition to trans fats, there are other adulterating processes such as *interesterification*. Those particular processed oils are known to raise resting blood glucose – awful for diabetics. As you already discovered, Dr. Rowen’s “Living Foods” diet guarantees eliminating / minimizing of the potential for adulteration of PEOs, but for the rest of us, please heed the following warning.

**Unless the food is “certified organic/unprocessed,”
there will be PEO adulteration.**

WARNING: A small amount of trans fats—0.5 grams—causes tremendous harm!¹

It is important physicians see and understand the importance of the following example so they fully understand the damage their patients are inadvertently causing themselves! Although margarine and other hydrogenated products currently contain relatively few *trans fats* – often as little as 1% – **this still translates to an enormous number of dangerous *trans fat* molecules.** In absolute numbers there are some 1×10^{21} molecules (1, followed by 21 zeros, or 1,000 million trillion molecules!) *in each tablespoon* of oil. As the calculation in the footnote below makes clear, a single tablespoon of *just 1% adulterated* oil provides some **100,000 defective oil molecules for each cell in our body – a tremendous overload potential.**²

1 Special thanks to Brian Vonk, M.D., for making me aware how much of a problem *a supposedly insignificant* 0.5 grams of trans fats really is.

2 Here is how that figure of 100,000 defective oil molecules per cell is derived: The molecular weight of a triglyceride (any PEO-containing oil, good or bad) is approximately 1,000. A liter (slightly more than a quart) of oil contains approximately 1,000 grams (about 2.2 pounds), and from chemistry a mole (gm molecular weight) of any substance contains about 6×10^{23} molecules. Therefore, there is a mole of triglycerides in a liter of cooking oil. There are 64 tablespoons per liter, but let's simplify that to 100. This would give us 6×10^{21} (six thousand million trillion molecules of oil) per tablespoon (10^{23} molecules per 100 tablespoons = 10^{21} molecules) but again, for the sake of simplicity, we

It gets much worse. Many patients consume more than just a single tablespoon of processed oil each day. In fact, renowned lipid expert Dr. Mary Enig placed the percentage of trans fat oils to unadulterated oils consumed at closer to 5–15%, *not a mere 1%*.³ The heart disease-/cancer-causing potential is staggering.

An adulterated PEO is NO longer a PEO!

Why a half a gram of trans fat really IS a problem

From this analysis, we see *1% defective oil equals some 100,000 nonfunctional, defective PEOs overpowering each cell*. We take the calculation further to see how many defective PEOs—per cell in the body—a half a gram will work out to be. Oil weighs about 14 grams per tablespoon. Therefore, half a gram is 1/28 of a tablespoon (.036 tablespoon). Multiply that by the 100,000 defective PEOs in a tablespoon to determine the defective PEOs in half a gram, and this is the consequence:

will ignore the 6. A 1% defective amount is therefore (1/100) or 10^{19} molecules. The body contains about 100 trillion (10^{14}) cells. Therefore, the overload potential of bad EFAs on body cells is 10^{19-14} , or 100,000 *adulterated/“bad” PEOs overwhelming each of your body’s cells*. If you think this calculation somehow overestimates the number of bad fats, don’t forget the factors we skipped for ease of calculation. **There are actually many more defective molecules than the 100,000-fold factor from a (10^{14}) mere 1% adulteration.**

3 Schmidt, Michael A., *Smart Fats*, Frog, Ltd., Berkeley, California, 1997, pg. 91. Ref.: Enig, MG, et al., “Isomeric Trans Fatty Acids in the U.S. Diet,” *J Am Col Nutr* 1990; 9(5):471-86.

WARNING: The food label is legally allowed to state “0 grams,” because it is less than 1%. Yet, just 0.5 grams of 1% adulterated oil contains 3600 defective PEOs per cell in the body.

How would you like to have to fight alone against 3,600 opponents wishing you harm? That’s the challenge of each cell. **You had better have a “big army” of fully functional PEOs to combat them.** Imagine how much healthier your patients will be when replacing many of these defective PEOs with fully functional/ *unadulterated* PEOs.

Unknowingly consuming this amount of *adulterated* oils, without a corresponding healthy dose of fully functional, *unadulterated* PEOs, is paramount to consuming poison on a daily basis.

Oxidation Caused by Heating Cooking Oil Also a Danger

Unfortunately, it is even worse. The oil does not have to undergo hydrogenation (the process that makes it a trans fat) to lose functionality. In particular, frying oils get used for weeks with added “extenders,” which get oxidized (become rancid). This is an *entirely different issue* than a processed PEO like a *trans fat* or *interesterified fat*. **Any process negating or negatively impacting PEO’s oxygen transferring capability (even preservatives) is dangerous.** The degree of damaged/ adulterated cooking oil that is allowed in commercial restaurant use is frightening.

The article in the Lipid Library⁴ under the heading of FRYING OILS-CHEMISTRY, entitled “Formation of Epoxy-, Keto- and Hydroxy-Fatty Acids,” by Dr. M. Carmen Dobarganes, discusses the nutritional degradation caused by oxidized fats and oils, and the excessive use of these oils in fast food restaurants:

“...The interest in the study of this group of compounds is related to both the **high amounts formed during frying** and the implication of **oxidized dietary fats and oils in the impairment of the nutritional and physiological properties**. Thus, quantification of total polar compounds and their distribution in used frying fats and oils around the **limit of rejection** (25% polar compounds) has shown that the amount of **oxidized triglyceride monomers is considerable, ranging from 5.9% to 9.4% expressed on fat or oil weight**.

“...The **upper limit (25%) allowed in used frying fats, often surpassed in a significant number of oils and fats from fast food outlets...**”

► **PEO Solution** analysis: Fast food and even fine dining restaurants often operate above the 25% “allowed” limit. Twenty-five percent is still highly unsafe because the range of harmful oils to good oils is a dangerous 5%–15%. **All oils undergo adulteration when heated, even olive oil, which is highly resistant to oxidation at low temperatures.**

4 The American Oil Chemists’ Society (AOCS) owns the **Lipid Library—the world’s largest source of information on lipid analyses, biochemistry, and chemistry**. I am especially indebted to Dr. William Christie—technical editor—for his assistance with my questions.

The *Real-Life* Solution: Ensure adequate patient PEO consumption to offset the potentially deleterious effects of cooking and consumption of *adulterated* PEOs.

Warned but Few Listened

The 2001 journal article, “Health effects of oxidized heated oils,” warned us of an emerging health issue:⁵

“Considerable evidence has accumulated over the past two decades that heated cooking oils, especially polyunsaturated oils, may pose several types of health risks to consumers of fried foods and even people working near deep fat fryers. Heat degrades polyunsaturated fatty acids to toxic compounds; *saturated and monounsaturated fatty acids are resistant to heat-induced degradation.*

“...In view of the extremely **toxic nature of the aldehydic end-products generated**, the employment of PUFA-containing culinary oils for **domestic or commercial frying / cooking** episodes poses **health hazards** that have recently attracted much public and clinical interest.”

The authors linked the cytotoxic agents contained in these cooking oils to **atherosclerosis** and the attendant ischemic [reduced blood supply] **heart disease and**

5 Grootveld, Martin, et al., *Foodservice Research International*, Vol. 13, 2001, pages 41–55.

peripheral vascular disease—all due to the extreme reactivity of aldehydes with critical biomolecules.

OB/GYN Newsflash: Pregnant women, beware:

“... the intake of such oxidized oils during pregnancy may be partially responsible for the neural tube defects found in humans. Differences in the type of heated oil used in standard frying or cooking processes may also be responsible for the differing rates of neural tube defects found among different populations.”

Parent omega-6 is sacrificed

As the 2002 journal article in *Lipids*, makes clear:⁶

“As a result of oxidation, it was possible to obtain within 1–2 h a controlled oxidative **destruction of corn and sunflower oil triacylglycerols** equivalent to many months of autoxidation by thin-film exposure to air. **About 90% destruction** of 18:2 [**Parent omega-6**] had occurred with **relatively little loss of 18:1** as judged from the ratio of the unsaturated fatty acids to palmitic acid in the oxidized oil. The proportion of the saturated fatty acids (16:0, 18:0, 20:0, and 22:0) had proportionally increased in the oxidized corn and sunflower oil triacylglycerols along with the appearance of hydroperoxy and epoxy

6 Sjövall, O., et al., “Formation of Triacylglycerol Core Aldehydes During Rapid Oxidation of Corn and Sunflower Oils with *tert*-Butyl Hydroperoxide/Fe²⁺,” *Lipids*, Vol. 37, No. 1, 2002, pages 81–94.

fatty acid. It was, therefore, anticipated that the **major triacylglycerol core aldehydes** would have arisen largely **from the oxidation of 18:2** and would be found in combination with palmitic and oleic acids as the DNPH derivatives of the oxotriacylglycerols.”

Interesterified Fats: Out of the Frying Pan into the Fire

We all are aware of the dangers of CVD and cancer from hydrogenated oils. New York City banned their use in restaurants in 2008. When the news was announced, I stated to a colleague that its replacement would be worse—much worse. He was incredulous and asked how I possibly knew that. I answered, “Did anyone publicly discuss the replacements for *trans fats*?” No, and they won’t.

In the zeal to do the right thing, we often unknowingly harm ourselves, like overdosing on fish oil.

I wasn’t the only one asking the question of what would replace trans fats. The answer is *interesterified* fats. Interesterified fats combine polyunsaturated oil and fully hydrogenated oil. The process, called randomization, transfers the location of fatty acids from one molecule to another, using chemicals or enzymes, with the result that the fat doesn’t go rancid as fast.⁷ (This will be explained in greater detail in the PEO analysis below.)

7 Harder, Ben, “Ingredient Shuffle: A trans fat substitute might have risks too,” *Science News*, Web edition: February 7, 2007, Print edition: February 10, 2007; Vol.171 #6 (p. 84), accessed May 30, 2013.

Unfortunately, the results can be **catastrophic for diabetics**. Jack Challem’s insightful article, “Newsflash: The New Fat That’s Worse Than Trans Fat,” (*Better Nutrition*, April, 2007) reported on a study where interesterified fats *raised fasting blood sugar levels by 40%*.

- “Just about everyone knows that *trans fats* are bad news when it comes to boosting cholesterol and heart disease risk. **But their replacement—known as *interesterified fats*—are even more dangerous**, according to a study in the January, 2007, journal *Nutrition & Metabolism*.
- “Like *trans fats*, interesterified fats raised blood levels of the “bad” LDL cholesterol. But **the real shock** came when the researchers looked at the blood sugar levels. After one month of consuming the interesterified fats, the **subjects’ fasting blood sugar skyrocketed by 40%** (compared with the saturated fat diet). Hayes [a researcher at Brandeis University in Massachusetts] noted that these changes **amounted to pre-diabetes.**”

Warning for existing diabetic patients and “pre-diabetic” patients: Interesterified fats cause more tragic results for diabetics. These processed [interesterified] fats also caused a fasting blood glucose rise of nearly 40% along with significantly depressed plasma insulin levels!⁸

8 Sundram, K, et al., “Stearic Acid-rich Interesterified Fat and Trans-rich Fat Raise the LDL/HDL Ratio and Plasma Glucose Relative to Palm Olein in Humans,” *Nutrition & Metabolism*, January 15, 2007, 4:3, pages 1-12.

► **PEO Solution** analysis: Makers of interesterified fats assumed that their *altered* triglyceride structure at the second carbon of the glycerol molecule—was inconsequential. ***That assumption is false.*** Random insertion of a fatty acid on the glycerol backbone has dire consequences for humans. Details matter, as consumed food is not always simply broken down into the simplest of components. An *isomer* is a perfect example that chemists understand well. **See** Scientific Support at PEO-Solution.com for much more information, including an analysis of *adulteration* from steaming salmon fillets vs. pan-frying. *Steaming is worse!*

Interesterified fats typically start with a saturated fat. They can also use a polyunsaturated fat (PEO) as its base. Significant problems occur with both methods. Contrary to what we have been told, a saturated fat is not harmful, as it cannot easily react with anything or have its structure easily adulterated with frying or baking. If your patients choose to fry, then highly saturated fats are best, with monounsaturated fats second best: coconut oil, palm oil, lard, olive oil, etc. Of course, it is best to use organic oils.

Adulterated Fats are Incorporated Into All Tissues and Organs

The journal articles, “Dietary fatty acids with trans unsaturation,” “Membrane fatty acid composition of rat skeletal muscle is most responsive to the balance of dietary n-3 and n-6 PUFA,” and “Quantitative effects of dietary polyunsaturated fats on the composition of fatty acids [PEOs] in rat tissues,” make very clear the dangers of consuming adulterated fats and how they are incorporated into all tissues and organs [not just adipose tissue]:

“The concentration in adipose tissue triacylglycerols is roughly proportional to the dietary concentration and is now frequently used as a measure of relative dietary intakes.”⁹

“It has been long known that the fatty acid composition of the diet can influence membrane fatty acid composition.”¹⁰

“...The tissues maintained a linear relationship [proportional] between the amount of 18-carbon polyunsaturated fatty acids [EFAs] in the diet and in the tissue.... Plasma, liver, and red [blood] cells all tended to maintain n-3 / n-6 [Parent omega-3 / -6 ratio] of the diet being fed....”¹¹

► **PEO Solution analysis: The more adulterated fats your patients consume, the more of these poisons are incorporated into their tissues.** This analysis confirms other researchers’ findings. This harmful incorporation causes lack of optimal functionality and oxygen impairment (hypoxia), too. **Parent omega-6 (LA) is where the majority of the damage occurs.**

9 “Gurr, Michael I., Dietary Fatty Acids with Trans Unsaturation,” *Nutrition Research Reviews* (1996), 9, 259-279.

10 Abbott, Sarah K, “Membrane fatty acid composition of rat skeletal muscle is most responsive to the balance of dietary n-3 and n-6 PUFA,” *British Journal of Nutrition* (2010), 103, 522-529.

11 “Quantitative Effects of Dietary Polyunsaturated Fats on the Composition of Fatty Acids [PEOs] in Rat Tissues,” Department of Biological Chemistry, University of Illinois at Chicago, published in the medical journal *Lipids*, Vol. 25, No. 9, 1990, pages, 505-516.

Adulterated, Non-functional PEOs Must Be Replaced with Functional PEOs

Dr. David Horrobin was the world's leading authority on Parent omega-6 and its derivatives. Horrobin's superb article detailing EFA metabolic pathways states:

...Thus high intakes of non-EFAs [*adulterated* PEOs] may lead to an increased requirement for EFAs [PEOs]....¹²

► **PEO Solution** analysis: Dr. Horrobin hits the nail on the head. Adulteration by food processors causes non-functionality of Parent omega-6 (LA). This defective substance must be replaced in tissue/organs as its *adulteration* is at the core of all of our epidemics.

Regardless of other interventions, the patient's consumption of *adulterated* Parent omega-6 *MUST* be solved first to increase effectiveness of all other protocols.

Dr. Rowen's *Living Foods* diet minimizes these potential hazards. In Appendix II you will learn that oxidation of Parent omega-6 from food processing becomes incorporated into LDL-C and is the root cause of defective cholesterol, thus impairing cell membrane fluidity¹³ and functionality, including impairing

12 Horrobin, D.F., "Nutritional and Medical Importance of Gamma-linoleic Acid," *Prog. Lipid Res.*, Vol. 31, No. 2, pages 163-194, 1992.

13 Hochgraf, Edna, et al., "Dietary Oxidized Linoleic Acid [Parent Omega-6] Modifies Lipid Composition of Rat Liver Microsomes and Increases Their Fluidity," *J. Nutr.* 127: 681-686, 1997.

membrane oxygen transfer. Consumption of PEOs minimizes their damage.

Adulteration of oils is a significant issue and fish oil is commonly used in animal feeds.

You have already discovered how highly unstable fish oil is. Fish oil is now used in numerous animal feeds. This is another reason to purchase “natural/organic” or decrease the amount of poultry and pork you consume. Here’s what the journal *Feed tech* has to say in 2010:¹⁴

“Oils and fats are essential ingredients in feed formulations used in the **poultry, pig and aquaculture** industry. A wide variety of different lipid sources are used in agrifoods applications, including vegetable oils. But what about their quality?

“Fish oil is a highly unstable product and **as soon as it is extracted** from fish and **exposed to oxygen, metals, light and heat it begins to oxidize.**”

► **PEO Solution** analysis: Tables are presented in the article both for peroxide value and TBA, a secondary oxidation product. **Fish oil rancidity was the highest** in both compared to animal fat and fat blends—19% of tested samples were problematic for PV (>20 meg/kg) and 25% of samples were problematic for TBA (>4 ppm). **These values were by far the worst averages of any group.** If fish oil is this problematic in animal feed, imagine how destructive it is in your patients’ bodies.

14 Vereyen, Tom, Oxidation key issue in use of oils and fats for feed,” *Feed Tech*, Vol. 13, Nr 1, 2009 (2 Feb 2010).

Anti-Aging Medicine

Physicians, regardless of specialty, can benefit from patients' increasing demands for anti-aging solutions. "Anti-aging" has become the largest growing segment of medicine. As you have already discovered, **PEO Solution** offers unprecedented patient solutions for this new market segment.

Scientist Dr. A.J. Hulbert details the connection between PEOs and the integrity of cell membranes in his paper, "Metabolism and Longevity: Is There a Role for Membrane Fatty Acids?"¹⁵ He discusses the damage to the cell membranes caused by lipid peroxidation—the process whereby lipids in cell membranes are degraded by free radicals. As free radicals grab electrons, they produce reactive molecules that become involved in a damaging chain reaction that weakens the cell membrane. Of particular concern is the mitochondrial membrane, which helps to determine longevity. It is mostly polyunsaturated fatty acids that are affected.

- "Although unknown in Rubner's time [Rubner was a scientist studying metabolic rate and correlated longevity], one aspect of body composition of mammals also varies with body size, namely the *fatty acid composition of membranes*. Fatty acids **vary dramatically** in their **susceptibility to peroxidation** and the products of lipid peroxidation are very powerful reactive molecules that damage other cellular molecules.

15 Hulbert, A.J., "Metabolism and Longevity: Is There a Role for Membrane Fatty Acids?" *Integrative and Comparative Biology*, Vol. 50, No. 5: 808-817, **2010**.

It is apparent that membrane composition is regulated for each species. The exceptional longevity of Homo sapiens combined with the limited knowledge of the fatty acid composition of human tissues support the potential *importance of mitochondrial membranes in determination of longevity.*

- “The insight that the exceptionally long-living species, Homo sapiens, potentially provides for understanding the mechanisms determining animal longevity, is that the *fatty acid composition of mitochondrial membranes may be much more important than the composition of other cellular membranes.*”

► **PEO Solution** analysis: As Dr. Hulbert makes clear; membrane lipid composition is species specific. The journals articles referenced above examine forced overdoses. Diet typically has a minimal effect on its composition EXCEPT when unnaturally overdosed (as with flax oil or fish oil). This excess has to get incorporated improperly into tissue—it all can’t simply be “burned up” for energy. **Physicians specializing in anti-aging know about the importance of mitochondrial function.** Dr. Hulbert emphasizes the importance of structural integrity and that requires plenty of fully functional, unadulterated Parent omega-6. I have written about mitochondrial composition—in particular, its dependence on fully functional Parent omega-6.

Continuing with this amazing article, Dr. Hulbert explains what makes cell membranes so susceptible to adulteration by peroxidation:

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- “In naturally occurring polyunsaturates [including PEOs], the $-C=C-$ units [these are the double-bonded carbon units] are all separated by a single-bonded $-C-$ [carbon] atom. The hydrogen atoms attached to each of these intermediate $-C-$ atoms are called *bis-allylic* hydrogens, and have the lowest C-H [weakest] bond-energies of the fatty acid chain. This [weak bond] makes them the *most susceptible to attack by Reactive Oxygen Species (ROS)* [chemically reactive molecules which contain oxygen] produced during aerobic metabolism.”¹⁶

***Bis-allylic* (weak-bonded) hydrogens in the cellular membrane are the most susceptible to attack.**

Dr. Hulbert’s explanation immediately exposes the dangers of fish oil:

- “**Docosahexaenoic acid** (22:6), which has six double bonds and consequently *five bis-allylic hydrogens per chain*, is **320 times more susceptible to [anti-oxidant] attack** than the common **monounsaturated oleic acid** (18:1) which has “no” *bis-allylic* hydrogens in its chain.”

... and warns of additional DNA and protein DAMAGE:

- “Membrane lipid peroxidation should not be perceived solely as a ‘damage to membranes’ scenario but also

16 Hulbert, A.J., “Metabolism and Longevity: Is There a Role for Membrane Fatty Acids?” *Integrative and Comparative Biology*, Volume 50, Number 5, 808–817, 2010.

as a significant *endogenous source of damage to other cellular macromolecules*, such as proteins and DNA (including mutations).”

► **PEO Solution analysis: Aside from PhDs in chemistry, the medical profession is not used to this biochemical term or the superior Peroxide Index (PI).** The more polyunsaturated the oil is, the more *bis-allylic chains* are present. Fish oil’s DHA (22:6) has five of them and therefore, is enormously more reactive than the monounsaturated oleic (olive oil), which contains none, and seven times more reactive than Parent omega-6. To combat this oxidation, your body is forced to “use up” its reserve of anti-oxidants, leaving other areas vulnerable.

This chapter’s **Scientific Support** Section shows you how to calculate membrane susceptibility to peroxidative damage. A membrane containing just 5% DHA (fish oil) can be *16 times more susceptible* to peroxidative damage! The hundred trillion cells of each patient are at risk from overdosing on fish oil. **Although not necessarily adulterated BEFORE consumption, all marine oils are immediately subject to it AFTER consumption!**

Fish oil supplementation changes important mitochondrial composition

Anti-Aging physicians need to see this. In 2005, Jon Ramsey published a paper showing that both (adulterated) corn and fish oil reduces Parent omega-6 in the mitochondrial tissue, while drastically increasing the entire omega-3 series, resulting in altered regulation of energy production.¹⁷

17 Ramsey, Jon, “Influence of Mitochondrial Membrane Fatty Acid

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- “Six-month-old male FBNF1 rats *were fed diets* with a primary fat source of *either corn or fish oil* for a 6-month period.
-
- “Studies have reported that long-term calorie restriction (CR), an intervention that has consistently been shown to *increase maximum lifespan, increases mitochondrial linoleic acid [Parent omega-6] content and decreases the content of docosahexaenoic acid [DHA]*.
-

With either the Parent omega-6 in the food (*adulterated* corn oil) or fish oil, the Parent omega-6 in the entire mitochondria **decreased from 19% down to 15%**. That is a **20% decrease of the amount found in the tissue itself**. But DHA composition **increased** from 3.9% to 12.7% — a **3-fold increase** in the tissue. In fact, **the entire omega-3 (n-3) series went from 6.3% up to 25.5%** — a **4-fold increase** — *when overdosed* with supra-pharmacological levels of either (adulterated) corn or *fish oil*. Your body doesn't want either *adulterated* Parent omega-6 or fish oil.

- “Nevertheless, the top-down metabolic control analysis results show that the regulation of **oxidative phosphorylation** [energy production] is **altered** in animals consuming diets where the primary lipid source is either **fish** or (adulterated) **corn** oil, and this compliments previous work showing that dietary fat composition can **influence mitochondrial ATP** production and the **activity of electron transport complexes**.”

Composition on Proton Leak and H₂O₂ Production in Liver,” *Comparative Biochemistry and Physiology, Part B*, 140 (2005):99–108.

[Note: supra-physiologic amounts of anything are rarely good. **Fish oil causes HARMFUL physiologic changes—much more than even the adulterated corn oil. An excess of fully functioning Parent omega-6 would not have this deleterious effect.**]

► **PEO Solution** analysis: The damage fish oil does to the all-important mitochondria is eloquently proven by this study. Independent experiments have confirmed this deleterious effect.

21st Century Update: Given these unequivocal results of food processing and fish oil overdosing, physicians should consider prescribing / recommending PEO supplementation to all patients while ceasing marine oils.

Not using fully chemically processed oil was a major step forward. This is simply “lack of a negative.” With experiments utilizing fully functional, unprocessed / organic Parent omega-6 the results are spectacular as demonstrated in the IOWA (screening) Experiment.

Organic / unprocessed Parent omega-6 is rarely used in clinical trials. As expected, outcomes from studies using adulterated oils are typically negative. Adulterating oils by hydrogenating or interesterifying them, etc. are known to cause cancer, cardiovascular disease, and diabetes. Am I the only one differentiating adulterated from unadulterated Parent omega-6? No. Professor Stephen Anton et al., published a superb **2013** review titled,

“Differential effects of adulterated versus unadulterated forms of linoleic acid on cardiovascular health”¹⁸

“Recently, the beneficial health effects of omega-6 polyunsaturated fatty acids, particularly linoleic acid (LA), on cardiovascular health have been called into question with some scientists suggesting that consumption of LA [Parent omega-6] should be reduced in Western countries. **The focus of this critical review is on the controversy surrounding the effects of dietary intake of LA [Parent omega-6] on cardiovascular health.** Specifically, we critically *examined the effects of both unadulterated and adulterated forms of LA* on cardiovascular health outcomes based on findings from epidemiological studies and randomized controlled trials.

“...[I]t is *critical to distinguish between the effects of unadulterated versus adulterated forms of LA* to understand the true effect of this fatty acid on cardiovascular health.

“... Based on the evidence reviewed above, we believe that the *failure to distinguish between the effects of adulterated versus unadulterated forms of LA* [Parent omega-6] on cardiovascular health has led to *incorrect conclusions* that dietary intake of LA increases CVD risk.

18 Anton SD, et al., “Differential effects of adulterated versus unadulterated forms of linoleic acid on cardiovascular health,” *J Integr Med*, 2013; 11(1): 2-10.

“Our critical review indicates that unadulterated forms of LA [Parent omega-6] are cardioprotective and should be consumed as part of a healthy diet. In contrast, abundant evidence now indicates that adulterated forms of LA, predominately hydrogenated vegetable oils, are atherogenic and should not be considered part of a healthy diet. The ability to adulterate the natural omega-6 fatty acid, LA, has contributed to mixed findings regarding the effects of this fatty acid on cardiovascular health. Thus, it is critical that the source of LA be taken into account when drawing conclusions about the physiological effects of this fatty acid. The findings of the present review are in line with the current dietary recommendations of the American Heart Association [Fully functional LA was understood by the AHA to be cardioprotective years ago. They clearly stated thinking otherwise showed a naïve understanding of biochemistry.]

“We strongly recommend that future studies using LA clarify the form, namely, *unadulterated versus adulterated*, of the fatty acid being tested *to avoid further controversies.*”

► **PEO Solution** analysis: Can nearly everyone be wrong? Yes. We applaud Dr. Anton and his colleague’s analysis to help correct this tragic oversight.

Warning: Antibiotics and pesticides deplete precious PEOs...¹⁹

Dr. Spiteller confirms that **EFAs are among the most highly oxygen sensitive molecules**. He tells us how easily they are ruined – by both storage, where they oxidize automatically, and by heating them. **Consequently, we understand the potential fragility of EFAs and why supplementation is often required.** We also see why we require the body's most efficient antioxidant, S.O.D., to stop the free-radical process. He states:

- “**Large amounts of LPO (lipid peroxidation) were found after poisoning** not only by toxic organic compounds such as *antibiotics*, aflatoxin, carbon tetrachloride, and *pesticides*, but also by **treatment with reagents** estimated to be not harmful, **such as fatty acids [EFAs]**.
- “...The liberated free **PUFAs serve as substrates** [the basis] for many LOXs (lipoxygenases) which are able to cleave esterified PUFAs...
- “Apparently **this switch requires** a certain amount of substrate (free PUFAs) and is *combined with the depletion of oxygen.*”

19 Spiteller, Gerhard, “Peroxyradicals: Inductors of neurodegenerative and other inflammatory diseases. Their origin and how they transform, cholesterol, phospholipids, plasmalogens, polyunsaturated fatty acids, sugars, and proteins into deleterious products,” *Free Radical Biology and Medicine*, Volume 41, Issue 3, August 2006, pages 362–387.

► **PEO Solution** analysis: Both antibiotics and pesticides (routinely used in growing fruits and vegetables) cause depletion of PEOs and a depletion of oxygen, too. This oxygen depletion is integral to cancer initiation (**See** “The Hidden Story of Cancer” at Pinnacle-Press.com).

For more information, see **Scientific Support** for chapter 8, found at PEO-Solution.com, which contains:

- Excerpts from Dr. Hulbert’s remarkable treatise, “Life and Death: Metabolic Rate, Membrane Composition, and Life Span of Animals,” (Hulbert, A.J., et al., *Physiological Reviews*, Vol. 87, October 2007, pages 1175–1213) and is required reading if you really want a more detailed understanding of aging, free radicals, and tissue membranes physiology.
- Additional detailed information on oxidative damage in lipids and aqueous environments, the difference between the naïvely referenced “Unsaturation Index,” and the more insightful “Peroxidation Index” (PI).
- Additional information concerning cellular and tissue incorporation of adulterated and supra-physiologic oils in a dose-dependent manner.
- A link to my *Townsend Letter* article on cardiolipin’s criticality in the mitochondria.

Please also see Appendix I, which is Dr. Rowen’s seminal and superb explanation of the “French Paradox.” Hint: It has to do with adulteration of oils, but in a very interesting way. Kudos to Dr. Rowen!

From Dr From Dr. Rowen:



You've read how very important natural fats, in their original unadulterated states, are. I want you also to know the science behind what happens when you heat ("cook") fats. Then I will tell you about Pottenger's cats, the extensive study which showed that heated foods can produce deficiencies that extend for generations.

The Toxic Effect of Heating Fats on Human Health

When you heat fats, a smorgasbord of *oxidized fats, aldehydes and volatile compounds* enter your body. How does this happen and what is the result?

All fats in nature that you eat are in the form of triglycerides, which are composed of three fatty acids and glycerol (a sugar alcohol compound). Heat breaks the bonds of the natural triglycerides, making free fatty acids, which are toxic, and an *independent risk factor for sudden death in middle-aged men*.²⁰ Heat in the presence of oxygen not only breaks these bonds (releasing the free fatty acids) but also further damages the fats, producing other non-naturally occurring compounds that can be dangerous to you. (For those technically inclined, please see the Scientific Support for chapter 8 at PEO-Solution.com for a more detailed explanation.)

Remember, oxidized and otherwise damaged fats are the fundamental cause of vascular disease. **We are simply dumping**

20 *Circulation* 2001 Aug 14;104(7):756-61.

into our bodies a horrible mishmash of molecules not found in nature, not native to foods, and not metabolizable by the body, which can give rise to most any toxic bodily reaction, especially damage to cell membranes.

I haven't covered trans fatty acids here. You've heard a lot about them, including margarine. But what you don't know is that the high heat in processing and clarifying cooking oil converts a lot of the native "cis" fatty acids into "trans." (*Cis* is a Latin-derived prefix meaning "on this side of," and *trans* means "across." These double-bonded molecules have the same number of atoms, but the atoms are arranged differently. It is when the cis molecule is converted to the trans molecule that it becomes a problem.)

Most oils used for cooking are valued for their "smoke" points. That's the temperature at which the oil will visibly burn. Most vegetable oils are in the 215–265° C range. That's an awfully high temperature. Water boils at 100° C (212° F). Olive oil is a bit lower at 190° C. Even if your oil doesn't smoke, the higher ranges will induce conversion of cis bonds to damaging trans.

If you don't believe me, do this simple experiment. Take any unsaturated oil and smear it on the inside of a pan. Heat it for a period of time at moderate heat. The longer you do this, the less "oily" the oil remains and the tackier (sticky) it becomes. This is due to molecular damage to the oils and cross-linking **almost making the oil into a plastic**. This is what is happening in your body in slow motion.

The Danger of Processed/Adulterated Fats

The ability of oil to withstand high temperatures before smoking is an additional reason fried foods are the worst things you can eat. Aside from the damaged oils, the heat wipes out whatever nutritional value might have been there.

But now consider the impact of heat on cholesterol oxidative damage in your food. **(We know that cholesterol isn't the bad guy: it is cholesterol that is oxidized that is the problem.** Oxidized cholesterol is taken up in your vascular endothelial cells and seen by your immune system as "foreign." An immune attack is launched against these foreign molecules and your own tissues take a huge hit.)

So what does heat do to cholesterol? With raw fish heated, pan-fried in vegetable oil, or steamed, the sum of **cholesterol oxidation products (COPs)** is increased from 4-fold to 10-fold after the heating processes, as represented in the following table.

Cholesterol Oxidation Products From Heating Raw Fish²¹

	Before heating	After heating
Pan-fried without oil	0.9 microg/g	6.0 microg/g
Pan-fried with olive oil	0.9	4.0
Pan-fried with corn oil	0.9	4.4
Pan-fried with partially hydrogenated plant oil	0.9	3.3
Steamed	0.9	9.9

21 Al-Saghir S., et al, *J Agric Food Chem* **2004** Aug 11;52(16):5290–6.

This represents a 400%–900% increase in COPs. **Strangely enough, the highest amount of COPs was found in steamed fish over pan-fried fish, which was attributed to longer heat exposure.** The authors of this study concluded that even salmon, touted for its heart-sparing effects, could provide COPs as a potential toxicological health risk.

Uncooked fresh butter had virtually NO COPs. So the **fears about the saturated fats in butter is hogwash**, which I explain in Appendix A, **“The French Paradox Resolved.”** Furthermore, as Prof. Peskin makes clear, **there is NO SATURATED FAT in an arterial occlusion.**

Pottenger’s Cats: The Toxic Impact of Heat on Cooked Meat

A famous experiment on 900 cats was conducted by Francis M. Pottenger, Jr. in Monrovia, California from 1932 to 1942. One of the groups was fed raw meat, raw milk and cod liver oil. The other group was fed cooked meat, raw milk and cod liver oil. Over three generations, a number of differences were observed in the two groups.

The raw meat group maintained excellent tissue tone and good-quality fur. Membranes were firm and pink, with no evidence of degeneration. Inflammation of the gums was seldom seen. Calcium and phosphorus content in their bones was consistent, and internal organs were normal. They were resistant to infections, fleas and parasites, with no allergies. They were friendly and predictable in their behavior. They rarely miscarried, and had an average of five very similar kittens per litter, with approximate weight at birth being 119 grams.

The Danger of Processed/Adulterated Fats

The cooked meat group, on the other hand, developed a very long list of ailments and reproduction difficulties. They had litters of kittens quite dissimilar in size and skeletal pattern, with many variations in the configuration of their facial and dental structures in the second and third generation. Kittens averaged 100 grams in size. Miscarriages in the first generation were at 25% and up to 70% in the second generation. Many of the third generation were unable to reproduce, and on the average, only lived six months.

The long bones of these cats increased in length and decreased in diameter, becoming longer in the hind legs than the fore legs. Bones became coarser and showed less calcium. By the third generation, an inherited condition appeared where bones were brittle and subject to fracture. They developed heart problems and vision problems. The thyroid became inflamed and underactive. There were infections of the kidneys, liver, testes, ovaries, and bladder. There was inflammation of the joints and nervous system. There was arthritis, paralysis and meningitis. Common causes of death were pneumonia, abscess within the chest space, and diarrhea.

Pottenger discovered that it took approximately four generations for the cooked-meat group to recover to a state of normal health. His findings almost exactly mirror what we are seeing now in younger human populations: the horrific rise in diseases in our younger human generations: autism, collapse in sperm counts, immune dysfunction, etc.

Alteration of DNA Expression Takes Four Generations to Recover

The Journal of the American Medical Association published a startling discovery in 1981. Rats made deficient in zinc gave birth to offspring with immune defects. Even when zinc was restored

to their diet, it took **four** generations for them to regain normal immune function.²² I first learned about this about nine years later and it shook me regarding nutrition!

This finding is confirmed with modern experiments on epigenetics, using nutritional deficiencies and environmental xenobiotics (substances foreign to a body or ecological system). Epigenetics is the science of DNA or gene expression. Your DNA might be perfectly intact. The problem is, dietary deficiencies, toxins, or even stress might compromise its expression. Your DNA is like your computer's hard drive. You control what the hard drive does through your keyboard commands. Imagine missing a key (nutritional deficiency) or a heavy brick (toxin) loading one or more keys. Your hard drive, perfectly intact otherwise, is not going to perform!

We are finding that nutritional or toxic damage to animals induces alteration in DNA EXPRESSION, not the genetic sequence. This has profound implications for the offspring and it takes about four generations to recover.

There is a Biblical passage about this: “[P]unishing the children for the sin of the fathers to the third and fourth generation of those who hate me.” (Exodus 20:5). Although I am NOT a Bible thumper, it seems the Bible accurately predicted epigenetic effects and their lasting effects over 3,000 years ago!

22 *JAMA*. 1981;245(1):53-58.



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