THE LOWDOWN ON LINOLEIC ACID

Exposing the Damaging Effects of This Pernicious Ingredient

(and How to Eliminate It From Your Life)

Dr. Joseph Mercola

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Introduction

Fact: Sugar, while absolutely damaging for your health, is NOT the worst ingredient that can put you at risk of disease.

There's an even worse offender that's just as prevalent yet not as widely recognized for its pernicious influence on health.

You can find it in most supermarkets and groceries. Chances are, you may even have a bottle at home.

It's none other than industrially processed seed oils — also known as "vegetable oils."

Seed oils, also called trans fats, PUFAs, vegetable oils, edible oils and plant oils, are a fairly new invention. Yet, they've become so popular that they're now found in 600,000 processed foods.

In fact, most Americans today are getting approximately 25% of their total calories from seed oils. This is alarming, considering that seed oils are the leading reason why rates of chronic disease are increasing today — heart disease, cancer, age-related macular degeneration, diabetes, obesity and dementia.

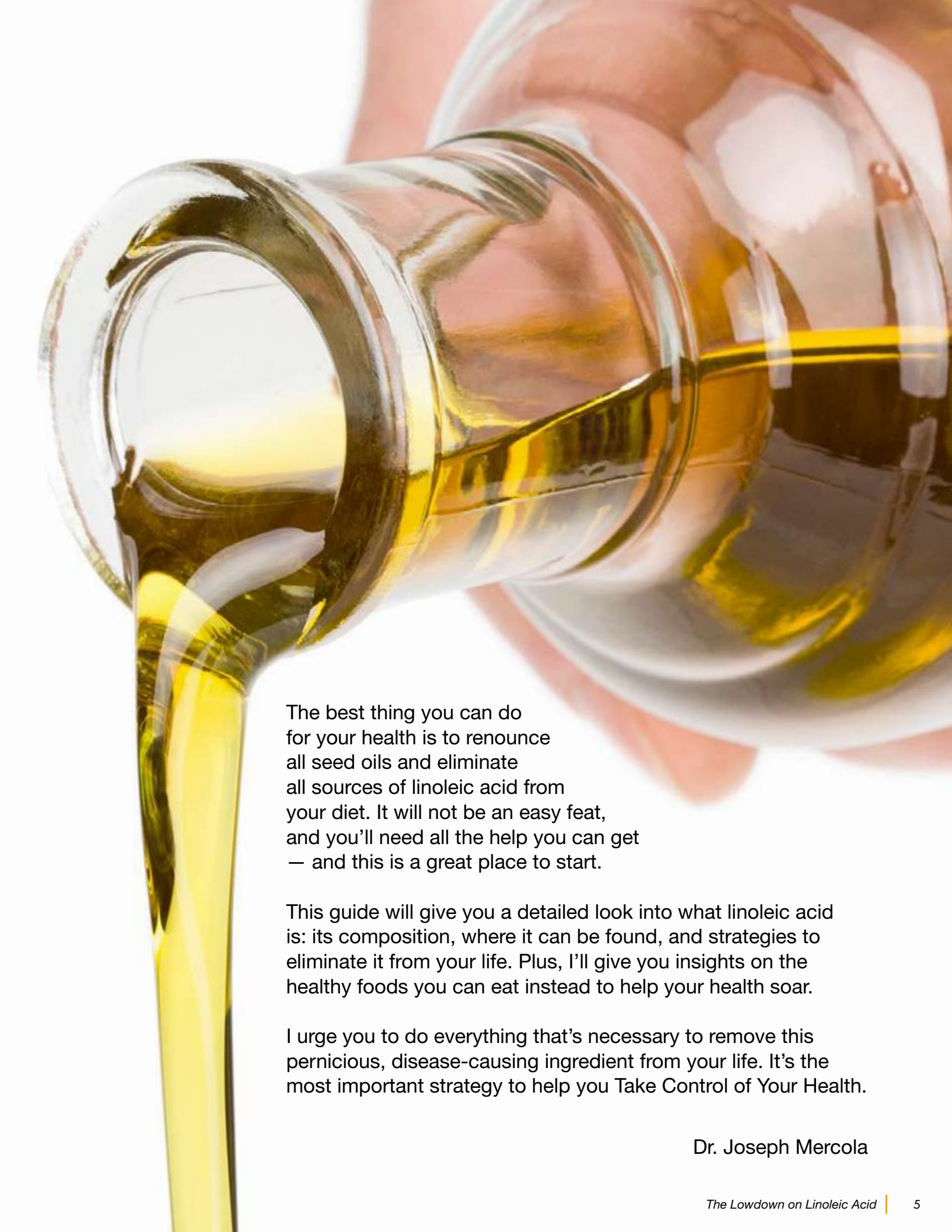
So what is it about seed oils that make them so dangerous and damaging to your health?

The harmful biochemical reactions triggered by seed oils are brought on by an omega-6 fat called linoleic acid (LA).

Linoleic acid is the most pernicious toxin in the modern diet and is the primary contributor to chronic disease.

When consumed in excessive amounts, linoleic acid heightens your risk of chronic diseases because it keeps your mitochondria from working properly.

You may think that avoiding linoleic acid can be as simple as avoiding processed foods and seed oils, but beware: Even animal products like "lean" white meats chicken and pork contain excessive amounts of this omega-6 fat.



The best thing you can do for your health is to renounce all seed oils and eliminate all sources of linoleic acid from your diet. It will not be an easy feat, and you'll need all the help you can get — and this is a great place to start.

This guide will give you a detailed look into what linoleic acid is: its composition, where it can be found, and strategies to eliminate it from your life. Plus, I'll give you insights on the healthy foods you can eat instead to help your health soar.

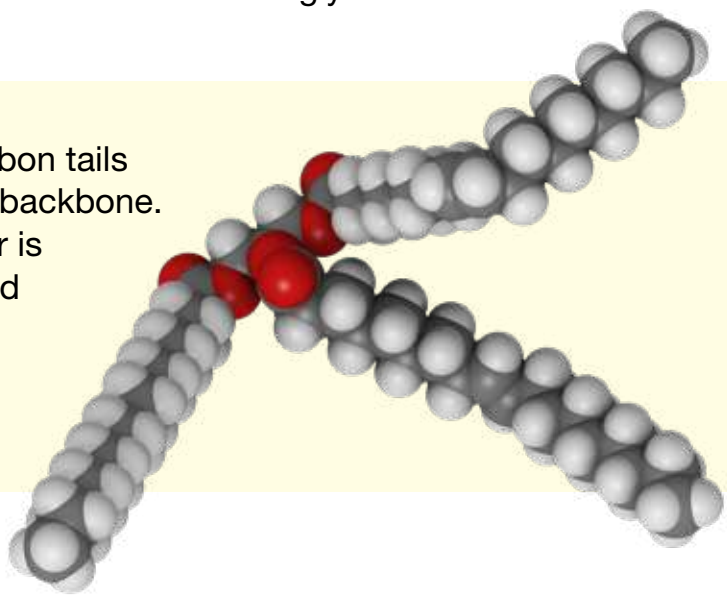
I urge you to do everything that's necessary to remove this pernicious, disease-causing ingredient from your life. It's the most important strategy to help you Take Control of Your Health.

Dr. Joseph Mercola

Fats 101:
Distinguishing Healthy Versus Unhealthy Fats

Fats, also known as lipids, are the primary building blocks of your cell membranes. The membranes are semi-permeable, and their primary role is regulating the entrance and exit of materials from the cell. Another function of fats is to store energy and use it when needed. In this context, fats are now known as triglycerides.

Fat molecules are made of three hydrocarbon tails and a glycerol molecule, which act as the backbone. What distinguishes them from one another is the specific combination they're composed of, as well as their hydrogen saturation and length of molecules, which are referred to as "chain length."

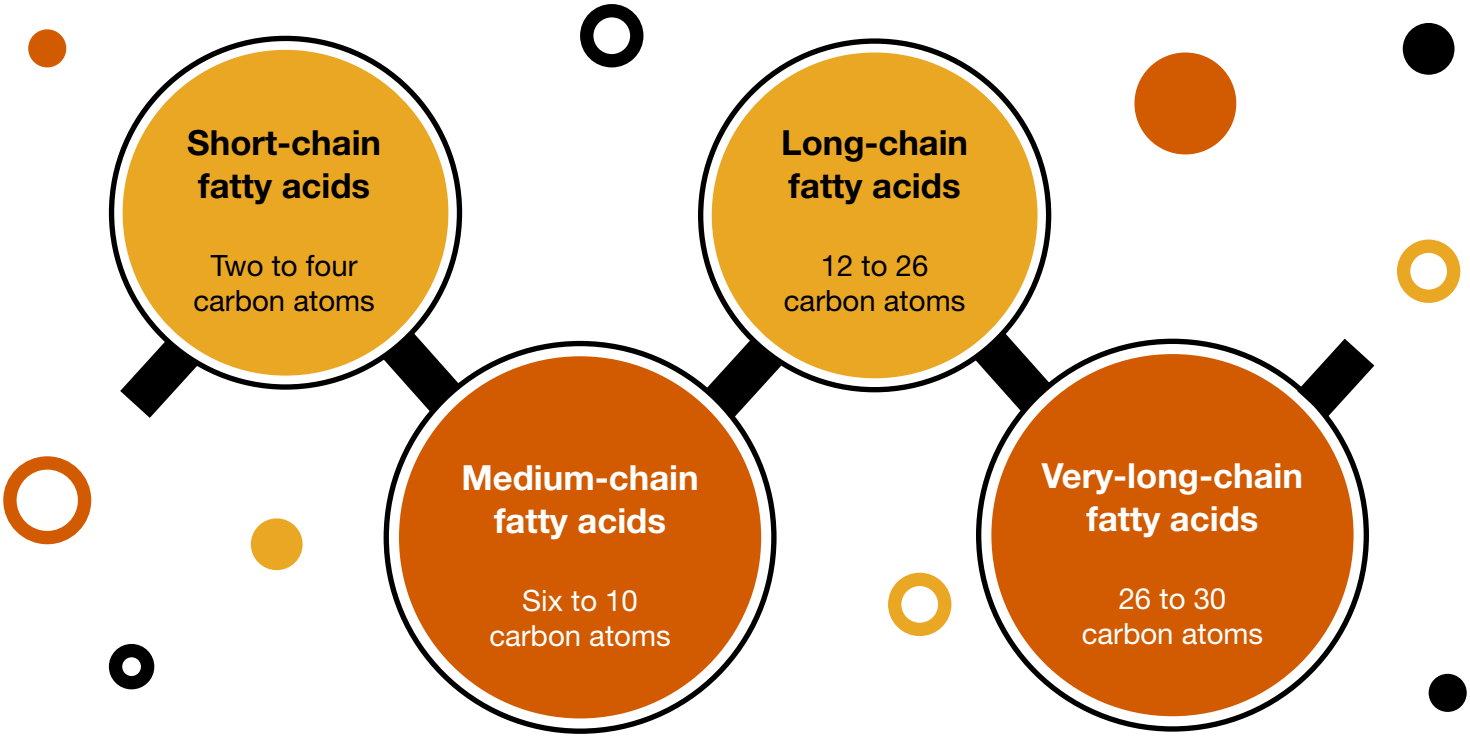


The Different Types of Fats Explained

There are two basic types of fatty acids based on how many of their carbon bonds are paired with hydrogen:

- **Saturated fats** — Fully loaded with hydrogen atoms forming straight chains. Typically solid at room temperature
- **Unsaturated fats** — Have at least one of the pairs of hydrogen atoms from their carbon chain, which are broken down further in two varieties:
    - **Monounsaturated fats** — Missing one pair of hydrogen atoms
    - **Polyunsaturated fats (PUFAs)** — Missing more than one pair of hydrogen atoms, hence the name "poly"

In addition to varying levels of hydrogen saturation, fats vary in the length of their carbon chains. This leads to another classification scheme based on their number of carbon atoms:



To summarize, the chain length and hydrogen saturation level determine a particular fat's melting point. As chain length increases, melting point increases as well.

Beware of PUFAs: Excess Intake Can Be Harmful to Your Health

One significant problem in PUFAs is that they're chemically unstable, making them prone to being damaged by oxygen species that occurs during energy metabolization. The damage creates ALEs (advanced lipid peroxidation end products), which are dangerous metabolites that increase your risk of chronic disease. A study published in 2021 supports these sentiments:

> *PUFAs are susceptible to lipid peroxidation, which can lead to oxidative stress, inflammation, atherosclerosis, cancer and disorders associated with inflammation, such as insulin resistance, arthritis and numerous inflammatory syndromes.*

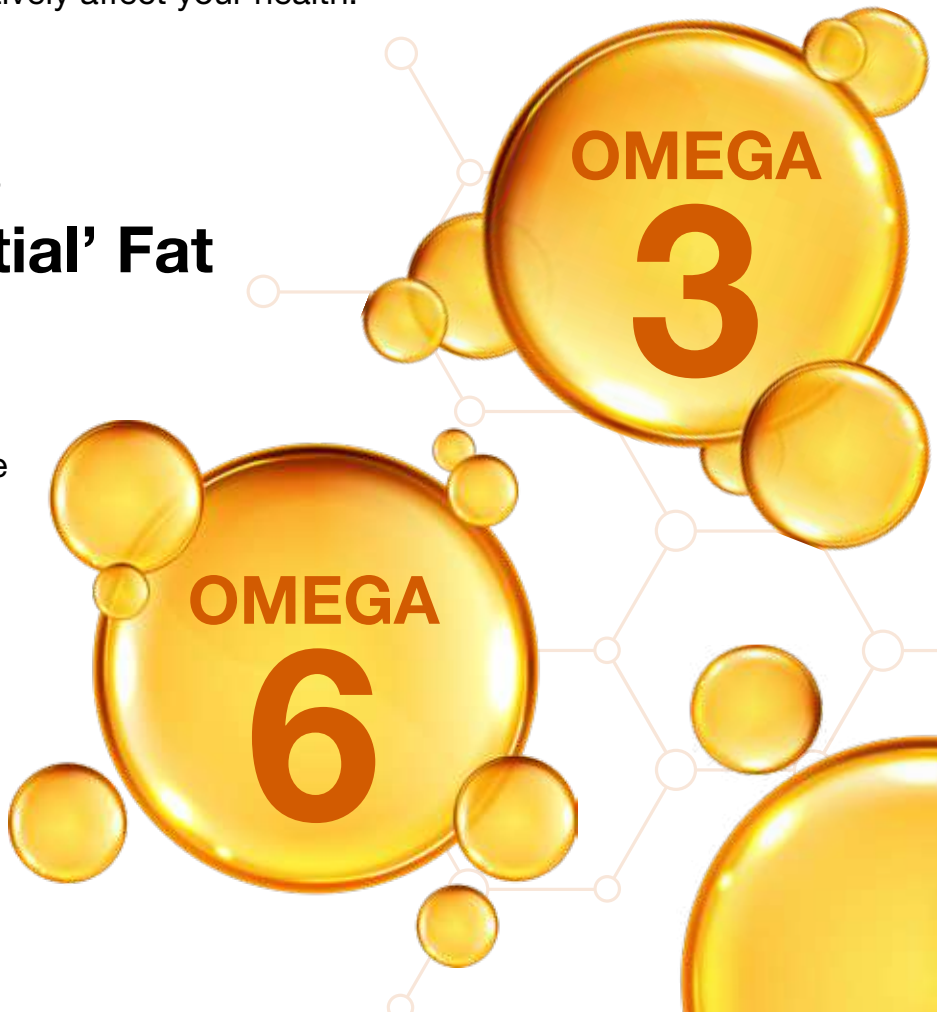
Your tissues are mostly made up of saturated and monounsaturated fats, hence your body requires more of them than PUFAs. These fats seem to be healthier as well.

According to a study published in Missouri Medicine, participants who consumed a diet high in monounsaturated fatty acid had higher energy expenditure and were able to use fat as fuel. Meanwhile, healthy adults who consumed palm oil (a vegetable oil) had decreased energy expenditure and increased body fat.

Another reason to avoid excess PUFA intake is their integration into your cell membranes, which can remain for five to seven years and are also prone to oxidation. When they break down, they turn into OXLAMs (oxidized linoleic acid metabolites), which can negatively affect your health.

Linoleic Acid Is NOT an 'Essential' Fat

Understand that PUFAs are subdivided into omega-3 and omega-6 fats. The end of the fatty chain that is opposite the acid end is the "omega end." The location of the first double bond from the omega end dictates whether a fatty acid is an omega-3 or omega-6 fatty acid.



Again, I would like to emphasize that omega-6 fat, especially linoleic acid (LA), is the most pernicious toxin in the modern diet. LA makes up 60% to 80% of omega-6 fats and is the primary contributor to chronic disease. However, it's only toxic when you eat it in excessive quantities, but the problem is that a large portion of the modern Western diet has too much of it.

Make no mistake, LA is an essential fatty acid required for cell membrane function. The reality is that you only need small amounts of LA. It's found in most foods, so it's virtually impossible to become deficient in it, which is why I'm arguing that it's not an "essential" fat that you need to prioritize in your diet. Research has also shown that large amounts of LA inhibit delta-desaturase, an enzyme critical for PUFA biosynthesis.

Mind Your Omega-6 Intake

Omega-6 fat is required for cell membrane composition, but too much of it can cause inflammation.

Seed Oils: The Most Pernicious Root of All Chronic Diseases

Excessive LA intake via seed oil consumption is one of the most important drivers of chronic disease today — even more so than sugar. In fact, up to 50% of the overall calories in most processed foods come from seed oils, while only 21% comes from sugar.

This suggests that the role of sugar might actually be relatively minor when compared to the impact of seed oils on your health. The connection between seed oils and chronic diseases is further highlighted by the U.S. carb consumption, which has been on a decline since 1997, yet obesity and Type 2 diabetes continue to increase. Interestingly, this steady increase coincides with the surge of seed oil consumption.

Seed Oils Last Longer in Your Body

Unlike glycogen stores that can be quickly exhausted within one to two days, LA has a half-life of 600 to 680 days, which means it can take you about six years to replace 95% of the LA in your body with healthy fats.

Chronic Diseases Rose With PUFAs

As consumption of PUFAs continued to increase throughout the years, so did the incidence of chronic degenerative diseases. According to Dr. Chris Knobbe, an ophthalmologist who has done extensive research on omega-6 fats, only 12.5% of the U.S. population died of heart-related disease in 1900 — this number ballooned to 32% by 2010.

In 1811, only 1 in 118 people died of cancer. But by 2010, its mortality rate had gone up to as many as 1 in 3 people. The incidence of Type 2 diabetes has also increased 25-fold in the last 80 years, while rates of obesity in America rose from 1.2% in the 19th century to 39.8% in 2015.

At the root of all these chronic conditions is LA, which is the primary fatty acid in PUFAs and accounts for as much as 80% of total fats in vegetable oils. When LA oxidizes, it forms harmful metabolites such as OXLAMs (oxidized LA metabolites), which are cytotoxic, genotoxic, mutagenic, carcinogenic, atherogenic and thrombogenic.

PUFAs Affect Eye Health, Too

The incidence of macular degeneration went from no more than 50 cases in 1930 to a whopping 196 million cases in 2020.

LA Contributes to Heart Disease and Cancer

LA is the biggest contributor to heart disease and cancer — two of the leading causes of mortality in the United States. When you consume seed oils, LA makes low-density lipoprotein (LDL, aka bad cholesterol) more susceptible to the oxidative process, thereby forming foam cells (macrophages stuffed with fat and cholesterol) that can build up in the arteries and eventually progress to atherosclerosis, the precursor to heart disease.

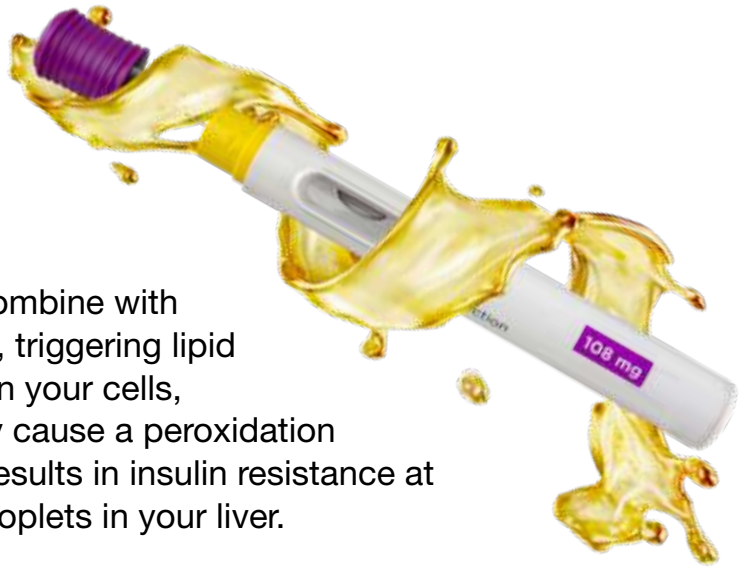
LA also makes the cell membranes more susceptible to oxidative damage, which is what increases your risk of cancer. Moreover, one of the oxidized byproducts of LA is 4-hydroxynonenal (4HNE) cyclic aldehydes, which has been linked not only to increased risks of heart failure but also DNA damage.

A Misconception on LDL

Contrary to popular belief, LDL itself does not cause atherosclerosis. It's the oxidation of LDL due to PUFAs that leads to heart disease.

4HNE is a mutagen that primarily damages the P53 anticancer gene. This particular gene damage is found in 15% of cancers, making it a common mutation, which isn't surprising considering the ubiquity of LA in modern diets.

PUFAs Create Insulin Resistance



When you consume excessive PUFAs, they combine with reactive oxygen species like hydroxyl radicals, triggering lipid peroxidation. These PUFAs then accumulate in your cells, membranes and the mitochondria, where they cause a peroxidation reaction. Excessive reactive oxygen species results in insulin resistance at the cellular level and the production of lipid droplets in your liver.

Linoleic acid, in particular, plays a big role in this harmful process. According to Dr. Paul Saladino, a physician journalist and functional medicine practitioner, LA "breaks the sensitivity for insulin at the level of your fat cells," which will ultimately lead to insulin resistance because the fat cells are responsible for regulating your body's insulin sensitivity.

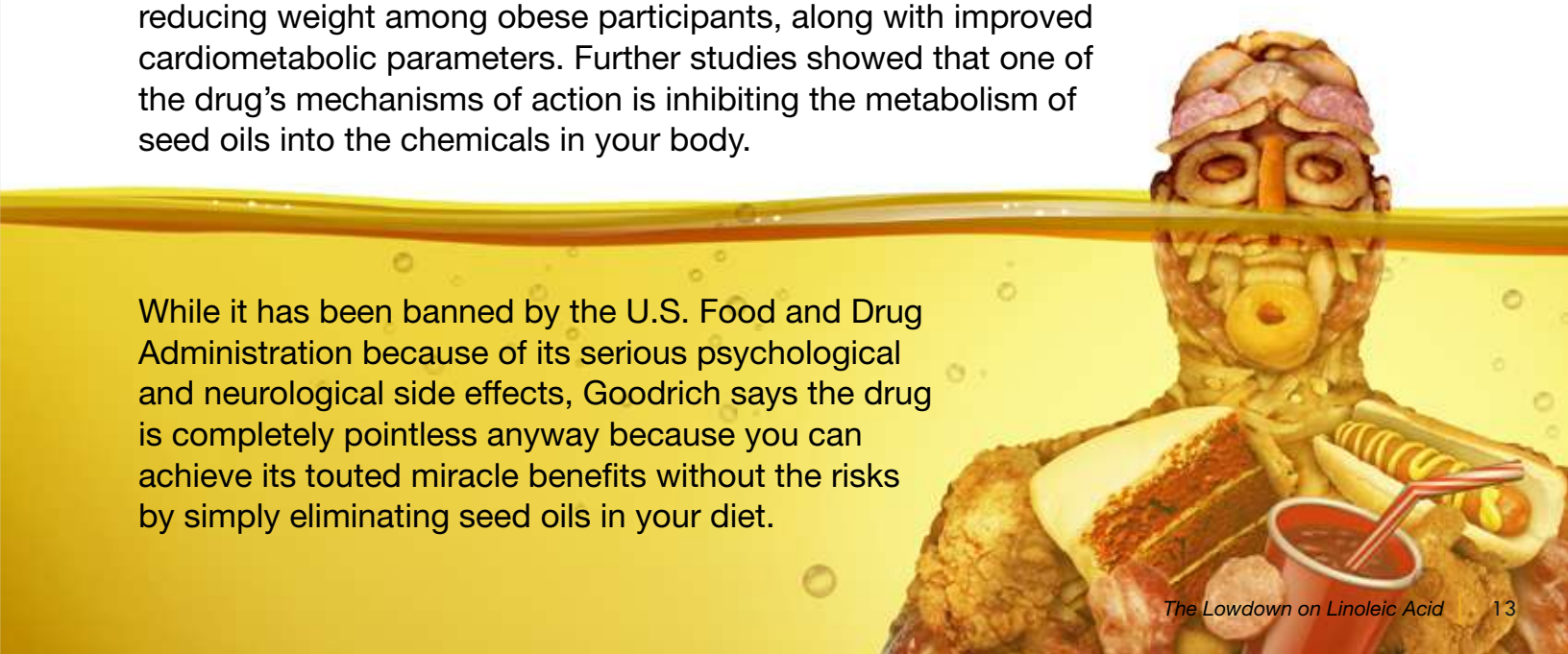
A High-LA Diet Causes Obesity

Excessive consumption of linoleic acid has been implicated with obesity time and again. Tucker Goodrich, a technology executive who has done extensive research on seed oils, cited research involving an "miracle" anti-obesity drug called Rimonabant to explain the importance of eliminating seed oils to manage obesity.

Another Link Between LA and Obesity

The increased concentration of LA in the adipose tissues of American adults today is highly correlated with the increased obesity rates.

Randomized trials of this drug demonstrated efficacy in reducing weight among obese participants, along with improved cardiometabolic parameters. Further studies showed that one of the drug's mechanisms of action is inhibiting the metabolism of seed oils into the chemicals in your body.



While it has been banned by the U.S. Food and Drug Administration because of its serious psychological and neurological side effects, Goodrich says the drug is completely pointless anyway because you can achieve its touted miracle benefits without the risks by simply eliminating seed oils in your diet.

Higher LA Intake Increases Risk of Sunburn

Several animal studies have demonstrated the effect of PUFA intake on UV radiation -induced skin cancer. One study showed that saturated fats had a protective effect against UV tumorigenesis on mice compared to PUFAs, while another animal study revealed that omega-6 fat intake increased carcinogenic expression of non-melanoma skin cancer.

A 2018 study published in the journal Cancer Epidemiology, Biomarkers and Prevention set out to determine if PUFAs were as destructive to human skin health as they were to animal models, and the results showed that there is indeed an increased risk for squamous cell carcinoma, basal cell carcinoma and melanoma among people with higher omega-6 intake. These evidence highlight that eliminating seed oils from your diet may help dramatically decrease your risk of sunburn and related skin diseases.

8 Additional Dangers of Processed Seed Oils

Processed seed oils not only cause you to prematurely age and degrade your body by compromising your mitochondria and metabolic function. They can also lead to the following health consequences:

1. Damage the cell lining of your blood vessels, making the subendothelium more permeable to LDL and very-low-density lipoprotein (VLDL)
2. Increase your risk for memory impairment and Alzheimer's disease
3. Reduce glutathione in your liver, thereby depleting your antioxidant enzymes and lowering your innate defenses against oxidative stress
4. Compromise your immune function and increase mortality
5. Interfere with the conversion of short-chained omega-3s to longer-chained omega-3s in your liver by inhibiting delta-6 desaturase
6. Cause the cell membranes to be less fluid, which impairs hormone transporters in the cell membrane and slows down metabolic rate
7. Inhibit cardiolipin and prevents your mitochondria from efficiently producing energy in the form of adenosine triphosphates (ATPs)
8. Interfere with cardiolipin's apoptosis signaling, causing dysfunctional cells to continue growing and possibly turn into cancerous cells

Here's Why You Should Avoid All Chicken and Pork

While seed oils are a primary source of LA, a number of animal foods you might not suspect are also loaded with this harmful fat. This is because not all animal meats are the same.

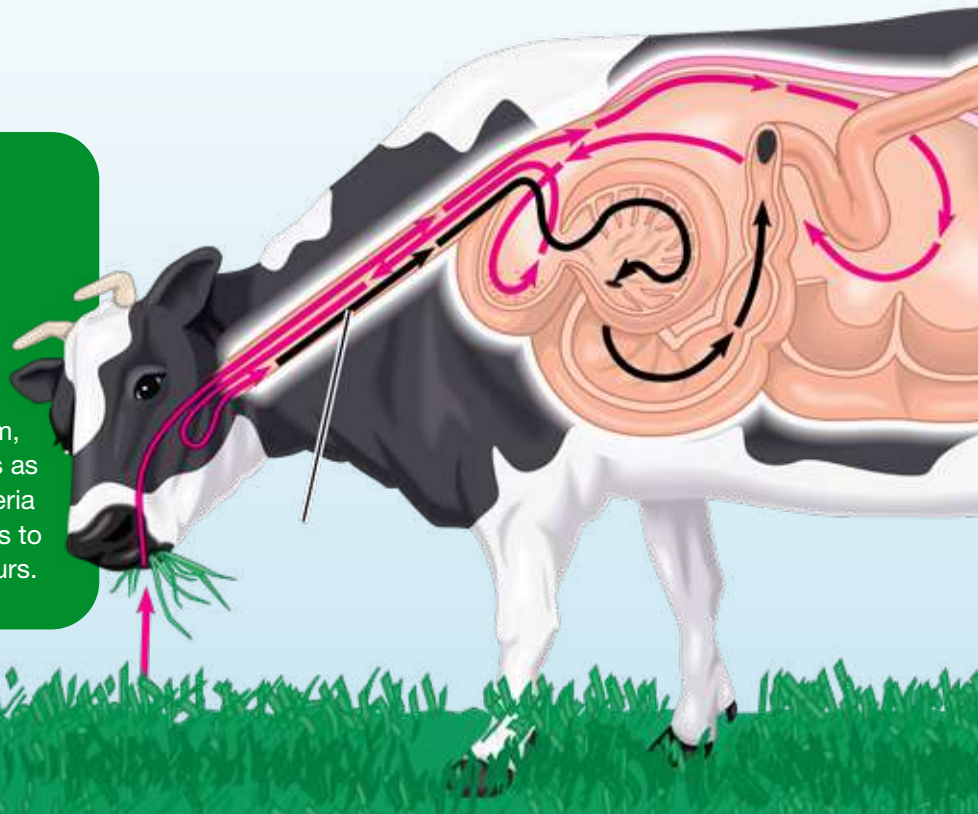
The Difference Between Monogastric and Polygastric Animals

Animal meats can be divided into two types: those that come from polygastric animals, or animals with multiple stomachs (also known as ruminants), and monogastric animals, which have a single stomach.

Ruminants include cows, buffalo, sheep, lamb, goats, deer, elk and many other game animals. They have low LA content in their milk and meat, no matter what they eat, thanks to the fact that they have multiple stomachs with bacteria that can convert the high LA fat they eat into saturated and monounsaturated fats.

The Ruminant Digestive System

Ruminant stomachs have four compartments: the rumen, reticulum, omasum and abomasum. The rumen acts as a biohydrogenation chamber where bacteria reside and where the conversion of LA fats to saturated and monounsaturated fats occurs.



Monogastric animals, or those who have a single stomach, however, like chickens and pigs, cannot make this conversion. This is crucial, as most people consume these lean “white" meats believing they’re leaner than red meat, but nothing could be farther from the truth.

In fact, chicken and pigs are mostly fed genetically engineered (GE) corn and soy, which are high in LA, meaning their meat and eggs will also be high in LA.

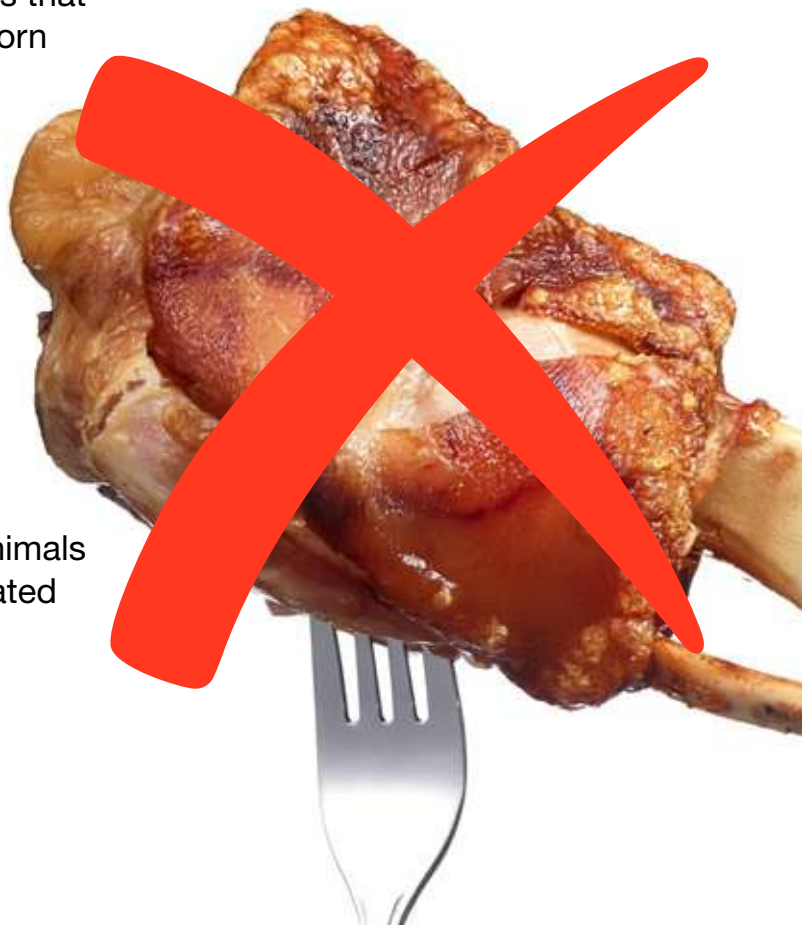
Humans Are Monogastric, Too

The human body only has a single stomach, meaning it cannot convert LA into monounsaturated fats — this means we also drive high LA levels into our tissues.

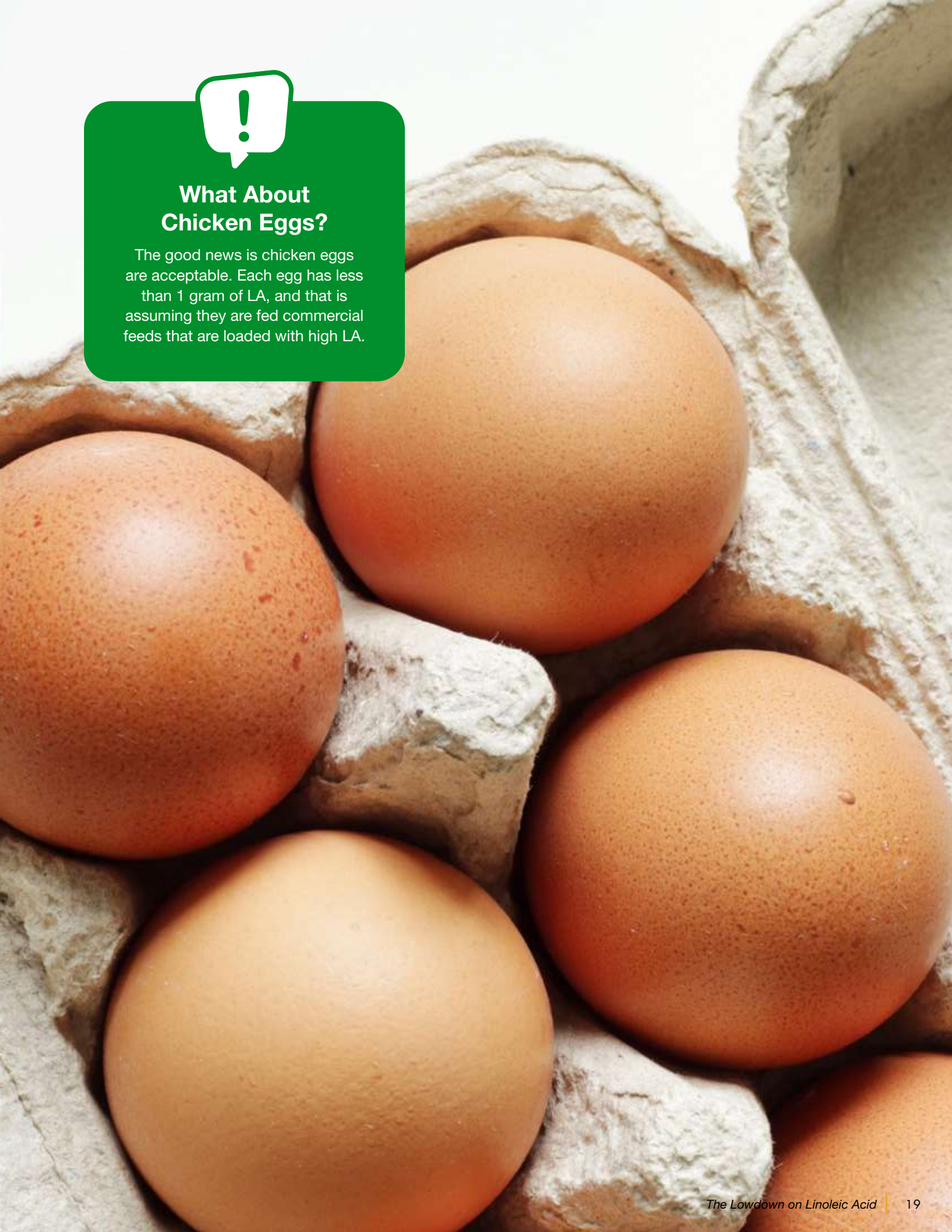
Chicken and Pork Are About the Worst Meats You Can Eat

If you're eating chicken and pork, believing they are good for you, you're beingmisled – in fact, these lean meats help drive the chronic disease trend because they have over 25% LA.

Interestingly, the difference in LA in ruminants that are 100% grass fed and those that are fed corn and soy is only about 0.5%, which is why, from an LA perspective, there isn't much difference between conventional beef and grass fed-only beef. That said, grass fed beef is still preferred as it typically has less glyphosate and hormones.



So, in summary, your best option is to get most of your animal protein from ruminants and avoid or limit all chicken and pork. My favorite meats are bison and lamb. Ideally, it should be organic and the animals should not be fed any food that is contaminated with glyphosate or other pesticides.



What About Chicken Eggs?

The good news is chicken eggs are acceptable. Each egg has less than 1 gram of LA, and that is assuming they are fed commercial feeds that are loaded with high LA.

What Are the Best Cooking Oils?

One of the primary reasons why linoleic acid is so harmful is because it's found in virtually every processed food. On top of the list are seed oils — many processed foods high in sugar also contain seed oils. So the first thing you should do, aside from staying away from chicken and pork, is to eliminate all seed oils from your diet, including seemingly healthy ones like olive and avocado oils.

Bad Versus Good Oils/Fats

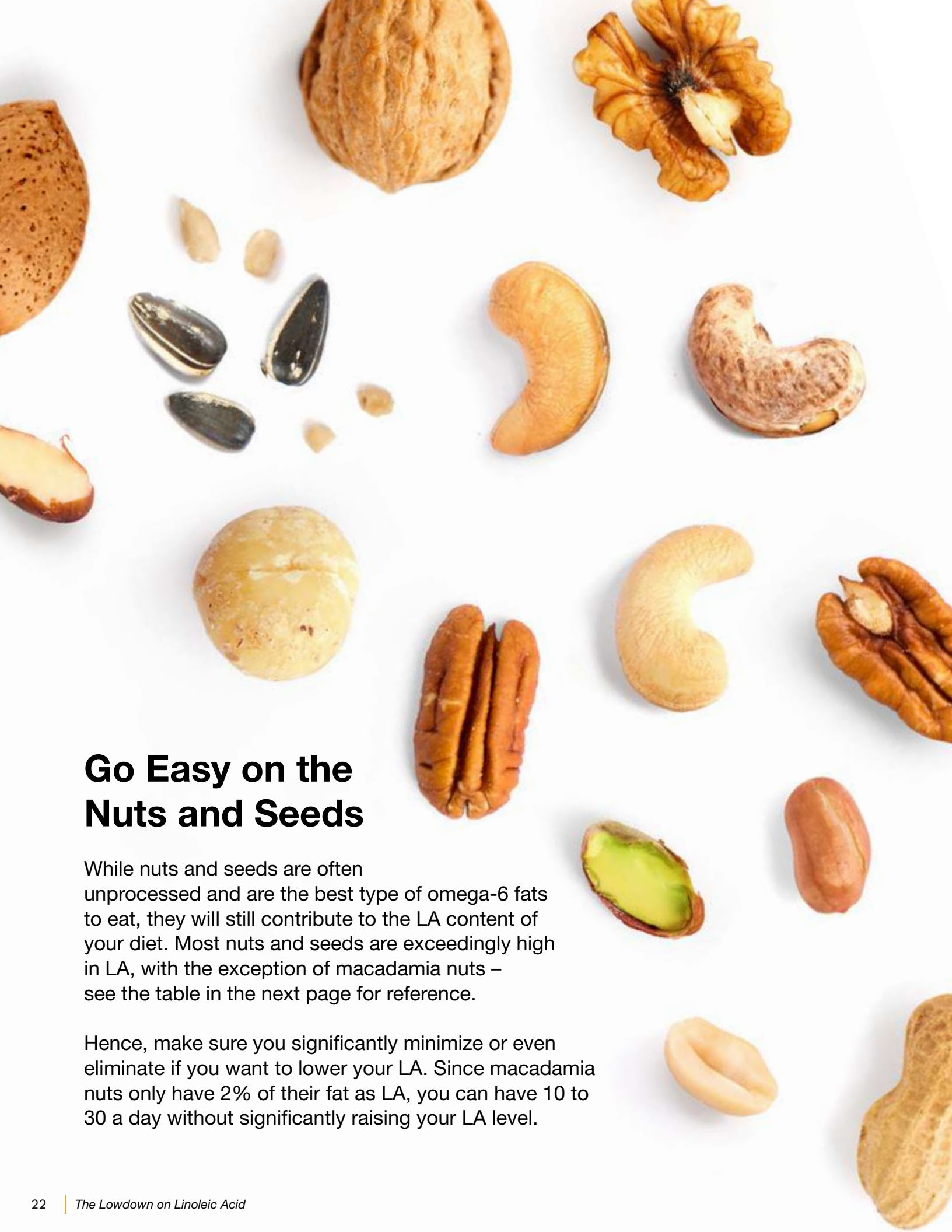
The table on the next page provides a fairly comprehensive list of the most commonly consumed oils and their approximate LA content. In general, the lowest LA-containing fats — butter and beef tallow — would be the fats of choice, as they're the lowest in LA, and will also provide the fat-soluble vitamins A, D and K2. Coconut oil is also very low in LA but doesn't provide the important fat-soluble vitamins that tallow and butter contain.

What About Olive Oil or Avocado Oil?

Tests have revealed that anywhere from 60% to 90% of the olive oils sold in American grocery stores and restaurants are adulterated with cheap, oxidized, omega-6 vegetable oils.

Many believe avocado oil is as healthy as olive oil, but this is simply not the case. A 2020 study showed that 82% of avocado oil is adulterated, mislabeled or of poor quality.

Cooking Oils	% Linoleic Acid (LA) Average Value (Range in Parentheses)
Safflower	70%
Grape seed	70%
Sunflower	68%
Corn	54%
Cottonseed	52%
Soybean	51%
Rice bran	33%
Peanut	32%
Canola	19%
Olive oil	10% (3% to 27%)
Avocado	10%
Lard	10%
Palm oil	10%
Tallow (CAFO)	3%
Butter (CAFO)	2%
Coconut oil	2%
Tallow (Grass Fed)	1%
Butter (Grass Fed)	1%



Go Easy on the Nuts and Seeds

While nuts and seeds are often unprocessed and are the best type of omega-6 fats to eat, they will still contribute to the LA content of your diet. Most nuts and seeds are exceedingly high in LA, with the exception of macadamia nuts – see the table in the next page for reference.

Hence, make sure you significantly minimize or even eliminate if you want to lower your LA. Since macadamia nuts only have 2% of their fat as LA, you can have 10 to 30 a day without significantly raising your LA level.

Seeds/Nuts	% Linoleic Acid (LA) Average Value (Range in Parentheses)
Poppy seed	62%
Hemp	57%
Wheat germ	55%
Walnut	53%
Pecan	50%
Pumpkin	45%
Brazil nuts	43%
Sesame	41%
Peanut	32%
Pine nuts	33%
Chia	16%
Almond	16%
Flaxseed	14%
Pistachio	13%
Hazelnuts	12%
Cashew	8%
Macadamia	2%

What Are the Best Fish to Consume?

I've already mentioned about the importance of staying away from chicken and pork due to their high LA content. Since these animals, even healthy, organically grown ones, are typically fed grains, they are loaded with omega-6 fats and may have 10 TIMES the LA content that beef, lamb or buffalo do.

To further balance your omega-3 to omega-6 ratio, you also need to get enough omega-3s ideally from seafood. Not all seafoods contain omega-3s, though — only fatty, cold-water fish do, like wild-caught Alaskan salmon, sardines, anchovies, mackerel and herring. Avoid all types of farmed seafood and fish because of their potential for contamination. Farmed fish are susceptible to the same conditions as land-based concentrated animal feeding operations (CAFOs), such as pollution and disease.

Another notable drawback to farmed fish is the disparity in their fat levels. According to research, farmed salmon only have half of the omega-3 fats compared to wild salmon. Even worse, the ratio of omega-6 to omega-3 are 10 times higher than that of wild salmon! You'll be doing your health a great disservice if you choose farmed salmon, or any farmed fish, for that matter.

Don't be misled by the idea that you may need to consume more omega-3. While you certainly need to consume some for good health, omega-3s is also a PUFA, so getting it in excessive amounts is also a prescription for disaster.

The Ideal omega-6 to omega-3 ratio is 1:1 or 4:1. In fact, a study noted that reducing the intake to a 4:1 ratio led to a 70% reduction in total mortality. Lowering omega-6 intake into preferable levels also helped reduce symptoms of rheumatoid arthritis and asthma.

Just How Out of Balance Is Our Omega-6 Intake?

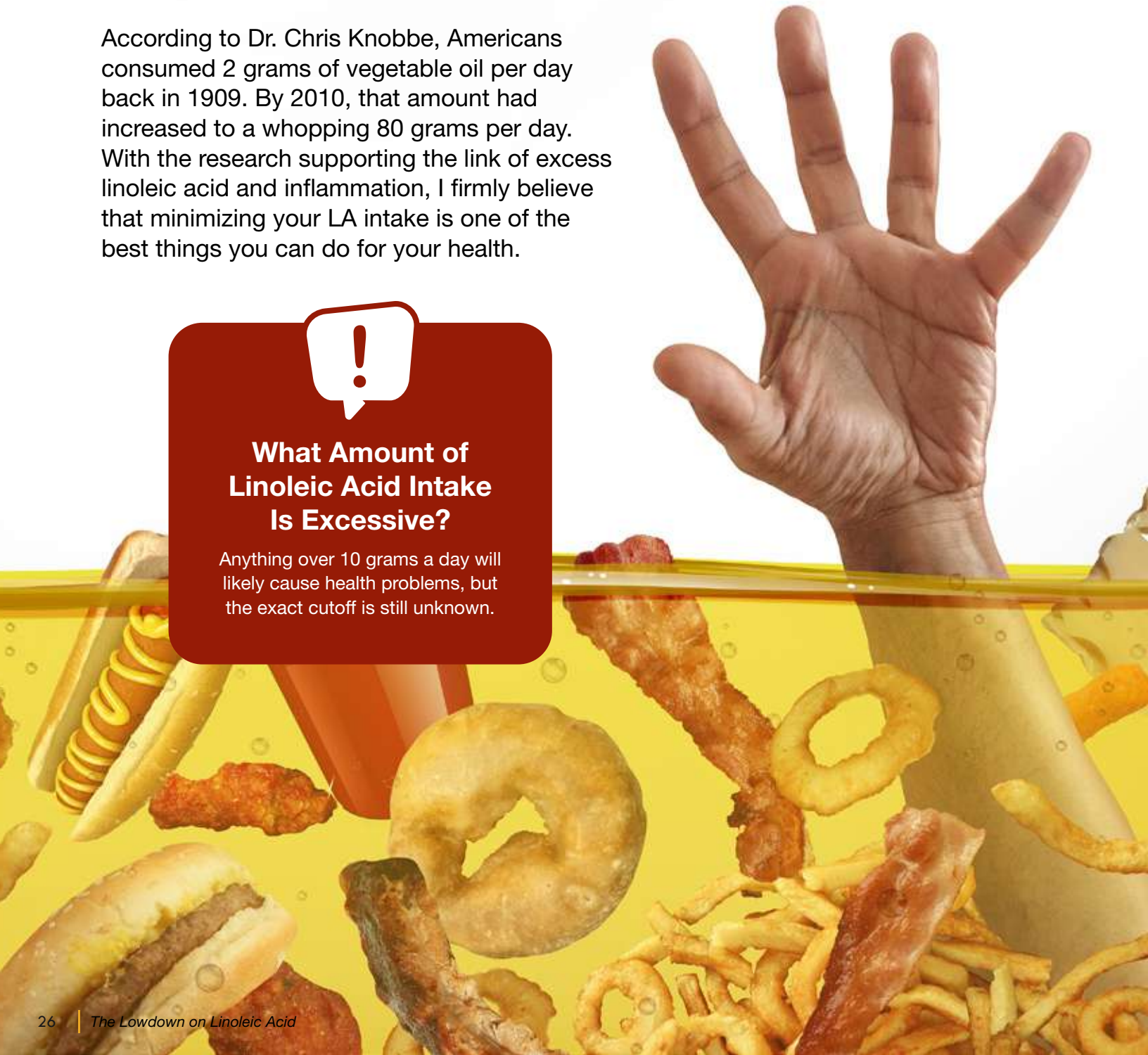
A study suggested that the modern Western diet has a shocking 15:1 ratio!

How Much Linoleic Acid Is Too Much?

Ideally, you should only be having a total of 2 to 3 grams of linoleic acid per day, which is close to what our ancestors used to get before all sorts of chronic diseases appeared. To determine your intake, I suggest taking stock of all foods you're eating that contain seed oils or vegetable oils.

Even supposedly "healthy" oils, such as olive oil, have linoleic acid as well. Whenever you're using this in your meals, count your intake, as carelessness may put you over the limit.

According to Dr. Chris Knobbe, Americans consumed 2 grams of vegetable oil per day back in 1909. By 2010, that amount had increased to a whopping 80 grams per day. With the research supporting the link of excess linoleic acid and inflammation, I firmly believe that minimizing your LA intake is one of the best things you can do for your health.



What Amount of Linoleic Acid Intake Is Excessive?

Anything over 10 grams a day will likely cause health problems, but the exact cutoff is still unknown.

Again, since seed and vegetable oils are virtually inescapable, minimizing your intake is the best course of action. Be sure to watch out for these six ingredients in whatever products you buy:


Soy


Canola


Sunflower


Corn


Safflower


Peanut

Aside from minimizing your intake of linoleic acid, I recommend eating a diet composed of organic whole food. If your recipe calls for the use of cooking fat, stick with coconut oil or grass fed tallow.

Beef tallow actually contains 37% to 43% beneficial oleic acid,which is protective against both cardiolipin oxidation and LDL oxidation.
Lard is also viable, as it has 34.2% oleic acid.

What Is Cardiolipin?

Cardiolipin is a type of fat located in your mitochondria. Oxidation of cardiolipin is one of the things that controls autophagy. By altering the composition of cardiolipin in your mitochondria to one that's richer in omega-6 fats, you make it far more susceptible to oxidative damage.

Take Note of These Healthy Fat Sources

Once you've understood the importance of lowering omega-6 fats in your diet, you should simultaneously introduce healthy fat. I recommend the following:

Organic coconut oil

Ghee

Raw dairy products

Black seed oil (Nigella sativa)

Organic pastured eggs

Lard

Raw nuts (Macadamia)

Avocados

Tallow

Grass fed butter

Olives

Shopping Guide Checklist

Remember that junk foods are inherently high in LA, so stay away from chips fried in vegetable oil, commercial salad dressings and sauces, virtually all processed foods and any fried fast food, such as french fries.

To summarize, here's a general list of foods you should eat versus those you must minimize or eliminate to ensure you're keeping your LA consumption as low as possible.

Don't Eat

Ultraprocessed junk foods, including restaurant meals and fast foods

Chicken and pork

Seed and vegetable oils (including olive oil and avocado oil)

Most nuts and seeds

Margarine and vegetable spreads

Farmed fish, especially farmed salmon

Eat This Instead

Fresh, high-quality homemade meals made from organic produce, vegetables and fruits (in moderate amounts)

Ghee, beef tallow and coconut oil

Macadamia

Organic butter

Wild-caught Alaskan salmon, sardines, anchovies, mackerel and herring

Organic grass fed beef, buffalo, lamb, goat, deer, elk and bison
Note:
Chicken eggs are acceptable

About Dr. Mercola

Dr. Joseph Mercola has always been passionate about helping preserve and enhance the health of the global community. As a doctor of osteopathic medicine (DO), he takes a “whole-person” approach to wellness, helping you develop attitudes and lifestyles that can help you Take Control of Your Health.

In 1997, he founded Mercola.com as a portal for up-to-date natural health information and resources that can help readers and subscribers adopt better lifestyles and achieve optimal health. It’s one of the first health websites that focuses on holistic medicine and is now routinely among the top 10 natural health websites.

Dr. Mercola is also a best-selling author, with three of his books, namely "Effortless Healing," "The No-Grain Diet" and "The Great Bird Flu Hoax,” having been included in The New York Times Best Sellers list. His most recent book, “The Truth About COVID-19,” is also a national bestseller on Amazon, Wall Street Journal, USA Today and Publishers Weekly.

By sharing valuable knowledge about holistic medicine, regenerative practices and informed consent principles, he has become the most trusted source for natural health information, with a legacy of promoting sustainability and transparency.

Visit **Mercola.com** to get timely health updates and information from Dr. Mercola.

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