

America's Favorite Cooking Oil Linked to Obesity in Mouse Study

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STORY AT-A-GLANCE

- › Soybean oil dominates the U.S. food supply. Americans' intake has increased from about 2% to nearly 10% of calories over a century, alongside sharp rises in obesity and diabetes
- › A mouse study published in the Journal of Lipid Research found that a soybean oil-based diet led to more weight gain than a coconut oil-based diet with the same calories. In addition, specific liver oxylipins made from linoleic acid (LA) tracked with that weight gain — pointing to how LA is metabolized, rather than food intake alone, as a likely driver of fat accumulation in these animals
- › Research links high soybean oil and LA intake to oxidative stress, mitochondrial damage, gut permeability, and long-lasting inflammatory byproducts that may continue to affect your metabolism for years due to LA's extended half-life in body fat
- › Whole soybeans and many soy-derived ingredients contain additional disruptive compounds, including phytoestrogens, phytic acid, enzyme inhibitors, lectins, saponins, and goitrogens, and most U.S. soy is genetically engineered to tolerate herbicides such as glyphosate
- › Reducing LA intake means eliminating sources of soybean and other vegetable oils from your diet, and replacing them with stable fats like ghee, tallow, grass fed butter, or coconut oil

From restaurant meals to packaged staples, soybean oil is almost everywhere in the modern diet. In the United States, it's the most widely consumed oil, with intake climbing from roughly 2% of total calories to nearly 10% over the last century.¹ During this period, U.S. adult obesity has surged to more than 42% (based on 2017 to 2018 national survey data), while Type 2 diabetes and other metabolic disorders have increased in parallel.^{2,3}

Despite these trends, soybean oil and other vegetable oils rich in polyunsaturated fats (PUFs), particularly omega-6 **linoleic acid** (LA), have long been framed as "healthy" replacements for animal fats like butter and lard. Public health messaging has reinforced this idea for decades, and even as evidence has piled up against it, the myth has been hard to dismantle.

To get a clearer picture of what soybean oil is really doing inside the body, a team of researchers at the University of California, Riverside (UCR), recently set out to look beyond calorie content alone and examine the biological effects linked to consuming it in mice. Their findings, published in the *Journal of Lipid Research*,⁴ provide more insights into why soybean oil has been consistently linked to the obesity epidemic.

New Insights on the Link Between Soybean Oil and Obesity

The UC Riverside team used two groups of male mice — normal mice and genetically modified mice with an altered version of a liver protein called HNF4 α . This protein acts as a master regulator of metabolism in the liver, controlling which genes get turned on or off. The modified mice produce a different form of HNF4 α than normal mice, and as a result, their livers produce much lower levels of certain enzymes that break down LA into other compounds.⁵

- **Both groups were fed high-fat diets for up to 35 weeks** — Some mice received a diet where 10% of calories came from LA using a mixture of soybean oil and coconut oil, while others received a diet based primarily on coconut oil, where only 2% of calories came from LA. A third group ate standard low-fat laboratory chow as a control. The total fat content and total calories were identical between the two high-fat diets.

- **Normal mice gained more weight despite identical food intake** — Wild-type mice on the soybean oil diet gained 411% of their starting weight compared to 370% on coconut oil. The modified mice, however, gained much less weight on the soybean oil diet than normal mice did, and their weight gain on soybean oil was essentially the same as on coconut oil.

In other words, the researchers found no difference in the number of calories the mice consumed on the different diets, indicating that overeating did not explain the difference.

- **Soybean oil raised obesity-linked oxylipins through LA metabolism** — A key finding was the sharp contrast in oxylipin production. Oxylipins are oxidized metabolites derived from LA as well as alpha-linolenic acid, another fatty acid in soybean oil. Wild-type mice produced more oxylipins, which have been associated with weight gain, fatty liver disease, and metabolic dysfunction.

The study suggests the issue is not just LA intake but what the body converts it into, since wild-type mice generated more of these obesity-linked oxylipins, while the genetically altered mice produced fewer of these compounds, which the researchers linked to lower levels of key enzyme families responsible for converting LA into oxylipins.

- **Only liver oxylipins, not blood oxylipins, matched body weight** — The researchers also found that oxylipins in liver tissue, not those in the bloodstream, tracked with body weight. In earlier work, the same team found that blood oxylipin levels in soybean oil-fed mice were no higher than on a low-fat diet, which the researchers say suggests standard blood tests may miss early diet-driven metabolic shifts.

Even the lean modified mice showed elevated levels of the four key oxylipins on a low-fat diet, but without obesity. So, oxylipins looked necessary for weight gain but not sufficient on their own, suggesting that other metabolic factors help determine whether oxylipins translate into visible metabolic harm.

- **Partially blocking oxylipin production didn't change weight gain** — To narrow down which oxylipins might be driving weight gain, researchers treated wild-type mice on soybean oil with a chemical that blocks a final step in oxylipin production. The treatment shifted some oxylipins, but not the four most tied to obesity.

Those levels stayed high, and treated mice gained as much weight as untreated soybean-oil mice. This supported the idea that these specific oxylipins may be helping to drive soybean oil's fattening effect in mice.

- **The findings may help explain why seed oils hit some bodies harder than others** — The study points to a mechanism in which weight gain in these mice depended not only on how much fat or how many calories they ate, but on which specific compounds their livers produced from that fat. Because the work was done only in male mice — female mice don't become obese on this diet — and no human trials are planned, it remains to be seen how closely the same process applies to people.^{6,7}

Researchers are digging deeper to understand how oxylipins promote weight gain and to see if similar effects occur with other LA-rich oils like corn, sunflower, and safflower oils. According to Frances Sladek, a UCR professor of Cell Biology:

*"It took 100 years from the first observed link between chewing tobacco and cancer to get warning labels on cigarettes. We hope it won't take that long for society to recognize the link between excessive soybean oil consumption and negative health effects."*⁸

While LA is technically essential, modern consumption levels far exceed biological needs, and that overload may create biochemical damage that can persist for years. It doesn't simply act as a benign source of energy; it becomes raw material for metabolic byproducts that may influence your weight and health over time.

How Does Soybean Oil Influence Weight?

Understanding how soybean oil might promote weight gain requires looking at what happens to LA once it enters your body. LA has multiple double bonds in its chemical structure, which make it highly reactive and vulnerable to damage from oxygen, heat, and normal metabolic processes. When LA is oxidized, it breaks down into compounds that can push your metabolism toward dysfunction. Beyond the specific oxylipins measured in the UCR study, other LA byproducts include:^{9,10,11}

- **Oxidized linoleic acid metabolites (OXLAMs) can contribute to lasting cellular damage** — OXLAMs are created when LA is exposed to oxidative stress. These include reactive aldehydes, such as 4-hydroxynonenal (4-HNE) — the most extensively studied product of LA oxidation — along with other oxidized metabolites such as 9- and 13-HODE. Aldehydes bind to proteins, DNA, and membranes, altering their structure and function.
- **LA overload may destabilize cardiolipin and weaken energy production** — Cardiolipin is a key fat in the inner mitochondrial membrane that stabilizes energy generation. When LA intake is high, more LA is built into cardiolipin, and LA-containing cardiolipin is especially vulnerable to oxidative damage. Oxidized cardiolipin can disrupt energy production and is involved in the signals that lead cells to clear out damaged mitochondria (mitophagy) or self-destruct (apoptosis).
- **High LA intake may disrupt your gut microbiome and weaken the intestinal barrier** — In mice, a high-LA soybean oil diet reduced beneficial *Lactobacillus* bacteria while allowing an adherent, invasive strain of *E. coli* to expand, making the gut more prone to inflammation. The same research found that the high-LA diet increased the permeability of the intestinal barrier, which can allow unwanted compounds to move into circulation, and raised the animals' susceptibility to colitis.
- **Stored LA may keep producing inflammatory signals for years** — Once incorporated into your body fat, LA has a long half-life of around two years. This means that even if you stop consuming soybean oil today, your tissues may continue producing inflammatory metabolites for months or even years afterward. This chronic exposure helps explain why LA is considered a persistent metabolic disruptor.

Taken together, these pathways suggest how chronic high LA intake gradually shifts your metabolic terrain. For a deeper look at how industrial seed oils affect your health, read "[Linoleic Acid and Its Links to Chronic Disease](#)."

Other Compounds in Soy That May Affect Your Health

The concerns around soy go beyond the LA content of its oil. Soybeans contain a range of biologically active compounds — some of which remain in soy flour, soy protein, and other soy ingredients, although refining strips most of them out of soybean oil itself — that can interfere with nutrient absorption, hormone balance, digestion, and thyroid function, including:

- **Phytoestrogens** — These compounds mimic estrogen by binding to estrogen receptors in your body. A 2014 commentary published in German Medical Science notes that phytoestrogen intake has been reported to affect fertility and sexual development in animals, and that high doses of isoflavones taken over long periods may stimulate breast and uterine tissue — which is why women treated for breast cancer have been advised to avoid them.¹²
- **Phytic acid** — A compound that binds to minerals such as calcium, magnesium, iron, and zinc, reducing your ability to absorb them — minerals your body relies on for energy production and many enzyme systems.¹³

Soybeans and soy concentrates are among the richer sources of phytic acid. That said, traditional preparation such as soaking, cooking, sprouting, and fermentation can reduce it considerably, but soy flours, concentrates, and protein isolates used in processed foods can still carry substantial amounts.

- **Enzyme inhibitors** — These compounds, such as trypsin inhibitors, can interfere with protein digestion by blocking key digestive enzymes, which may limit your ability to access essential amino acids needed for muscle repair, detoxification, neurotransmitter production, and immune health.

- **Saponins, soyatoxin, lectins, and oxalates** — These are antinutrients that, in sufficient amounts, may irritate the gut lining, increase intestinal permeability, and trigger immune responses. While small amounts may not pose a threat, the widespread inclusion of soy in processed foods means these compounds are consumed far more often than people realize.
- **Goitrogens** — Substances that can interfere with iodine uptake and thyroid hormone synthesis. Over time, this may disrupt thyroid function, particularly in individuals with borderline iodine status or underlying thyroid issues. Soy isoflavones are among the dietary compounds studied for this effect.¹⁴

In one 2021 case report, a 33-year-old woman developed rapid growth of a multinodular goiter after a weight loss program left her eating 20 to 40 grams of soy protein a day from meal replacement bars, despite reportedly adequate iodine intake. A single case can't establish cause, but the authors advised caution with high soy protein intake, especially in people at risk for goiter.¹⁵

- **GMO and glyphosate exposure** — Around 95% of soybeans grown in the U.S. are genetically engineered to tolerate herbicides, most notably glyphosate, the active ingredient in Roundup. Glyphosate use on these crops has risen roughly 15-fold since the 1990s, raising the potential for residues in soy-derived products.¹⁶ Animal research and clinical case reports have linked glyphosate exposure to microbiome disruption, liver toxicity, and possible endocrine effects.¹⁷

If soy ingredients, namely soy flour, soy protein, soy lecithin, and soybean oil, show up regularly in your dressings, baked goods, fried foods, or packaged snacks, then you're likely being exposed to some of these bioactive compounds, along with a heavy LA load. Learn more about soybean oil's side effects in "[Soybean Oil Linked to Genetic and Neurological Damage](#)."

Smarter Dietary Choices and Simple Swaps to Lower Your LA Load

While you can't undo years of accumulated LA overnight, you can stop adding more today. The goal is straightforward – reduce your intake of LA from all sources, with soybean oil being the most pervasive but far from the only culprit. I recommend keeping your total LA intake below 5 grams per day. Here's where to start:

- 1. Eliminate soybean oil from your diet** – Cutting down on soybean oil begins with knowing where it shows up. It's not just the bottle in your pantry – refined soybean oil is baked, fried, blended, and sprayed into a wide range of everyday foods. Manufacturers rely on it because it's cheap, shelf-stable, and neutral in flavor.

Labels don't always say "soybean oil" outright. Instead, you'll see vague terms like "vegetable oil," or related soy ingredients such as "soy lecithin," often tucked into products marketed as organic, natural, or "heart-healthy." Unless you check every ingredient list, it's easy to miss. Here's where soybean oil frequently hides in your diet:

Category	Common Products That Contain Soybean Oil
Condiments and dressings	Mayonnaise, salad dressings, marinades, dipping sauces, and sandwich spreads
Packaged snacks	Chips, crackers, popcorn, pretzels, granola bars, and trail mix
Baked goods	Breads, bagels, muffins, cookies, tortillas, and pastries
Frozen and convenience foods	Pizza, microwave meals, frozen dinners, meat substitutes, and non-dairy creamer

Category	Common Products That Contain Soybean Oil
Restaurant foods	Fried items, grilled foods, commercial breads and buns, and salad dressings
Pantry staples	Peanut butter, powdered soup mixes, boxed rice, or pasta dishes
Health foods and supplements	Protein bars, energy drinks, plant-based shakes, and soy lecithin in capsules
Infant and toddler products	Baby formula, toddler snacks, and puffed cereals

If you're busy or overwhelmed, use a barcode-scanning grocery app or an AI ingredient checker to flag hidden seed oils fast. To track your intake, I recommend you download my app, [Pax](#), which comes out soon. It has a feature called the Seed-Oil Sleuth, which monitors your LA intake to a tenth of a gram so you can stay in charge of your metabolism.

- 2. Replace your cooking fats with stable, low-LA options** — Use fats like ghee, grass fed butter, beef tallow, or coconut oil for daily cooking. These options are low in linoleic acid and far more resistant to heat damage than vegetable oils. Coconut oil is well-suited for medium-heat cooking and baking, while ghee and tallow offer better stability at high temperatures and add rich flavor to roasted vegetables, stir-fries, and seared meats.

Here's a quick guide to common cooking fats and oils, their typical smoke points, and how they hold up under heat:^{[18,19,20](#)}

Fat/Oil	Typical Smoke Point	Stability/Suitability for Cooking
Ghee (clarified butter)	~ 485°F (≈ 252°C)	Highly heat-stable saturated fat, good for high-heat cooking and searing
Beef tallow/lard	~ 370 to 420°F (≈ 188 to 216°C)	More stable for roasting or frying than most seed oils; note that lard from conventionally raised pigs can be high in LA
Coconut oil	~ 370 to 420°F (≈ 188 to 216°C)	Reasonably stable for moderate heat cooking and baking, low in LA
Extra-virgin olive oil (EVOO)	~ 375 to 405°F (≈ 191 to 207°C)	Suitable for low-heat cooking or finishing dishes, but high in MUF
Soybean oil (refined)	~ 400 to 460°F (≈ 204 to 238°C)	Widely used seed oil; high smoke point, but its LA is prone to oxidation and exposes you to a high LA load
Canola oil/generic vegetable oil (seed-oil blend)	~ 400 to 450°F (≈ 204 to 232°C)	Common cooking oil; high LA/PUF load, high smoke point, but contributes to LA overconsumption

Fat/Oil	Typical Smoke Point	Stability/Suitability for Cooking
Refined sunflower oil	~ 450°F (≈ 232°C)	Another common seed oil high in LA; similar issues as with soybean oil
Peanut oil (refined)	~ 450°F (≈ 232°C)	Frequently used for frying, but still delivers high PUF and LA content

- 3. Choose low-LA animal proteins and skip high-PUF meats** — When buying meat, prioritize grass fed beef, lamb, and bison over chicken or pork. Ruminant animals like cows and sheep metabolize LA differently, as microbes in their rumen convert much of it into more stable saturated fats before it can be stored.

In contrast, poultry and pigs deposit dietary LA directly into their fat and muscle tissue, meaning their meat reflects whatever corn- or soy-based feed they consumed. If you eat eggs, look for **pasture-raised** options from hens not fed corn or soy. These eggs are typically lower in PUFs and a better match for a metabolically supportive diet.

- 4. Avoid nuts and seeds, and use olive oil only in moderation** — Many popular whole foods are surprisingly high in LA. Almonds, walnuts, pecans, sunflower seeds, pumpkin seeds, and most nut butters are all concentrated sources. If you're regularly snacking on trail mix, blending nut butters into smoothies, or using seed oils in homemade recipes, it's easy to push your LA intake far beyond the 5-gram daily limit.

Even macadamia nuts, though lower in LA, are still rich in oleic acid, a **monounsaturated fat** (MUF), which is why they're no longer on my recommended list. Large amounts of oleic acid may interfere with glucose metabolism and

mitochondrial energy production.

Olive oil, another common MUF source, comes with similar concerns, which is why it's best used only in moderation. The soybean oil vs. olive oil comparison is often used to frame olive oil as the better choice, but that doesn't mean it's ideal. In addition, some commercially sold olive oils have also been found to be diluted or adulterated with cheap, oxidized seed oils, making them far from clean.

- 5. Choose cleaner sources of seafood and carbohydrates —** **Flaxseed** is often promoted as a plant-based omega-3 source, but in a high-LA environment, it's largely ineffective. Excess LA inhibits the enzymes your body needs to convert plant omega-3s into the usable forms EPA and DHA. Flax is also high in fragile PUFs and contains lignans, which are plant estrogens that can disrupt hormone balance when consumed in large amounts.

If you eat seafood, choose wild-caught salmon over farmed varieties, which has a less favorable fat profile. Small, oily fish like sardines, mackerel, and anchovies are also ideal choices. When it comes to carbs, prioritize fruit, root vegetables, and white rice over packaged or fried products.

If your gut is still healing, white rice and whole fruits are the best place to start, and other complex carbs and starches work best once your digestion is functioning well. High-fiber foods, on the other hand, can increase endotoxin when your gut microbiome is compromised, so keep them limited.

- 6. Limit eating out —** Your best option is to prepare most of your meals at home, because most restaurant kitchens default to soybean or canola oil for frying, grilling, baking, and dressings. When you do eat out, check The Templeton List (TempletonList.com), a free directory of restaurants rated on criteria that include healthy oils and real butter, and ask what oils are used and request butter or no added fat when possible.

Grilled foods may seem safe, but they're often marinated or brushed with seed oil blends before hitting the heat. For salads, bring your own dressing or stick to lemon juice, vinegar, and salt. Planning ahead is the most reliable way to stay clear of high-LA cooking oils when you're not in charge of the kitchen.

Get more tips on how to lower your LA exposure in "[Historical Rise of Cancer and Dietary Linoleic Acid – Mechanisms and Therapeutic Strategies](#)."

Frequently Asked Questions (FAQs) About Soybean Oil

Q: Does soybean oil cause weight gain?

A: Research in mice suggests it may, independent of calorie intake. In the UC Riverside study, mice fed identical calorie amounts gained significantly more weight on a soybean oil-rich diet than those on a coconut oil-based diet. The difference didn't come from eating more; the researchers linked it to how the animals' livers metabolized LA, the dominant fat in soybean oil. Whether the same holds true in people hasn't yet been tested directly.

Q: Is soybean oil inflammatory?

A: It may contribute to inflammation. Soybean oil is the largest dietary source of LA in the U.S., and high LA intake has been linked to inflammatory processes in animal and laboratory research. When LA is oxidized — either during cooking or inside the body — it forms toxic byproducts like oxylipins and aldehydes (e.g., 4-HNE).

These byproducts can damage mitochondria, activate inflammatory signaling, and LA's long half-life in fat tissue means your body can keep producing them for years. In animal studies, high LA intake has also disrupted the gut microbiome and weakened the intestinal barrier, both of which may contribute to systemic inflammation.

Q: Is high-oleic soybean oil different?

A: High-oleic soybean oil has been engineered to contain more MUF (oleic acid) and less LA. While it may generate fewer oxidized LA byproducts, it's still not ideal. Oleic acid is more stable than LA, but high intakes of it may interfere with glucose metabolism and mitochondrial energy production.

Additionally, high-oleic oils still come from genetically modified soybeans and may carry similar concerns about glyphosate exposure.

Q: How much soybean oil is "okay"?

A: Ideally, none. LA is technically essential, but your biological requirement is extremely low, and I recommend keeping your intake below 5 grams per day. Most Americans consume several times that amount. Removing soybean oil from your diet is the most effective way to stay below that limit.

Q: What are good soybean oil alternatives?

A: Grass fed butter, ghee, beef tallow, and coconut oil are all excellent options for cooking. These fats resist oxidation, contain minimal PUFs, and may better support mitochondrial and metabolic function. Avoid common substitutes like canola, corn, or sunflower oil, as they are also high in LA.

This article is for informational purposes only and does not constitute medical advice. Consult a qualified health care provider before making changes to your health regimen.

Sources and References

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