

**EXTENSION****FAPC-244**

Seed oils explained

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Recently, seed oils have become a controversial hot topic on social media. The ongoing debate about whether they are beneficial or harmful to human health is often misleading and overlooks credible scientific evidence. Before engaging in this debate, it is important to understand what seed oils are and try to distinguish fads and myths from science-based evidence available from reliable sources.

Oklahoma State University Extension has published several fact sheets on seed oils, covering their health effects, processing techniques and quality aspects. Several selections are linked in the references at the end of this fact sheet.

In summary, seed oils are extracted from the seeds of various plants. Oils from soybeans, canola, sunflower and cotton seeds are commonly used in edible applications and for cooking. These oils have a long history of safe human consumption.

Both fats and oils are primarily composed of fatty acids, which are long, straight chain hydrocarbons made up of hydrogen and carbon atoms with a carboxylic acid group at one end. The carbon chain length of a fatty acid (typically four to 24 carbons in fats and oils) and the types of bonds between the carbon atoms (single/saturated or double/triple/unsaturated bonds) influence the chemical and physical properties of the product, as well as its health effects.

In oils and fats, most of the fatty acids are present in the form of triacylglyceride (TAG), meaning three fatty acids are bound to a glycerol backbone. Over 95% of good quality fats and oils consist of TAGs. The presence of free fatty acids (not attached to glycerol) promotes degradation reactions, reduces oxidative and thermal stability, shortens shelf life and can lead to the formation of off flavors and other compounds that can be very harmful or toxic to human health.

One common claim in this debate is that seed oils are toxic or unhealthy because they are ultra-processed. It is true that seeds undergo processing, first to extract and then to refine it to edible quality (Dunford, N.T., Oil and Oilseed Processing I, II and III). The term processing has unfortunately gained a negative connotation. There is no universally accepted or official definition of ultra-processed foods. Even washing, peeling, cutting and cooking vegetables from your own garden constitutes processing. Not all processing is harmful; in fact, the primary goals of food processing are to make food safer, more enjoyable and to extend shelf life. Processing also requires time and resources, so food manufacturers do not benefit from processing foods unnecessarily.

For example, seed oils are refined to remove undesirable components naturally present in crude or low-quality oils. Free fatty acids, for instance, are removed during the deacidification step of refining because they reduce product quality and may lead to the formation of harmful compounds. Mechanically pressed and unrefined oils are usually touted as healthier. However, if seeds and fruits are not properly handled or stored and become damaged, mechanically extracted oil will contain harmful compounds and have a shorter shelf life without refining.

Some oil seed processors use organic solvents such as hexane for efficient extraction. The desolventization step removes the solvent from the extracted oil. Residual solvent levels in the oil are well below the harmful thresholds, and refining further reduces any remaining traces. The final products on supermarket shelves do not contain solvent. An average person's intake of any residual solvent from oils is significantly lower than exposures from other sources, such as gasoline fumes.

Another claim is that seed oils are harmful because they contain omega-6 fatty acids, which are said to cause inflammation, weaken the immune system and contribute to chronic diseases. While it is true that both seed oils and animal fats contain omega-6 fatty acids, it is curious that the criticism is often directed only at seed oils. Fruit-based oils like olive and avocado oils are often considered healthier alternatives, but also contain omega-6 fatty acids.

The effects of food on human health are complex. Lifestyle, genetics, health history and overall diet all play a role. Several large-scale clinical studies and meta-analyses have shown that higher intake of omega-6 fatty acids is associated with better cardiovascular health and improved glucose metabolism (A. Poli et al., 2023; F. Marangoni et al., 2019). Data from randomized

trials, case-control and cohort studies, and long-term animal feeding experiments, also indicate that consuming 5%–10% of daily energy from omega-6 polyunsaturated fatty acids reduces the risk of cardiovascular disease compared to lower intakes (W.S. Harris et al., 2009). These studies suggest that higher intakes of omega-6 fatty acids are safe and may be even more beneficial when part of a diet low in saturated fat and cholesterol. The American Heart Association supports an omega-6 PUFA intake of at least 5%–10% of daily energy, in line with other lifestyle and dietary recommendations.

Therefore, a common-sense approach to good health includes consuming oils and sugars in moderation, avoiding saturated fats and increasing the intake of vegetables and fruits.

In light of the scientific evidence, replacing seed oils with highly saturated animal fats like lard or tallow for cooking may not be a healthy choice, especially for consumers with hypercholesterolemia (K.C. Maki et al., 2021; V.H. Telle-Hansen et al., 2022).

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