Is Canola Oil Safe to use for Cooking?

(Adapted from "The Nutrition Source" published by Harvard T. H. Chan School of Public Health, 2015, written by Guy Crosby)

The most frequently asked question that I receive regards the safety of canola oil. Many people have the impression that canola oil is toxic and unsafe for use. But is this true? The answer is very definitely NO. Canola oil is generally safe to use and has been thoroughly tested and approved for use by the US Food and Drug Administration, and has been safely used in the United States for 30 years. In 2018 a rumor started to spread that canola oil had been banned for use in Europe because it was unsafe. But this rumor is false. One of the reasons may be that canola oil contains erucic acid that can be harmful to the heart. But starting in the 1970's the rapeseed plant used to extract canola oil was bred through traditional plant breeding methods to contain extremely low levels of erucic acid. More recently very low erucic acid rapeseed plants have been developed for producing oil through genetic engineering. The use of genetically modified plants to produce canola oil for food use may have further alarmed consumers about the safety of canola oil. Before drawing any conclusions regarding the safety of genetically modified plants please read my essay on "The Island of Conclusions", which follows.

Canola oil is considered to be a healthy oil for cooking because it contains a beneficial ratio of omega-3 to omega-6 unsaturated essential fatty acids of 1 to 2, and contains only 7% saturated fatty acids. Like other unsaturated vegetable oils, such as soybean and corn, canola oil can be oxidized when heated in air at temperatures generally above 350 degrees F for many hours at a time, such as in deep-fat fryers in fast food restaurants where the oil may not be changed frequently enough. Excessive consumption of fried foods can be a risk factor for developing a number of chronic diseases. There is a concern that oxidized cooking oils may cause inflammatory reactions in the body. But canola oil is no less safe for cooking than other commonly used oils such as soybean and corn oils. When used in the home these oils are safe to use because they are heated at relatively low temperatures for short times.

The top four vegetable oils consumed in the United States are soybean, canola, palm, and corn oil, in that order. These are referred to as refined, bleached, deodorized oils – or RBD for short – because this describes the process by which they are manufactured.

- RBD oils are produced by crushing the plant material, usually seeds, to express the oil, followed by extraction of the crushed material with a low-boiling solvent, most commonly hexane, to obtain the remainder of the oil.
- Canola oil is generally considered a "healthy" oil because it is very low in saturated fat (7%). Like olive oil it is high in monounsaturated fat (63%).
- Canola oil also contains a significant level of polyunsaturated omega-3 (ω-3) fat (9-11%),
- In addition, canola oil contains significant amounts of phytosterols (about 0.9% by weight) that reduce the absorption of cholesterol into the body.

As with many highly processed food products there are concerns about the safety of canola oil.

First is the use of a solvent such as hexane to extract the maximum amount of oil from the seed. Hexane is a very volatile solvent (boiling point 69ºC, or 156ºF) with a very low toxicity (LD_{50} in rats of 49.0 milliliters per kilogram). Hexane has been used to extract oils from plant material since the 1930s, and "*there is no evidence to substantiate any risk or danger to consumer health when foods containing trace residual concentrations of hexane are ingested.*" [1]

It has been estimated that refined vegetable oils extracted with hexane contain approximately 0.8 milligrams of residual hexane per kilogram of oil (0.8 ppm). [2] It is also estimated that the level of ingestion of hexane from all food sources is less than 2% of the daily intake from all other sources, primarily gasoline fumes. *There appears to be very little reason for concern about the trace levels of hexane in canola oil.*

Another concern is the report that canola oil might contain trans-fats that have been linked with significant health problems. In fact, canola oil does contain very low levels of trans-fat, as do all oils that have been deodorized. Deodorization is the final step in refining ALL vegetable oils. This process produces the bland taste that consumers want.

As a comparison, the fat of cattle and sheep, as well as the milk obtained from cows, contain about 2-5% of natural trans-fat as a percent of the total fat. [3] When canola oil is deodorized it is subjected to temperatures above 200ºC (as high as 235ºC, 455°F) under vacuum for various lengths time to remove volatile components such as free fatty acids and phospholipids. During exposure to these high temperatures a small amount of the unsaturated fatty acids, especially the essential ω-6-linoleic and ω-3–linolenic acid, are transformed into trans-fatty acid isomers. Because of earlier studies showing that even quite low levels of trans isomers of ω-3–linolenic can have adverse effects of blood cholesterol fractions, the processes used for deodorization have been modified to limit the production of these compounds.

Other vegetable oils, and even nut oils, have been found to contain levels of trans-fatty acids that are comparable to the levels in beef fat. The table below summarizes the content of trans-fatty acids found in a number of oils. [4] In both canola oil and soybean oil, trans-isomers of linoleic acid have been found to account for 0.2-1.0% of total fatty acids, while trans-isomers of linolenic acid may total as much as 3%. [5] Linolenic acid isomerizes with heat about 12-15 times faster than linoleic acid.

Oil	**Trans Content (%)**
Soybean*	**0.4-2.1%**
Walnut*	**2.0-3.9%**
Sunflower	**1.1%**
Canola*	**1.9-3.6%**
Olive	**0.5%**
PH soybean oil**	**43.6-50.2%**

*Results of multiple samples of commercial oil
** Partially hydrogenated soybean oils for comparison

A consequence of transforming some of the natural unsaturated fatty acids to trans-fat during the deodorization step is a reduction in the content of beneficial ω-3–fatty acids.

- Heating bleached canola oil at 220°C for ten hours reduces the content of linolenic acid by almost 20%. [5] Keep in mind that canola oil sold in the supermarket still contains 9-11% natural ω-3–linolenic acid**.**
- The same transformation occurs during commercial deep-fat frying operations with canola oil. Thus canola oil used to fry French fries for seven hours per day for seven days at 185°C (365°F) resulted in increasing the total trans-fatty acid content of the oil from 2.4% to 3.3% by weight of total fat. [6]
- Of potentially greater concern is the formation of oxidation products of polyunsaturated fatty acids during prolonged commercial deep-fat frying. But this is less of a concern for canola oil than for oils with higher levels of more readily oxidized polyunsaturated fat such corn, soybean, sunflower, and safflower oils.

When considered in the context of other commercial fats, the low trans-fat content of canola oil is no different from other vegetable oils. But one word of caution is appropriate. Bottles of canola, soybean, and corn oil in the supermarket proudly proclaim "Contains zero grams of trans-fat." Read the fine print that states *zero grams of trans-fat per serving*, which is only one tablespoon, or about 14 grams of oil. The FDA allows any component that is less than 0.5 grams per serving to be listed as zero grams! *Despite this claim, virtually all vegetable oils sold in the supermarket contain small amounts (less than 5%) of trans-fat.*

So what other options are there if one wants to avoid RBD oils?

Should a consumer want to avoid RBD oils, cold-pressed oils can be an option, since they are not treated with heat, not extracted with solvents, and not deodorized. [7] Depending on the type, these oils may feature a range of descriptions on their labels, such as "cold-pressed," "unrefined," "virgin," etc. Due in part to their higher price point, adulteration of these types of oils (such as undisclosed "blending" with an RBD oil) has been an issue, so consumers looking to completely avoid RBD oils may also want to select high-quality oils from reputable sources, or those that have been verified to meet quality standards.*

Given the above information, is commercially processed canola oil harmful?

Although care must be taken in handling and processing of canola oil and other vegetable oils, canola oil is a safe and healthy form of fat that will reduce blood LDL cholesterol levels and heart disease risk compared to carbohydrates or saturated fats such as found in beef tallow or butter. Indeed, in a randomized trial that showed one of the most striking reductions in risk of heart disease, canola oil was used as the primary form of fat. [8] Whether using cold-pressed canola oil provides some small additional benefit is not clear.

In general, variety is a good strategy in nutrition, and thus consuming a variety of oils is desirable, for example using extra virgin oil when the special flavor is desired and canola oil or soybean oil for other uses. Both canola and soybean oils provide ω-3 fatty acids that are important to include in an overall diet. Of course, avoiding overheating and burning of oils is important to provide the best taste and to avoid damaging the healthy-promoting fatty acids that they contain [9].

References

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