

Question: What are potential food safety hazards associated with coconut oil?

Response:

Coconut Allergies

Coconut allergies appear to be quite rare (Teuber and Peterson, 1999, Benito et al., 2007, Anagnostou, 2017). A report from the U.K. concludes “we do not see evidence for coconut to be an emerging allergen” (Kirk et al., 2016).

FDA [classifies](#) coconuts as tree nuts for labeling purposes, although coconuts are not technically tree nuts. Several reports identified patients with allergic reactions to both coconut and tree nuts and identified cross-reacting antibodies (Teuber and Peterson, 1999, Nguyen et al., 2004, Jin et al., 2017) but one of the papers concluded “there is no general indication to advise patients with tree nut allergy to avoid coconut” (Teuber and Peterson, 1999). The allergens associated with reactions to coconut are believed to come from a seed storage protein, cocosin (Jin et al., 2017).

Only a single report of a case of coconut allergy associated with consumption of coconut **oil** was identified, but it was unclear if the oil was refined or not and few details from this older French report are available (Couturier et al., 1994, Crevel et al., 2000).

Composition of Coconut Oil

Mature coconut kernels contain about 3.6 to 5.5% protein (Patil and Benjakul, 2018).

Coconut oil consists of >90% saturated fats (Krishna, 2010). Coconut oil is unique in that its major fatty acid, lauric acid, accounts for about half of its overall fatty acid content (Dayrit, 2015).

Beyond triacylglycerols and free fatty acids, crude coconut oil contains a small (0.5 to 1.5%) amount of unsaponifiable matter, including sterols, tocopherols, squalene, pigments, and odor compounds (such as lactones) and “small amounts” of protein (Kochhar, 2017).

Potential of Refined Coconut Oil to Cause Allergies

Categories of pure coconut oil are virgin coconut oil (made from fresh coconut), crude coconut oil (made from dried coconut) and refined coconut oil (Kochhar, 2017, Liu et al., 2019). Traditional chemical and physical refining methods (including bleaching and deodorizing) are used to produce refined coconut oil (Krishna, 2010, Vaisali et al., 2015, Kochhar, 2017). In some cases, enzymes are used in the initial extraction of oil from the coconut paste or milk (Patil and Benjakul, 2018).

No papers that quantitated the amount of residual protein in refined coconut oil were found in this search. However, residual protein in another refined vegetable oil (refined commercial soybean) oil was measured, and the levels are found to be very low (62 to 265 ng protein/g oil, compared to crude oil which contained >80,000 ng protein/g oil). The others of that report concluded that even the most sensitive individuals would have to consume >50 g of refined oil to experience allergenic symptoms (Rigby et al., 2011).

Another review concluded that “refined peanut oil is safe for the overwhelming majority of peanut allergic individuals... as peanut is acknowledged to be one of the most potent food allergens, it is reasonable to extrapolate the conclusions drawn up for peanut oil to other edible oils” (Crevel et al., 2000). However, another paper suggests that an allergen in sunflower seed oil persisted throughout the refining process (Zitouni et al., 2000).

Also regarding peanut oil, the American College of Allergy, Asthma, & Immunology states the following:

“Most individuals with peanut allergy can safely eat highly refined peanut oil. This is not the case, however, for cold-pressed, expelled, extruded peanut oils. If you are allergic to peanuts, ask your allergist whether you should avoid peanut oil.”

One peer-reviewed document produced for people with coconut allergies advised them that they [should avoid cold-pressed, unrefined coconut oil](#). Refined coconut oil was not specifically addressed.

Pathogenic Concerns Related to Coconut Oil

No papers were identified that suggested coconut oil could present a microbial hazard.

Coconut oil is rich in medium chain fatty acids, which have demonstrated antibacterial activities as well as activity against some viruses and yeasts (Nasir et al., 2017).

Lauric acid and related compounds (monolauric and monocarpic fatty acids) found in coconut oil have antimicrobial properties, which has led to coconut oil being proposed for various uses such as [natural antimicrobial mouthwashes](#) (Woolley et al., 2020). Lauric acid and its derivatives appear to have more antimicrobial activity against bacteria (particularly Gram-positive organisms) than other saturated fatty acids (Dayrit, 2015).

Other Concerns

Consumption of coconut oil has been touted as “healthful” in the press based on animal studies or data with components of coconut oil like medium-chain triglycerides and some epidemiological data for populations consuming large amounts of coconut oil (Anonymous, 2014, Dayrit, 2015, Kochhar, 2017, Ramesh et al., 2019, Sacks, 2020), but clinical studies have also suggested that coconut oil leads to less favorable lipid profiles in consumers (Sacks, 2020).

A recent study discussed potential environmental concerns as well as problems facing farmers associated with coconut production (Gurbuz and Manaros, 2019).

References

- Anagnostou, K. 2017. Coconut Allergy Revisited. *Children (Basel)* 4(10):85.
Anonymous. 2014. COCONUT OIL NOT ALL ITS CRACKED UP TO BE. *Food Australia* 66(6):7-7.

- Benito, C., E. Gonzalez-Mancebo, M. de Durana, R. M. Tolon, and M. Fernandez-Rivas. 2007. Identification of a 7S globulin as a novel coconut allergen. *Annals of Allergy Asthma & Immunology* 98(6):580-584.
- Couturier, P., D. Basset-Sthème, N. Navette, and J. Sainte-Laudy. 1994. [A case of coconut oil allergy in an infant: responsibility of "maternalized" infant formulas]. *Allerg Immunol (Paris)* 26(10):386-387.
- Crevel, R. W. R., M. A. T. Kerkhoff, and M. M. G. Koning. 2000. Allergenicity of refined vegetable oils. *Food Chem. Toxicol.* 38(4):385-393.
- Dayrit, F. M. 2015. The Properties of Lauric Acid and Their Significance in Coconut Oil. *J. Am. Oil Chem. Soc.* 92(1):1-15.
- Gurbuz, I. B. and M. Manaros. 2019. IMPACT OF COCONUT PRODUCTION ON THE ENVIRONMENT AND THE PROBLEMS FACED BY COCONUT PRODUCERS IN LANA DEL NORTE PROVINCE, PHILIPPINES. *Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development* 19(3):235-246.
- Jin, T. C., C. Wang, C. Y. Zhang, Y. Wang, Y. W. Chen, F. Guo, A. Howard, M. J. Cao, T. J. Fu, T. H. McHugh, and Y. Z. Zhang. 2017. Crystal Structure of Cocosin, A Potential Food Allergen from Coconut (*Cocos nucifera*). *J. Agric. Food Chem.* 65(34):7560-7568.
- Kirk, K., H. Ball, G. Stiefel, and D. Luyt. 2016. Prevalence of coconut sensitisation and allergy in children with diagnosed peanut and/or tree nut allergy - is coconut an emerging allergen? *Allergy* 71:370-371.
- Kochhar, S. 2017. Processing Coconut Oil. *OFI Magazine*.
- Krishna, G., Raj, G. Ghatnagar, A.S., Kumar, P., Chandrashekar, P. . 2010. Coconut Oil: Chemistry, Production and Its Applications - A Review. *Indian Coconut Journal*:15-27.
- Liu, R., X. Guo, M. Cheng, L. Zheng, M. Gong, M. Chang, Q. Jin, and X. Wang. 2019. Effects of chemical refinement on the quality of coconut oil. *J. Food Sci. Tech. Mys.* 56(6):3109-3116.
- Nasir, N. A. M. M., Z. Abllah, A. A. Jalaludin, I. A. Shahdan, and W. N. H. W. Abd Manan. 2017. Virgin Coconut Oil and Its Antimicrobial Properties against Pathogenic Microorganisms: A Review. *Proceedings of the International Dental Conference of Sumatera Utara 2017 (Idcsu 2017)* 8:192-199.
- Nguyen, S. A., D. R. More, B. A. Whisman, and L. L. Hagan. 2004. Cross-reactivity between coconut and hazelnut proteins in a patient with coconut anaphylaxis. *Annals of Allergy Asthma & Immunology* 92(2):281-284.
- Patil, U. and S. Benjakul. 2018. Coconut Milk and Coconut Oil: Their Manufacture Associated with Protein Functionality. *J. Food Sci.* 83(8):2019-2027.
- Ramesh, S. V., V. Krishnan, S. Praveen, and K. B. Hebbar. 2019. Coconut oil - scientific facts. *Current Science* 117(4):564-565.
- Rigby, N. M., A. I. Sancho, L. J. Salt, R. Foxall, S. Taylor, A. Raczyński, S. A. Cochrane, R. W. R. Crevel, and E. N. C. Mills. 2011. Quantification and Partial Characterization of the Residual Protein in Fully and Partially Refined Commercial Soybean Oils. *J. Agric. Food Chem.* 59(5):1752-1759.
- Sacks, F. M. 2020. Coconut Oil and Heart Health Fact or Fiction? *Circulation* 141(10):815-817.
- Teuber, S. S. and W. R. Peterson. 1999. Systemic allergic reaction to coconut (*Cocos nucifera*) in 2 subjects with hypersensitivity to tree nut and demonstration of cross-reactivity to

- legumin-like seed storage proteins: new coconut and walnut food allergens. *J Allergy Clin Immunol* 103(6):1180-1185.
- Vaisali, C., S. Charanyaa, P. D. Belur, and I. Regupathi. 2015. Refining of edible oils: a critical appraisal of current and potential technologies. *International Journal of Food Science and Technology* 50(1):13-23.
- Woolley, J., T. Gibbons, K. Patel, and R. Sacco. 2020. The effect of oil pulling with coconut oil to improve dental hygiene and oral health: A systematic review. *Heliyon* 6(8):e04789.
- Zitouni, N., Y. Errahali, M. Metche, G. Kanny, D. A. Moneret-Vautrin, J. P. Nicolas, and S. Fremont. 2000. Influence of refining steps on trace allergenic protein content in sunflower oil. *Journal of Allergy and Clinical Immunology* 106(5):962-967.

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