COCONUT OIL IS NOT LINKED TO HEART DISEASE

An Update on the Coconut Oil Controversy

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On June 15, 2017, the American Heart Association (AHA) published its presidential advisory online entitled "Dietary Fats and Cardiovascular Disease" where it reiterated its position against saturated fat, in general, and coconut oil, in particular.[1] This advisory is the latest in a long list of recommendations dating to the 1950s, which have warned against saturated fat and coconut oil. This article will analyze the claims of the AHA presidential advisory and then review evidence from the 1950s to the present to show that the claim that coconut oil is linked to heart disease is erroneous.

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The AHA Presidential Advisory

The AHA presidential advisory claimed that it would present scientific evidence, including the "most recent studies" which satisfy "rigorous criteria for causality" to justify its warning against saturated fat. However, the AHA article did no such thing. The authors presented four papers dating from 1968 to 1979[2] and just did a statistical re-evaluation of the old data. Aside from being old studies, none of them satisfied rigorous scientific criteria for causality and none of them used coconut oil as a test oil. Two of the cited studies had been criticized for being inadequately controlled trials.[3] A comment from the medical center of the University of Groningen (Netherlands) best summarizes the numerous criticisms raised against the AHA presidential advisory: "The AHA meta-analysis conveys the notion of 'cherry picking'. There are at present at least nine expert reviews that failed to find a clear link between SFA (saturated fatty acid), cardiovascular mortality and total mortality."[4] This is a clear accusation of bias against the AHA and a careful analysis of the AHA presidential advisory using their own claims shows that it did not present any valid evidence against coconut oil.

The Evidence against Coconut Oil is Erroneous

The objections against the warning against coconut oil are based on the following:

1. The evidence against coconut oil is tainted by the presence of trans fats in both old and new studies due to the use of hydrogenated coconut oil.
2. Coconut oil has been mistakenly identified with animal fat. Unlike animal fats, coconut oil is made up mainly of medium-chain fats and has a negligible amount of cholesterol; animal fats are long-chain fats and contain considerable amounts of cholesterol.
3. The available evidence on coconut oil shows that it is a healthy oil.

1. The evidence against coconut oil is tainted by the presence of trans fats

The most famous proponent against saturated fat is Ancel Keys. As early as 1957, Keys already proclaimed that saturated fat raises serum cholesterol levels and that elevated cholesterol is a predictor of heart disease.[5] Unfortunately, the test material that he used in his experiments was *hydrogenated* coconut oil. It was not well known at that time that hydrogenation of fats and oils produces trans-fats and that trans-fats cause heart disease.[6]

From the 1960s to the 1980s, Keys led the pioneering 15-year Seven Countries Study, the first multi-national long-term dietary study to be conducted. The seven countries included the US, five European countries and Japan. At the conclusion of this study, Keys and co-workers reported that: "Death rates were related positively to average percentage of dietary energy from saturated fatty acids."[7]

However, in a follow-up study on the composition of the diet in the seven countries, it was revealed that their diet included significant amounts of animal fat and margarine which was hydrogenated and rich in trans fats.[8] Thus, an important correction needs to be made on the 1986 Seven Countries Study: the correlation with heart disease should be made with trans fat and animal fat and not saturated fat. It should also be noted that coconut oil was not part of the diet in these seven countries.

This error was repeated in a 1999 study by Hu and co-workers[9] which identified lauric acid as a risk factor for heart disease in a US population. However, closer analysis of the evidence reveals two key weaknesses: First, the amount of lauric acid ingested in the diet of the study population was a minute 0.24% of total calories. Second, the major sources of lauric acid in this population were coffee whitener, which is made using hydrogenated coconut oil, and cheese, milk, and butter, which are animal fats. Unfortunately, the Hu paper became one of the bases of the FAO Food and Nutrition Paper 91 entitled: "Fats and fatty acids in human nutrition"[10] which recommended that lauric acid should be replaced with polyunsaturated fatty acids, and since coconut oil is

rich in lauric acid, its consumption should be discouraged. However, if lauric acid is such a strong risk factor, there should be an epidemic of heart disease in the tropics where lauric acid intake may account for over 5% of total energy since it makes up 20% of coconut milk,[11] a major dietary item in many tropical cuisines.[12]

2. Coconut oil has been mistakenly identified with animal fat.

The fatty acid composition and cholesterol content of coconut oil is vastly different from those of butter, pork, beef fat (Table 1). Coconut oil contains about 65% medium-chain fatty acids (MCFA), while butter contains only 10% MCFA, and both beef and pork fat contain no MCFA. In addition, butter contains 3% trans fat. Further, coconut oil contains negligible amounts of cholesterol (up to 0.003 g/kg), while butter contains 2g/kg and beef and pork fat both contain about 1g/kg. Therefore, any comparison between coconut oil and butter, pork fat, and beef fat are fundamentally erroneous.

Virtually all the studies that claim a link between coconut oil and heart disease have been reported in Western countries where the amount of coconut oil consumed is negligible. Coconut oil was not a significant part of the diet in any of the seven countries[13] and it was not mentioned in the 1986 Keys paper. In 2016, Zong and co-workers[14] analyzed the intake of individual saturated fatty acids to look for a correlation with risk of heart disease in US men and women. Although they concluded that "higher dietary intakes of major SFAs are associated with an increased risk of coronary heart disease," their data showed that lauric acid consumption was only 0.15 to 0.31% of total energy, while palmitic acid, which is closely associated with animal fat, accounted for 4.8 to 8.0% of total energy. It is clear that the SFA consumed in the US comes mainly from animal fat and that the link with heart disease likely comes from consumption of animal fat or meat, not coconut oil.

3. The available evidence on coconut oil shows that it is a healthy oil.

In 1988, Kintanar and Castro[15] conducted an extensive review of 119 scientific publications which addressed the question of whether coconut oil is atherogenic and cholesterolemic. They reported that 73% of the papers did not agree with the statement, while 27% were in agreement. They noted that the studies which recommended to limit calories from saturated fat were done in populations that did not consume coconut oil.

Table 1. Fatty acid and cholesterol content of coconut oil, butter, beef fat, and pork fat.

Component	Coconut oil[1]	Butter[2]	Beef fat[2]	Pork fat[2]
Fatty acid, %				
C4		3		
C6:0	<0.7	2		
C8:0	7			
C10:0	7	3		
C12:0	49	4		
MCFA	65	10	0	0
C14:0	19	12	3	2
C16:0	9	26	27	27
C18:0	3	11	7	11
Saturated LCFA	31	49	37	40
C16:1		3	11	4
C18:1	7.5	28	48	44
C18:2	1.8	2	2	11
C18:3	<0.2			
Unsaturated FA	8	33	61	59
Cholesterol, ppm	0 to 3	2,150	1,090	950

1 Codex Alimentarius 210-1999
2 USDA

Reports on coconut oil consumption that have appeared since 1988 show that coconut oil is a beneficial component of the diet:

- Kaunitz & Dayrit[16] reported that: "All available population studies show that dietary coconut oil does not lead to high serum cholesterol nor to high coronary heart disease mortality or morbidity rate." A plot of the dietary fat consumption and coronary heart disease in various countries is reproduced (Figure 1). The approximate linearity of the pattern among the US and most European countries is consistent with the high consumption of animal fat and trans-fat. No studies since 1992 have reported otherwise. It is worth noting that this figure resembles the plot that Keys presented in his 1986 Seven Countries Study[17] which proposed a correlation between saturated fat and all-cause death rates; however, this correlation should now be with animal fat and trans-fat.
- Lindeberg and co-workers[18] observed that the inhabitants of Kitava Island, Papua New Guinea, who consumed coconut as part of their staple but did not suffer stroke and ischemic heart disease.
- Galanis and co-workers[19] reported that American Samoans who shifted to a Western diet showed greater obesity and higher risk for CVD as compared with Western Samoans who retained their traditional island diet. American Samoans consumed more energy as carbohydrate and significantly less as fat and saturated fat.
- In its 2003 report entitled Diet Food Supply and Obesity in the Pacific, the WHO[20] concluded that the Pacific islanders were "2.2 times more likely to be obese and 2.4 times more likely to be diabetic if they ate imported fats than if they ate traditional fat sources." The imported fats included vegetable oils and margarine while the traditional fats included coconut oil.

In summary, it is clear that the warning against coconut oil is based on statistical correlations with LDL on Western populations that consume *hydrogenated* coconut oil in processed foods. On the other hand, in populations that consume natural coconut oil, there is no link with heart disease.

Conclusions

Today, diabetes and obesity have become epidemics, not only in the US which promotes the *Dietary Guidelines*, but globally as well, since the same dietary guidelines have been adopted widely. Recently, a *causal* link between these epidemics and the Western diet was demonstrated in a study that showed that endothelial dysfunction and hypertension are induced by the Western diet.[21] This is consistent with the studies mentioned previously that showed that replacing the traditional high-coconut based diet with a Western diet is detrimental. Now, there is strong epidemiologic evidence against the Western low-fat high-carbohydrate diet.[22] In its attack on coconut oil, the AHA presidential advisory complained that: "A recent survey reported that 72% of the American public rated coconut oil as a 'healthy food' compared

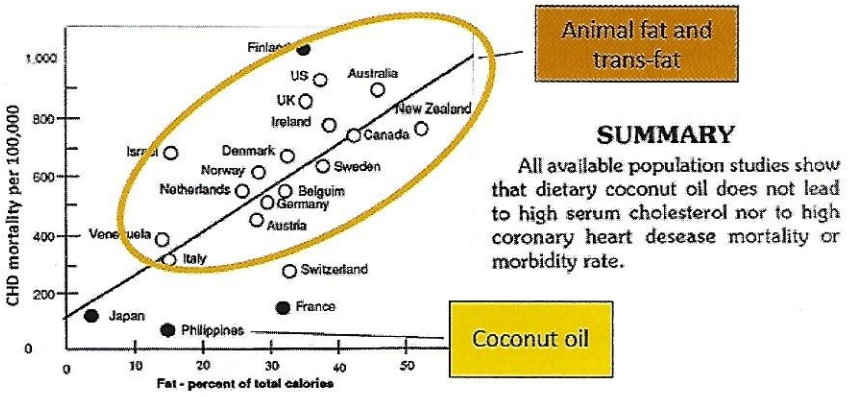

Figure 1. Plot of dietary fat consumption and CHD in various countries (modified from: Kaunitz & Dayrit, 1992).

with 37% of nutritionists. This disconnect between lay and expert opinion can be attributed to the marketing of coconut oil in the popular press."[23] In fact, the bigger issue here is not the marketing by the popular press but the loss of trust by Americans in the dietary guidelines that have made people obese and unhealthy. Contrary to the claims of the AHA, people are re-discovering the truth that coconut oil is a healthy oil, and that there is no basis for the warning that links coconut oil to heart disease.

Supplement Table 1 shows the history of the anti-saturated fat advice and the trend in obesity of the United States: Might these be related?

References

[1] Sacks FM et al. Dietary Fats and Cardiovascular Disease. Circulation. 2017;136:e1–e23. The online version was posted on June 15, 2017.

[2] The articles that were cited by the AHA are as follows: a. Morris JN et al. Controlled trial of soya-bean oil in myocardial infarction. Lancet 1968;2:693–699. b. Dayton S et al. A controlled clinical trial of a diet high in unsaturated fat in preventing complications of atherosclerosis. Circulation 1969;40 (suppl II):1–63. c. Leren P. The Oslo Diet-Heart Study: eleven-year report. Circulation 1970;42:935–942. d. Turpeinen O, et al. Dietary prevention of coronary heart disease: the Finnish Mental Hospital Study. Int J Epidemiol 1979;8:99–118.

[3] Hamley S. 2017. The effect of replacing saturated fat with mostly n-6 polyunaturated fat on coronary heart disease: a metq-analysis of randomised controlled trials. Nutrition Journal. 16:30. 16 pages. The articles that were criticized were those by Leren (Oslo Diet-Heart Study) and Turpeinen (Finnish Mental Hospital Study).

[4] Muskiet FAJ, Ruiz-Nunez B, Dijck-Brouwer DAJ. 2017. Comment on the report 'Dietary Fats and Cardiovascular Disease. A Presidential Advisory from the American Heart Association (AHA).' Ned Tijdschr Klin Chem Labgeneesk. 42: 224-228.

[5] Keys A. 1957. Diet and the epidemiology of coronary heart disease. JAMA 164(17):1912-1919.

[6] Kris-Etherton PM. 2010. Trans-fats and coronary heart disease. Critical Reviews in Food Science and Nutrition. 50:29-30.

[7] Keys A with 14 co-authors. 1986. The diet and 15-year death rate in the Seven Countries Study. American Journal of Epidemiology. 124(6):903-915.

[8] Menotti A et al. 1999. Food intake patterns and 25-year mortality from coronary heart disease: Cross-cultural correlations in the Seven Countries Study. European Journal of Epidemiology. 15(6):507-515.

[9] Hu FB et al. Dietary saturated fats and their food sources in relation to the risk of coronary heart disease in women. American Journal of Clinical Nutrition. 70:1001–1008.

[10] Fats and fatty acids in human nutrition: report of an expert consultation. FAO Food and Nutrition Paper 91. Rome: Food and Agriculture Organization of the United Nations; 2010.

[11] USDA National Nutrient Database for Standard Reference. Basic Report 12176, coconut milk. Downloaded on March 3, 2018 from https://ndb.nal.usda.gov/ndb/foods/show/3703.

[12] Albala K. 2011. Food Cultures of the World Encyclopedia, Volume 2. ABC-CLIO, ISBN: 0313376271, 9780313376276.

[13] a. [FAOSTAT] Food and Agriculture Organisation Statistics Data. 2006. World lipid availability, Kg/capita/year, 1961. Food Balance Sheets, Rome: FAO; b. Pitts M, Dorling D, Pattie C. 2007. Oil for Food: The Global Story of Edible Lipids. Journal of World-Systems Research, Vol XIII, No 1, pp 12-32.

[14] Zong G et al. 2016. Intake of individual saturated fatty acids and risk of coronary heart disease in US men and women: two prospective longitudinal cohort studies. BMJ 2016;355:i5796.

[15] Kintanar QL, Castro JS. 1988. Is coconut oil hypercholesterolemic and atherogenic? A focused review of the literature. Transactions of the National Academy of Science & Tech. (Phils.). 10:371-414.

[16] Kaunitz H, Dayrit CS. 1992. Coconut oil consumption and coronary heart disease. Philipp J Coconut Studies. 17(2):18-20.

[17] Keys et al. 1986.

[18] Lindeberg S, Lundh B. 1993. Apparent absence of stroke and ischaemic heart disease in a traditional Melanesian island: a clinical study in Kitava. J Int Med. 233:269-275.

[19] Galanis DJ, McGarvey ST, Quested C, Sio B, Aafele-Fa'amuli S. 1999. Dietary Intake of Modernizing Samoans: Implications for Risk of Cardiovascular Disease. J Am Diet Assoc. 99(2):184–190.

[20] [WHO] World Health Organization, Regional Office for the Western Pacific. 2003. Diet, food supply and obesity in the pacific (http://www.who.int/nutrition/publications/obesity/9290610441/en/).

[21] Kramer B, Zhang K, Zhang Y, Gerdes AM, Carrillo-Sepulveda MA. 2017. Short-term Western Diet Induced Hypertension in Female Rats is Associated With Vascular Epigenetic Modification. Hypertension. 2017;70:AP205.

[22] Dehghan M and co-authors of the PURE study. 2017. Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from five continents (PURE): a prospective cohort study. Lancet. 390: 2050–2062. (PURE: Prospective Urban Rural Epidemiology)

[23] Sacks et al. 2017.

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Supplement Table 1. A history of anti-saturated fat advice and the trend in obesity of the United States: Might these be related? One of the earliest proponents for the replacement of saturated fat with polyunsaturated fat is Ancel Keys in 1957 [1]. Since its first edition in 1980, the *Dietary Guidelines for Americans* (DGA) has consistently advocated for a reduction in saturated fat. This table documents the rate of overweight, obesity and extreme obesity of adults in the US from the 1960s [2]. The American Heart Association has been recommending to lower saturated fat in the diet further to as low as 5% [3]. Much of the rest of the fat would be polyunsaturated.

Dietary Advice	Overweight	Obesity	Extreme obesity
1957: Saturated fat be replaced by unsaturated fat (Keys)	38*	10*	1*
1980: Avoid too much fat, saturated fat, and cholesterol (DGA)	32.1	15.0	1.4
1985: Avoid too much fat, saturated fat, and cholesterol (DGA)	No survey conducted		
1990: Choose a diet low in fat, saturated fat, and cholesterol (DGA)	Data combined with next period		
1995: Choose a diet low in fat, saturated fat, and cholesterol (DGA)	32.6	23.2	3.0
2000: Limit foods high in saturated fat and cholesterol (DGA)	33.6	30.9	5.0
2005: Limit the intake of saturated, trans fats, cholesterol (DGA)	32.2	35.1	6.2
2010: Consume less than 10% of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids. (DGA)	32.7	36.1	6.6
2015: Limit calories from added sugars and saturated fats. (DGA)	31.9	38.2	8.1

* Data for 1957 are estimates for men only. All other data are for adults, 20 years and older.

References

[1] A. Keys, J.T. Anderson, F. Grande. Prediction of serum-cholesterol responses of man to changes in fats in the diet. Lancet. 1957: 959-996.

[2] C.D. Fryar et al. Division of Health and Nutrition Examination Surveys. Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults Aged 20 and Over: United States, 1960–1962 Through 2013–2014. Health E-Stats, National Center for Health Statistics, 2016.

[3] American Heart Association. http://www.heart.org/en/health-topics/cholesterol/prevention-and-treatment-of-high-cholesterol-hyperlipidemia/the-skinny-on-fats. Downloaded on Aug. 29, 2018