The Effect of Coconut Oil Consumption on Serum Cholesterol and Triglyceride Levels: A Literature Review

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Abstract

Objective – Current medical opinion is that consuming saturated fats will almost certainly lead to an elevation of cholesterol levels and cardiovascular disease. However, many believe consuming coconut oil with its medium chain fatty acids provides health benefits and may reduce risk factors for cardiovascular disease. This review provides an overview and analysis of available literature concerning the effects of consuming coconut oil on cholesterol levels.

Methods – Searched PubMed for randomized controlled trials, cohort studies, meta-analyses, and literature review articles in peer reviewed journals.

Conclusions – The research seems to be confirm that processed coconut oil elevates LDL, however, it appears virgin coconut oil does not have this effect. Further research is needed.

Key Words – *coconut oil; virgin coconut oil; lauric acid; LDL; HDL; atherosclerosis; cardiovascular disease*

Introduction:

The purpose of this paper is to review available literature as it relates to coconut oil consumption and its effects on plasma cholesterol levels, specifically, low density lipoproteins (LDL), high density lipoproteins (HDL) and also triglyceride levels.

The seeds of the coconut palm, *Cocos nucifera,* are the source of coconut oil. The oil is obtained through one or more different processes. If the fruit is dried in either the sun or a kiln, the meat of the fruit, known as copra, is processed to obtain the oil. If the oil is obtained in this manner, it is not fit for human consumption without further processing due to the unsanitary methods of drying the fruit. To make it fit for human consumption, the oil is exposed to high heat and bleached.[1]

If the oil is obtained from the raw fruit without the use of heat, bleaching, deodorizing or other chemical refining, the oil can be referred to as virgin coconut oil. The preparation of virgin coconut oil preserves natural components of the coconut such as phytosterols, polyphenols, vitamin E and provitamin A.[1]

Once demonized for its high levels of saturated fat, many now believe coconut oil to be healthier than unsaturated fats. A myriad of health benefits have been attributed to the use of coconut oil. It has been reported to be useful in weight loss,[2] to be antibacterial and antiviral,[3] to increase HDL[4], and even to increase testosterone levels in men,[5] among others.

Coconut oil is composed of primarily of short and medium chain fatty acids with lauric acid (12:0) and myristic acid (14:0) accounting for approximately 46.5% and 20.5% of the fatty acid content, respectively.[6] Of these, lauric acid is believed to be the fatty acid responsible for

most of the benefits listed above. Medium chain fatty acids, such as lauric acid, are transported directly to the liver via the portal vein. Once in the liver the medium chain fatty acids are metabolized quickly by β-oxidation.[7]

Discussion

When designing the experiments, researchers could choose the type of coconut oil to use. Most chose to use the processed oil, which is likely to contain hydrogenated oils. Some also chose to add cholesterol to the food consumed by the subjects. A small number of researchers chose to use virgin coconut oil for the study.

Processed coconut oil with cholesterol supplementation

Reiser, et al, conducted an experiment comparing coconut oil, safflower oil, and beef fat. Nineteen men were studied over the course of 35 weeks. The study was designed to have 7 cycles of 5 weeks each. On the odd numbered weeks, the subjects were to eat their habitual diets. On the even numbered weeks, the subjects ate meals prepared with safflower oil, coconut oil, or beef fat. Since safflower oil and coconut oil do not contain cholesterol, those were supplemented with half an egg yolk per day to mimic the cholesterol content of the beef fat. There were some weaknesses in the study, however. This study did not have a control group, it's unknown if the subjects were blinded to the fat being used, and the subjects didn't consume the same fat throughout the study. In fact, of the 19 men in the study, 12 of the men consumed all

three of the fats, 16 consumed the safflower oil, and 17 consumed both the beef fat and coconut oil as part of the study.[8]

Additionally, the subjects were allowed, but not required, to consume alcohol on the condition it was in moderation and was consumed throughout the study.[8] Without a control group, blinded participants, and consistent fat and alcohol consumption, this study seems to lack validity. A more appropriate study would have used a control group and all the test groups would have consumed the same fat throughout the study.

The results were somewhat surprising since those consuming the beef fat actually had a small decrease in LDL levels. Safflower oil also resulted in a decrease of LDL. However, both also had a decrease in HDL levels. Those consuming coconut oil had an increase in total cholesterol and HDL.[8]

However, to present a more accurate picture, the researchers should have also tested the coconut oil and the safflower oil without the addition of the extra cholesterol. It is understandable to add cholesterol to coconut oil and the safflower oil to provide a baseline comparison to the cholesterol containing beef fat, but without the extra data, it's not prudent to make a claim that beef fat causes less of an increase of cholesterol levels that coconut oil. This would be analogous to a 100 pound sprinter wearing a 300 pound weight vest race a 400 pound man in a 40 yard dash. If the 400 pound man wins, it doesn't mean he can run faster than the 100 pound sprinter.

In another study, Mangiapane, et al, tested the effects of coconut oil and olive oil on 32 Golden Syrian Hamsters. In this test, the investigators began by inducing atherosclerotic lesions

in the aortas of all the hamsters by feeding them an "atherosclerotic diet" consisting of 82% commercial rodent chow, 15% coconut oil, and 30% cholesterol by weight for 4 weeks.[9] After the initial 4 weeks, 8 were selected randomly, fasted overnight and killed. The aortas were dissected out and analyzed and all showed the beginnings of atherosclerotic lesions.[9]

After the initial cull, the remaining hamsters were split into 3 groups with one group remaining on the atherosclerotic diet for the remainder of the study. Group 2 was fed a diet consisting of 85% commercial rodent chow and 15% coconut oil with no added cholesterol. Group 3 was fed a diet consisting of 85% commercial rodent chow and 15% extra virgin olive oil without added cholesterol.[9]

At the conclusion of the study, those in group 1 had significantly elevated total cholesterol levels and demonstrated larger atherosclerotic lesions after consuming the "atherosclerotic diet" for a total of 12 weeks. Groups 3 and 4 both experienced increases in HDL and decreases in LDL. Both groups 3 and 4 also had a regression of the atherosclerotic lesions.[9] Unlike the previous study, this study tested coconut oil with cholesterol supplementation and without the cholesterol supplementation.

Processed coconut oil without cholesterol supplementation

In a study conducted on 21 New Zealand White Rabbits, Sabitha, et al, split the rabbits into 4 groups. The first group of 6 rabbits was fed a standard commercial rabbit feed. Group 2 was fed the same rabbit feed but with the addition of 0.5g of cholesterol daily. Groups 3 and 4 were also fed the same feed, but with the addition of coconut oil and sunflower oil, respectively

for 6 months. At the end of the 6 month period, there was no significant change in the HDL or LDL levels in those that consumed the coconut oil. Those that consumed the sunflower oil experienced a decline in HDL and LDL.[10]

In another animal study, conducted in Iran, researchers studied the effects of combination therapy and its relationship to cardiovascular risk factors in rats. The combination being examined was combining physical activity with vitamin D3, calcium, and boron supplementation and feeding the rats certain fats. They randomly divided the rats into 7 groups. The first group was the control group and was fed "regular food and water." Group 2 was identical to group 1, but included whole body vibration as the physical activity. Group 3 was identical to group 2 with the addition of vitamin D3, calcium, and boron. Groups 4-7 were identical to group 3 with the addition of canola oil, sunflower oil, a mixture of sunflower and canola, and coconut oil, respectively.[11]

After 8 weeks, it was noted that the most significant increase of LDL was in group receiving the mix of canola and sunflower oil. The coconut oil group had a moderate increase in both HDL and LDL levels. The other oils tested all resulted in decreased HDL and increased LDL. The coconut oil group actually had a much better LDL/HDL ratio than the others.

Virgin coconut oil

Liau, et al, were conducting an investigation into the safety and efficacy of using virgin coconut oil to reduce visceral adiposity. They used 16 overweight but health volunteers for the study. Inclusion criteria included being 20-60 years old and have a BMI greater than 23kg/m^2.

Excluded were those who were ill, pregnant, drank any alcoholic beverages, or who have a history of intolerance to coconut. The subjects were all evaluated one week before beginning and one week after ceasing the consumption of virgin coconut oil. The evaluation included height/weight, diet, activity, lipid profiles and blood tests.[12]

One week after the evaluation, the subjects were to take 30ml of virgin coconut oil daily divided into 3 equal doses 30 minutes before each meal, for four weeks. They were then re-evaluated one week after ceasing.[12]

When the data were analyzed, the mean decrease in waist circumference was approximately 3 cm. However, there was an insignificant increase in LDL and HDL. While the goal of this study was not to measure cholesterol levels, the data suggest virgin coconut oil doesn't cause hyperlipidemia. One of the strengths of this study was the fact that consuming the virgin coconut oil was the only change the subjects had to make. They were to continue the diet, daily activities, and physical activities throughout the study.[12]

Virgin coconut oil was shown not to elevate total cholesterol or the total cholesterol/HDL ratio in a cohort study of 1839 Filipino women aged 35-69. In this study, blood samples were collected following a 12 hour fast. Coconut oil consumption was measure over 2 consecutive days using the mean of two 24 hour dietary recalls.[13] The average consumption was 9.54 grams of coconut oil per day. The women were regular users of coconut oil and continued to consume amounts that were normal for each person. When the data were analyzed, it was determined that coconut oil did not elevate total cholesterol or total cholesterol/HDL ratios of these women.[13]

Conclusions

Most of the literature reviewed suggests that coconut oil causes an increase in LDL and HDL. However, many of the researchers supplemented the diets of those consuming the coconut oil with cholesterol. When comparing to the beef fat, it is understandable to add cholesterol to ensure both have the same baseline. However, failing to test without the supplementation may skew the results.

Some of the researchers used hydrogenated coconut oil which contains *trans*-fats. It's practically common knowledge the effects these substances can have on health of the consumer. These are both well known to negatively affect the integrity of the cardiovascular system. In an article published in the New England Journal of Medicine, the authors concluded that the effect of *trans*-fats on serum cholesterol is at least as strong as saturated fatty acids since they not only increase LDL, but they also decrease HDL.[14]

In other studies the researchers used virgin coconut oil which is made without exposing the coconut to high heat or chemicals to obtain the oil. When virgin coconut oil was tested the data suggested it does not lead to an increase in LDL. Those who incorporated physical activity and supplementation into the study either saw no significant change in cholesterol levels or at least maintained a close to LDL/HDL ratio. Ursula, et al found that consuming palm oil and coconut oil have little effect on HDL or LDL, even though both are high in saturated fats.[15]

Some of the results seem very promising…even exciting, but others seem to show coconut oil isn't the healthy option some are claiming. However, the results of the studies of virgin coconut oil would indicate much more research must be done. Since we know, and have known for years, the deleterious effects of *trans*-fats, it would seem we would know to avoid hydrogenated coconut oil.

Even if coconut oil is eventually proven beyond a doubt to increase cholesterol levels to dangerous levels, the significant weight loss noted in the studies above and the finding that physical activity in conjunction with coconut oil consumption may overshadow the increase in cholesterol levels.

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