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The Effects of Coconut Oil on Plasma Cholesterol Level and Plasma Triglyceride Level of the U.S. Population are Not Clear

Coconut oil is mainly composed of saturated fatty acids[1]. There are all kinds of opinions that relate to the health effects of coconut oil in the public. In particular, some of the debates center around whether the dietary effects of coconut oil on the consumers' plasma cholesterol level and plasma triglyceride level are just as negative as that of the other commonly consumed saturated fats in the United States population[2].

However, there is not enough comprehensive research that looks at these dietary effects of coconut oil on human subjects. Most of the information about coconut oil either come from the limited numbers of experimental and observational studies of Polynesian and Malaysian populations that traditionally incorporate coconut into their common diets[3,4,5], or come from experiments that use animal subjects.[6,7] There is no research that focuses on U.S. subjects, and examines how coconut oil can affect their health, provided that coconut oil is not so common in their daily diets compare to that of the Polynesian and Malaysian islanders on whom the studies are done.

Based on the current research articles, the possible dietary effect of coconut oil on plasma cholesterol level and plasma triglyceride level is too ambiguous and biased to be applicable to the United States population. Some research that use Polynesian subjects show that coconut oil has positive effects on plasma cholesterol levels,[1,3] and some show positive effects of coconut oil on plasma triglyceride level through conducting experiments mainly on animal subjects.[6] However, other research articles present negative results of coconut oil based on experiments that focus on similar scopes.[4,6] Therefore, in order to make good suggestions to the U.S. population on the proper intake of coconut oil, more research should be conducted.

The two research articles being discussed below find various conflicting results based on the effect of coconut oil on plasma cholesterol levels of the Polynesian and Malaysian subjects.[3,4] The major flaws that lessen the applicability of these research articles to the U.S. population are

the biased usage of the amount of coconut oil consumed by the subjects, and the potential genetic variations between the subjects.

In one of the research, Cox et al. choose 41 Polynesians as the subject of the experiment.[3] The experimental diet contains "36% fat as a fraction of total energy intake", within which 47% is composed of coconut oil.[3] In other words, coconut oil contributes to 17% of the total energy intake.[3] The researchers strictly enforce this diet on the subjects being studied.[3] The study finds that "cholesterol synthesis is lower during diets rich in coconut fat compared with diets rich in butter[.]"[3] This finding suggests that coconut oil, although composed mostly of saturated fatty acids, might have some positive effects compared to butter, which is the type of saturated fat commonly consumed in the United States. The result of the research is reliable in the designed experimental environment since the "average subjects complied satisfactorily with [the assigned] dietary instructions."[3]

In another research, Ngo et al. use 33 normocholesterolemic Malaysians as the subjects, and compare their entry plasma cholesterol level with their plasma cholesterol level after a "coconut oil-rich" diet.[4] The experimental diet contains coconut oil that "contribute[s] to 23% of the total dietary energy or two-thirds of the total daily fat intake."[4] This suggests that the total dietary fat intake for the subjects contributes to 34% of the total energy intake.[4] The subjects have to follow the "specific dietary guide lines", which include eating a uniform lunch and "us[ing] only coconut oil provided for cooking purposes at home."[4] This research concludes "that coconut oil cause[s] a significant elevation in total cholesterol, high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) . . . and might be the primary source of the cholesterolemic activity in normocholesterolemic humans."[4] This research strictly controls the diets of the subjects and therefore the data is reliable under its own experimental conditions.

The two experiments above are among the very few experiments focusing on the dietary effects of coconut oil on human subjects. Both experiments base their operation on a relatively normal amount of total fat intake according to the the Academy of Nutrition and Dietetics,[8] within which coconut oil contributes to 17% and 23% of the total energy intake, respectively.[3,4] The amount of coconut oil also takes up different proportions with thin the total fat intake.[3,4] Provided that both experiments include strictly enforced diets for the subjects, and that the data produced is considered trustworthy under their specific experimental conditions, the conflicting

results between these two experiments might relate to the exact amount of coconut oil in the design, and the potential genetic variation between the two groups of subjects being studied.

The presence of bias in the amount of coconut oil intake is justified by another observational study. Prior et al. collect the total plasma cholesterol level data from the Pukapukan and Tokelauan people.[5] These two groups of people all belong to the general Polynesian population.[5] The data reflects that the Tokelauan people had elevated blood cholesterol level that is probably caused by their high coconut oil intake which makes up 63% of their total energy intake.[5] Since "Of the total population 99% were examined", these data should be reliable. Looking at these three research articles, there seems to be a shift of the effect of coconut oil from positive to negative on plasma cholesterol level as the amount of coconut oil consumed increases, yet no solid conclusion can be made at this point due to the lack of experimental evidence. Therefore, future research should focus on altering the amount of coconut oil consumed by the same group of subjects in order to make a better conclusion to the dietary effect of coconut oil on plasma cholesterol level.

The presence of bias in the potential genetic variation of the two groups of subjects relates to the example of lactase persistency.[9] Itan et al. find that lactase persistency is a genetic variation that mostly exists in people with a pastoral life style, and that it is probably being selected for under the dairy-rich life style.[9] This research derives its conclusion from the study of a particular allele and the various credible sources and therefore is reliable.[9] The relationship between dairy and the lactase persistent individuals in this example is analogous to the relationship between coconut oil and the Polynesians and Malaysians since both types of food are abundant in the specific geographical locations and have been consumed traditionally as important food sources.[5,10] An article about the history of coconut by Hocher et al. justified the fact that coconut is an abundant food source in Malaysia.[10] Therefore, it is highly possible that some genetic variations might contribute to the conflicting plasma cholesterol levels of the Polynesian subjects and Malaysian subjects in the two experiments above. This also underlines that the results from these two experiments are not applicable to the United States population, in which the majority of the people do not consume coconut oil as their major food source.

The overview of all these research articles suggests an incomplete understanding of the dietary effect of coconut oil on plasma cholesterol level. This further suggests that more comprehensive research should be conducted to fit the needs for the American public. Therefore,

in order to provide reliable dietary suggestions about coconut oil to the United States population, future research should be done on subjects collected within the United States with strictly enforced diets to the degree comparable to the above two experiments, while setting the amount of coconut oil as a variable to be monitored and observed.

Conflicting results arise from the research articles studying the dietary effects of coconut oil on plasma triglyceride levels in rats. These articles have flaws similar to those studies discussing the effects of coconut oil on plasma cholesterol level of the Polynesians and Malaysians, regarding the amount of coconut oil being used and the potential genetic variations among the subjects.

In one research, Nevin et.al. feed male Sprangue-Dawley rat subjects strict diets containing 8% of each type of test oil, respectively, to see the effects that these oils might have on different physiological parameters including plasma triglyceride level.[6] Virgin coconut oil is one of the oils being tested.[6] This research concludes that "Triglycerides in serum and tissues [are] significantly lower in [virgin coconut oil]-treated animals [compare] to [animals treated with other test oils]", and that "The results [demonstrate] the potential beneficiary effect of virgin coconut oil in lowering lipid levels in serum and tissues[.]"[6] The result from this experiment is reliable because the diets, as well as the living environments of all subjects are all highly controlled.

In another experiment, conducted by Kritchevsky et al. feed male Wistar rats using a diet containing 10% of coconut oil.[7] This diet is similar to the diet used in the experiment carried out by Nevin et al.[7] The experiment comes to the conclusion that the subjects treated with coconut oil have higher blood triglyceride levels than subjects treated with other test oils.[7] The result of the research is also reliable because the diets of the experimental rats are carefully measured in ordet to rule out any potential variable that can affect the result.[7]

These two experiments studying the rat subjects differ only in the amount of coconut oil applied to the diets, and the genetic variation between the two kinds of male rat subjects. Both of these factors can be responsible for the conflicts between the results of these two experiments.

In general, the results of research conducted under similar scopes do not agree with each other, and therefore provide ambiguities for their applications in United States. The major flaws that appear in these research articles concentrate in the different amount of coconut oil used in the experimental diets, and the potential genetic variations between the subjects.

The Academy of Nutrition and Dietetics states that "The truth is that there isn't yet enough scientific evidence to support all of these claims about coconut oil's potential health benefits."[2] This statement should be relatively accurate and up-to-date since the article from which it is extracted is published recently in 2014.[2] In addition, more research should be conducted on subjects found in the U.S. to eliminate potential genetic variation due to traditional dietary environment as much as possible before a reliable conclusion about the effect of coconut oil on plasma cholesterol levels and plasma triglyceride levels of the U.S. population can be drawn.

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