

## Review Article

## A Review on the Importance of Having Eggs in the Diet

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## Abstract

The consumption of eggs has been declining since 1945. They continued to decline after the Federal Trade Commission ruled that the National Commission on Egg Nutrition could not claim that dietary cholesterol did not cause heart disease. Several health organizations came out against the egg saying that dietary cholesterol caused coronary heart disease. This paper revisits the concerns of not eating a whole egg every day. Consuming an egg a day is an inexpensive source of protein and will provide all the essential amino acids and essential fatty acids to maintain a healthy body.

**Keywords:** Eggs; Nutrition; Cholesterol; Heart failure; Transfat; Oxidized Cholesterol

## Abbreviations

AHA: American Heart Association; USDA: United States Department of Agriculture; EAA: Essential Amino Acids; PUFA: Polyunsaturated Fatty Acids

## Introduction

Dietary cholesterol has been a concern of physicians, cardiologists, and patients since the 1970s. Cardiologists believe that eating eggs cause an increase of cholesterol in the plasma. This thought was reinforced when the Federal Trade Commission held a hearing, in 1975, on the role of eggs and cholesterol in heart disease. The cardiologists who testified agreed that cholesterol was the cause of heart disease and recommended that eggs should not be eaten. [1]. When they were reminded that they were under oath the judge asked again if they knew what caused heart disease. They all said that they did not know. Judge Barnes, the administrative law judge, asked everyone that testified what they thought caused heart disease. I testified as an expert witness at this Federal Trade Commission Hearing on egg nutrition on June 12, 1975 in Washington DC. I told the judge that I did not know what caused heart disease and I spoke in favor of eggs. Dr. Michael De Bakey, the preeminent heart surgeon, also spoke in favor of eggs. We were the only two in favor of eating eggs, as far as I am aware. Both of our testimonies were disregarded because we were not cardiologists. All the cardiologists that testified were believed.

This hearing's conclusion stated that the National Commission on Egg Nutrition could not advertise "that eating eggs does not cause heart attacks, heart disease, atherosclerosis, arteriosclerosis, or any attendant condition or represents that there exists or describes scientific evidence which supports the theory that consumption of dietary cholesterol, including in eggs, does not increase the risk of

**Table 1:** 1961 AHA Dietary Guidelines [3].

1. Maintain a correct body weight.
2. Engage in moderate exercise, e.g., walking to aid in weight reduction.
3. Reduce intake of total fat, saturated fat, and cholesterol. Increase intake of polyunsaturated fat.
4. Men with strong family history of atherosclerosis should pay particular attention to diet modification.
5. Dietary changes should be carried out under medical supervision.

heart attacks, heart disease, atherosclerosis, arteriosclerosis, or any attendant condition." Unless it is clearly believed by many medical experts "that existing evidence indicates that increased consumption of dietary cholesterol, including that in eggs, may increase the risk of heart disease" [2].

## Dietary Recommendations

The AHA has recommended since 1961 to reduce intake of total fat, saturated fat, and cholesterol and increase intake of polyunsaturated fats [3] (Table 1). The U. S. Senate Committee on Nutrition came out with dietary guide lines in 1977. They stated that the general public should reduce cholesterol consumption to about 300 mg/d [4] (Table 2). Every edition of the dietary guidelines since 1980 have stated to reduce cholesterol consumption to about 300 mg/d. including the latest edition published in 2010. The 1988 statement of the National Cholesterol Education Program Expert Panel on Detection and Treatment of High Blood Cholesterol in Adults advocated 200mg/day of cholesterol for hyper cholesterolemic individuals [5]. The last update was in 2002 and the recommendations are still the same (Table 3).

The National Cholesterol Education Program has not, in my opinion, given adequate consideration to the biological value of the cholesterol-containing foods such as eggs, meat, and dairy products. These foods, from 1909 to 1968, provided 70g of protein and 600mg of cholesterol/day to the American diet [6]. In 1968 the ad hoc committee on fats of the AHA, of which I was a member, cautioned in their report entitled Diet and Heart Disease, "Because cholesterol is abundant in many protein foods of high biological quality, careful planning is necessary to lower the intake of cholesterol without impairing the intake of foods high in protein" [7]. I went along with this in 1968 because I did not know then that cholesterol from the diet did not cause heart failure. Eleven years later I found that dietary

**Table 2:** Dietary Goals for the American People [4].

1. Increase carbohydrate consumption to account for approximately 55 to 60% of energy intake.
2. Reduce overall fat consumption from 40 to 30%.
3. Reduce saturated fat consumption to account for about 10% of total energy intake; and balance that with polyunsaturated and monounsaturated fat, which should account for 10% of energy intake each.
4. Reduce cholesterol consumption to about 300 mg/day.
5. Reduce sugar consumption by about 40% to account for about 15% of total energy intake.
6. Reduce salt consumption by about 50 to 85% to about 3 g/day.

**Table 3:** Therapeutic Lifestyle Changes (TLC) Diet.

Calorie level kept to a level needed to maintain a healthy weight	
1. Fat	20-35% of total calories
	Keep saturated fat below 7% of calorie intake
Protein	15% of total calories
Carbohydrates	50-60% of total calorie intake
Salt	below 2,300 mg daily
Other Key Nutrients	
	Fiber 22-34g
	Potassium 4,700mg
	Calcium 1,000-1,300mg
	Vitamin B <sub>12</sub> 2.4micrograms
	Vitamin D 15 micrograms
Cholesterol	Below 200mg
Limit egg yolks to 2 per week. Unlimited egg whites.	
Exercise at least 30minutes a day.	

Third Report of the NCEP Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Final Report.

cholesterol was not cause heart disease [6]. In this study swine were fed a cholesterol free diet and the swine arteries had the same changes in structure as the arteries of humans who had died of heart disease.

The most current recommendations from the USDA were printed in 2010 [8]. These recommendations stated to consume less than 300mg/day of dietary cholesterol. They further stated that the body makes more than enough cholesterol for the purposes of physiological and structural functions. Therefore, people do not need to eat sources of dietary cholesterol. I agree that people do not need to eat sources of dietary cholesterol for the cholesterol but they need to eat those sources for the protein.

### Reasons to Eat an Egg Everyday

Animal food products, like the egg, contain all ten EAAs that are needed to build the 60 trillion endothelial cells that make up the human body [9]. The least expensive and most convenient way to get all ten EAAs is to eat an egg every day. The whole egg needs to be consumed to reap all the benefits. Various parts of the egg contain different portions of the EAAs. The yolk while containing most of the vitamins, minerals, and fat needs the protein from the whites to metabolize the fat. If just egg whites are eaten only protein is consumed. Figure 1 shows the comparison of equal amounts of egg white, egg yolk and whole eggs. The protein and EAAs in the egg help to synthesis the non-EAAs and they are important to transport protein like the apoproteins.

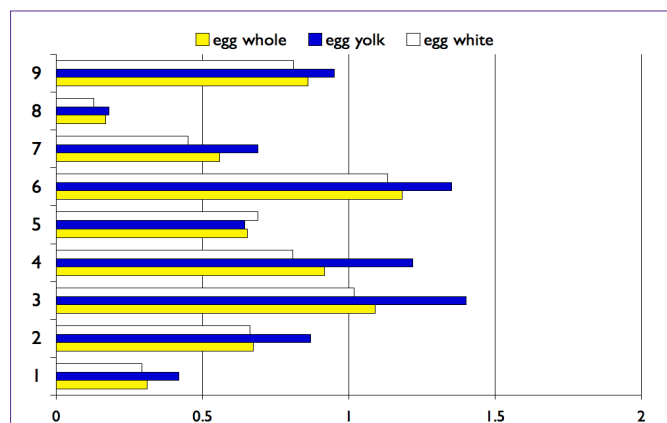
In order to maintain "normal" plasma cholesterol level the human

body needs all ten EAAs in the correct proportions. Eggs and human milk are the only food items that contain the correct proportions of EAAs that the human body needs [10] (Figure 2). Furthermore eggs and milk have the best biological value of all the proteins (Table 4).

A large egg yolk contains 5g of fat; 2.7g are unsaturated fat and 1.6g of saturated fat. The unsaturated fat contains oleic, linoleic, palmitoleic, and linolenic [11] The polyunsaturated fatty acids (PUFAs), like linoleic acid and linolenic acid, are needed to keep the blood flowing [12] Linoleic acid (n-6) is made (synthesized in the body) into arachidonic acid and then into prostaglandins or thromboxanes. Linolenic acid (n-3) is made into Eicosapentaenoic acid and also into prostaglandins or thromboxanes. Prostaglandins and thromboxanes have to be continually made from the essential fatty acids because they last only about 10 seconds in the blood and thus must be continually replaced. Prostaglandins is synthesized in the endothelial cells in the blood vessel wall. Thromboxanes are synthesized in the platelets in the blood. The human body cannot store prostaglandins or thromboxanes, but it can store the linoleic acid and linolenic acid from which they are made. One of those regulators, prostaglandins, keeps the blood fluid, and the other, thromboxanes, clots the blood, and there is a complex balance between the two. Blood needs to flow smoothly all the time and to clot only when there is a cut in the skin or if there is an aneurysm, a break in the artery itself [13].

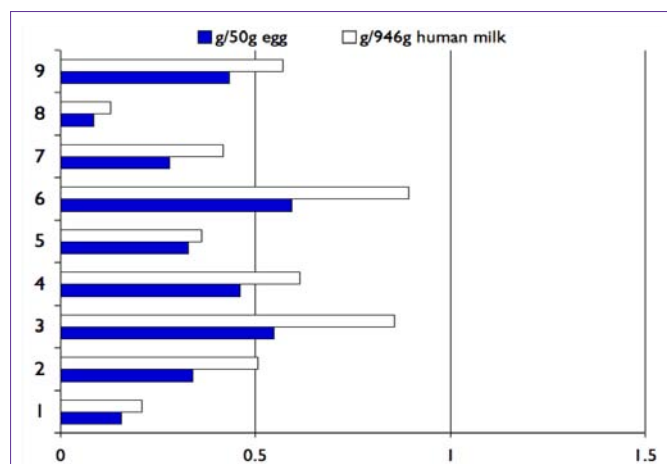
### Dangers of Oxidized Cholesterol and Trans fatty Acids

Polyunsaturated fats can be easily oxidized. Oxidation occurs



**Figure 1:** Essential amino acid composition of egg white, egg yolk and whole eggs.

1) Histidine 2) Isoleucine 3) Leucine 4) Lysine 5) Methionine and Cystine 6) Phenylalanine and Tyrosine 7) Threonine 8) Tryptophan 9) Valine g/100g Data from the USDA, 2005. Used with permission.



**Figure 2:** Essential amino acids in one egg compared to quart of human milk.

1) Histidine 2) Isoleucine 3) Leucine 4) Lysine 5) Methionine and Cystine 6) Phenylalanine and Tyrosine 7) Threonine 8) Tryptophan 9) Valine Data from USDA, 2005. Used with permission.

when polyunsaturated fats are heated for long periods of time and over used. When foods fried in this fat are eaten, the oxidation of fat causes thromboxanes synthesis in the platelets enhancing thrombosis [14]. Oxidized cholesterol is only made in the presence of oxidized fats. Once cholesterol is oxidized to oxysterols, there is a change in the phospholipids composition in the arterial wall. This change causes calcification of the coronary arteries [15-17].

Another danger is the 14 synthetic fatty acids that are made when oils are partially hydrogenated. Synthetic “trans” fatty acids prevent the synthesis of prostaglandins from arachidonic acid [18]. These synthetic fatty acids were introduced into the diet in 1910 as shortening and margarine.

### Information Pathways

Consumers receive health information from many sources including physicians, neighbors, websites, and the popular press. Cardiologists encourage physicians to advise patients not to eat eggs to keep their cholesterol low or to reduce the cholesterol in the

**Table 4:** The Biological Value -The Net Protein Utilization (NPU) of Food [13].

Food	NPU	Amount needed daily if a single food source
Eggs	94%	6 ½ eggs
Milk	86%	5 ½ cups milk
Swiss or cheddar cheese	82%	5 ounces
Beefsteak	75%	6.6 ounces
Soyabeans	66%	2 cups
Peanuts	56%	2 cups
Whole wheat	53%	36 slides of whole wheat bread
Dried beans and peas	34%	7.2 cups beans

plasma. Consumers change their attitude slowly as they receive more information. As they became aware that too much cholesterol or fat in the diet might increase the risk of heart attacks they eat less animal food products.

### Conclusion

Since dietary cholesterol is not the cause of heart disease an egg could be included in a healthy diet. Many benefits can be reaped by eating a whole egg a day. This nutritious food will provide all the necessary components to build a healthy body. Even though the egg contains cholesterol it is the best biological source of protein.

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