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Vilified Again, One of the World's Healthiest Foods?

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STORY AT-A-GLANCE

- In 2015, egg restriction was eliminated from the U.S. dietary guidelines due to lack of evidence that cholesterol from eggs cause heart disease. Then, a new study again urged people to avoid eggs
- This study analyzed data from six studies with a median follow-up of 17.5 years, and claims to have found a dose-dependent relationship between egg consumption and cardiovascular disease (CVD) and all-cause mortality
- Health and nutritional experts have weighed in on this study, pointing out its multiple flaws. For starters, the researchers claim eggs cause CVD by raising your cholesterol, but higher egg intake was actually related to lower LDL (so-called "bad" cholesterol associated with CVD)
- Several meta-analyses have also refuted the claim that egg consumption raises your risk for CVD
- Eggs contain valuable vitamins and minerals, including selenium, vitamins B2 (riboflavin), B5 (pantothenic acid), B7 (biotin) and B12, high-quality protein, iodine, vitamin D, zinc, omega-3 fats, lutein, zeaxanthin and choline

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While the consumption of chicken as a source of protein has become popularized in recent decades, eggs have been unfairly vilified, in part because of misconceptions

regarding their cholesterol content. For decades, the American public was told that eggs, as a source of cholesterol and saturated fats, promote heart disease.

However, in recent years, studies have clearly shown that eggs — particularly egg yolks — are one of the healthiest foods you can eat, and even though egg yolks are relatively high in cholesterol, numerous studies have confirmed eggs have virtually nothing to do with raising your cholesterol, having only a minimal impact on plasma lipoprotein levels.[1] As previously reported by NPR:[2]

> *"[E]ating cholesterol can raise levels of it in the blood, but, as a growing body of research has shown, not by that much. Consuming sugar, trans fats or excessive saturated fat (from unhealthy sources) can be more harmful to cholesterol levels than dietary cholesterol itself.*
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> *Most of the cholesterol in our bodies we make ourselves in the liver, and total body levels are heavily influenced by genetics, gender and age. As more and more research suggests that some degree of cholesterol consumption is harmless, if not healthy, the egg's reputation is gradually returning."*

In 2015, dietary cholesterol (and egg restriction) was finally eliminated from the U.S. dietary guidelines, and the controversy appeared to have been settled. Then, a new study again linked egg consumption and dietary cholesterol to an increased risk of cardiovascular disease and death, and these researchers urged people to avoid eggs.

New Study, Old Arguments

The study[3,4,5] in question, published March 19, 2019, in the journal JAMA, analyzed data from 29,615 American adults pooled from six prospective cohort studies with a median follow-up of 17.5 years, and claims to have found a dose-dependent relationship between egg consumption and cardiovascular disease (CVD) and all-cause mortality.

The researchers calculated two risk ratios: an adjusted hazard ratio (HR) and an adjusted absolute risk difference (ARD). According to this study:

- Each 300 milligrams (mg) of dietary cholesterol consumed per day (equating to approximately one and a half eggs) had a:
    - HR of 17% and an ARD of 3.24% for CVD
    - HR of 18% and an ARD of 4.43% for all-cause mortality
- Even each additional half an egg consumed per day was associated with higher risk of incident CVD and all-cause mortality
- Eating three to four eggs per week was associated with a:
    - HR of 6% and an ARD of 1.11% for CVD
    - HR of 8% and an ARD of 1.93% for all-cause mortality

According to lead researcher Wenze Zhong, Ph.D.,[6] a post-doctoral student at the time, but now a principal investigator and assistant professor in the Division of Nutritional Sciences at Cornell University, the results suggest there's no safe amount of egg consumption, and the team believes the results should be taken into consideration when the U.S. dietary guidelines are updated.

> *"Any level of egg consumption is associated with increased risk of cardiovascular disease and mortality, because we found a dose-response association. Greater consumption means higher risk,"* he told Runner's World.[7]

What's Wrong With This Egg Study?

A number of health and nutritional experts have already weighed in on the study, pointing out its multiple flaws. As noted by Runner's World:[8]

> *"'For one, the amount of risk, or hazard, that's reported here is trivial — and the way in which they calculated it doesn't exactly lend itself to an easy determination of someone's true risk,' [Stuart] Phillips [Ph.D., director of the McMaster Centre for Nutrition, Exercise, and Health Research] said …*

> *[T]he researchers noted there may be measurement error because the diet data was based on recall … Not only can this type of self-reported data be unreliable, but also, researchers assessed this only once … and assumed it didn't change in an average of 17 years of follow-up.*
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> *Also, they stated that all cohorts used different dietary assessment tools, leading them to implement their own methodology to harmonize diet data. Finally, the study findings are observational, so while they can suggest a relationship, they can't prove that one thing caused the other."*

Andrew Mente, Ph.D., principal investigator for the Epidemiology Program at the Population Health Research Institute, pointed out a clear contradiction in the data, telling Runner's World:[9]

> *"The primary hypothesis here is that eggs increase your bad cholesterol, and the more you eat, the worse it gets. But buried way down in the appendix is a note that they found higher egg intake is related to a reduction in LDL, your bad cholesterol. So, what's driving the association in this research? It seems like there's a contradiction with the findings."*

Zoe Harcombe, who has a Ph.D. in public health nutrition, went a step further, listing no less than 10 different problems, including the following:[10,11]

The study found an association between egg consumption and CVD, but not coronary heart disease, which is a major part of CVD.

The meta-analysis included six studies, one of which was dominant, and all of which looked at American populations only, which means findings are not applicable to non-Americans, as dietary patterns are not generalizable between populations.

Association does not mean causation, and according to Harcombe, "17% is too small to get off the ground for Bradford Hill criteria," also known as Hill's criteria for causation.[12]

This refers to a set of nine principles commonly referred to when trying to establish evidence of a causal relationship between a proposed cause and an observed effect. The nine criteria include effect size (strength of association), reproducibility of effects, specificity, temporality, biological gradient, plausibility, coherence, experimental evidence and analogous evidence.

Harcombe explains the 17% relative risk, saying, "It would equate to an absolute risk difference of 17 versus 15 events (i.e., two events) per 1,000 person years to use the event rate from the dominant study" of the six studies included in the analysis.

The study did not evaluate pure egg consumption. "It was a study of 'Ingredients in mixed dishes,'" Harcombe says, "which — for eggs — means a long list of junk food from cakes to ice cream."

They also did not adjust for significantly different CVD risk factors. Instead, it was assumed that different characteristics could have been caused by eggs and/or cholesterol.

Interestingly, people reporting the lowest intake of dietary cholesterol also had significantly lower energy intake overall — a mere one-third of the energy intake of those with the highest cholesterol intake. Harcombe suggests, "Maybe people weren't eating more eggs or dietary cholesterol — they were just more honest about, or better at recalling, their food intake!"

The researchers also resorted to a strangely random selection when it came time to calculate the risk of harm from each additional half egg. "[S]ub-group analysis revealed that this only applied to specific, but random, groups of participants, e.g., women, but not men; slim, but not overweight people."

And now for the BIG one — conflicts of interest — Harcombe points out they're "the who's who of statin manufacturers," adding, "The paper appears to have as its core purpose resurrection of the diet-cholesterol-heart myth — the dietary cholesterol part of which was rejected … at least 65 years ago."

Several Studies Have Confirmed Eggs Are Good for Your Heart

It's also worth noting that several meta-analyses have refuted the claim that egg consumption raises your risk for CVD. Among them:

- Research[13] published in 2009 discovered that the proteins in cooked eggs are converted by gastrointestinal enzymes, producing peptides that act as ACE inhibitors (common prescription medications for lowering blood pressure) — a finding that supports the stance that eggs are in fact part of a heart-healthy diet.
- A 2013 meta-analysis that found eating up to one egg per day "is not associated with increased risk of CVD or stroke."[14]
- A 2016 meta-analysis, which concluded that "Overall, summary associations indicate that intake of up to one egg daily may be associated with reduced risk of total stroke." With regard to coronary heart disease, there was no clear association between egg intake and risk.
- A 2017 analysis "reviewed the evidence of egg consumption on major CVD risk factors in individuals with or at risk for Type 2 diabetes (prediabetes, insulin resistance or metabolic syndrome)," finding "consumption of six to 12 eggs per week, in the context of a diet that is consistent with guidelines on cardiovascular health promotion, has no adverse effect on major CVD risk factors in individuals at risk for developing diabetes or with Type 2 diabetes."
- A 2018 meta-analysis looking at observational and interventional studies published within the past 10 years that addressed cholesterol intake and risk of CVD and Type 2 diabetes concluded that "Dietary patterns, physical activity and genetics affect the predisposition of CVD and T2D [Type 2 diabetes] more than a single food item such as eggs.

  In conclusion, up to seven eggs per week can safely be consumed, but in patients with established CVD or T2D only with special emphasis on a healthy lifestyle."

Eggs Are an Important Part of a Healthy Diet

Instead of focusing on the faulty science that made you worry unnecessarily about consuming too much cholesterol, there are numerous reasons to go ahead and enjoy them. They're loaded with valuable vitamins and minerals, including selenium, vitamins B2 (riboflavin), B5 (pantothenic acid), B7 (biotin) and B12, high-quality protein, iodine, vitamin D, zinc, omega-3 fats and more.[15] Eggs are also an important source of lutein and zeaxanthin, two antioxidants known to play a role in healthy vision and the prevention of cataracts and macular degeneration.

I currently have 17 chickens that free range on two acres. I have four eggs a day consumed as raw egg yolks and cooked whites for my breakfast. The KEY though to having healthy eggs is to avoid ALL commercial chicken feeds as they are loaded with seed oils. Your chickens can produce eggs with 75% less dangerous linoleic acid by feeding them without seed oils.

I feed my 17 chickens one and half pounds of 3 day sprouted field peas and one half pound barley with either four ounces of melted tallow or one stick of butter. Also add four cups of cooked white rice to which I add three tablespoons of calcium carbonate and some other poultry minerals. They also get seasonal fruit that I grow as available, like mangos, bananas or watermelon.

Egg Yolks Are the Highest Source of Dietary Choline

Importantly, eggs are one of the best sources of choline available. Choline was officially recognized as an essential nutrient by the Institute of Medicine (IOM) in 1998. Egg yolks are the most concentrated source of choline in the American diet, providing 680 milligrams per 100 grams.[16]

Choline helps keep your cell membranes functioning properly, plays a role in nerve communications and prevents the buildup of homocysteine in your blood, which is good because elevated levels are linked to heart disease. Choline also helps reduce chronic inflammation.

This vital nutrient is also prized because it enables your body to make the brain chemical acetylcholine, which is involved in storing memories. In pregnant women, choline helps prevent birth defects such as spina bifida, while also playing a role in your baby's brain development.

According to a study[17] published in the journal Nutrients, only 8% of U.S. adults are getting enough choline — including only 8.5% of pregnant women. Among egg consumers, however, more than 57% meet the adequate intake levels for choline. Based on the outcomes, the study authors concluded that "it is extremely difficult to achieve the adequate intake for choline without consuming eggs or taking a dietary supplement."[18]

Some of the symptoms associated with low choline levels include lethargy, memory problems and persistent brain fog. Because your body can only synthesize small amounts of this nutrient, you must get it from your diet on a regular basis.

Choline and Nonalcoholic Fatty Liver Disease (NAFLD)

The two major fates for choline are to be phosphorylated and used to make phospholipids, or to be oxidized and used as a donor of methyl-groups. An especially important choline metabolite in the liver is phosphatidylcholine, which is necessary for the packaging and export of triglycerides in very low density lipoprotein (VLDL).

It has only recently been appreciated that you need choline to help remove triglycerides from your liver. So if you have insulin resistance from a poor diet and high triglycerides it will be vital to make sure that you increase your choline intake or you will radically increase your risk of nonalcoholic fatty liver disease (NAFLD). This is largely related to its role in phosphatidyl choline and transporting fats out of your liver.[19]

If you have normal triglycerides, choline augmentation is not as important for NAFLD but still plays a vital role in the other benefits described in the previous section.

Also choline is an important part of the mitochondrial membrane and mitochondrial dysfunction is a central mechanism in the pathogenesis of NAFLD.[20] Choline deficiency

likely plays a major role in NAFLD because it disturbs mitochondrial bioenergetics[21] and fatty acid oxidation.[22]

Not All Eggs Are Created Equal

When it comes to eggs, quality is important. Most of the eggs you find at your local grocery store come from concentrated animal feeding operations (CAFOs), which are known to be hotbeds for Salmonella infection.[23] Eggs can become contaminated while they are being formed if the Salmonella bacteria exist inside a chicken's ovaries.

As noted in the report,[24,25] "Food Safety and Cage Egg Production" by the Humane Society, published in 2011, "All 16 scientific studies published in the last five years comparing Salmonella contamination between caged and cage-free operations found that those confining hens in cages had higher rates of Salmonella, the leading cause of food poisoning-related death in the United States."

Today, we also have antibiotic-resistant strains of salmonella to contend with, which makes potential contamination even more worrisome.

While there's no way to guarantee 100% safety at all times, the benefits of free-range poultry are becoming more well-recognized, and reduced disease risk is definitely part of that benefits package. Unfortunately, loopholes abound, allowing CAFO-raised chickens and eggs to masquerade as "free-range" and "organic."

It's worth noting that "cage-free" still does not mean the chickens were raised under ideal conditions. They're not raised in cages, but they may still not have access to the outdoors, and the organic label simply means the hens have been raised on organic feed. It is not an indication that they've been humanely or sustainably raised.

So, there are still significant differences even between "cage-free" and "free-range" (or "pastured") eggs. With so many loopholes and lack of transparency, it can be very confusing to sort through it all. The Cornucopia Institute addresses these issues in its egg report[26] and organic egg brand scorecard,[27] which ranks 136 egg producers according to 28 organic criteria.

As noted by Mark A. Kastel, The Cornucopia Institute's codirector and senior farm policy analyst, "The organic egg scorecard enables concerned consumers to select authentic brands delivering the very best quality eggs regardless of the hyperbole on the label."

Best Certifications to Look for With Milk, Meat and Produce

On a final side note, organic misdirection and outright fraud are also rampant in dairy and meat production, and dedicated organic leaders have struggled to come up with newer, stricter rules for true organics.

At present, two of the absolute best certifications are the American Grassfed Association (AGA) certification[28] and the Demeter certification,[29] which is biodynamic certification that goes far beyond mere organics.

The AGA certification covers meat and dairy from animals raised on a diet of 100% forage. The animals are never confined to a feedlot; never treated with antibiotics or hormones; and are born and raised on American family farms. These two certifications presently offer the absolute best assurances that the food you buy has been sustainably produced, without toxic chemicals or inhumane treatments.

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