

# Why Choline Is NOT Associated With Prostate Cancer

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## STORY AT-A-GLANCE

- › Choline, essential for numerous physiological processes such as brain development, DNA synthesis and fat metabolism, was officially recognized as a vital nutrient in 1998, with deficiencies linked to severe health issues
- › High choline intake is associated with significant health benefits, including reduced risks of heart disease, breast cancer and nonalcoholic fatty liver disease, underscoring its importance in your diet
- › Studies suggesting a link between choline intake and an increased risk of prostate cancer fail to account for various dietary and environmental factors, leading to misleading conclusions about eggs
- › Choline deficiency poses a greater health risk than high intake. An estimated 90% of Americans already do not meet the adequate daily intake values set by the Institute of Medicine
- › Eggs from chickens fed a low-linoleic acid diet are a powerhouse of nutrition. They provide high-quality protein, essential fats, vitamins like D, E and K, and minerals such as selenium and zinc. Eggs also contain B vitamins essential for energy production

Some studies,<sup>1</sup> including analyses from NHANES data, have stirred up fears about choline and its alleged link to an increased risk of prostate cancer. This fear causes people to avoid one of the most important nutrients to their health.

As your guide to deciphering the complexities of health and nutrition, I feel it's imperative to address these concerns and explain why the fear surrounding choline intake, particularly from eggs, is not only misplaced but may also deter you from enjoying one of nature's most nutrient-dense foods.

First, let's understand what choline is. Choline, initially discovered in 1862,<sup>2</sup> was officially recognized as an essential nutrient for human health by the Institute of Medicine in 1998.<sup>3</sup> It plays a critical role in many physiological processes, including:<sup>4</sup>

**Healthy fetal development**<sup>5</sup> – Choline is required for proper neural tube closure,<sup>6</sup> brain development and healthy vision.<sup>7</sup> Research shows mothers who get sufficient choline impart lifelong memory enhancement to their child due to changes in the development of the hippocampus (memory center) of the child's brain.<sup>8</sup> Choline deficiency also raises your risk of premature birth, low birth weight and preeclampsia.

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**The synthesis of phospholipids**, the most common of which is phosphatidylcholine, better known as lecithin, which constitutes between 40% and 50% of your cellular membranes and 70% to 95% of the phospholipids in lipoproteins and bile.<sup>9</sup>

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**Nervous system health** – Choline is necessary for making acetylcholine, a neurotransmitter involved in healthy muscle, heart and memory performance.<sup>10</sup>

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**Cell messaging**, by producing cell-messaging compounds.<sup>11</sup>

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**Fat transport and metabolism** – Choline is needed to carry cholesterol from your liver, and a choline deficiency could result in excess fat and cholesterol buildup.<sup>12</sup>

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**DNA synthesis**, aiding in the process along with other vitamins, such as folate and B12.

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**Methylation reactions.**<sup>13</sup>

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**Healthy mitochondrial function.**<sup>14</sup>

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## Health Benefits of Choline

Studies have linked higher choline intake to a range of benefits, including a decreased risk for heart disease,<sup>15</sup> a 24% decreased risk for breast cancer,<sup>16</sup> and the prevention of nonalcoholic fatty liver disease (NAFLD).

In fact, choline appears to be a key controlling factor in preventing the development of fatty liver by enhancing secretion of very low-density lipoprotein (VLDL) particles, which are required to safely transport fat out of your liver.<sup>17</sup> Research has also discovered evidence of epigenetic mechanisms of choline,<sup>18</sup> which also helps explain how choline helps maintain healthy liver function.

Research<sup>19</sup> published in 2020 also concluded that choline has anti-inflammatory activity and can be particularly useful in those with insulin resistance and/or metabolic syndrome. And, while a choline supplement was good in this regard, eggs were far better. Choline has also been shown to prevent neurodegenerative diseases such as Alzheimer's by:<sup>20,21</sup>

- **Reducing your homocysteine level**, an amino acid that has been shown to cause neurodegeneration and is involved in the formation of amyloid plaques, two hallmarks of Alzheimer's. Choline converts homocysteine into methionine, which has several beneficial effects.
- **Inhibiting microglia activation** – Microglia cells clear debris from your brain, and while this is a crucial function, in Alzheimer's the microglia tend to become overactivated, causing inflammation in the brain that can result in the death of neurons. By reducing activation of microglia, choline can help protect Alzheimer's patients from further brain damage.

## Study Linking Choline to Prostate Cancer Has Many Weaknesses

The primary study<sup>22</sup> that has many people second-guessing their egg consumption analyzed meat, milk and egg intake and their potential associations with prostate cancer. All of these are sources of choline, although eggs contain the highest amounts.

It suggested there might be a link between high dietary choline intake and an increased risk of advanced, lethal prostate cancer. According to the authors, “Men in the highest quintile of choline intake had a 70% increased risk of lethal prostate cancer.” However, this conclusion overlooks several crucial aspects.

For starters, the study was observational, meaning it can indicate associations but cannot prove causation. Considering the many dietary and environmental factors that can influence health outcomes, it's extremely difficult to isolate the effect of a single nutrient.

What's more, they only collected dietary information six times during 22 years of follow-up, which raises questions about accuracy. Many can't even recall what they ate a few days ago, let alone the type of food and weekly quantity they consumed over the past year. Other shortcomings of this study include the following:

- It does not account for other components of the diet that could influence prostate cancer risk, such as phytonutrients, fiber, and other vitamins and minerals.
- No dose-response relationship across quintiles of choline intake was established. Understanding whether the risk of prostate cancer increases linearly with choline intake or if there's a threshold effect would be crucial for dietary recommendations.
- The study also looked at postdiagnostic intake of choline and its relationship with lethal prostate cancer among men who were initially diagnosed with nonmetastatic disease and here, no statistically significant link could be found.

## **The Source of Choline Matters**

The source of the choline also matters. Not all choline sources are created equal. Eggs, especially those from chickens fed low-linoleic acid (LA) diets, are incredibly nutrient-dense, offering not just choline but also vitamins, minerals and antioxidants in a natural package that your body can efficiently use.

Conversely, conventionally-raised eggs tend to be high in LA, and as I detailed in my extensive [report on LA](#), this dietary component is a major driver of all chronic disease,

including cancer, as it impairs your mitochondrial function and inhibits energy production.

An estimated 90% of the U.S. population is deficient in choline.<sup>23</sup> At the same time, most people consume several times more LA than is safe based on historical intakes. So, what's more likely to contribute to cancer? LA or choline?

There's also the issue of generalizing. The study population, comprised of 47,896 male health professionals from the United States, may not represent the broader public due to its homogeneity in terms of profession, education, and potentially, socioeconomic status.

These factors can influence dietary habits, health awareness, access to healthcare, and the ability to engage in preventative health behaviors, which in turn could affect the study's findings and their applicability to the general population.

For example, while health professionals are commonly expected to have greater knowledge about nutrition and disease prevention, this is rarely the case. Rather, they tend to follow standard dietary recommendations issued by government, which have repeatedly been proven to be disastrous for health.

Case in point, for decades, the recommendation has been to avoid saturated fat and cholesterol (both of which are high in eggs) and to opt for polyunsaturated (PUFA) seed oils instead, which, as it turns out, is a perfect recipe for cancer. So, was high choline consumption really the issue, or did they also have higher LA intake because of following misguided dietary recommendations?

## **Low-PUFA Eggs Are a Powerhouse of Nutrition**

Focusing on a single nutrient also fails to consider the synergistic effects of foods. Whole foods like eggs contain a complex mix of nutrients that work together to support health.

Indeed, egg yolks from chickens fed low-LA diets are a powerhouse of nutrition. They provide high-quality protein, essential fats, vitamins E and K, and minerals such as selenium and zinc. Moreover, eggs are one of the few dietary sources of vitamin D, which is crucial for bone health and immune function.

A single hard-boiled egg can contain anywhere from 113 milligrams<sup>24</sup> (mg) to 147 mg<sup>25</sup> of choline, or about 25% of your daily requirement, making it one of the best choline sources in the American diet.<sup>26</sup> Only grass fed beef liver beats it, with 430 mg of choline per 100-gram serving.<sup>27</sup>

Egg yolk also contains a large amount of B vitamins, all of which are necessary cofactors in the steps to produce energy in your body.

If you're micronutrient deficient, your metabolism will be low because you don't have the necessary cofactors to generate ATP, and in carbohydrate metabolism, choline is one of those necessary cofactors. When you add the high rate of choline deficiency in the general population into the mix, it's highly unlikely that choline would be the cause behind lethal cancer.

## **How Much Choline Do You Need?**

While a dietary reference intake value has not yet been established for choline, the Institute of Medicine set an "adequate daily intake" value of 425 mg per day for women, 550 mg for men and 250 mg for children<sup>28,29</sup> to help prevent a deficiency and potential organ and muscle damage.

Curiously, those in the highest quintile of choline intake in this study<sup>30</sup> were only getting a median of 509 mg per day, which doesn't even meet the IOM's ADI.

Keep in mind, however, that requirements can vary widely, depending on your overall diet, age, ethnicity<sup>31</sup> and genetic makeup. As noted in one paper,<sup>32</sup> "People with one of several very common genetic polymorphisms in the genes of choline metabolism are more likely to develop hepatic dysfunction when deprived of choline."

Another study<sup>33</sup> found that in some men, 550 mg of choline per day was insufficient as they still developed organ dysfunction. Postmenopausal women were also more prone to develop signs of organ dysfunction than premenopausal women when deprived of adequate amounts of choline for just under six weeks.

Eating a diet high in (otherwise healthy) saturated fats may also increase your choline requirement by as much as 30%.<sup>34</sup> Pregnant and breastfeeding women, athletes and postmenopausal women also need higher amounts.

**“The fearmongering around eggs and choline is a perfect example of how isolating nutrients from their dietary context can lead to misleading conclusions.”**

The tolerable upper intake level for choline is 3.5 grams per day. Side effects of excessive choline include low blood pressure, sweating, diarrhea and a fishy body odor.<sup>35</sup> Unfortunately, none of these signs and symptoms of choline excess were investigated in the featured study.

## **The Bigger Picture**

It's essential to look beyond headlines and understand the broader context of nutrition science. The fearmongering around eggs and choline is a perfect example of how isolating nutrients from their dietary context can lead to misleading conclusions.

A balanced diet focusing on whole, unprocessed foods is key to optimal health, and sadly, many simply don't get enough essential nutrients because their diets are so loaded with processed food.

Food testing by Moms Across America (MAA) highlights the seriousness of the situation, as they found [school lunches contain more toxins than nutrients](#).<sup>36</sup> All school lunches tested contained heavy metals – some at levels up to 6,293 times higher than

the maximum levels allowed in drinking water – and 95% had detectable levels of glyphosate.

Meanwhile, most of the meals were “abysmally low” in essential nutrients. Similarly, fast food meals provide nowhere near your daily nutrient requirements for vitamins and minerals.<sup>37</sup>

So, in conclusion, don't let fearmongering dictate your dietary choices. Eggs, particularly from chickens on a healthy diet, remain one of the most nutrient-rich foods you can eat. As always, it's about the quality and the source. Incorporating eggs into a balanced, nutrient-dense diet supports health far more than it harms.

Assuming you're not getting choline from other sources, you need to eat at least two, probably three and more, egg yolks per day. I eat six yolks a day (but only one egg white) because I work out and walk at least five to six miles a day. The more active you are, the more choline you need to support a higher metabolic rate.

## Sources and References

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