

Vitamin K 101 – Essential Basics for Bone and Heart Health

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STORY AT-A-GLANCE

- › Vitamin K is a fat-soluble vitamin necessary for blood clotting, bone health and cardiovascular function. It exists in two main forms: K1 (phylloquinone) found in green leafy vegetables, and K2 (menaquinones) found in animal products and fermented foods
- › Vitamin K2 plays an important role in calcium metabolism, which research links to bone and cardiovascular health
- › Research suggests vitamin K2 and vitamin D work together to support bone health. Specifically, vitamin K2 helps direct calcium toward your bones and away from your arteries
- › Vitamin K2 is involved in activating proteins like osteocalcin and matrix Gla protein, which regulate calcium deposition in bones and arteries. This activation is thought to help limit calcium buildup in the arteries and support bone strength
- › The intake of vitamin K2 is often insufficient in Western diets, which is why K2-rich foods – and, for some people, supplements – are worth considering for supporting bone and heart health

Vitamin K is a fat-soluble vitamin known for its essential role in blood clotting. However, its functions extend far beyond coagulation, encompassing processes that maintain bone integrity and cardiovascular health. There are two primary forms of vitamin K: K1 (phylloquinone), predominantly found in green leafy vegetables, and K2 (menaquinones), which is present in animal products and fermented foods.

While both forms are important, vitamin K2 has garnered significant attention for its unique ability to regulate calcium metabolism, directing this mineral to where it's needed most in your body. As such, it has drawn interest in its potential role in supporting bone density and helping keep calcium out of artery walls.

When vitamin K2 is low, calcium is more likely to accumulate in your arteries, a change that has been associated with a higher risk of cardiovascular disease. Conversely, insufficient calcium in your bones contributes to osteoporosis, a condition characterized by weakened bones and an increased risk of fractures.

Despite its benefits, vitamin K2 is often under-consumed in Western diets, primarily due to the limited intake of fermented foods and certain animal products, combined with the overconsumption of processed foods. Certain medical conditions and medications also impair the absorption and metabolism of vitamin K2, increasing deficiency risks.

Understanding the Different Forms of Vitamin K

When it comes to maintaining optimal health, vitamin K often doesn't get the spotlight it deserves. Understanding the different forms of vitamin K and their sources is essential to help you make informed decisions about your diet and supplementation.

Seed oils like soybean and canola are rich in vitamin K1, but relying on these products is a poor choice for your overall energy and metabolic health. High intake of seed oils, which are loaded with linoleic acid (LA), may impair mitochondrial energy production, which is essential for cellular function. That said, aim to keep your LA intake below 5 grams per day, ideally.

While these oils are often listed among the main dietary sources of vitamin K1, cutting them out of your diet is one of the most important changes you can make for your health. That makes it important to get your vitamin K from other sources. Meanwhile, vitamin K2 appears to have roles that K1 does not. MK-7, a form of K2, has a much

longer half-life in your body than K1, which allows for more stable blood levels. While K1 is taken up mainly by your liver, K2 is carried more widely to tissues outside the liver, including blood vessels, where it activates proteins that regulate calcium deposition.

Researchers are studying whether this dual action may help support bone strength and limit arterial calcification, which has been associated with heart disease. However, reviews of the research note that the evidence is not yet conclusive.

As for intake, the European Food Safety Authority considers 1 microgram per kilogram of body weight per day of total vitamin K an adequate intake for both children and adults, including pregnant women.¹ Some researchers have explored whether higher intakes of K2 may offer additional benefits for bone and cardiovascular health, although this has not been established.

In clinical trials, MK-7 doses have mostly ranged from 100 to 180 micrograms daily. Moreover, results for bone have been mixed — some trials found improvements in bone mineral density (BMD), mainly in women with osteoporosis after long-term use, while others found no significant effect. That said, natural forms of vitamin K are considered largely safe, although minor digestive complaints and skin rashes have been reported with K2. Synthetic vitamin K3 (menadione), on the other hand, can be toxic in high doses and should be avoided. Lastly, if you take a blood thinner such as warfarin, talk to your doctor before taking vitamin K in any form, as it directly affects how these drugs work.

Getting both K1 and K2 through diet and, if needed, supplements can meet your body's needs without relying on seed oils. For example, leafy greens are good sources of K1, while natto and certain animal foods provide K2.

Understanding Vitamin K Deficiency

Although vitamin K deficiency is not common in adults, when it occurs it shows up through symptoms primarily related to impaired blood clotting. You might notice spontaneous cutaneous purpura, which are purple spots on your skin caused by small

blood vessels leaking under the surface. Epistaxis, or nosebleeds, is another possible sign.

Additionally, you could experience gastrointestinal bleeding, genitourinary bleeding (i.e., blood in the urine, vaginal bleeding or bleeding from the urethra), gingival bleeding (bleeding gums) or other unexplained bleeding episodes. In addition to poor dietary intake, certain health conditions increase your risk of vitamin K deficiency by impeding your body's ability to absorb or use vitamin K.

Liver disease can also compromise your vitamin K status. Cholestasis, a condition where bile flow is reduced or blocked, also hinders vitamin K absorption since it's a fat-soluble vitamin. Additionally, conditions like cystic fibrosis, alcoholism, and malabsorption disorders (including inflammatory bowel disease) also compromise your vitamin K levels.²

Weight loss surgeries that alter the digestive system also affect nutrient absorption, including vitamin K. So, if you've undergone such procedures, monitoring your vitamin K intake becomes essential. Certain drugs also interfere with vitamin K metabolism or absorption.

Coumarin-based anticoagulants, commonly prescribed to prevent blood clots, directly inhibit vitamin K's role in blood clotting. The antibiotic rifampicin can reduce vitamin K absorption by speeding up its metabolism, while broad-spectrum antibiotics can suppress the gut bacteria that produce vitamin K. Further, orlistat, a weight-loss medication, can lower vitamin K absorption because its digestive side effects lead people to cut back on dietary fat, which vitamin K needs to be absorbed.³

What a Comprehensive Review Reveals About Vitamin K2

A comprehensive review published in Food Science & Nutrition explored the reported biological effects of vitamin K2, including its potential roles in bone health, [cardiovascular protection](#), menopause, mitochondrial energy, and liver and brain health.⁴

The authors aimed to clarify the mechanisms behind these effects, but noted that because research in this area consists largely of animal studies and case reports, the findings remain inconsistent and more research is needed.⁵

The featured review summarized mixed findings. On the bone side, one meta-analysis of trials in postmenopausal women reported benefits from vitamin K2, while another found no effect on BMD or vertebral fractures. On the cardiovascular side, an observational study of 564 postmenopausal women linked higher dietary vitamin K2 intake with less coronary artery calcification, although the authors noted that a protective effect against cardiovascular disease has not been widely demonstrated.⁶

The featured review also discussed vitamin K2 and cancer. This evidence comes mostly from laboratory studies on liver cancer cells, along with one animal study and a single human case report. The authors stressed that further investigation is needed, so these findings do not show that vitamin K2 prevents or treats cancer in people.⁷

Furthermore, the featured review explored how vitamin K2 and vitamin D may work together. In cell and rat studies, vitamin K2 enhanced vitamin D's effects on bone-building cells and reduced bone loss. In a 12-month trial involving postmenopausal women, a diet enriched with vitamin K, calcium, and vitamin D3 protected lumbar spine bone density better than calcium and vitamin D3 alone. These findings suggest the two vitamins may work together to help direct calcium where it's needed.⁸

If you're supplementing with vitamin D, it's important to balance it with vitamin K2 and magnesium, which work together in calcium metabolism and may help keep calcium from depositing where it doesn't belong.

Different Forms of Vitamin K2

The featured review noted that MK-4, MK-7 and MK-9 are the most studied forms of vitamin K2. Of these, MK-4 has the highest bioactivity. MK-7, meanwhile, was noted for its superior bioavailability and longer half-life, allowing it to remain active in your body

for extended periods.⁹ Natto, a traditional Japanese fermented soybean dish, is the richest source of MK-7.¹⁰

While the majority of vitamin K1 is stored in your liver, MK-4 is the primary form of vitamin K2 found in human tissues. This distinction indicates that different forms of vitamin K have specific roles and are stored differently within your body.¹¹

Vitamin K2, as mentioned, is particularly involved in the maintenance of calcium homeostasis. Calcium homeostasis refers to the regulation of calcium levels in various biological pathways, ensuring that calcium is available where needed for functions like bone formation while preventing its accumulation in soft tissues and blood vessels.¹²

By helping direct calcium to your bones, vitamin K2 is thought to support both skeletal and cardiovascular health, although the review's authors note that further investigation is needed.¹³ Vitamin K2 achieves this by activating proteins such as osteocalcin and matrix GLA-protein (MGP). For context, osteocalcin helps bind calcium to your bone matrix.

Meanwhile, MGP helps inhibit calcium deposits in blood vessel walls, a process known as vascular calcification that has been associated with cardiovascular disease.¹⁴ Additionally, vitamin K2 modulates the activity of osteoblasts and osteoclasts, the cells responsible for bone formation and resorption, respectively.

In laboratory studies, vitamin K2 downregulated the activation of nuclear factor- κ B, a protein complex involved in inflammatory responses, which appears to help balance the activity of these bone cells.¹⁵

The review also touched upon possible neuroprotective effects of vitamin K2. Specifically, in cultured rat astrocytes (support cells in the brain), MK-7 protected the cells from apoptosis, or programmed cell death, induced by low-oxygen conditions. Whether this translates into any benefit for people with neurodegenerative or mitochondrial disorders has not been established as of this writing.¹⁶

Vitamin K2's Possible Role in Mitochondrial Energy Production

Vitamin K2 has been reported to act on almost all major body systems, and researchers have also explored whether it influences mitochondrial energy release. Mitochondria are responsible for producing adenosine triphosphate (ATP) through the electron transport chain.

Because vitamin K2 is structurally similar to coenzyme Q10 (CoQ10), researchers have hypothesized that it may play a role in mitochondrial energy metabolism.¹⁷ One study in fruit flies found that vitamin K2 acted as a mitochondrial electron carrier, rescuing mitochondrial dysfunction caused by a deficiency of Pink1, a protein linked to Parkinson's disease.¹⁸ In that model, vitamin K2 supported electron transport within the mitochondria, but this effect has not been confirmed in human cells.

However, conflicting evidence exists regarding vitamin K2's role in mammalian mitochondrial function. While some studies suggest beneficial effects on mitochondrial respiration and energy release, others indicate that vitamin K2 does not substitute for CoQ10 in restoring electron flow or ATP synthesis in CoQ10-deficient cells. This discrepancy highlights the need for further research to uncover vitamin K2's exact role in mitochondrial energy metabolism across different species.

Vitamin K2 and Bone Health After Menopause

Menopause induces significant hormonal and physiological changes, contributing to conditions such as osteoporosis, osteopenia and increased vascular calcification. Vitamin K2 has been studied for its potential effects on these changes, with mixed results.

Some clinical trials have found that vitamin K2 supplementation, particularly in the forms of menaquinone-4 (MK-4) and MK-7, helped maintain bone mineral content (BMC) and slowed age-related loss of bone mineral density (BMD) in postmenopausal women,

and a meta-analysis of 19 randomized trials involving 6,759 participants reported benefits for postmenopausal women with osteoporosis. However, a separate meta-analysis and a three-year trial found no improvement in BMD.^{19*}

For instance, in one three-year trial, daily MK-4 improved hip bone geometry and bone strength in postmenopausal women by increasing BMC, although BMD did not increase.²⁰ In a three-year randomized trial in 142 postmenopausal women with osteopenia, MK-7 (375 micrograms per day) taken with calcium and vitamin D3 increased osteocalcin carboxylation, but it did not improve BMD, bone turnover markers or bone microarchitecture.^{21*}

These findings are from research conducted in clinical settings. Results may not apply to all individuals.

What Lab and Animal Studies Suggest About Vitamin K2, Your Liver, and Your Brain

Laboratory and animal research also suggests vitamin K2 may have protective effects on liver and nerve cells. In a rat model of chemically induced liver injury followed by partial liver removal, vitamin K2 enhanced liver regeneration.^{22*}

Additionally, in laboratory studies of liver cancer cell lines, vitamin K2 showed cytotoxic effects by inducing cell cycle arrest and apoptosis through multiple signaling pathways, including the suppression of NF- κ B and MAPK activities.²³ Note that these are cell culture findings and do not show that vitamin K2 treats liver cancer in people.*

Vitamin K may also matter to brain health. In rats, a lifelong low-vitamin K diet led to cognitive deficits in old age, and in laboratory studies, vitamin K2 reduced inflammatory activity in brain immune cells. Lab research also suggests vitamin K2 may activate the Gas6/Axl/Akt signaling pathway, which helps protect cells from programmed cell death.^{24*}

Moreover, in cell culture studies, vitamin K2 protected neural cells from oxidative stress and amyloid-beta toxicity, factors implicated in Alzheimer's disease.²⁵ The authors describe vitamin K supplementation as a possible neuroprotective strategy worth studying, but whether it helps prevent or manage neurodegenerative diseases in people is not yet known.

*These findings are from laboratory or animal research and may not directly apply to human health.

Vitamin K and COVID-19 – An Early Area of Research

Researchers have also explored whether vitamin K status matters in COVID-19. Because COVID-19 is associated with coagulopathies and excessive inflammation, some researchers have proposed that vitamin K's roles in coagulation and immune regulation could be relevant. In observational studies, low vitamin K status was associated with more severe disease, and in one study with higher mortality – although that link disappeared after accounting for other health conditions.²⁶

One proposed explanation is that pneumonia may deplete vitamin K outside the liver, impairing activation of vitamin K-dependent proteins like MGP and Protein S, which help protect elastic fibers in the lungs and prevent thrombosis.²⁷ However, no clinical trial has yet shown that vitamin K2 improves outcomes in COVID-19 patients. A randomized trial has been set up to test this, and the review's authors called for larger clinical trials.

Vitamin K2, Parathyroid Disorders, and Cerebral Palsy – What's Known So Far

A review published in the journal *Nutrients* also looked at vitamin K2's role in calcium-related disorders. The authors reported that the data they reviewed point to a possible positive impact of vitamin K2 on several calcium-related conditions, including parathyroid disorders, cerebral palsy, and sperm motility. However, they stressed that its

potential as a treatment for conditions such as cerebral palsy and parathyroid disease is unknown, and that limitations in the quality and volume of research mean further investigation is needed.²⁸

Parathyroid disorders, particularly hyperparathyroidism, involve the excessive secretion of parathyroid hormone (PTH), leading to elevated serum calcium levels (hypercalcemia) and subsequent bone resorption. Because vitamin K2 plays a role in calcium metabolism, researchers have speculated about its relevance to these conditions.

In one 12-month study of hemodialysis patients with low PTH levels, vitamin K2 (as MK-4) increased levels of carboxylated osteocalcin but had no impact on PTH, calcium or phosphate levels. The review's authors concluded that, on this evidence, vitamin K2 cannot be used on its own for parathyroid conditions.²⁹

The authors also proposed that, because vitamin K2 activates MGP, a protein that inhibits vascular calcification, it could theoretically be relevant to hyperparathyroidism, though this has not yet been studied.

Vitamin K2 has not been shown to lower PTH levels, and there is no evidence yet that it helps manage parathyroid disorders. With this in mind, if you have a parathyroid condition, work with your doctor on treatment.

Cerebral palsy (CP) is a group of neurological disorders that affect movement, muscle tone and posture, often resulting in decreased BMD and increased fracture risk. Osteoporosis is prevalent among individuals with CP due to reduced mobility and subsequent bone resorption. The review's authors pointed to research showing significantly lower BMD in children and young people with CP and suggested that whether vitamin K2 could help reduce fractures in this group is an unexplored question worth investigating.³⁰ However, no studies have yet tested vitamin K2 in people with CP, so whether it would help their bone health remains unknown.

Vitamin K and Sperm Health — Early Animal Research

Sperm motility is a critical factor in male fertility and depends in part on calcium channels in the sperm cell membrane. Because vitamin K is involved in calcium metabolism, researchers have begun to explore whether it plays a role in sperm maturation and motility.

In a study in rats, researchers found that genes for vitamin K-dependent proteins were highly expressed in the epididymis, the site of sperm maturation. When warfarin was used to block vitamin K activity, sperm count and motility declined, suggesting that inadequate vitamin K may impair sperm maturation.³¹

Vitamin K-Dependent Proteins in Biomineralization

A review published in the International Journal of Molecular Medicine focused on the role of vitamin K in the activation of proteins essential for bone and vascular health, emphasizing its involvement in biomineralization processes.³² The review underscored the importance of vitamin K in the post-translational modification of vitamin K-dependent proteins (VKDPs), which are primarily involved in coagulation and calcification.³³

There are 17 identified VKDPs, which include osteocalcin and MGP. Osteocalcin, synthesized by osteoblasts, requires vitamin K for carboxylation, converting glutamic acid residues to gamma-carboxyglutamate (Gla) residues.³⁴ This conversion enhances osteocalcin's calcium-binding capacity, allowing it to bind to the bone matrix, although the featured review notes that osteocalcin's overall effect on bone remains debated.³⁵

Without sufficient vitamin K, osteocalcin remains undercarboxylated and binds less effectively to bone.³⁶ Similarly, MGP gains a higher affinity for calcium upon carboxylation, which helps prevent calcium from depositing in arterial walls.³⁷

The featured review highlights that when MGP is not properly activated, calcium can accumulate in arteries. In animal studies, MGP-deficient mice and warfarin-treated rats developed extensive vascular calcification, and in people, higher levels of inactive MGP

have been associated with arterial stiffness and cardiovascular death.³⁸ Additionally, the review noted that vitamin K1 is concentrated in the liver, while vitamin K2 is more widely distributed in tissues other than the liver.³⁹

The review also addressed the absorption and transport pathways of vitamin K1 and K2, noting that vitamin K1 is transported by triglyceride-rich lipoproteins, while vitamin K2 is primarily transported by low-density lipoproteins (LDL).⁴⁰ This difference in transport may help explain why each vitamin K form is distributed differently in your body.⁴¹

The Interplay Between Lipids and Vitamin K Metabolism

A review published in *Nutrition & Metabolism* further explored the intricate relationship between lipids and vitamin K metabolism, specifically focusing on how lipid levels affect the absorption and transportation of vitamin K within the body.⁴²

The authors analyzed published research, including studies of people with different blood lipid levels and of cholesterol-lowering medications such as statins. They noted that vitamin K's absorption, transportation, and distribution are influenced by lipids, and that the rise in blood vitamin K after supplementation is driven largely by blood fat (triglyceride) levels rather than by existing vitamin K status.⁴³

Vitamin K shares several transporters with cholesterol in the gut and liver, and the authors suggest the two may compete for at least one of them, namely NPC1L1. As such, this could affect how much vitamin K is absorbed.

The study also explored the role of lipoproteins, which are particles that transport fats, including cholesterol and triglycerides, through the bloodstream. It was found that low-density lipoproteins (LDL), often referred to as "bad cholesterol," carry vitamin K2 forms such as MK-4 and MK-9, unlike vitamin K1, which may help distribute K2 to tissues beyond the liver.⁴⁴

Furthermore, statins inhibit the mevalonate pathway, a biochemical pathway that's involved not only in cholesterol synthesis but also in the production of vitamin K2 isoforms like MK-4. In mice, the commonly prescribed statin drug known as atorvastatin reduced MK-4 levels in the kidneys by about 45%, though not in other organs, and the authors proposed this as a possible mechanism behind statin-associated calcification that still needs to be confirmed.⁴⁵

Whether vitamin K2 supplementation helps people taking statins has not yet been tested; the authors flagged it as a question for future research. Knowing this, if you take a statin, talk with your doctor before adding a supplement. Moreover, the interplay between lipids and vitamin K metabolism extends to dietary recommendations. Because vitamin K is fat-soluble, eating vitamin K-rich foods with healthy fats such as grass fed butter, ghee, or tallow may help your body absorb it.

Remember, vitamin K is a lipophilic vitamin, meaning it dissolves in fats and is transported through your body via lipid-based carriers. This characteristic necessitates the presence of dietary fats for effective absorption in your small intestine. Once absorbed, vitamin K is packaged into lipoproteins for distribution to various tissues. The efficiency of this process is directly tied to your body's lipid metabolism, illustrating the interconnectedness of these two important components.⁴⁶

Vitamin K and Its Impact on Other Nutrients

Understanding how vitamin K interacts with other nutrients is also helpful for getting the most out of your diet and any supplements you take. A review of vitamin pharmacokinetics notes that fat-soluble vitamins can compete with one another for absorption and metabolism, although few studies have examined this directly.⁴⁷

One notable interaction involves vitamin K and vitamin E, another fat-soluble antioxidant. The two share similar metabolic pathways, and their interaction can lead to abnormal blood clotting. In a laboratory study using human intestinal cells, the presence of other fat-soluble vitamins (A, D, and E) significantly reduced vitamin K uptake, by 34% to 58%.⁴⁸

Researchers have proposed several possible explanations for the vitamin E–K interaction. One is that vitamin E competes with vitamin K1 for cytochrome P450 (CYP450) enzymes that hydroxylate (to add a hydroxyl group to a compound) the vitamin K side chain; another is that vitamin E activates pathways that increase the metabolism and excretion of vitamin K.⁴⁹

So, if you're supplementing with vitamin E, especially at high doses, it makes sense to pay attention to your vitamin K intake, since the interaction between the two can affect blood clotting. If you take high-dose vitamin E or a blood thinner, talk with your health care professional about the right balance for you.

Practical Ways to Increase Your Vitamin K2 Intake

As shown in the featured research, vitamin K2 plays an important role in calcium distribution, helping direct this essential mineral toward your bones and away from your arteries. Getting enough vitamin K2 is one way to support both bone strength and cardiovascular health over the long term.

Determining whether you're getting enough vitamin K is challenging because while vitamin K can be measured directly in the blood, the testing is technically difficult and does not fully reflect K2 status. Researchers often look instead at markers such as undercarboxylated osteocalcin, which reflects vitamin K activity in your body, but these assays are not yet standardized and are not part of routine testing.

Low vitamin K status has been observed in some groups, including older adults and some postmenopausal women, and early animal research suggests that statins may lower the body's own production of the K2 form MK-4. Because vitamin K2 intake tends to be low in Western diets, many people may benefit from eating more K2-rich foods. To increase your intake:

- 1. Prioritize vitamin K2-rich foods** — Incorporate natto (fermented soybeans), by far the richest source of the MK-7 form of K2, which remains in your body for extended periods. Most other fermented vegetables contain much smaller amounts.

Certain cheeses, including Brie, Munster, and Gouda, also provide vitamin K2. If you're getting these products, make sure they're certified raw-milk cheeses made with animal rennet. Grass fed organic animal products, including egg yolks, liver, butter, tallow and raw dairy products, are also good sources of vitamin K2.

- 2. Align K2 intake with healthy fats** — As vitamin K2 is fat-soluble, it should be consumed alongside healthy fats such as grass fed butter or tallow to enhance absorption. This may help your body make better use of this nutrient for bone and cardiovascular health.
- 3. Harmonize K2 with complementary nutrients** — Vitamin K2, vitamin D, magnesium, and calcium work together as an interconnected system in calcium metabolism. Calcium is the main structural mineral of bone. The active form of vitamin D, 1,25-dihydroxyvitamin D, is the primary hormone controlling how much dietary calcium the intestine absorbs.⁵⁰ Magnesium supports this process upstream, because the liver and kidney enzymes that convert vitamin D into its active forms use magnesium as a cofactor.⁵¹ In a randomized trial, magnesium supplementation changed blood vitamin D levels in a pattern that depended on participants' starting vitamin D status.⁵² Vitamin D also increases production of vitamin K-dependent proteins, including osteocalcin in bone and matrix Gla protein (MGP) in blood vessel walls, and these proteins need vitamin K to become biologically active.⁵³ Activated MGP is a key natural inhibitor of calcification in soft tissues, and mice lacking MGP develop severe arterial calcification.⁵⁴ In human trials, vitamin K2 supplementation consistently increases MGP activation, shown by lower circulating levels of its inactive form.^{55, 56}
- 4. Choose supplements carefully** — If you choose to use supplements, look for those containing the MK-7 form of K2. There is no official recommended daily intake for vitamin K2; a practical guide is about 180 micrograms of K2 for every 5,000 IUs of vitamin D3 you take. Take supplements with meals that include healthy fats to support absorption. Again, if you take warfarin or another blood thinner, check with your doctor first.

Egg Yolks Are a Top Source of Vitamin K2 as MK-4

Of the foods highlighted above, egg yolks are among the highest dietary sources of MK-4, a form of vitamin K2 involved in calcium regulation, bone health and cardiovascular function. Including egg yolks in your diet can contribute meaningfully to your MK-4 intake.

You just need to be careful about your egg sources as most commercial egg sources — even free-range organic — have high PUFA levels as they are fed grains like soy and corn. Ideally, chickens should be fed rice, barley and split peas. I personally eat six egg yolks a day from chickens who are fed this and have 80% less linoleic acid than regular chickens.

Below is a comprehensive overview of egg yolks as a top source of MK-4, along with additional dietary sources and considerations.

Summary Table: Nutrient Comparison in Egg Yolks vs. Other Sources

Nutrient	Egg Yolk Content (per large yolk)	Other Top Sources
MK-4 (Vitamin K2)	~15 mcg	Chicken liver (~13 mcg/100g), Beef liver (~11 mcg/100g), Butter (~15 mcg/100g)
Choline	~147 mg	Beef liver (~418 mg/100g), Soybeans (~116 mg/100g), Salmon (~56 mg/100g)
Vitamin D	~37 IU (0.925 mcg)	Fatty fish (~400-600 IU/100g), Fortified dairy (~100 IU per serving)
Vitamin A	~245 IU	Beef liver (~6,582 IU/100g), Sweet potatoes (~19,218 IU/100g)
Selenium	~15.4 mcg	Brazil nuts (~544 mcg/100g), Tuna (~108 mcg/100g)
Vitamin B12	~0.6 mcg	Clams (~84 mcg/100g), Beef liver (~70 mcg/100g)
Riboflavin (B2)	~0.2 mg	Beef liver (~4.5 mg/100g), Almonds (~1.1 mg/100g)
Folate (B9)	~24 mcg	Beef liver (~145 mcg/100g), Spinach (~194 mcg/100g)
Biotin (B7)	~10 mcg	Liver (~100 mcg/100g), Almonds (~60 mcg/100g)

This article is for informational purposes only and does not constitute medical advice. Consult a qualified health care provider before making changes to your health regimen.

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