

VITAMIN D3 WITH K2 LIQUID



RECOMMENDED USE

- *Helps in the development and maintenance of bones and teeth*
- *Helps in the absorption and use of calcium and phosphorus*
- *Helps to maintain immune function*
- *Helps to prevent vitamin D deficiency*

ESSENTIAL VITAMINS

What is Vitamin K with D3?

A growing body of research shows that when it comes to bone health, ensuring optimal intake of vitamin K is a critical piece of the puzzle. New research is focusing on the synergistic relationship between vitamin K (specifically, vitamin K2) and vitamin D3, especially in terms of bone strength¹. A group of naturally occurring and structurally similar, fat-soluble vitamins, vitamin K is essential for the proper utilization of calcium. Through its activation of the protein osteocalcin, vitamin K helps to bind newly absorbed calcium to the mineral matrix in bone. In addition, vitamin K has been found to help maintain bone mineral density by decreasing the activity of osteoclasts, a cell that breaks down the bone matrix². Thus, vitamin K and vitamin D not only share similar qualities but they also act synergistically with one another within the body.⁵ Ortho Molecular's Vitamin D3 with K2 liquid utilizes a medium chain triglyceride (MCT) delivery system providing 10 mcg of vitamin K2 (as MK-7) and 1000 IU of vitamin D3 per serving. Natural medium chain triglycerides have physical properties that allow them to be readily absorbed without additional emulsifying agents. MCTs are a great way to deliver pure, tasteless and odorless liquid vitamin K2 and D3, which easily combines with any beverage.

Overview

While vitamin D has long been known to assist calcium absorption, it is vitamin K, through its carboxylation of osteocalcin, which guides this calcium to bones and prevents

their absorption into organs, joint spaces and arteries. Vitamin K occurs in 3 main forms: K1 (phyloquinone), derived from foods such as green leafy vegetables, K2 (menaquinone) which originates from bacteria⁶; a third form, K3 (menadione), is a synthetic analogue. Numerous studies have shown that vitamin K2 influences bone building. In addition, though both reach the liver, most of the K1 is used for purposes of coagulation, with little left over to support the body's needs elsewhere.⁸ The profoundly different degrees of bioavailability between K1 and K2 is due to their differences in structure; only 10-20% of vitamin K1 that is absorbed from food even reaches the circulation, while the long side-chain of vitamin K2 allows it to bind with fat particles in circulation and facilitate its arrival at soft tissue, bones and arteries. There are two forms of vitamin K2 commonly used in supplements: MK-4 and MK-7. The MK-7 form has been shown to have 6 times the activity of MK-4 in the blood. MK-7 has also been found to remain in the blood approximately nine times as long as the MK-4 (8 hours versus 72 hours), making it the optimal form of K2 for health.⁹

Vitamin K Depletion

Although most people consume adequate dietary vitamin K to maintain sufficient blood clotting, most do not consume enough to meet bone health needs. Compromised intestinal absorption can also lead to insufficient K2 levels leaving calcium available to be exported out of bone and into other tissues. Other medications such as antibiotics, cholesterol lowering medications, and laxatives have also been found to contribute to a deficiency of vitamin K.¹⁰

Bone Health

Building and maintaining healthy bones requires a number of key nutrients including vitamin K, for the proper binding of calcium to the bone matrix. A 2005 study from northern Finland found that those with greater levels of vitamin K-carboxylated osteocalcin had stronger bones than those with lower levels of the protein. A Japanese study found superior bone health among women who were frequent MK-7-rich Natto eaters than those who were not.¹¹ Another randomized study which split 172 women into a vitamin K2 group, a vitamin D3 group, a vitamin K2 and D3 group, and a placebo group for 2 years found that the combination of vitamin D3 and K2 had the most benefits for supporting bone health among the groups.¹²

Immune Modulation

New evidence also suggests vitamin K plays a central role in balancing immune health. Recent studies have shown that both vitamins D and K impart immune-modulating effects. In the Framingham Offspring Study, one of the longest standing studies on generational health, higher serum levels of vitamins D and K were associated with stronger immune function.^{16,17} In a 2011 study, vitamin K was also found to suppress various markers of the immune system.¹⁸

Recommended Dose

Adults: Take one drop per day. Can be mixed with beverage of your choice.

Medicinal Ingredients (per capsule)

Vitamin D3 (Vitamin D, Cholecalciferol).....	25 mcg
Vitamin K2 (Menaquinone 7).....	10 mcg

Non-Medicinal Ingredients

Medium chain triglycerides.

Risk Information

If you are taking blood thinners, consult a health care practitioner prior to use.

References

1. Schurgers LJ, Spronk HM, Soute BA, Schiffrers PM, DeMey JG, Vermeer C. Blood. Regression of warfarin-induced medial elastocalcinosis by high intake of vitamin K in rats 2007;109(7):2823-31.
2. Weber P. Management of osteoporosis: is there a role for vitamin K? *Int J Vitam Nutr Res* 1997;67(5):350-6.
3. Geleijnse JM, et al. Dietary intake of menaquinone is associated with a reduced risk of coronary heart disease: the Rotterdam Study. *J Nutr* 2004;134(11):3100-5.
4. Beulens JW, High dietary menaquinone intake is associated with reduced coronary calcification. *Atherosclerosis* 2009;203(2):489-93. Epub 2008 Jul 19.
5. Kidd PM. Vitamins D and K as pleiotropic nutrients: clinical importance to the skeletal and cardiovascular systems and preliminary evidence for synergy. *Altern Med Rev* 2010;15(3):199-222.
6. Plaza SM, Lamson DW. Vitamin K2 in bone metabolism and osteoporosis. *Altern Med Rev* 2005;10(1):24-35.
7. Schurgers LJ, Teunissen KJ, Hamulyák K, Knapen MH, Vik H, Vermeer C. Vitamin K-containing dietary supplements: comparison of synthetic vitamin K1 and natto-derived menaquinone. *Blood* 2007;109(8):3279-83. Epub 2006 Dec 7. -7.
8. Shearer MJ. Vitamin K metabolism and nutriture. *Blood Rev* 1992;6(2):92-104.
9. Unpublished clinical studies, NattoPharma. On file
10. <http://umm.edu/health/medical/altmed/supplement-depletion-links/drugs-that-deplete-vitamin-k>
11. Kaneki M, Hodges SJ, Hosoi T, Fujiwara S, Lyons A, Crean SJ, Ishida N, Nakagawa M, Takechi M, Sano Y, Mizuno Y, Hoshino S, Miyao M, Inoue S, Horiki K, Shiraki M, Ouchi Y, Orimo H. Japanese fermented soybean food as the major determinant of the large geographic difference in circulating levels of vitamin K2: possible implications for hip-fracture risk. *Nutrition* 2001; 17(4):315-21.
12. Ushiroyama T, Ikeda A, Ueki M. Effect of continuous combined therapy with vitamin K(2) and vitamin D(3) on bone mineral density and coagulofibrinolysis function in postmenopausal women. *Maturitas* 2002; 41(3):211-21.
13. Geleijnse JM, Vermeer C, Grobbee DE, Schurgers LJ, Knapen MH, van der Meer IM, Hofman A, Witteman JC. Dietary intake of menaquinone is associated with a reduced risk of coronary heart disease: the Rotterdam Study. *J Nutr* 2004; 134(11):3100-5.
14. Beulens JW, van der A DL, Grobbee DE, Sluijs I, Spijkerman AM, van der Schouw YT. Dietary phylloquinone and menaquinones intakes and risk of type 2 diabetes. *Diabetes Care* 2010; 33(8):1699-705.
15. Choi HJ, Yu J, Choi H, An JH, Kim SW, Park KS, Jang HC, Kim SY, Shin CS. Vitamin K2 supplementation improves insulin sensitivity via osteocalcin metabolism: a placebo-controlled trial. *Diabetes Care* 2011; 34(9):e147.
16. Shea MK, Booth SL, Massaro JM, Jacques PF, D'Agostino RB Sr, Dawson-Hughes B, Ordovas JM, O'Donnell CJ, Kathiresan S, Keaney JF Jr, Vasan RS, Benjamin EJ. Vitamin K and vitamin D status: associations with inflammatory markers in the Framingham Offspring Study. *Am J Epidemiol* 2008; 167(3):313-20.

17. Iijima H, Shinzaki S, Takehara T. The importance of vitamins D and K for the bone health and immune function in inflammatory bowel disease. *Curr Opin Clin Nutr Metab Care* 2012; 15(6):635-40.
18. Checker R, Sharma D, Sandur SK, Khan NM, Patwardhan RS, Kohli V, Sainis KB. Vitamin K3 suppressed inflammatory and immune responses in a redox-dependent manner. *Free Radic Res* 2011; 45(8):975-85. Epub 2011 Jun 9.