K2 Liquid

K2 as Bioactive MK-7

Available in 1 fluid ounce (30 mL)

Clinical Applications

- Supports Vitamin K Repletion When Deficient*
- Promotes Bone Mineralization*
- Inhibits Vascular Calcification*

K2 Liquid *provides vitamin K2 as menaquinone-7 (MK-7), the bioactive form of K2 obtained through fermentation of* Bacillus subtilis *natto cultures. The highly bioavailable MK-7 supports vitamin K repletion when deficient and plays a role in inhibiting vascular calcification and promoting bone mineralization.**

Discussion

Vitamin K is a fat-soluble vitamin; however, the body has limited vitamin K storage capacity compared to other lipophilic vitamins. Vitamin K is rapidly depleted without regular dietary intake, but a small reserve is recycled through a complex oxidation-reduction cycle. The primary function of vitamin K is as a cofactor in the production of blood coagulation factors in the liver, but it also has a rather complicated physiological role in carboxylation of the proteins involved in bone mineralization and in inhibition of arterial calcification.*[1,2]

Naturally occurring vitamin K is found as either K1 (phylloquinone), which is derived from food sources such as green leafy vegetables, or K2 (menaquinones). Absorption of K1 from food can be limited due to its membrane-bound nature and an individual's digestive and absorptive variability. Menaquinones are designated as menaquinone-*n* or MK-*n*, where *n* denotes the length of the molecule's aliphatic side chain. Menaquinones are synthesized by bacteria and can be obtained from animal-based and fermented foods, most notably cheese and natto (fermented soybeans), dietary options that can make consuming adequate amounts of K2 from food a challenge. These factors may render dietary supplementation an important alternative.*[3-5]

Supplemental vitamin K can be found in three forms: synthetic K1; menaquinone-4 (MK-4), which is structurally similar to K1; and natural, long-chain menaquinone-7 (MK-7), which provides the highest vitamin K activity.[3] On dietary supplement labels, the percent of Daily Value (%DV) is based on an adequate intake level of 120 mcg for males and 90 mcg for females; however, only vitamin K1 is allowed for inclusion in the %DV.*

Structural variations between K1 and K2 impact their bioavailability and bioactivity. Menaquinone-7, with its longer side chain, is very hydrophobic. When compared to K1, the physiochemical properties of MK-7 make it highly transportable by plasma lipoproteins, increase its extrahepatic (bones, arteries, etc.) availability, and result in its long half-life.[2,4,6] Results from a series of studies comparing the in vivo properties of orally administered K1 and MK-7 demonstrated better bioavailability and utilization of MK-7. It should also be noted that MK-7 was found to be a more potent antidote for oral anticoagulation than K1. Based on calculations using an artificial model, the data obtained was used to determine that more than 50 mcg may interfere with anticoagulant treatment. However, given that this study did not include intakes below 100 mcg, additional research with varying dosages is warranted to confirm the impact of low-dose MK-7 on anticoagulant therapy.*[2]

Bone Mineralization

Among the dietary factors critical to bone health, vitamin K has emerged as a key nutrient believed to be necessary for bone mineralization. Through carboxylation, vitamin K activates osteocalcin, the protein needed to bind calcium to the mineral matrix in bone. Several studies have demonstrated the efficacy of MK-7 to increase osteocalcin carboxylation and to increase the carboxylated-to-uncarboxylated osteocalcin (cOC:ucOC) ratio. A high cOC:ucOC ratio is associated with bone health.*[2,4,6,7]

Results from phase 1 of a dose-finding, randomized, double-blind, placebo-controlled trial (N = 60) found 100 mcg of MK-7 to be an effective, minimum dose for improving osteocalcin carboxylation. When phase 2 (N = 120) used placebo or the 100 mcg MK-7 dose for 12-weeks with a controlled diet, the test group results demonstrated a significant increase in the cOC:ucOC ratio compared to placebo, confirming the improvement of bone health indices.*[4]

In a randomized, double-blind, placebo-controlled trial in healthy postmenopausal women (N = 244), the test group subjects received 180 mcg of MK-7 daily for three years. Supplementation of MK-7 significantly improved vitamin K status, and a decrease was seen in measurements of age-related bone loss.[7] Another trial investigated the effect on bone mineral density of post-menopausal women (N = 148) of 375 mcg of MK-7 administered with calcium and vitamin D over a 12-month period. The results of this randomized, double-blind, placebo-controlled trial suggested that MK-7 preserves trabecular bone structure.*[8]

Arterial Health/Cardiovascular Support

Vitamin K also has a role in the inhibition of vascular calcification, a mechanism similar to that of bone mineralization. Vitamin K benefits cardiovascular health by participating in the carboxylation of matrix GLA protein (MGP), a protein regarded to be the most potent inhibitor of arterial calcification.[3] It has been suggested that vitamin K plays a role in reducing arterial calcium deposits and that intake of long-chain menaquinones is inversely correlated with calcium accumulation in arteries.[6,9] Reviews of the research evaluating the relationship between vitamin K2 intake and cardiovascular health have suggested a reduction in the mortality rate related to arterial calcification when intake of K2 is present.[3,10] Additional randomized controlled trials are needed to further establish the role of long-term vitamin K supplementation for support of cardiovascular health.*[11]

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K2 Liquid offers 90 mcg of vitamin K2 (as MK-7) per ½ dropper serving. This formula is ideal for individuals seeking supplemental vitamin K in a highly bioavailable, easy-to-use, liquid form.*

K2 Liquid Supplement Facts

Serving Size: 0.5 mL (about ½ dropper)

	Amount Per Serving	%Daily Value
Vitamin K2 (as menaquinone-7)	90 mcg	**

** Daily Value not established.

Other Ingredients: Organic high oleic sunflower oil.

DIRECTIONS: Consume 0.5 mL (about ½ dropper) one to two times daily, or as directed by your healthcare professional.

Consult your healthcare professional before use. Individuals taking blood thinners or other medication should discuss potential interactions with their healthcare professional. Do not use if tamper seal is damaged.

STORAGE: Keep closed in a cool, dry place out of reach of children and away from light.

FORMULATED TO EXCLUDE: Wheat, gluten, yeast, corn, soy protein, animal and dairy products, fish, shellfish, peanuts, tree nuts, egg, sesame, ingredients derived from genetically modified organisms (GMOs), artificial colors, artificial sweeteners, and artificial preservatives.

References

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Additional references available upon request

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