

Bio-K Forte Caps[®]

Two forms of vitamin K are naturally occurring; vitamin K₁, known as phylloquinone and vitamin K₂, referred to as menaquinone. K₁ and K₂ differ in their structural arrangement, with K₁ compounds possessing a saturated side chain, while the K₂ family of compounds has an unsaturated side chain.⁽¹⁾ In addition to their structural differences, they also target different tissues.⁽²⁾

The K₁ family of compounds (phyloquinones), synthesized in green leafy vegetables and in plant leaves,⁽³⁾ is the primary dietary source of vitamin K, estimated to contribute about 40-50% of the total dietary intake. Alternative sources of phyloquinones include meals prepared with phyloquinone-rich oils such as soybean, cottonseed, canola and olive oils, estimated to contribute ~15% of the dietary phyloquinone intake.⁽⁴⁾ In relation to health, the phyloquinones are typically associated with bone mineralization. Suboptimal levels are correlated to an increase in both osteoporotic fracture rates and osteoporosis. The former has been correlated with a more "Westernized" lifestyle, which is typically high in protein. Consequently, as a result of a high protein diet, an increase in the net renal acid excretion has been observed, which in turn increases the excretion of urinary calcium.⁽⁵⁾ Even in healthy individuals it has been observed that there is a substantial fraction of undercarboxylated or incompletely carboxylated species of osteocalcin and matrix Gla protein (MGP) in circulation, indicating a quantifiable deficiency in vitamin K.⁽⁷⁾ In a study by Rejnmark L., et al., it was noted there was no effect on the bone mineral density (BMD) of the femoral neck or lumbar spine, with a vitamin K intake of 60 mcg/day. A separate study, utilizing a high phyloquinone intake, demonstrated a greater reduction in the percent of underconverted osteocalcin (P<0.05) with high dose supplementation (1000-2000 ug/day phyloquinone, compared to 500µg/day), implicating that a high intake was needed for the conversion of osteocalcin. This in turn may indicate the likelihood that the current daily reference intake (DRI) is too low to support the carboxylation of osteocalcin.⁽⁶⁾ Added to

the likelihood of a low dietary intake is the fact that phyloquinone is extensively catabolized in the liver. Subsequently, it has both a quick turnover rate, and a rapid depletion rate. This fact combined with the extensive loss due to excretion, suggests that a continual daily supply is appropriate to support bone maintenance.

Menaquinones, collectively referred to as vitamin K₂, are structurally defined by their content of isoprene units. Those of dietary relevance have from four (MK-4) through ten (MK-10) isoprenoid residues.⁽⁷⁾ Unlike phyloquinones, menaquinones are present in both human and animal tissues, and are largely synthesized by the gut microflora. Overall they contribute only a very small portion to the daily vitamin K supply, except in cultures consuming large amounts of fermented soybean products, which contains significant amounts of MK-6 and MK-8.^(8,9)

Vitamin K₂ is associated with beneficial cardiovascular attributes, and is believed to suppress arterial calcification via γ -carboxylation of matrix glutamic acid residues.⁽¹⁰⁾ Vascular calcification is considered a major complication in cardiovascular disease, as well as an independent risk factor for both myocardial infarction and ultimately death.⁽¹¹⁾ Experimental inactivation of MGP by treatment with a vitamin K antagonist has been demonstrated to result in rapid arterial calcification.⁽¹²⁾ However, this attribute is negated with high doses of vitamin K, as demonstrated by its ability to result in the regression of arterial calcification. The forms commonly utilized in nutritional supplements are the MK-4 and MK-7. Although both are effective, MK-4 has a very short half-life, about one hour, whereas the half-life of MK-7 is much longer, typically about three days.



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As a cofactor in the γ -glutamyl carboxylation pathway, the vitamin K dependent (VKD) proteins play a physiologically diverse role in cellular proliferation. These proteins also play a very important role in the activation of the coagulation cascade, and in the maintenance of both the flow and the structural integrity of vascular tissues.^(13,14,15,16) The VKD proteins, although traditionally associated with blood coagulation, are currently known to be present in virtually every tissue, and evidence indicates that they play a significant role in bone mineralization and metabolism, including bone development and maintenance, apoptosis, phagocytosis, growth control, chemotaxis, signal transduction and arterial calcification.⁽¹⁷⁾ In addition to their role in arterial calcification they have also been correlated to cardiovascular health, by virtue of their association with the coagulation cascade, particularly the recently described halotype vitamin K epoxide reductase complex subunit 1 (VKORC1).⁽¹⁸⁾

Currently the daily reference intake (DRI) for vitamin K is 90 mcg/day for adult females, and 120 mcg/day for adult males. However, as indicated above, this value may be too low to meet daily physiological needs. Vitamin K2 intakes of 45 mcg/day have been recommended by clinical nutritionists. Since approximately 60-70% of the daily dietary intake is lost via excretion, the need for a continuous dietary supply in an effort to maintain adequate tissue reserves is pertinent.⁽¹⁹⁾

References

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Bio-K Forte Caps® is available in 60-count bottles (#1017).

Supplement Facts

Serving Size: 1 Capsule

	Amount Per Serving	% Daily Value
Vitamin K (as menaquinone-7, phytonadione)	550 mcg	458%
Superoxide Dismutase (from vegetable culture†)	60 mcg	*
Catalase (from vegetable culture†)	60 mcg	*

* Daily Value not established

Other ingredients: Capsule shell (gelatin and water) and magnesium stearate (vegetable source).

† Specially grown, biologically active vegetable culture containing naturally associated phytochemicals including polyphenolic compounds with SOD and catalase, dehydrated at low temperature to preserve associated enzyme factors.

Each capsule supplies Vitamin K as menaquinone-7 and phytonadione in a 1:10 ratio.

This product is gluten, dairy and GMO free.

RECOMMENDATION: One (1) capsule each day as a dietary supplement or as otherwise directed by a healthcare professional.

CAUTION: Those taking blood thinners should avoid supplementation with Vitamin K unless specifically recommended and monitored by their physician. Pregnant and nursing mothers should avoid supplemental intakes higher than the RDI (90 mcg) unless specifically recommended and monitored by their physician.

KEEP OUT OF REACH OF CHILDREN

Store in a cool, dry area.

Sealed with an imprinted safety seal for your protection.

Product # 1017 Rev. 05/18

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