

# Vitamin K

## Physiological Functions

Vitamin K is a fat-soluble vitamin which was first identified as an essential factor for blood clotting. The alphabetical designation of this vitamin is derived from the Danish word, *koagulation* (coagulation). The primary role of vitamin K coenzyme is to catalyze the post-translational  $\gamma$ -carboxylation of glutamic acid residues within calcium-dependent proteins. The addition of a second carboxyl group on the  $\gamma$  carbon creates a region with two negative charges in close proximity where calcium is readily complexed. Carboxylated proteins include prothrombin and several other blood clotting factors which are collectively required for fibrin synthesis. Osteocalcin which is localized in the bone matrix is the most abundant protein in the body and may have a role in the calcification of bone.

## Factors Affecting Availability

Vitamin K requirements are partially met by microbial synthesis of the vitamin in the gastrointestinal tract. However, the amount of vitamin K produced is not sufficient to completely meet needs. Long-term antibiotic therapy, chronic diarrhea or impaired gall bladder function may increase risk of K deficiency.

Vitamin K acts synergistically with other fat-soluble such as with vitamins A and D in bone remodeling. Vitamin E has a sparing effect on vitamin K by regeneration of the reduced form.

## Deficiency

The classic sign of a vitamin K deficiency is a prolonged prothrombin time which increases risk of spontaneous hemorrhage. Since vitamin K is stored in the liver, clinical deficiencies are rare. Conditions associated with vitamin K deficiency include fat malabsorption, liver disease (as with other fat-soluble vitamins), and chronic antibiotic therapy. Excess vitamin E can inhibit vitamin K activity and precipitate signs of deficiency.

## Toxicity

Excessive intake of vitamin K rarely occurs. Excess doses (>1000 times the requirement) can promote thrombogenesis and hemolysis. These doses of vitamin K can also increase risk of jaundice.

- ❖ *The upper limit of safety for vitamin K has not been determined due to lack of data substantiating adverse effects at high intakes. The Food and Nutrition Board of the Institute of Medicine recommends that vitamin K should be consumed only from food sources to prevent intake of potentially toxic levels.*

## Requirements

The Daily Reference Intakes (DRI) for vitamin K are shown in the table below.

<b>Vitamin K Requirements</b> Daily Reference Intakes	
Life Stage	Vitamin K (µg)
<b>Infants</b>	
0-6 mo	2.0
7-12 mo	2.5
<b>Children</b>	
1-3 y	30
4-8 y	55
<b>Males</b>	
9-13 y	60
14-18 y	75
19-30 y	120
31-50 y	120
51-70 y	120
70 y	120
<b>Females</b>	
9-13 y	60
14-18 y	75
19-30 y	90
31-50 y	90
51-70 y	90
70	90
<b>Pregnancy</b>	
18 y	75
19-30 y	90
31-50 y	90
<b>Lactation</b>	
18 y	75
19-30 y	90
31-50 y	90

## Dietary Sources

Vitamin K is consumed primarily from green leafy vegetables and some fruits. It may also be found in dairy products, meats and eggs. See table for dietary sources.

<b>Vitamin K Rich Foods</b>	
<b>FOOD</b>	<b>Vitamin K (mcg)</b>
Brussel sprouts, _ cup cooked	460
Broccoli, _ cup cooked	248
Cauliflower, _ cup cooked	150
Swiss chard, _ cup cooked	123
Spinach, raw, 1 cup	120
Beef, 3.5 oz	104
Pork, 3.5 oz	88
Eggs, whole, 1 lg	25

Strawberries, 1 cup fresh, sliced	23
Oats, 1oz, dry	18
Milk, cow's, 8 oz, whole	10