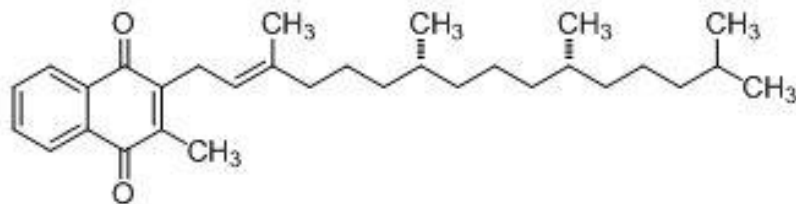
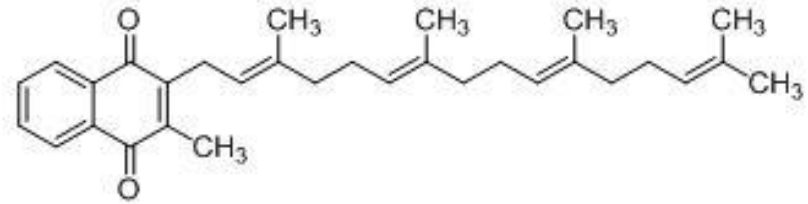


# Vitamin K

- A fat-soluble vitamin
- Common chemical structure; 2-methyl-1,4-naphthoquinone
  - Vitamin K<sub>1</sub>..... Phylloquinone
  - Vitamin K<sub>2</sub>..... Menaquinones (MK<sub>4</sub> - MK<sub>13</sub>, according to the length of their unsaturated isoprenyl side chains)



Vitamin K<sub>1</sub> (phylloquinone)



Vitamin K<sub>2</sub> (menaquinone)

# Vitamin K

- Cooking and freezing processes cause disruption of vitamin K.
- In dietary supplements, different forms of vitamin K may be used, such as vitamin K<sub>1</sub> as phylloquinone or phytonadione (a synthetic form of vitamin K<sub>1</sub>) and vitamin K<sub>2</sub> as MK-4 or MK-7.
- Menadione (vitamin K<sub>3</sub>), which is another synthetic form of vitamin K, is not used in dietary supplements due to the scientific study results showing the hepatotoxicity of this form.

# Vitamin K

- Responsible for blood clotting, healing cuts and wounds
- It is important to give to newborn babies and surgical patients to prevent excessive bleeding.
- Green tea leaves and extracts are rich in vitamin K<sub>1</sub>. However, the amount in infusion is small because a small amount of green tea leaves is used for one cup of tea.

# Main Sources

- Phylloquinone:
  - green leafy vegetables
  - olive oil, canola oil, cotton oil, soybean oil
- Menaquinones:
  - bacteria origin
  - animal-based and fermented foods (egg yolk, butter, cow liver, some cheeses, fermented soy products)
  - produced by bacteria in the human gut

# Function of Vitamin K

- Hemostasis (blood clotting);
- Coenzyme for enzymes required for the synthesis of proteins involved in hemostasis (e.i. Prothrombin)
- The liver synthesizes four proteins using vitamin K (Factors II, VII, IX, X) and these factors are essential for blood clotting.

# Function of Vitamin K

- Bone metabolism;
- The role of vitamin K effect on bone metabolism has not been clarified yet.
- Essential for the production of some proteins which are involved in bone metabolism
- Functions in calcium metabolism

# Use of Vitamin K

- Before/after operations
- After birth
  - To eliminate the risk of vitamin K deficiency bleeding in newborns
- Against osteoporosis
  - Consumption of calcium and vitamin D, during childhood, adolescence and early adulthood, is important to maximize bone mass and reduce the risk of osteoporosis.

# Use of Vitamin K

- Antiatherosclerotic
  - The role of vitamin K on arterial calcification is yet unclear.
  - Matrix Gla-protein is a vitamin K-dependent protein that may play a role in the prevention of vascular calcification.



# Use of Vitamin K

- To counteract the overdose of warfarin and derivatives.
- In case of coumarin poisoning.
- Anticancer (not enough scientific proof)
- Use at the dose of 100 mg/day reduces excessive menstrual bleeding. However, prescription is required in case of the use above daily doses, it should be used under the supervision of a doctor.

# Recommended Intake

Age	Male	Female	Pregnancy	Lactation
0-6 months	2 µg	2 µg		
7-12 months	2.5 µg	2.5 µg		
1-3 years	30 µg	30 µg		
4-8 years	55 µg	55 µg		
9-13 years	60 µg	60 µg		
14-18 years	75 µg	75 µg	75 µg	75 µg
19+ years	120 µg	90 µg	90 µg	90 µg

# Deficiency

- Rare in adults
- Newborns are in risk group due to poor vitamin K transport via placenta and low vitamin K content of breastmilk.
- People with malabsorption disorders or the patients taking drugs which effect vitamin K metabolism may suffer from vitamin K deficiency.

# Deficiency Symptoms

- Bleeding and hemorrhage (nose, gastrointestinal tract, through body cavities etc.)
- Reduction of bone mineralization and osteoporosis




# Cautions

- In case of long term antibiotic or chemotherapeutic use, need for vitamin K may increase due to the damaged intestinal flora.
- Vitamin K intake at high doses increases hemorrhage risk.
- People who use blood thinners such as warfarin should not use vitamin K.



# Toxicity

- Although it is a fat soluble vitamin, it does not accumulate in the body and does not cause toxic effects.
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# Interactions

- Broad spectrum antibiotics may reduce vitamin K production.
- Bile acid sequestrants such as colestyramine and colestypol, orlistat, which is a drug used for the treatment of obesity, reduce the absorption of vitamin K.
- Salicylates may cause vitamin K deficiency.
- Vitamin K antagonizes the activity of warfarin.
- High doses of vitamin A and vitamin E may cause vitamin K deficiency.