Vitamin K

By: Kirstie Ducharme-Smith

Adequate Intake

Life Stage Group	Vitamin K (μg/d)
Infants	
0 to 6 mo	2.0*
6 to 12 mo	2.5*
Children	
1–3 y	30*
4–8 y	55*
Males	
9–13 y	60*
14–18 y	75*
19–30 y	120*
31–50 y	120*
51–70 y	120*
> 70 y	120*
Females	
9–13 y	60*
14–18 y	75*
19–30 y	90*
31–50 y	90*
51–70 y	90*
> 70 y	90*
Pregnancy	
14–18 y	75*
19–30 y	90*
31–50 y	90*
Lactation	
14–18 y	75*
19–30 y	90*
31–50 y	90*

USDA, 2001

Sources

Plants →

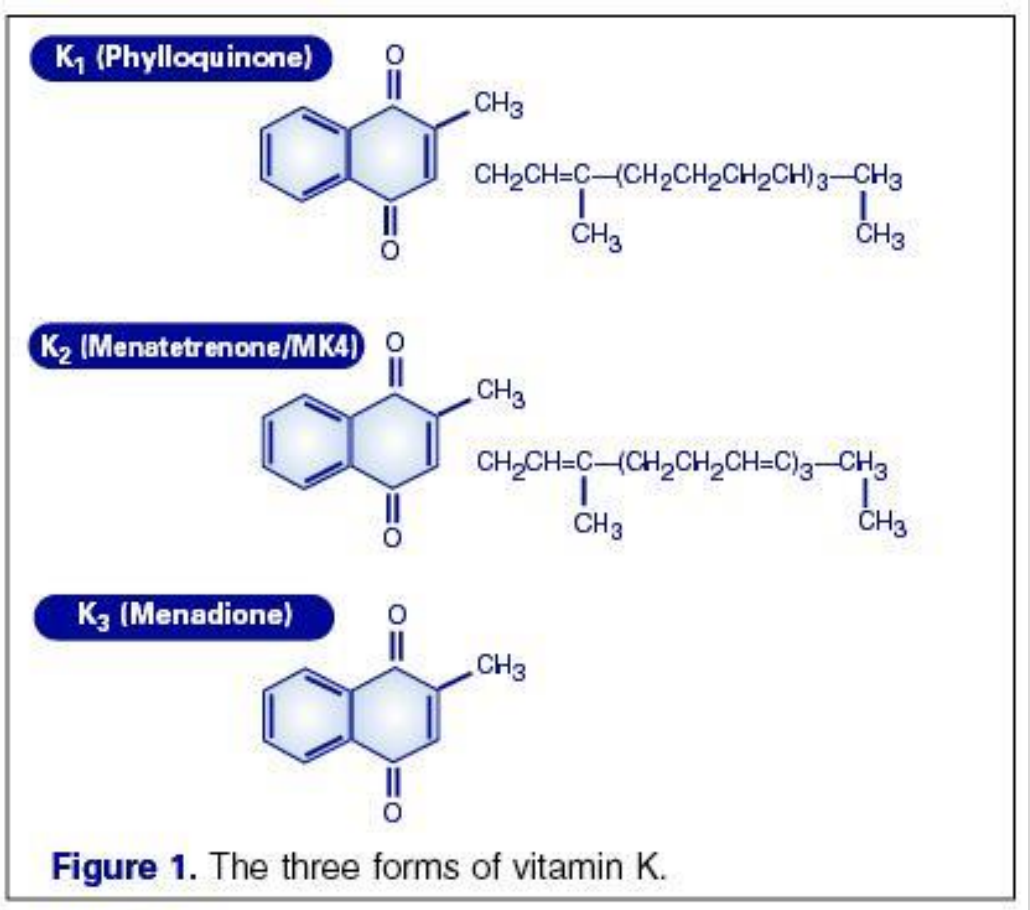


Figure 1. The three forms of vitamin K.

Oregon State University, 2004

Sources

Food	Serving	Vitamin K (mcg)
Olive oil	1 Tablespoon	8.1
Soybean oil	1 Tablespoon	25.0
Canola oil	1 Tablespoon	16.6
Mayonnaise	1 Tablespoon	3.7
Broccoli, cooked	1 cup (chopped)	220
Kale, raw	1 cup (chopped)	547
Spinach, raw	1 cup	145
Leaf lettuce (green), raw	1 cup (shredded)	62.5
Swiss chard, raw	1 cup	299
Watercress, raw	1 cup (chopped)	85
Parsley, raw	1/4 cup	246

Oregon State University, 2004

Sources

Animals →

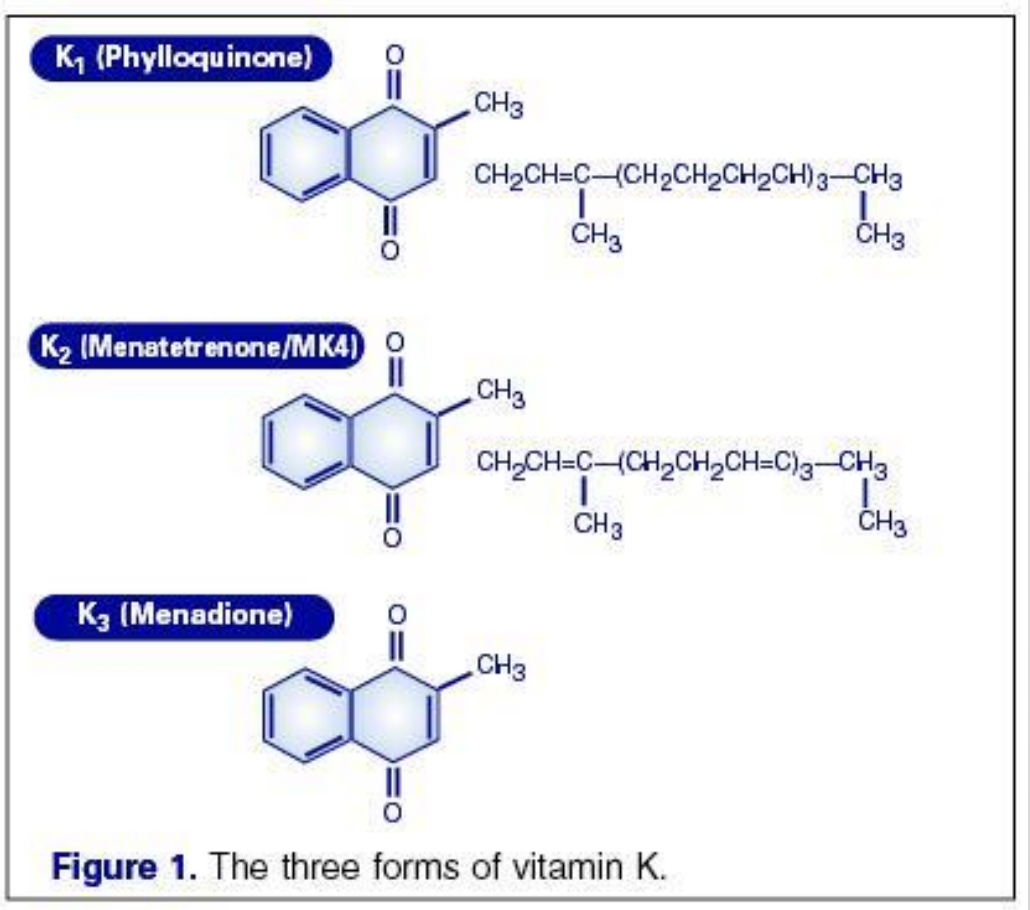


Figure 1. The three forms of vitamin K.

Oregon State University, 2004

Sources

FOOD	VITAMIN K2 (micrograms per 100 grams)
Natto	1,103.4
Goose Liver Paste	369.0
Hard Cheeses	76.3
Soft Cheeses	56.5
Egg Yolk (Netherlands)	32.1
Goose Leg	31.0
Curd Cheeses	24.8
Egg Yolk (United States)	15.5
Butter	15.0
Chicken Liver	14.1
Salami	9.0
Chicken Breast	8.9
Chicken Leg	8.5
Ground Beef (Medium Fat)	8.1
Bacon	5.6
Calf Liver	5.0
Sauerkraut	4.8
Whole Milk	1.0
2% Milk	0.5
Salmon	0.5
Mackerel	0.4
Egg White	0.4
Skim Milk	0.0
Fat-Free Meats	0.0

Oregon State University, 2004

Sources

Supplements →

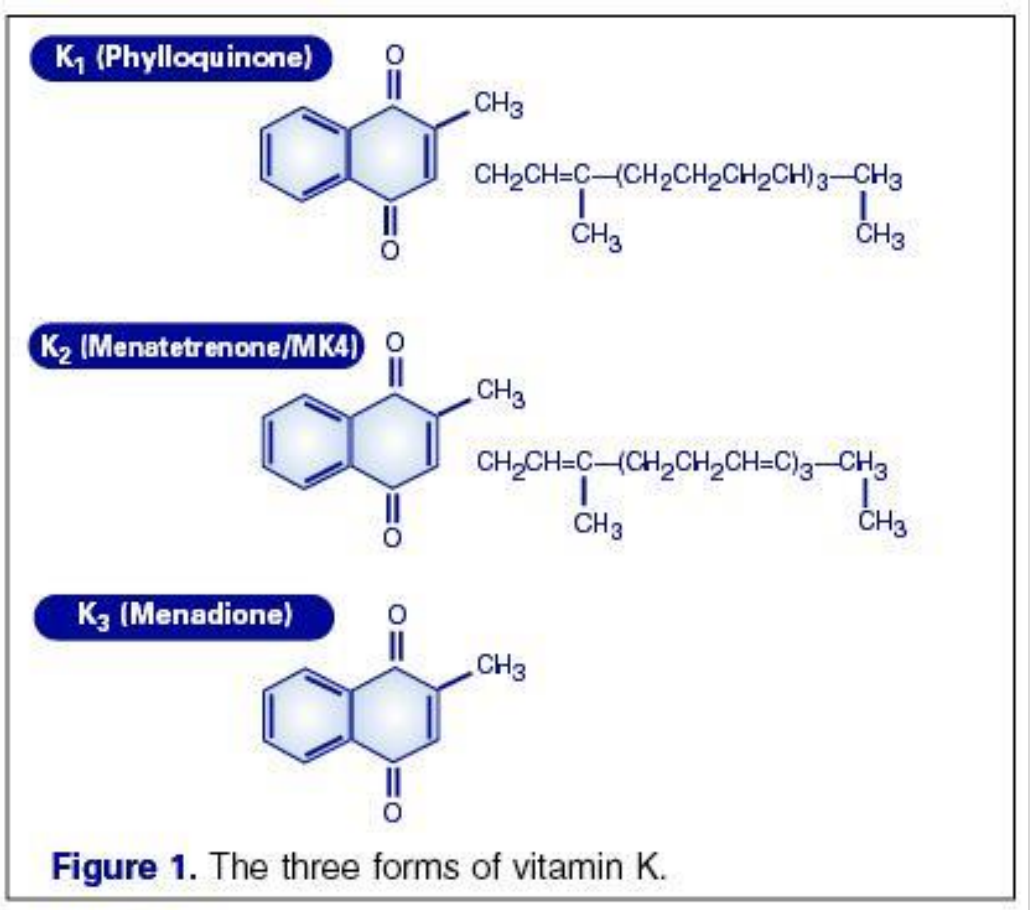


Figure 1. The three forms of vitamin K.

Oregon State University, 2004

Supplements

Centrum →

Supplement Facts

Servings Size: 1 Tablet
Servings per Container: 90

	Amount per Serving	%Daily Value
Vitamin A (as Vitamin A Acetate and 29% as Beta-Carotene)	3,500 IU	70%
Vitamin C (as Ascorbic Acid)	60 mg	100%
Vitamin D (as D3 Cholecalciferol)	400 IU	100%
Vitamin E (as dl-Alpha Tocopheryl Acetate)	30 IU	100%
Vitamin K (as Phytonadione)	25 mcg	31%
Thiamin (Vitamin B-1) (as Thiamin Mononitrate)	1.5 mg	100%
Riboflavin (Vitamin B-2)	1.7 mg	100%
Niacin (as Niacinamide)	20 mg	100%
Vitamin B-6 (as Pyridoxine Hydrochloride)	2 mg	100%
Folic Acid	400 mcg	100%
Vitamin B-12 (as Cyanocobalamin)	6 mcg	100%
Biotin (as d-Biotin)	30 mcg	10%
Pantothenic Acid (as d-Calcium Pantothenate)	10 mg	100%
Calcium (as Calcium Carbonate and Dicalcium Phosphate)	200 mg	20%
Iron (as Ferrous Fumarate)	18 mg	100%
Phosphorus (as Dicalcium Phosphate)	20 mg	2%
Iodine (as Potassium Iodide)	150 mcg	100%
Magnesium (as Magnesium Oxide)	50 mg	13%
Zinc (as Zinc Oxide)	11 mg	73%
Selenium (as Sodium Selenate)	55 mcg	79%
Copper (as Cupric Sulfate)	0.5 mg	25%
Manganese (as Manganese Sulfate)	2.3 mg	115%
Chromium (as Chromium Picolinate)	35 mcg	29%
Molybdenum (as Sodium Molybdate)	45 mcg	60%
Chloride (as Potassium Chloride)	72 mg	2%
Potassium (as Potassium Chloride)	80 mg	2%
Boron (as Boric Acid)	75 mcg	*
Nickel (as Nickelous Sulfate)	5 mcg	*
Silicon (as Silicon Dioxide)	2mg	*
Tin (as Stannous Chloride)	10 mcg	*
Vanadium (as Sodium Metavanadate)	10 mcg	*

*Daily Value Not Established

Pfizer, 2013

Deficiency

- Uncommon
  - Food
  - Vitamin K cycle
  - Gut flora

Toxicity

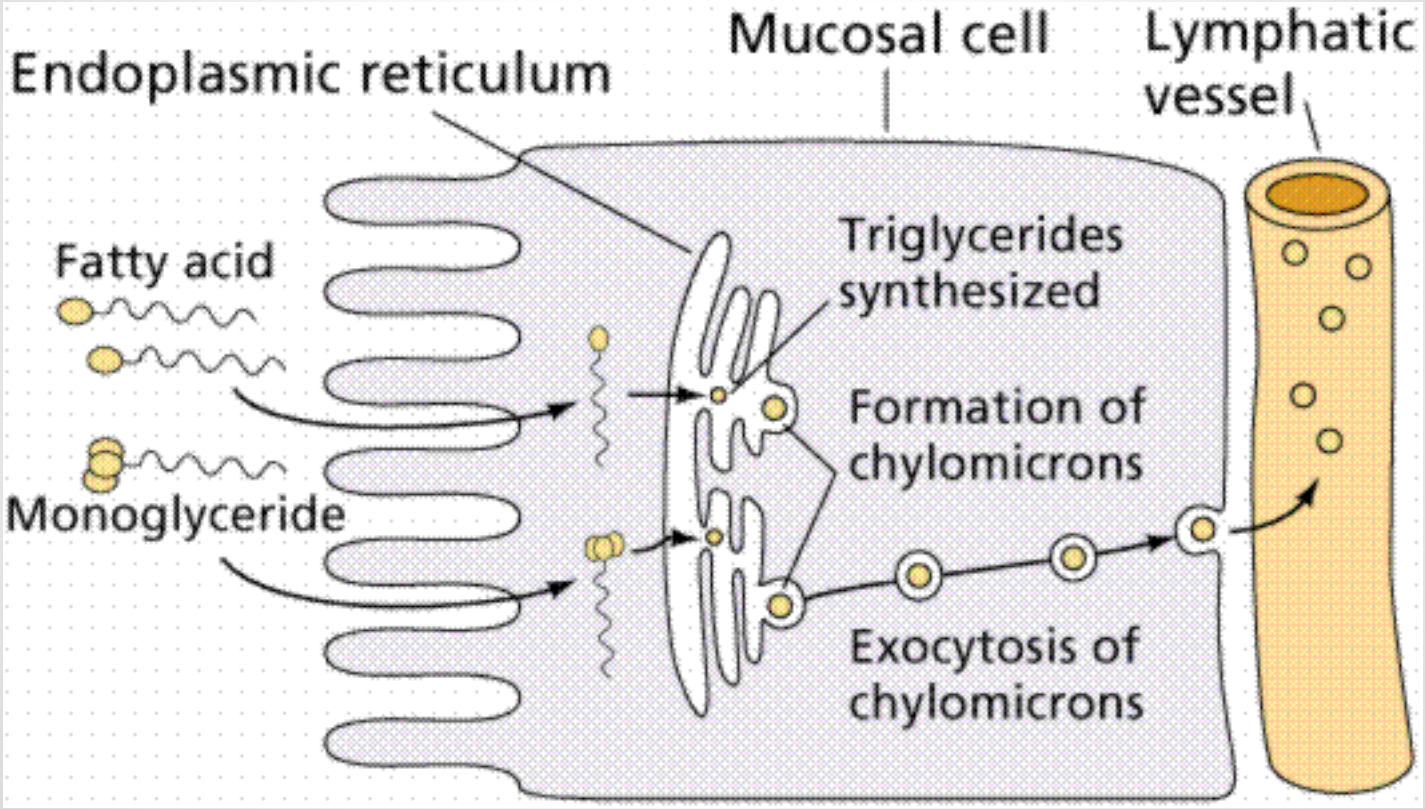
- Phylloquinone (K1)/Menaquinone (K2)

- Menadione (K3)

Claims

- Take vitamin K supplements on an empty stomach in order to promote absorption

Absorption

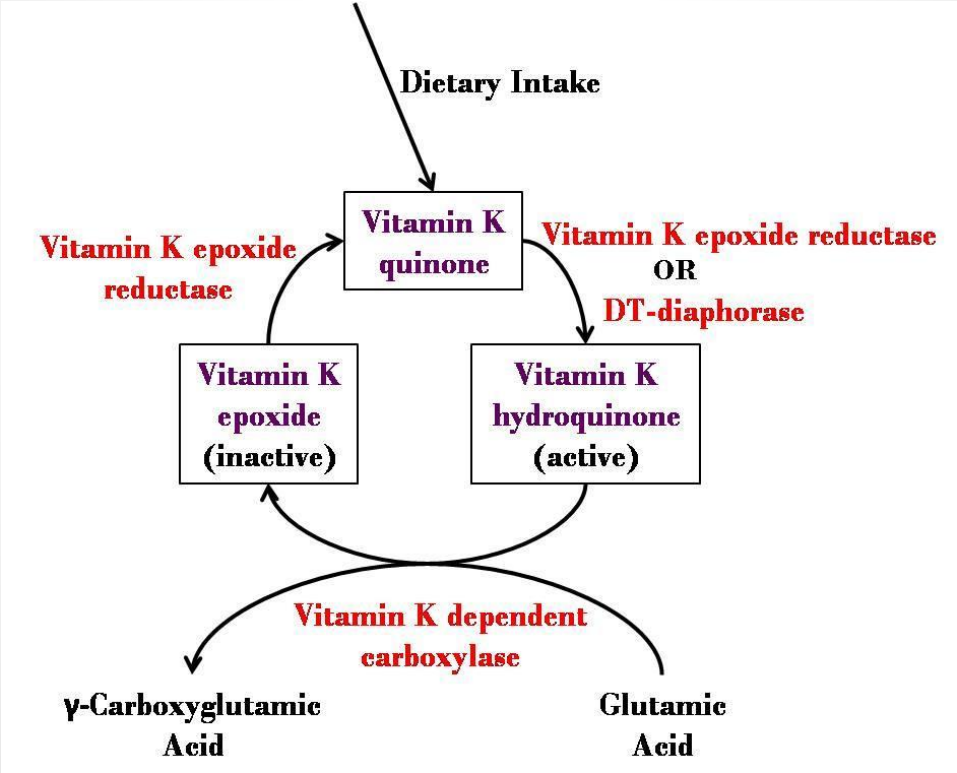


Farabee, 2001

Claims

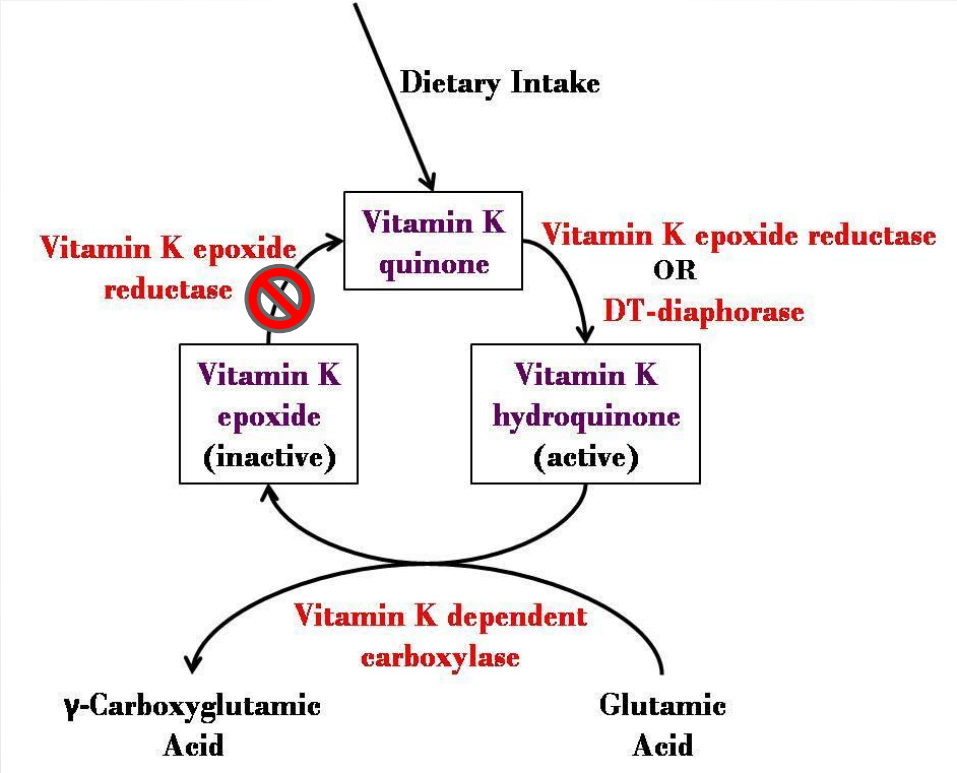
- Take vitamin K supplements on an empty stomach in order to promote absorption
- You should avoid vitamin K rich food sources while taking an anticoagulant

Coagulation



Furie, 1999

Coagulation



Furie, 1999

Claims

- Take vitamin K supplements on an empty stomach in order to promote absorption
- You should avoid vitamin K rich food sources while taking an anticoagulant
- Infants must be given vitamin K injections until they begin consuming whole foods

Vitamin K and Infants

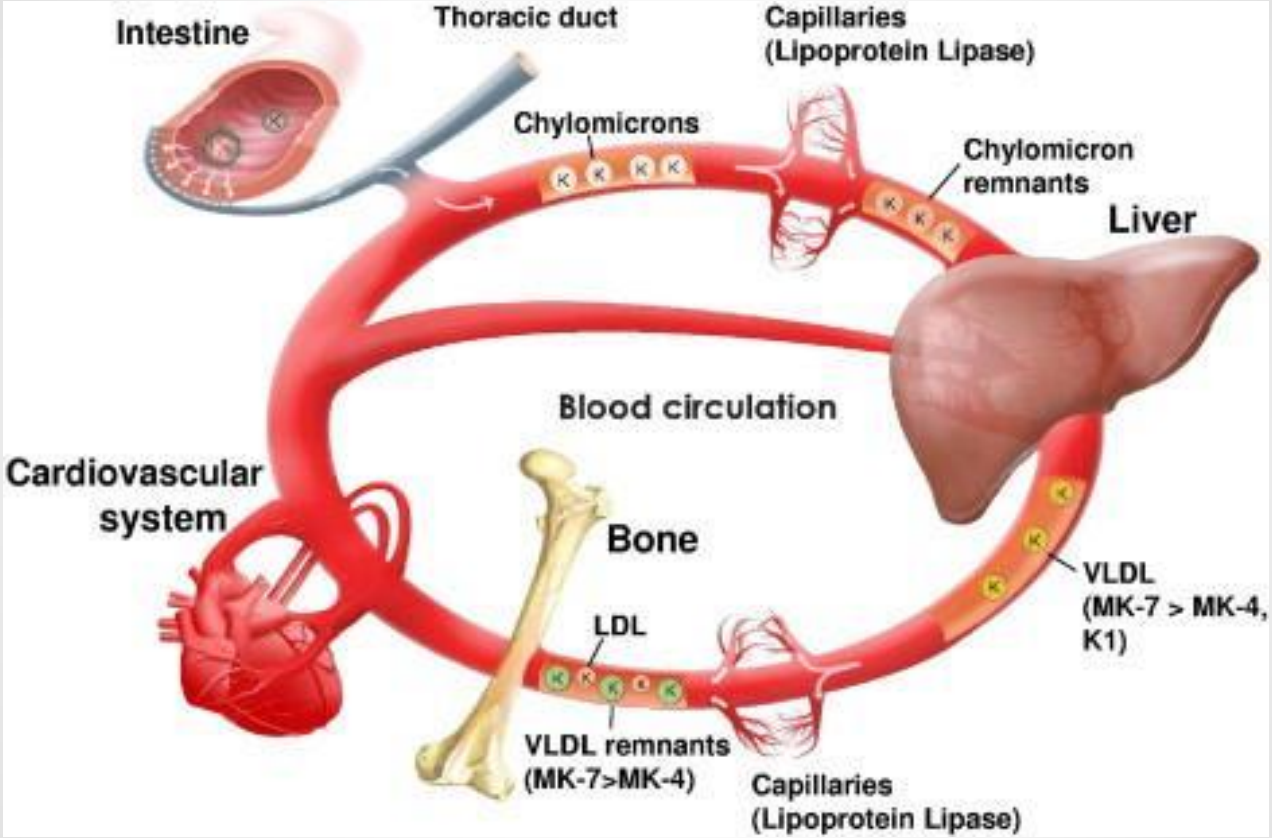
Nutrient (Unit)	Minimum Level Recommended[1]	Mature Human Milk	Typical Commercial Formula	Cow's Milk (Mean)
Protein (g)	1.8 (See note 2.)	1.3–1.6	2.3	5.1
Fat (g)	3.3 (See note 3.)	5	5.3	5.7
Carbohydrate (g)	. . .	10.3	10.8	7.3
Linoleic acid (mg)	300	560	2300	125
Vitamin A (IU)	250	250	300	216
Vitamin D (IU)	40	3	63	3
Vitamin E (IU)	0.3 FT 0.7 LBW 1 g linoleic	0.3	2	0.1
Vitamin K (μg)	4	2	9	5
Vitamin C (mg)	8	7.8	8.1	2.3
Thiamine (μg)	40	25	80	59
Riboflavin (μg)	60	60	100	252
Niacin (μg)	250	250	1200	131
Vitamin B_6 (μg)	15 μg/g protein	15	63	66
Folic acid (μg)	4	4	10	8
Pantothenic acid (μg)	300	300	450	489
Vitamin B_{12} (μg)	0.15	0.15	0.25	0.56
Biotin (μg)	1.5	1	2.5	3.1
Inositol (mg)	4	20	5.5	20
Choline (mg)	7	13	10	23
Calcium (mg)	5	50	75	186
Phosphorus (mg)	25	25	65	145
Magnesium (mg)	6	6	8	20
Iron (mg)	1	0.1	1.5 in fortified	0.08
Iodine (μg)	5	4–9	10	7
Copper (μg)	60	25–60	80	20
Zinc (mg)	0.5	0.1–0.5	0.65	0.6
Manganese (μg)	5	1.5	5–160	3
Sodium (meq)	0.9	1	1.7	3.3
Potassium (meq)	2.1	2.1	2.7	6
Chloride (meq)	1.6	1.6	2.3	4.6
Osmolarity (mosm)	. . .	11.3	16–18.4	40

[1]Committee on Nutrition, American Academy of Pediatrics.
[2]Protein of nutritional quality equal to casein.
[3]Includes 300 mg essential fatty acids.

Chessman, 2013

Research

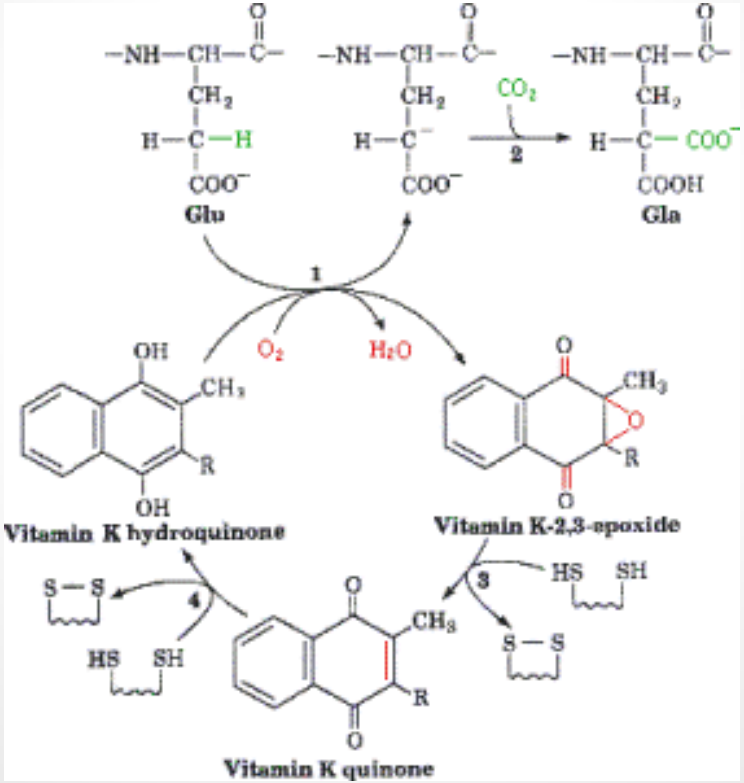
Reminder on Functions...



What is the relationship between Vitamin K intake and matrix Gla protein?

How does this relationship affect disease outcomes?

Circulating uncarboxylated matrix Gla protein, a marker of vitamin K status, as a risk factor of cardiovascular disease



Huevel, 2013

Circulating uncarboxylated matrix Gla protein, a marker of vitamin K status, as a risk factor of cardiovascular disease

- To examine the potential association of circulating dephosphocarboxylated and -uncarboxylated MGP (dp-cMGP and dp-ucMGP), reflecting vitamin K status, with the incidence of cardiovascular events and disease (CVD) in older adults.

Unmodified	Partially Modified	Maturated
dp-ucMGP	p-ucMGP	p-cMGP
	dp-cMGP	

Huevel, 2013

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- 577 community-dwelling older men and women of the Longitudinal Aging Study Amsterdam (LASA) aged >55 years, who were free of CVD.
- First cardiovascular events, either fatal or non-fatal. Onset of CHD, PAD and/or CVA
- A total of 35 non-fatal and 5 fatal CVD events occurred (28 of which were CHD, 4 PAD, and 8 CVA). 2-fold higher risk of CVD for the highest tertile of dp-ucMGP (compared with lowest tertile). Plasma dp-cMGP was not associated with CVD risk
- Vitamin K insufficiency, reflected by higher plasma concentrations of dp-ucMGP, is associated with an increased risk for CVD

Huevel, 2013

Vascular calcification in patients with type 2 diabetes: the involvement of matrix Gla protein

- To evaluate biochemical and clinical parameters associated with differences in dephospho-uncarboxylated MGP (dp-ucMGP) and total uncarboxylated MGP (t-ucMGP) and the potential association with peripheral vascular calcification

Unmodified	Partially Modified	Maturated
dp-ucMGP	p-ucMGP	p-cMGP
	dp-cMGP	

Liabeuf, 2014

Vascular calcification in patients with type 2 diabetes: the involvement of matrix Gla protein

- To evaluate biochemical and clinical parameters associated with differences in dephospho-uncarboxylated MGP (dp-ucMGP) and total uncarboxylated MGP (t-ucMGP) and the potential association with peripheral vascular calcification
- 198 patients with type 2 diabetes and normal or slightly altered kidney function
- Peripheral arterial calcification score, Matrix Gla protein
- Patients with an above-median peripheral arterial score had significantly lower t-ucMGP levels and significantly higher dp-ucMGP levels
- High dp-ucMGP levels were positively associated with peripheral arterial calcification score in patients with type 2 diabetes and normal or slightly elevated kidney function

Liabeuf, 2014

Vitamin K intake and mortality in people with chronic kidney disease from NHANES III

- To examine the relationship between vitamin K intake and mortality in CKD patients
- 3,401 participants with CKD from NHANES III
- Mortality; CVD and all-cause
- 876 and 1,815 participants died from CVD causes and all-causes, respectively. Participants with adequate vitamin K intake had 15% reduced all-causes mortality and 22% reduced CVD mortality
- Adequate intake of vitamin K may be associated with reduced all-cause and CVD mortality in CKD patients.

Cheung, 2014

Conclusion

Vitamin K intake is associated with higher levels of maturated matrix Gla protein, which is inversely associated with vascular calcification and CVD outcomes

Cheung, 2014

Questions?

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