DrPaulApproved

# MICRONUTRIENTS

VITAMINS,
MINERALS
& MORE

## VITAMIN C, D, E, K

DR PAUL APPROVED-VOLUME 4

# Table of Contents

DrPaulApproved

## *Vitamin C*



## *Vitamin D*



## *Vitamin E*



## *Vitamin K*



## *Supplement Recommendation*



Check Vitamin Levels At Home:
https://trylgc.com/paulthomasvitamin

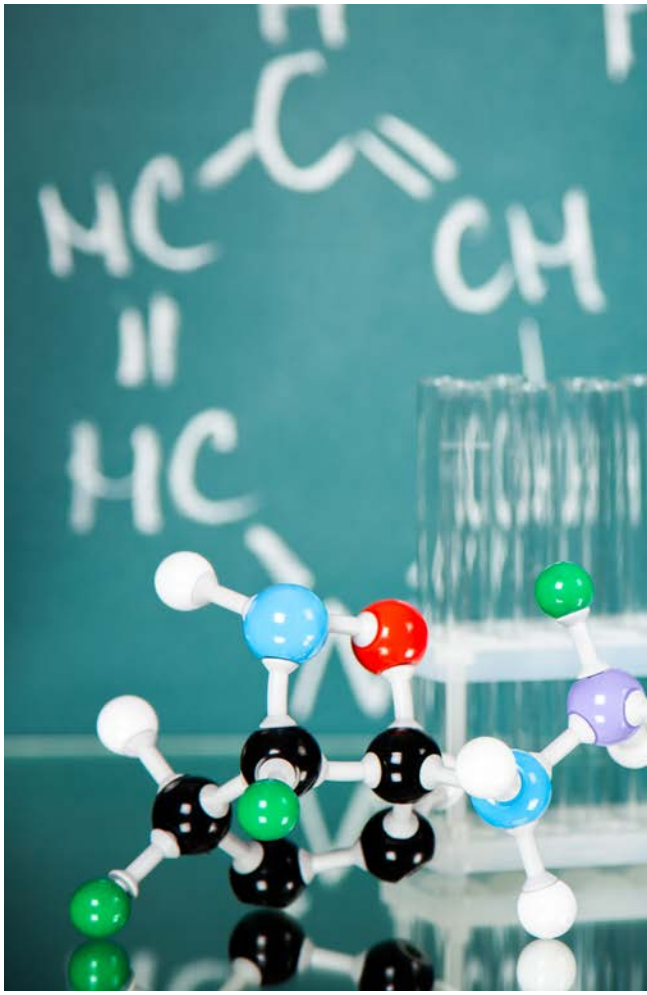

# ASCORBIC ACID

## WHY IS IT IMPORTANT?

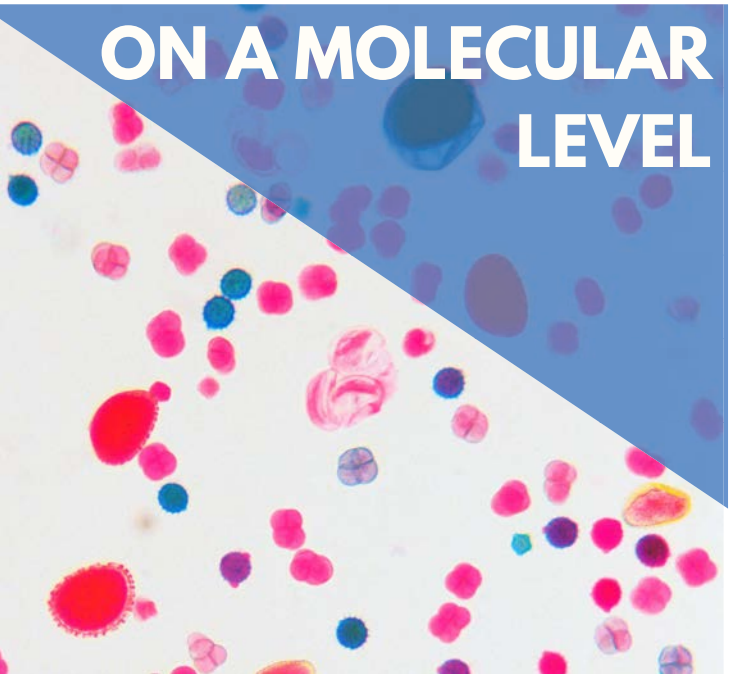
This water soluble vitamin must be eaten or taken as humans (unlike most other mammals) cannot make vitamin C.

Vitamin C is required for:

- the synthesis of collagen
- the synthesis of the neurotransmitter norepinephrine (NE)
- the synthesis of carnitine
- the metabolism of cholesterol to bile acids



## ON A MOLECULAR LEVEL



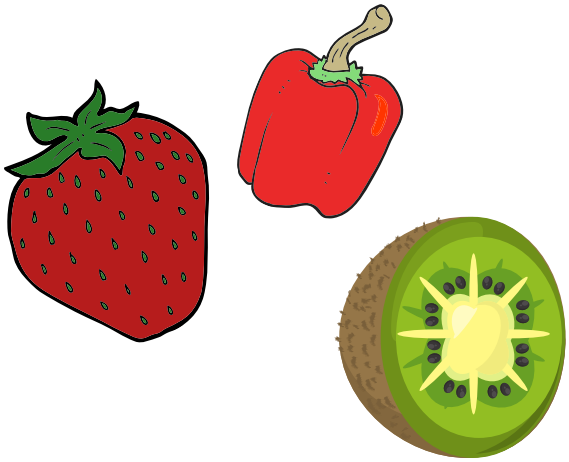
Vitamin C is also a key anti-oxidant protecting proteins, lipids, fats, carbohydrates, nucleic acids (DNA and RNA) from damage by free radials. Vitamin C also helps regenerate other antioxidants like vitamin E.

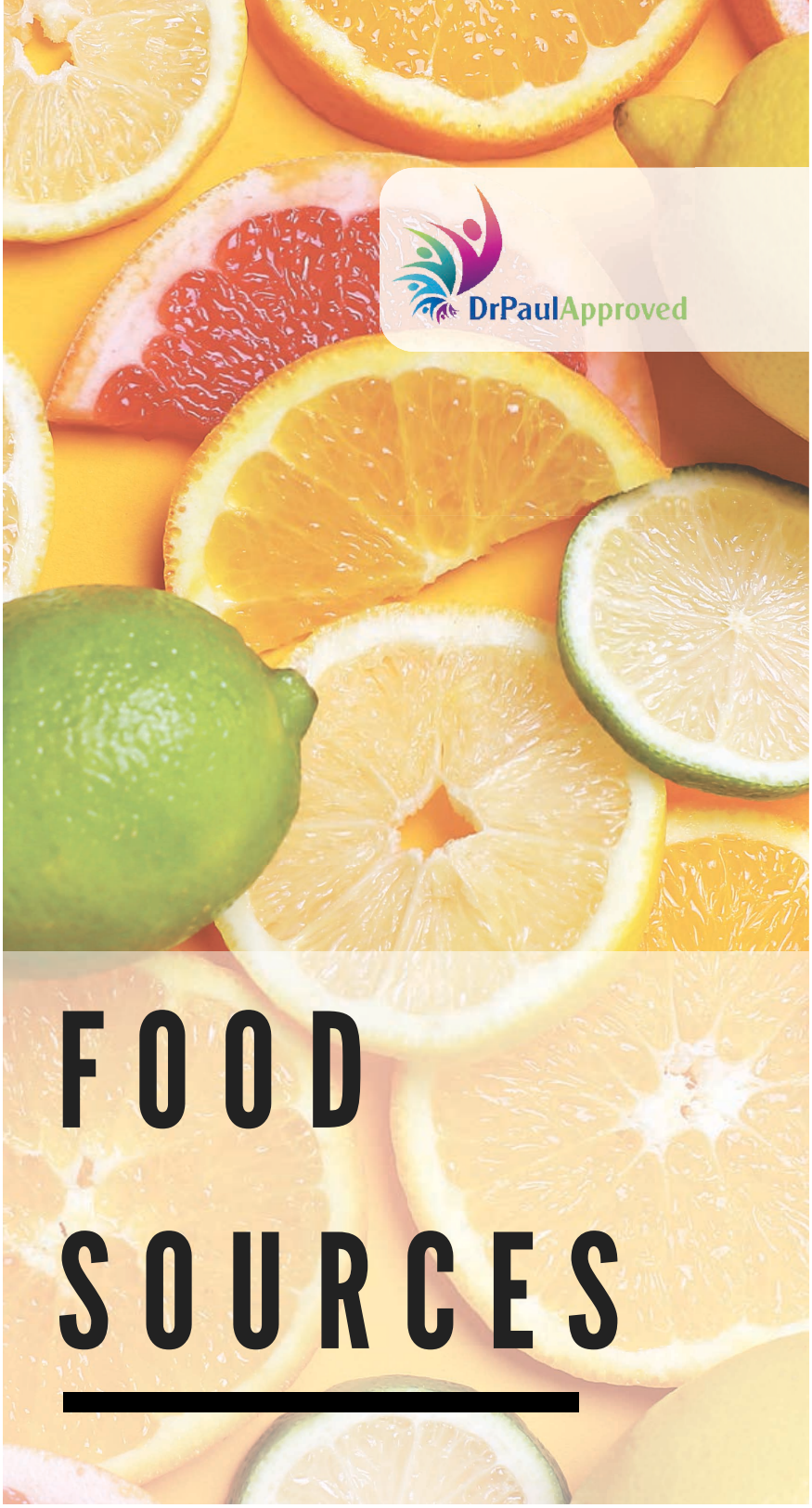
# SYMPTOMS OF DEFICIENCY

Scurvy, is the classic disease known for centuries, cured by eating oranges and lemons by early sailors. Symptoms include easy bruising and bleeding, hair and tooth loss and joint pain and swelling. Fatigue and low energy is seen, likely as a result of low carnitine and NE.

Studies have shown that vitamin C can improve the following conditions:

- Heart disease and stroke are reduced at 100 mg daily (also for those with high fruit and vegetable intake)
- Cancer - reduced at levels of vitamin C exceeding 80 - 110 mg daily intake
- Lead toxicity reduced at intake levels of 1000 mg daily by adults






# FOOD SOURCES

Citrus is the classic food high in vitamin C with a grapefruit having 90 mg and an average orange having 70 mg. Other fruits and vegetables high in vitamin C include; sweet red peppers, strawberries, kiwi, citrus, broccoli, kale and greens (fresh), fruit juices, fortified juices and cereals.

# SAFETY AND TOXICITY

DrPaulApproved

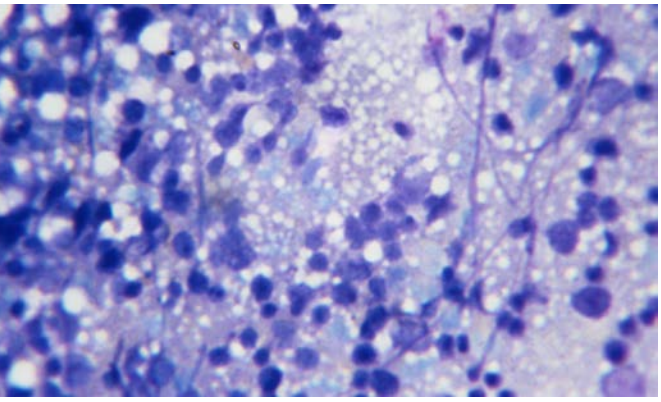
## RDA (Recommended Daily Allowance)

Most recent RDA Tolerable upper limit was set at 2000 mg daily. Though there are some conflicting results, it would seem that 2000 mg daily is safe in adults and up to 500 - 1000 mg would be safe in infants and children respectively.

Linus Pauling was reported to have taken 10,000mg daily for years (personal communication).

When Vitamin C is not buffered, the acidity can affect the enamel of the teeth, and upset the stomach. Some experience diarrhea at higher levels of vitamin C. There is no limit to the amount of vitamin C taken as food.


There is compelling information that extra vitamin C (as food even better) is warranted during pregnancy: http://ods.od.nih.gov/factsheets/VitaminC-HealthProfessional/

# WHY IS IT IMPORTANT?

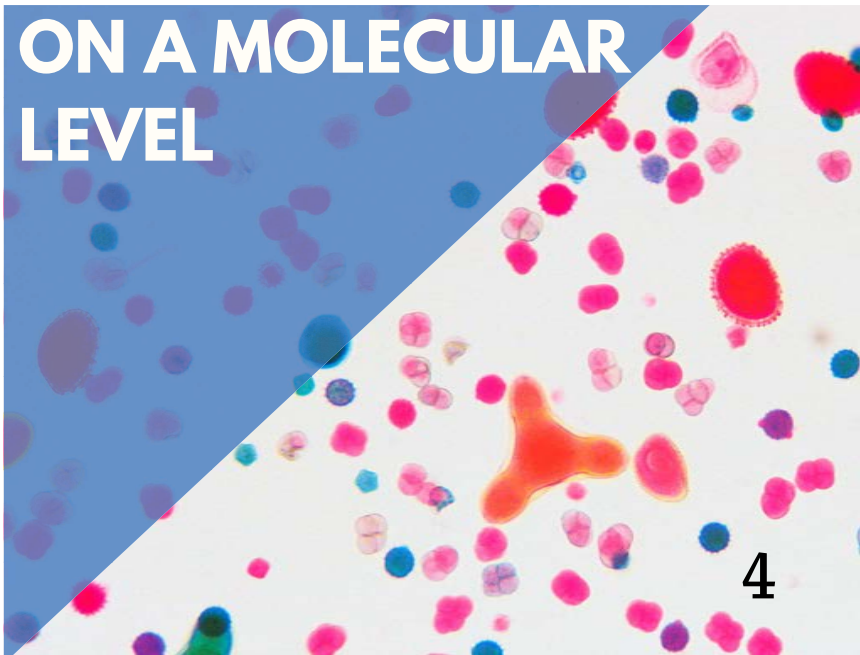
Along with vitamins A, E and K, vitamin D is one of the fat soluble vitamins. Vitamin D is actually more of a hormone - acting at distant receptors - the vitamin D receptor (VDR) and when combined with retinoid acid X receptors (RXR) this complex can interact with DNA at vitamin D responsive elements (VDRE) thus changing transcription of genes. It is in these ways that vitamin D is important for cell differentiation and the immune system - being important for the development of T-cells.

Vitamin $D_3$ enters the body from the diet or the skin where 7-dehydroxycholesterol is converted by the UVB of sunlight to vitamin $D_3$. Vitamin $D_3$ is converted to 25-hydroxy-$D_3$ (calcidiol),in the liver.

This is the major circulating form of Vitamin $D_3$. 25-OH-$D_3$ which is then converted in the kidneys to 1,25 hydroxy $D_3$ (calcitriol) the active form of vitamin D that increases calcium absorption from the intestines and releases calcium from bones.

The parathyroid glands also sense when calcium is low and release PTH (parathyroid hormone) which stimulates this activation of vitamin D into the active 1,25-OH-$D_3$ in the kidneys. Thus the common known function of vitamin D being that for normal bone formation.

## ON A MOLECULAR LEVEL



# SYMPTOMS OF DEFICIENCY

Rickets, is the classical disorder of low vitamin D. There is failure of bone mineralization and thus growth. Those bones growing most rapidly are affected the most resulting in bowed legs in infants and soft bones (osteomalacia) in adults and children which can result in bone pain and the obvious lack of mineralization.

There is an increasing rate of cancers (prostate, colorectal and breast) and autoimmune disorders (insulin dependent diabetes - IDDM, multiple sclerosis - MS, and rheumatoid arthritis - RA) in populations that have less sunlight (northern latitudes and darker skinned individuals).

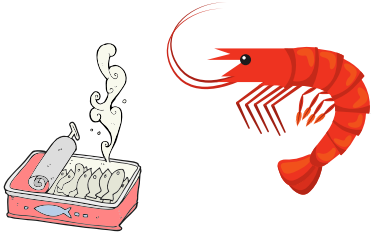

Those with minimal sun exposure are at the highest risk as there is virtually no vitamin D in food unless fortified or taken as a supplement. Infants tend to not be in the sun, the elderly often avoid sun and most of us wear clothing or sun screen to prevent sun exposure.

Cystic fibrosis and fat malabsorption conditions and inflammatory bowel disease all reduce the absorption of vitamin D resulting in deficiencies.

I have found that infants need at least 1000 IU and adults 3 - 5,000 IU daily. This would mean drinking over a gallon of milk for the infant and many gallons for an adult - just not possible!

This is the one vitamin/nutrient that everyone (except perhaps a lifeguard or laborer with their shirts off in the tropics) should take as a supplement.

| Food Sources | IU Vit D | Mg |
|---|---|---|
| Cod liver oil (tsp) | 450 | 11 |
| Herring (3 oz) | 760 | 19 |
| Salmon (3 oz) | 425 | 10.6 |
| Sardines 93 oz) | 255 | 6.4 |
| Milk - fortified (8 oz) | 100 | 2.5 |
| Shrimp (3 oz) | 90 | 2.3 |
| Egg yolk | 25 | 0.6 |



DrPaulApproved

# FOOD SOURCES

# SAFETY AND TOXICITY

DrPaulApproved

## RDA (Recommended Daily Allowance)

TOLERABLE UPPER LIMITS

Set at 1000 IU daily for infants and 2000 IU daily for children and adults. I am completely comfortable with the following upper limits:

Infants - 40 lbs 1000 IU / day
40 - 80 lbs 2000 IU / day
80 - 120 lbs 3000 IU / day
adults 4-5,000 IU / day

If you have been taking Vitamin D supplements for over a year at the higher levels - get your level tested.

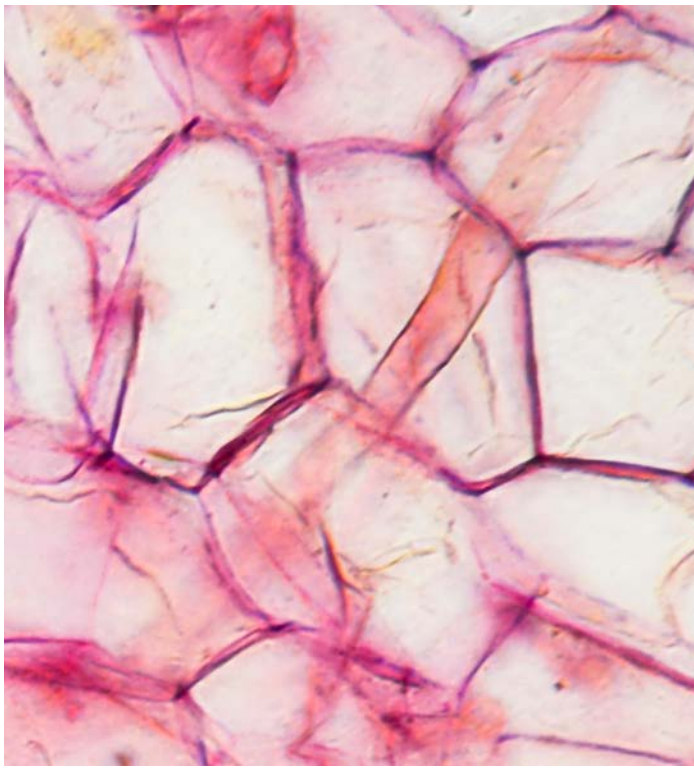
As a fat soluble vitamin, it is possible to take toxic amounts and develop hypervitaminosis D. The symptoms of this seem to be related to the elevated calcium that results; nausea and vomiting, loss of appetite, thirst, excessive urination, itchiness, joint pain and muscle weakness, and ultimately disorientation and coma. Supplementation at doses up to 10,000 IU daily for years has not resulted in any toxicity. I reviewing panels of vitamin D experts, all seem to feel that up to 8,000 IU daily is safe for adults. I put that limit at 5000 unless you have been taking 5000 IU daily consistently and still do not have your vitamin D at optimal levels (50 - 80 ng/dl).


DrPaulApproved

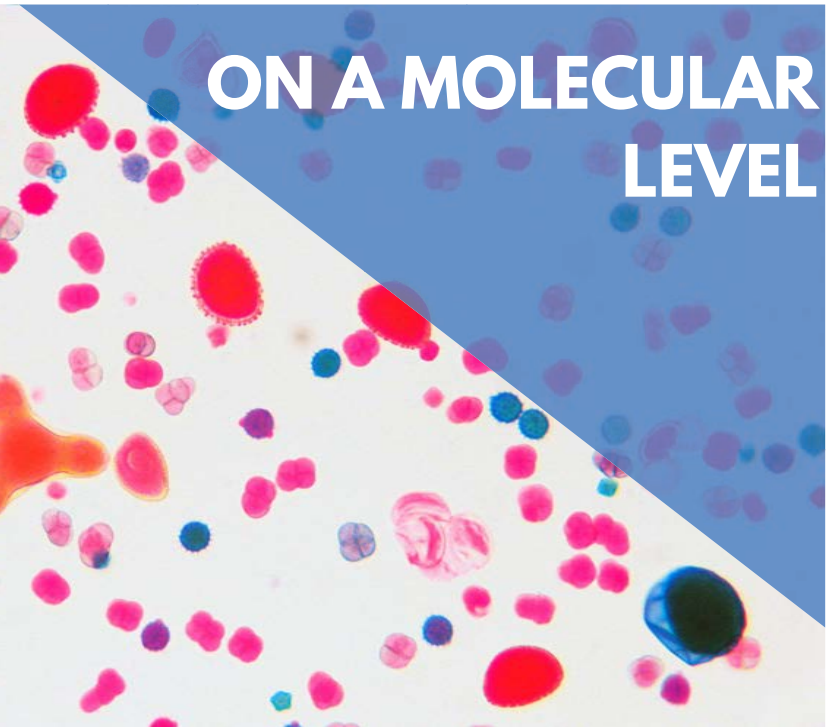
# WHY IS IT IMPORTANT?

Vitamin E is one of the 4 fat soluble vitamins along with A, D and K. Vitamin E comes in many forms with 4 tocopherols (alpha-tocopherol being the main biologically active one in humans), and 4 tocotrienols that seem to have little activity in humans.

Most chronic diseases have an inflammatory component, hence the importance of adequate vitamin E.



## ON A MOLECULAR LEVEL



The main function of alpha-tocopherol is as an anti-oxidant, intercepting free radicals and protecting fats and low density lipoproteins (LDL's) from oxidation. When alpha-tocopherol neutralizes a free radical it's anti-oxidant capacity is regenerated by vitamin C.

Vitamin E seems to directly control inflammation, red and white blood cell production, connective tissue growth, cell division and can convert arachadonic acid free radicals to less harmful derivatives and reducing inflammatory cytokines.

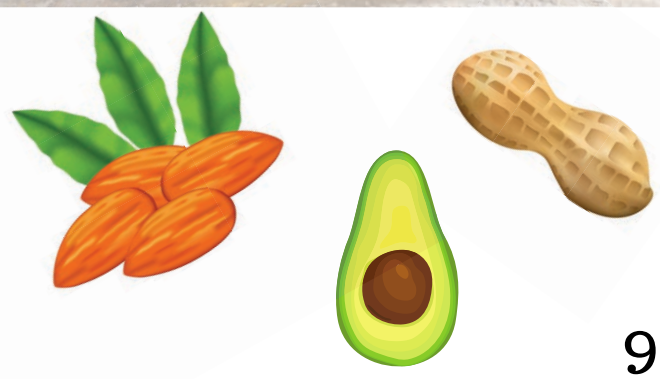
# SYMPTOMS OF DEFICIENCY

Severe deficiency can present with neurological symptoms like impaired balance and coordination and muscle weakness. Most symptoms are chronic in nature and related to the damage by free radicals and oxidative stress:

- Heart disease, arteriosclerosis and strokes
- Cancer
- Cataracts
- Reduced immune function
- Dementia and Alzheimer's
- Complications of diabetes
- Possible role in fibrocystic breast disease, menopause symptoms, tardive dyskinesia, Parkinson's and arthritis.


# FOOD SOURCES

| Food Sources | Alpha-tocopherol |
|---|---|
| Almonds (1 oz) | 12.8 mg |
| Hazelnuts (10z) | 6.1 mg |
| Peanuts (10z) | 3.2 mg |
| sunflower oil (Tbs) | 6.6 mg |
| safflower oil (Tbs) | 4.6 mg |
| canola oil (Tbs) | 2.9 mg |
| other oils (Tbs) | 1 - 2 mg |
| avocado | 3.3 mg |
| spinach (1/2 cup raw) | 1.7 mg |



# SAFETY AND TOXICITY

DrPaulApproved

## RDA (Recommended Daily Allowance)

Tolerable Upper Limits
Infants unknown (100 IU daily)
children 200 - 600 IU daily
teens/adults 1000 IU daily

Few side effects have been noted in adults. The major concern is an increased likelihood of hemorrhage at doses exceeding 1000 IU daily.


http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3997530/
http://ods.od.nih.gov/factsheets/VitaminE-HealthProfessional/

# VITAMIN K

DrPaulApproved

## WHY IS IT IMPORTANT?

Vitamin K2 (menaquinon) is made by gut bacteria in the gastrointestinal track and has a role in moving calcium into bone and away from deposition in blood vessel walls thus reducing arteriosclerosis and building strong bones.

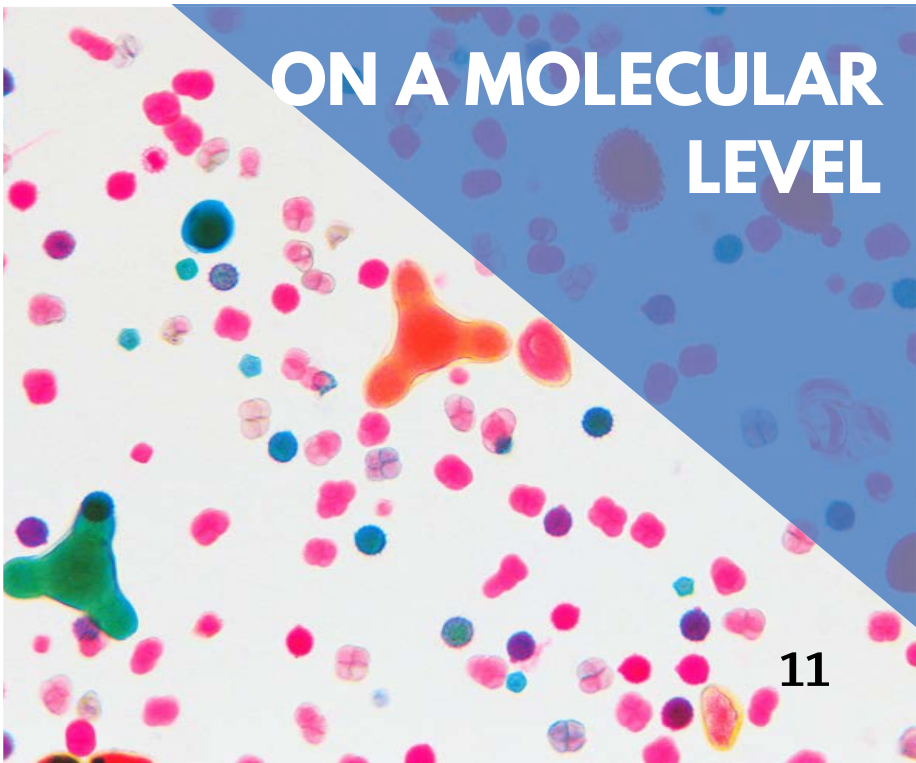
There are two forms of K2:
- MK-4 (menaquinone-4) found in butter, egg yolks and animal based foods
- MK-7 (menaquinone-7) found in fermented foods. This form stays in the body longer.

Vitamin K is one of the fat soluble vitamins along with A, D and E.

Vitamin K1 (phylloquinone) - is a required coenzyme for carboxylation of glutamic acid and is critical for calcium binding that is required for the activation of seven vitamin K dependent clotting factors including Factors II (prothrombin), VII, IX, X and protein Z, and protein S and C that regulate the coagulation cascade. These vitamin K dependent factors are synthesized in the liver, hence the bleeding issues that can occur with liver disorders.

The role of K2 in calcium metabolism works in concert with vitamin D needed for calcium absorption from the intestines and given the close interplay between calcium and magnesium, these two are often best given together.

Gas6 is a K-dependent protein found throughout the nervous system, heart, lungs, stomach , kidney and cartilage. It seems to be involved in cell signaling and cellular growth. There may be a significant role in the developing and aging nervous systems.



## ON A MOLECULAR LEVEL

# SYMPTOMS OF DEFICIENCY

Most symptoms of vitamin K deficiency involve easy bleeding or bruising, nose bleeds and rarely bleeding into the GI track with bloody or black stools, blood in the urine or heavy menses for women. Infants and newborns can have a bleeding disorder called hemorrhagic disease of the newborn (HDN) that can be life threatening and hence the recommendation that all newborns get a shot of phylloquinone (vitamin K1).

The other symptoms of vitamin K deficiency seem to relate to the long term calcium build-up in the blood vessels (arteriosclerosis) and poor bone mineralization from inadequate deposition of calcium with resulting osteoporosis, and increased risk of fractures.

The anti-coagulants coumadin and warfarin deplete vitamin K and patients on these should not take extra vitamin K unless directed to do so by their physician.


# FOOD SOURCES

| Food Sources | Mg |
|---|---|
| Kale 1 cup | 547 |
| Broccoli | 420 |
| Parsley | 324 |
| Swiss chard | 299 |
| Spinach raw | 120 |
| Cooking oils | 2 - 26 |

# SAFETY AND TOXICITY

## RDA (Recommended Daily Allowance)

No upper limits have been established for vitamin K.

Adequate Intake has been set at:
micrograms/day
Infants 2.0
children 30 - 60
Teens and adults 90

RDA for vitamin K is 1 microgram per Kg (per 2.2 lbs.) with 80 micrograms a day for adults. Therapeutic doses have been safely used in studies from 100 - 500 micrograms.

Clearly eating greens or broccoli will provide plenty and even therapeutic doses of vitamin K.

Vitamin K1 and K2 are safe with no upper limits having been established. Vitamin K3 (menadione) can interfere with glutathione and can induce liver toxicity, jaundice and hemolytic anemia.

The major toxicity (bleeding disorders) can occur when those taking anticoagulants (warfarin and coumadin) take vitamin K supplements.

DrPaulApproved

# DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)


**Basic Nutrients 2/day**
**60 caps by Thorne**


**PhytoMulti**
**60 caps by Metagenics**

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

DrPaulApproved

# DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)


## Vitamin C with Flavonoids by Throne


## Vitamin C Liposomal 4 by Quicksilver Scientific


## Buffered Vitamin C 1000mg by Integrative therapeutics

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

# DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)


**D3 plus K2 liquid**
**Ortho Molecular**


**D3 5,000+ K**

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.