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# VITAMINS

## FAT SOLUBLE VITAMINS

**A**

Fat Soluble



Vision,  
Reproduction,  
Bone Health,  
Immune System,  
Skin

**D**

Fat Soluble



Strengthens Bones,  
Calcium Absorption,  
Immune System

**E**

Fat Soluble



Immune System,  
Flushes Toxins

**K**

Fat Soluble



Blood Clotting,  
Bone Health



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# Classification

- Vitamins are classified based on their solubility in water or fats
- Fat soluble vitamins are A,D,E,K& water soluble vitamins are B&C.

- **Vitamin A**

- Three forms that are active in the body:Retinol,Retinal and Retinoic acid collectively called as Retinoids
- Beta carotene is the pro vitamin of vitamin A
- Vitamin A is present in vegetables that contain yellow pigment called Carotenes.



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# Functions of Vitamin A

- Essential for the formation of rhodopsin and normal functioning of the retinal for clear vision in dim light
- Participates in protein synthesis and cell differentiation, supports growth and reproduction
- Beta carotene acts as an antioxidant

## Sources of Vitamin A

- Foods of animal origin contain retinol, plant sources are rich in beta carotene
- Sources of vitamin A-Sheep liver, butter, ghee, egg, milk, curd
- Sources of beta carotene-greens, mango, carrot, Jack fruit, amaranth



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# Deficiency Symptoms

- Deficiency causes nutritional blindness, night blindness
- Eye ball loses moisture, white appearance and results in dryness of eyes (Xerosis)
- Raised muddy dry triangular patches (Bitots spots)
- Redness and inflammation of the eyes with gradual loss of vision
- central portion of the eye loses transparency leading to total blindness (Xerophthalmia)



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# Vitamin D

- Synthesized in the body in adequate amounts by exposure to sunlight, essential for bone growth and calcium metabolism
- Helps in deposition of calcium in the bones- denser and stronger

# Deficiency of Vitamin D

- Leads to decreased absorption of calcium causing muscular tetany rickets in children, osteomalacia in adults
- Rickets primarily affects children and is manifested as faulty deposition of calcium on the bones, bowing of legs, deformities of ribs, slow eruption of teeth, malformed & decay prone teeth



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- Osteomalacia in adults –Quality of the bone is reduced
- Occurs in women not exposed to sunshine especially low calcium level
- Symptoms-Softening of the bones, deformities of the limbs,spine,demineralization of the bones,pain in lower back and legs ,frequent bone fractures
- **Requirement & Sources**
- Liver oil, butter, yolk, cheese, milk,spinach and cabbage
- ICMR recommends adequate exposure to sunlight atleast 5min /day
- Deficient cases are recommended to take 400micro grams/day



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# Vitamin E

- Required for reproduction
- Primary antioxidant in the body and serves to protect PUFA from oxidation in cells and maintain integrity of cell membrane
- Protect RBC from haemolysis
- Reduces platelet aggregation
- Essential for iron metabolism & maintenance of immune function
- Prevents accumulation of lipid breakdown products



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# Deficiency

- Uncoordinated movement, weakness & sensory disturbances, Causes haemolytic anaemia in infants
- Defective functioning of the retina leading to permanent blindness in infants
- Reproductive failure

## Requirement & sources

- Food sources- vegetable oils, sunflower seeds, eggs, almonds, safflower oil, butter, cereal grains, sesame & mustard oil are good sources
- Requirement – Linked to that essential fatty acids and is required at 0.8 mg/g of essential fatty acid





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# Vitamin K

- Anti-haemorrhagic factor
- Essential for activation of prothrombin-injured tissue releases thromboplastin that catalyses prothrombin formation and vitamin k catalyses conversion of prothrombin to thrombin which further activates fibrinogen to form fibrin leading to clotting



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# Sources and Requirement

- Dark greens, fruits, tubers, dairy and meat products, seeds
- Not recommended because it is synthesized in the lower intestine by colonic bacteria
- Deficiency arises in infants resulting in delayed blood clotting and haemorrhage
- Deficiency does not occur in adults