Fat-soluble Vitamins

Vitamin A
Vitamin D
Vitamin E
Vitamin K
Overview

- Vitamins are essential organic substances needed in small amounts in the diet for normal function, growth, and maintenance of body tissues.

- Usually can’t be synthesized in sufficient quantities or synthesized at all.

- Found in plant and animal sources and should be supplied in the diet.

- Fat-soluble vitamins are not readily excreted and are stored in fat cells.
Vitamin A

- Vitamin A is a generic term for a class of compounds called retinoids.

- Types of retinoids: retinol, retinal, and retinoic acid.

- Carotenoids: pigment in fruits and vegetables used in forming vitamin A.

- Alpha & Beta-carotene are examples of pro-vitamins converted into vitamin A (retinol).
Health benefits of Vitamin A

- Helps to improve immunity
- Strengthens bones and teeth
- Helps to prevent cancer
- Reduces risk of macular degeneration and night blindness
- Aids in reducing risk of urinary stones
- Helps to protect skin against psoriasis, acne and dryness
- Aids in maintaining healthy reproductive system
- Helps to ensure proper muscle growth in children
- Beneficial in slowing down aging of skin
- Protects against heart diseases and stroke

Caution: Overdose of vitamin A may cause blurred vision and nausea
Functions of vitamin A

• Vision
• Gene transcription
• Immune function
• Embryonic development and reproduction
• Hematopoiesis
• Bone metabolism
• Skin and cellular health
• Antioxidant activity
Visual

• Retinal in retina of the eye turns visual light into nerve signals to the brain.

• Retinoic acid maintains normal differentiation of the cells that make up the various structural components of the eye.
Gene transcription

• Nuclear retinoid (RAR and RXR) receptors bind to DNA and cause gene expression

• Used in growth and differentiation of epithelial, nervous, bone tissues
Immunity

- Vitamin A increases cell differentiation – produce cells involved in specific (e.g., lymphocytes) and nonspecific immunologic defences (e.g., mucosal surfaces).

- It promotes normal growth and healthy nerve functions.
Dietary Sources

- Liver, sweet potato, carrots, spinach, mango, acorn, squash, kale, broccoli, margarine, peaches, apricots, papaya.
## Recommended dietary allowances

| Group          | Particulars       | Vitamin A (µg/d) |  |
|----------------|-------------------|------------------|
| **Man**        |                   |                  |  |
| Sedentary work | Retinol           | Carotene         |  |
| Moderate work  | 600               | 4800             |  |
| Heavy work     |                   |                  |  |
| **Woman**      |                   |                  |  |
| Sedentary work | 600               | 4800             |  |
| Moderate work  |                   |                  |  |
| Heavy work     |                   |                  |  |
| Pregnant woman | 800               | 6400             |  |
| (0-6months)    | Lactating woman   |                  |  |
| (6-12 months)  |                   |                  |  |
| **Infants**    |                   |                  |  |
| (0-6months)    | 350               | 2800             |  |
| (6-12 months)  |                   |                  |  |
| **Children**   |                   |                  |  |
| 1-3 yrs        | 400               | 3200             |  |
| 4-6 yrs        |                   |                  |  |
| 7-9 yrs        | 600               | 4800             |  |
| **Boys**       |                   |                  |  |
| 10-17 yrs      | 600               | 4800             |  |
| **Girls**      |                   |                  |  |
| 10-17 yrs      |                   |                  |  |
Problems of excess

- Hypervitaminosis is caused by excess dosages (100 times RDA) and can be fatal (13,000 times RDA)

- Chronic: liver damage, hair loss, bone/muscle pain, loss of appetite, dry skin and mucous membranes, haemorrhages, coma.

- Acute: gastrointestinal upsets/nausea, headache, dizziness, muscle contraction.
Vitamin A toxicity:

- Acute toxicity: Headache, vomiting, stupor, death

- Chronic toxicity: Weight loss, dryness of lips, bone and joint pains, hepatomegaly, bone fractures

- Congenital malformations: Cause CNS, cardiac and craniofacial defects
Deficiency diseases

**Xerophthalmia**

Conjunctival Xerosis: Normally wet, smooth & shiny (muddy, dull, dry & wrinkled.)

Corneal xerosis: Normally wet, smooth, shiny (dry, dull, opaque)
• **Bitot’s spots** (keratin deposited in conjunctiva; associated with night blindness)
• Follicular hyperkeratosis (protein keratin deposited around hair follicle)

• Xerosis

• Immune suppression

• Anemia

• Impaired tissue growth
NIGHT BLINDNESS

VITAMIN A DEFICIENCY

RETINITIS PIGMENTOSA

Xerophthalmia Due To Vitamin A Deficiency

Beta-Carotene Excess – Discoloration of the Skin