

Carotenoids

Minerals

Vitamins

Probiotics  
Prebiotics

Plants


Poly-  
Unsaturated  
Fatty Acids


Flavonoids

Nutraceuticals



# Vitamins

- vital - amine
  - Vitamins are the organic substances which are required to maintain basic body functions and prevent diseases.
  - Vitamins are essential nutrients which an organism needs in small quantities for the proper functioning of its metabolism.
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- It is necessary to take vitamins and minerals to maintain a healthy life together with carbohydrates, fats and proteins, which are the main nutrients.
  - Dietary deficiency of vitamins leads to deprivation syndrome in metabolism.



# Classification of Vitamins

- Due to the differences in their chemical structure, the solubility of vitamins differs.
- Vitamins are classified in two basic groups:
  - Water-soluble vitamins
  - Fat-soluble vitamins

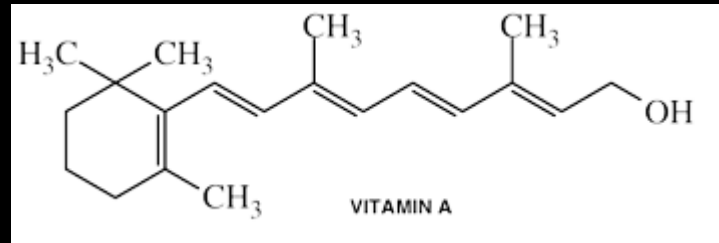


# Classification

- Water-soluble vitamins
  - Vitamin C
  - Vitamin B complex
- Fat-soluble vitamins
  - Vitamin A
  - Vitamin D
  - Vitamin E
  - Vitamin K

# Vitamin A


- It is a fat-soluble vitamin and is mainly stored in liver.



- Vitamin A is especially found as fatty acid esters of its active form –also known as retinol- in the nutrients from animal sources.
- It is found in the form of carotenoids as precursor in herbal resources (Especially in yellow, orange and dark green vegetables).




# Vitamin A

- **Naturally found all-trans retinol in the form of fatty acid ester;**
  - **Vitamin A palmitate (retinyl palmitate)**
  - **Vitamin A acetate (retinyl acetate)**
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# Other vitamin A forms which are found naturally

- Retinol (retinaldehyde, retinene, vitamin A aldehyde)
- Retinoic acid (Vitamin A<sub>1</sub> acid)
- Retinoil-beta-glucuronide (Vitamin A<sub>1</sub> beta glucuronide)
- Retinyl phosphate (Vitamin A<sub>1</sub>-phosphate)
- 3-dehydroretinol vitamin A<sub>2</sub>)
- 11-cis retinal
- 5,6-epoxyretinol
- Anhydroretinol
- 4-keto retinol



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- Bioavailability of retinol from animal sources is higher.
  - 1  $\mu\text{g}$  retinol = 1 retinol equivalent (RE)
  - 1  $\mu\text{g}$  beta-carotene = 0.167  $\mu\text{g}$  RE
  - 1  $\mu\text{g}$  other provitamin A carotenoids = 0.084  $\mu\text{g}$  RE

# Sources

## ➤ Animal Sources

- Egg
- Meat
- Milk
- Cheese
- Liver
- Kidney
- Fish
- Fish oil

## ➤ Herbal Sources

- Carrot
- Sweet Potatoe
- Pink Grapefruit
- Apricot
- Broccoli
- Spinach
- Pumpkin

Vitamin A is found basically in two levels in the body;

**1-In the retina of the eye;**

- Dietary retinol transported to ocular tissue and retina, all-trans-retinol is converted to retinaldehyde and conjugates with opsin leading to the formation of a visual pigment rodopsin.
- Rodopsin is a critical protein because it transforms during photochemical reactions and provides vision in twilight.
- Night blindness may occur in case of vitamin A deficiency.

## 2- In all body fluids; to ensure the development and robustness of cells

- Growth, development and differentiation of epithelial cells are particularly affected by vitamin A deficiency. Cellular integrity is impaired, mucus secretion is reduced and the defense of the body against pathogenic microorganisms weakens.
- The mechanism of action is supposed to be as follows;
  - retinoic acid esters activate receptors,
  - activated receptors induce DNA to provide the necessary protein synthesis to maintain normal physiological functions.

# Why is vitamin A essential?

- Eye health
- Growth and development
- Health of skin, mucous membranes (provides epithelization)
- Health of bones and teeth
- Healthy functioning of the immune system
- Protective effect against cancer
- Important metabolic and hormonal functions
- Fertility

# Daily Dose

Age	Requirement ( $\mu\text{g RE/day}$ )	Recommended safe dose ( $\mu\text{g RE/day}$ )
0-6 months	180	375
7-12 months	190	400
1-3	200	400
4-6	200	450
7-9	250	500
10-18	330-400	600
<u>19-65 (women)</u>	<u>270</u>	<u>500</u>
> 65 (women)	300	600
<u>19-65 (men)</u>	<u>300</u>	<u>600</u>
> 65 (men)	300	600
Pregnancy	370	800
Lactation	450	850

# Daily Dose

- **Vitamin A:** 1 IU = 0.3  $\mu\text{g}$  retinol activity
- Up to 8000 IU intake is recommended for normal development of the fetus during pregnancy period.
- Synthetic retinoids should not be used during pregnancy.



# Toxicity


Vitamin A is stored in liver as it is a fat-soluble vitamin. Regular use at high doses may cause toxic effects especially on liver.

- Liver damage
  - Bone abnormalities
  - Articular pain
  - Alopecia
  - Headache
  - Vomiting
  - Skin irritation
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# Toxicity

- No toxic effect was observed in children when 15.000-30.000  $\mu\text{g}$  retinol taken as one dose.
- It is found to cause liver cirrhosis in case of daily intake at 7500  $\mu\text{g}$  for 6 years.
- Daily dose should not exceed 900  $\mu\text{g}$ .
- It has been reported that 7500  $\mu\text{g}$  daily intake in the early period of pregnancy causes fetal abnormalities.



Intake at higher dose than recommended daily dose;

- Treatment of diabetes (daily dose of 25.000 UI provides allows the body to use insulin and normalize blood sugar levels)
- Treatment of chronic bronchitis and asthma (treatment with daily dose of 5.000 UI decreases the symptoms of chronic lung disease)
- Treatment of acne

# Use of Vitamin A

- It is used in the treatment of cystic acne, acne vulgaris, psoriasis and photoaging of skin.
- Treatment of night blindness
- Prevention from some birth defects; it is reported that retinoic acid signaling is required in the early stages of embryo development and vitamin A is necessary for some neurological and behavioral development.

# Vitamin A Preparations

- Retinyl acetate and retinyl palmitate
- Vitamin A combined with beta-carotene
- Beta-carotene
- **COD LIVER OIL**
- Daily dose shouldn't exceed 10.000 IU