vitamins
**VITAMINS**

**Definition**

Vitamins are organic nutrients that are required in small quantities for a variety of biochemical functions and which generally cannot be synthesized in the body and must be supplied by the diet.

**IMPORTANCE OF VITAMINS**

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VITAMINS

Classification

Water soluble
- B complex
- C or Ascorbic acid

Fat soluble
- A or Retinol
- D or Cholecalciferol
- E or Tocopherol
- K

FACTS ABOUT VITAMINS

- Vitamins are found in almost everything you eat
- Processing affects vitamin content
- Dietary supplements can boost vitamin intake
- Not all of what you eat can be used by the body
FAT-SOLUBLE VITAMINS

• VITAMIN A
• VITAMIN D
• VITAMIN E
• VITAMIN K

Vitamin A

• Assists with formation of skin and mucus membrane
• Maintains healthy eyes
• Assists with bone remodeling
Vitamin A

- Dry skin, poor immunity and slow growth
- Night blindness, xerophthalmia (total blindness)
VITAMIN A

The benefits of vitamin A:
- Maintains health of specialized tissues such as the retina
- Aids in growth and health of skin and mucous membranes
- Promotes normal development of teeth, soft and skeletal tissue

Adult RDA: 1000 µg RE
Fat-soluble

sources

Sources of vitamin A and beta-carotene:
- Vitamin A comes from animal sources such as eggs, meat and dairy products
- Beta-carotene, a precursor of vitamin A, comes from green, leafy vegetables and intensely colored fruits and vegetables
Vitamin D

- Considered as hormone that facilitates absorption of Ca and P
- It assists with bone formation by aiding the absorption of calcium

VITAMIN D

it is also called **SUNSHINE VITAMIN.**
it is available in 2 forms
  D₃ – cholecalciferol
  D₂ - ergocalciferol

**Cholecalciferol (vitamin D₃)**
is made from 7-dehydrocholesterol in the skin of animals and humans.

**Ergocalciferol - D₂**
obtained artificially by irradiation of ergosterol
Functions

Vitamin D promotes the body’s absorption of calcium, essential for development of healthy bones and teeth.

DRI: 5 μg
Fat-soluble

Sources

The body itself makes vitamin D when it is exposed to the sun.

Cheese, butter, margarine, fortified milk, fish and fortified cereals are food sources of vitamin D.
Vitamin D deficiency

A deficiency of vitamin D or an inability to utilize vitamin D may lead to a condition called rickets, a weakening and softening of the bones brought on by extreme calcium loss.

Ricketts
Osteoporosis

Vitamin E

- Antioxidant and promotes RBC
- Deficiency of vitamin E is hemolytic anemia
- RDA 15 mg / day
Functions of vitamin E

The benefits of vitamin E:
- Protects cell membranes and tissues from damage by oxidation
- Aids in the formation of red blood cells and the use of vitamin K
- Promotes function of a healthy circulatory system

Adult RDA: 15 mg
Fat-soluble

Recent studies suggest vitamin E may help:
- Slowing cognitive decline in Alzheimer's patients
- Lower blood pressure and cholesterol levels
- Protect tissues from the destructive action of oxidants
Sources

Vitamin K

• Assists in the synthesis of prothrombin required for blood clotting
• Deficiency symptoms are prolonged bleeding and increased clotting time.
Functions of vitamin K

- Increased risk with
  - Fat malabsorption syndromes
  - Diffuse liver disease
  - Absence of vitamin K-synthesizing bacterial flora

- Deficiency causes bleeding diathesis (skin, gums, ............)
Sources of vitamin K

Food sources of vitamin K include cabbage, cauliflower, spinach and other green, leafy vegetables, as well as cereals.

Vitamin F

- Essential fatty acids (EFAs) cannot be made by the body and have to be supplied through nutrients. These EFA's are also known as unsaturated fatty acids or polyunsaturated fatty acids.
- The most essential of all EFAs are linoleic acid and alpha-linolenic acid (LNA).
- Your daily requirement should be 10 - 20% of your total calorie intake of the day.
Vitamin F deficiency

- They are often advised to patients from doctors to lower cholesterol levels, blood pressure levels and reduce strokes and heart attacks.

Sources of vitamin F
### VITAMINS

- **Water soluble vitamins**

#### Vitamin B complex
- B₁ - Thiamine
- B₂ - Riboflavin
- B₃ - Niacin
- B₅ - Pantothenic acid
- B₆ - Pyridoxine
- Biotin
- Folic acid
- B₁₂ - Cobalamin

#### Vitamin C or Ascorbic acid

### THIAMIN OR VITAMIN B₁

- Very important vitamin to prevent Beriberi
- A Japanese surgeon in the navy found that beriberi on ships could be avoided by adding meat and whole grains to the diet.
- Still occurs in developing countries where polished (white) rice is most of the diet
THIAMIN IMPORTANCE

Vitamin B1 (Thiamine) helps the body convert food into energy, and aids the function of the heart and cardiovascular system and the brain and nervous system.

RDA: 1.5 mg
Water-soluble

BERIBERI (Thiamine Deficiency)

Thiamin (vitamin B₁) prevents the nervous system disease called beriberi.
SOURCES OF THIAMIN

RIBOFLAVIN OR VITAMIN B₂

• Very important vitamin because it is part of two coenzymes (FMN) and (FAD) which are oxidizing agents
RIBOFALVIN IMPORTANCE

Vitamin B2

Riboflavin (vitamin B2) works with other B vitamins to promote healthy growth and tissue repair, and helps release energy from carbohydrates.

Healthy skin

RNA - 1.7 mg

Water-soluble

Healthy red blood cell production

SYMPTOMS OF RIBOFLAVIN DEFICIENCY

• Anemia
• Swollen and dark tongue
• Cracks in corners of mouth and lips
SOURCES OF RIBOFLAVIN

Vitamin B<sub>2</sub>
Food sources of Riboflavin (vitamin B2):
- Cereal, nuts, milk,
- eggs, green leafy vegetables
- and lean meat

NIACIN OR VITAMIN B<sub>3</sub>

- Niacin is the compound that prevents development of Pellagra.
- It was isolated from nicotine acid
- It plays an important role in coenzyme NAD which is very important in protein metabolism.
IMPORTANCE OF NIACIN OR VITAMIN B 3

Niacin (vitamin B3) works with other B vitamins to help release energy from carbohydrates.

Healthy nerves
Healthy skin
Healthy digestive system

Adult RDA: 19 mg
Water-soluble

SOURCES OF NIACIN

Food sources of Niacin (vitamin B3) include dairy, poultry, fish, lean meat, nuts and eggs.
DEFICIENCY OF NIACIN

• Pellagra: dermatitis
• Muscular weakness
• Anorexia
• Indigestion
• Skin eruptions
• Diarrhea

DEFICIENCY OF NIACIN OR B3

An inability to absorb niacin (vitamin B3) or the amino acid tryptophan may cause pellagra, a disease characterized by scaly sores, mucosal changes and mental symptoms.
VITAMIN B$_5$ OR PANTOTHENIC

- Part of Coenzyme A which plays an important role in energy metabolism.
- Is essential for the formation of ATP from the breakdown of carbohydrates, protein, fat and alcohol.

DEFICIENCY OF B$_5$

- Headache
- Fatigue
- Impaired muscle coordination
- GI tract disorders
Vitamin B₆ or Pyridoxine

- Very important vitamin since it plays a coenzyme role in more than 100 enzymatic reactions.
VITAMIN B₆ FUNCTIONS

Vitamin B₆ (pyridoxine) is important for maintaining healthy brain function, the formation of red blood cells, the breakdown of protein and the synthesis of antibodies in support of the immune system.

Adult RDA: 2 mg
Water-soluble

DEFICIENCY OF VITAMIN B₆

• Weakness
• Sleeplessness
• Personality changes
• Dermatitis
VITAMIN B₆ SOURCES

Food sources of vitamin B₆ (pyridoxine) include beans, legumes, nuts, eggs, meats, fish, breads, and cereals.

BIOTIN OR VITAMIN H/B₇

- Biotin participate in reactions in which carbon dioxide is added to a compound.
- Essential cofactor for 5 carboxylase enzyme that add CO₂ to various compounds.
DEFICIENCY OF BIOTIN

- Skin rash
- Neurological disorders
- Impaired growth
- Hair loss
- Fatigue
- Muscle pain

SOURCES OF BIOTIN

- Whole grains
- Eggs
- Nuts
- legumes
FOLATE OR VITAMIN B₉

- Folate is derived from Latin word means leaf because dark leafy vegetables are the best source for folate

Folic acid function

Folic acid is necessary for red blood cell production and neural tube formation

Neural tube
Folic acid functions

RDA for adults is 400 μg / day

FOLATE OR VITAMIN B₉

Food sources of folate include beans and legumes, citrus fruits and juices, whole grains, dark green leafy vegetables, poultry, pork, shellfish and liver.
VITAMIN B\textsubscript{12}

- Cyanocobalamin or vitamin B\textsubscript{12} is very important vitamin

- It plays an important role in many Coenzymes

RDA for adults is 2.4 μg/day
Deficiency can cause anemia
**Sources of VITAMIN B₁₂**

- Food sources of vitamin B₁₂: Eggs, meat, poultry, shellfish, milk and milk products

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**VITAMIN C OR ASCORBIC ACID**

- Is involved in many processes in human body
- The most important function for vitamin C is the synthesis of collagen, the principal tissue protein found in tendon
ASCORBIC ACID OR VITAMIN C

Vitamin C promotes a healthy immune system, helps wounds heal, maintains connective tissue and aids in the absorption of iron.

RDA: 60 mg
Water-soluble

RDA for vitamin C for adults is 60 mg / day

A deficiency of vitamin C may lead to a condition called scurvy, characterized by weakness, anemia, bruising, bleeding gums and loose teeth.
SCURVY IN HUMAN

Fig. 2-8 - Periodontal disease seen in scurvy.

SOURCES OF VITAMIN C

Citrus fruits, green peppers, strawberries, tomatoes, broccoli and sweet and white potatoes are all excellent food sources of vitamin C (ascorbic acid).