

Vitamins

"A vitamin is something that makes us sick, when we do not eat it". This is the saying of Szent Gyorgyi on vitamins. Vitamins are defined as potent organic compounds, occurring in varying and minute proportions in food, which must be available to the organism from exogenous sources, in order to that physiological processes essential to life may proceed normally.

The **salient features** of vitamins can be summarised below:

1. Vitamins are organic compounds .
2. Plants synthesize vitamins; animals can synthesize a few
3. Animals obtain vitamins from the food stuffs
4. Man requires about 15 or lesser vitamins
5. They are required in very small quantities. function like hormones ,
- 6 They late the physiological activities functioning as catalyts.
7. They do not provide any energy for the animals
8. Vitamins are destroyed by high temperature that is found to be essential for 'vital' activities . Hence he coined the name Vitamine. But later it was found that amine was not present in all the vitamins discovered. Hence 'e' was deleted and the term Vita longer duration of time
9. When vitamins are deficient in the food, they produce a set of diseases called deficiency diseases. These diseases can be cured only with the treatment with the particular vitamin which is deficient

Vitamins are two types **fat soluble** vitamins and **water soluble** vitamins. Vitamins A, D, E and K are fat soluble and Vitamins B and C are water soluble.

Vitamin A: Retinol or antixerophthalmic

Functions: 1. Vitamin A is an important component of rhodopsin hence it is essential for vision

2. It promotes growth
3. It is essential for protein synthesis.
4. It maintains the normal growth and shape of bones.
5. It is essential for the synthesis of mucopolysaccharides
6. It promotes fertility.
7. It has some specific functions on carbohydrate metabolism
8. It is essential to the normal structure and functions of epithelia tissues.
9. It is essential for the metabolism of DNA.

Deficiency Symptoms: 1. In children deficiency of vitamin A retards growth. It leads to loss of weight. bare 2. Vision in dim light is carried out by the rhodopsin pigment present in the retina of eye. Vitamin A is essential for the synthesis of thodopsin. When vitamin A is deficient rhodopsin cannot be synthesized. This leads to a failure of vision in dim light. This type of eye defect is called night blindness or **nyctalopia**.

3. The deficiency leads to reddening, dryness, and lusterless condition of the eye. This defect is called **xerophthalmia**.

4. In extreme cases of deficiency, the cornea becomes soft ,disorganised and destroyed. This defect is called **keratomalacia**.

5. Degeneration of lacrymal gland.d und

6. Sweat and sebaceous glands of skin degenerate. lining degenerate.

7. The glands present in the alimentary canal and the epithelial degenerate.

8. The epithelium of the respiratory tract becomes stratified and Over dose of vitamin A is toxic to the body. It causes headache, vomitting and peeling of the skin. vitaminosis which is characterized by drowsiness, sluggishness, se

Sources spinach , green leafy vegetables, cod liver oil, fish, mangoes papaya and tomato

2. **Vitamin D: Calciferol or Antirachitic**

Functions: 1. It helps calcium absorption in the intestine,

2. It improves absorption of phosphate.

3. It is essential for calcium metabolism

. 4. It helps in the normal development of bone and teeth.

5. It helps in the deposition of calcium and phosphates in the

Deficiency Symptoms: Deficiency of this Vitamin causes rickets in children and osteomalacia in adults . bones

Rickets is deficiency disease caused by the deficiency of Vitamin D. It is commonly occurs in children. It is characterised by soft and weak bones and the leg bones are curved and bow-shaped.

Osteomalacia: It is a form of adult ricket. It is due to deficiency of Vitamin D and calcium salts in the diet. It occurs in women during pregnancy and lactation when a large amount of calcium is depleted from the mother.

. **Vitamin E: Tocopherol or Antisterility Vitamin**

It was discovered by Matill and Conclin in 1920. It is a fat soluble vitamin. The word tocopherol is derived from two Greek words namely, tokos = Childbirth; phero = to bear. It is necessary to the ferility of male and the birth process of female.

Functions

1. it is an antioxidant
2. Essential for the normal reproduction of rats
3. Essential for the normal functioning of muscles.
4. Essential for the biosynthesis of Co-enzyme Q

Deficiency Symptoms : Deficiency of Vitamin E causes the following defects:

1. In the female rat , the foetus dies some time after implantation This defect is called resorption sterility. Prolonged deficiency in f. male leads to loss of ability to conceive. In male, prolonged deficiency leads to the degeneration of testis and permanent sterility.
2. In rats, guinea pigs and rabbits , deficiency leads to degenerative changes in the muscles and paralysis. The defect is called nutritional muscular dystrophy.
3. in chicks, it leads to embryonic mortality due to the disintegration of blood vessels.
4. It leads to necrosis of the heart muscles.

Sources – wheat , germ oils , cotton seed oil ,liver of horse and cattle, muscles of heart and kidney

Vitamin k

Source s synthesized by green plants and micro organisms. Cabbage, spinach, alfalfa, tomato, soya beans, etc. are richest sources. It is present in small amount in liver, fish, milk, ghi egg, etc.

Functions: 1. It is essential for the synthesis of prothrombin the liver. Prothrombin is essential for the coagulation of blood. Hen Vitamin K is essential for the coagulation of blood. So it is called antihemorrhagic Vitamin.

Deficiency – coagulation is prevented

Vitamin Q

Source - it is a phospholipid extracted from soyabeans. It is essential for the proper functioning of blood-clotting mechanism in man.

6. **Vitamin U** -It is another new vitamin isolated from curd. It shows good curative effect on people suffering from gastritis and gastric and duodenal ulcers. It doubles the percentage of recoveries from gastro-intestinal diseases.

Vitamin B complex

Vitamin B Complex It includes a set of water soluble vitamins. It is divided into four B groups, namely B₁, B₂ and B₆. Again each group may be containing one or more vitamins and they are named according to their chemical nature. The important B complex vitamins are: 1 thiamine - B₁ 2. Riboflavin - B₂ 3. pantothenic acid - B₃ 4. Niacin B₅ 5. Pyridoxine – B₆ 6. Biotin - B₇ 7. B₁₂ – Cyanocobalamin 8. inositol

Thiamine

Source - unpolished rice

Functions: 1. It undergoes reaction with ATP in which two terminal phosphates from ATP are transferred to the thiamine molecule to

Form thiamine pyrophosphate

Thiamine + ATP → AMP + Thiamine pyrophosphate. The thiamine pyrophosphate acts as a coenzyme in glycolytic pathway

2. It activates carboxylase. Carboxylase is essential for the oxidative decarboxylation of pyruvic acid, ketoglutaric acid and other keto acids. It is an important step in the final oxidation of sugar in the liver and brain. When this vitamin is absent, pyruvic acid and lactic acid cannot be oxidised and hence they accumulate in the blood.

3. Thiamine pyrophosphate also acts as a coenzyme

4. It also helps the enzyme system which is responsible for the synthesis of fats from carbohydrates and proteins.

Deficiency Symptoms: The deficiency of this vitamin causes beriberi. The general symptoms of beriberi are :

1. Oedema especially in the legs.
2. Anorexia (loss of appetite).
3. Lactic and pyruvic acids accumulate in the blood, nerves and
4. Heart failure in extreme cases.
5. Gastric atony, indigestion and constipation.
6. It leads to polyneuritis.
7. Heart becomes weak and enlarged.

Riboflavin

The important sources of this vitamin are milk, liver, kidney, muscle, egg, whole grains, green leafy vegetables, dry beans, peas, nuts etc. They are found in large amounts in yeasts and fermenting bacteria.

Functions: 1. Riboflavin is a component of two important enzymes, namely flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD). They play major roles in various enzyme reactions

2. It is essential for the metabolism of growth.
3. It is essential for growth.
4. It is an important component of acyl-CoA dehydrogenase

Deficiency Symptoms: 1. Cheilosis: It is characterized by development of fissures developing in the lips and at the corners of the mouth and tongue.

2. Sore tongue
3. Seborrheic dermatitis affecting the face (ears, nose and forehead)

4. Deficiency of riboflavin leads to vascularization of the cornea. As a result, the eye becomes itchy, light sensitive (photophobia), vision becomes poor in dim light and leads to severe interstitial keratitis. The skin loses hair, it becomes dry and scaly

Pantothenic Acid

The richest **sources** of this vitamin are yeast, liver, kidney, egg, peas, wheat, rice bran, etc. But this vitamin is present in all the food materials in moderate amount. The word pantothenic acid is derived from Greek meaning from every where because this vitamin has universal distribution.

Functions: This vitamin is a component of coenzyme acyl (Co A). It is essential for basic reactions in metabolism.

Deficiency Symptoms: Its deficiency effect in man is not known because this vitamin occurs in all the food stuffs. Recently, it is found that burning feet syndrome is caused by the deficiency of pantothenic acid.

In other animals, deficiency leads to dermatitis, fatty liver, degeneration of spinal cord, myelin degeneration, thymus degenerations, gastro-intestinal disturbances, cornification of the skin and hypo function of adrenal cortex.

Nicotinic acid or Niacin

Source The richest source are kidney, muscles, fish, barley, maize, nuts, peas, beans, greens, vegsources of this vitamin are bran, germ, yeast, beef,

Functions:

1. It is essential for growth
- .2.It promotes the formation of fats from carbohydrates. an important role in oxidation and metabolism.

Pyridoxine

The richest **sources** are yeast, rice polishing, germs of grains and cereals, leafy vegetables, liver, eggs, meat, kidney, etc.

Functions: 1. Pyridoxol phosphate acts as a coenzyme

- . 2. It helps in the synthesis of fats from carbohydrates and proteins.
3. It is involved in the active transport of amino acids and certain metallic ions across cell membrane

Deficiency Symptoms: In rats, deficiency of this vitamin cause a specific type of dermatitis called acrodynia, anaemia . Dermatitis occurs in the jaws, tail, nose, mouth and ears. In characterized by scaliness, loss of hair, swelling, inhibition of growth and reduction in accessory reproductive organs

Biotin .

The richest **sources** yeast, egg, yolk, kidney, liver, milk, cauliflower, peas, nuts , etc. However moderate amount is present in all the foodstuffs. Biotin can synthesized by intestinal bacteria.

Functions: 1. It functions as a coenzyme for carboxylase. Hence fixation of carbon dioxide and carboxylation

2. It helps in the conversion of pyruvic acid to oxaloacetic acid.

3. It involves in deamination of certain amino acids like aspartic synthesis of carbamoyl phosphate. It is essential for the synthesis of lipids.

4 It involves in the prevents dermatitis in dogs and rats. J. Dermatitis of extremities.

Deficiency Symptoms:

1. It causes dermatitis in dogs and rats. In man the symptoms are as follows: Symptoms resembling thiamine deficiency and

2. Blood cholesterol increases.

Folic acid (B 9)

. The richest **sources** are green leafy vegetables, yeast, liver, kidney and beef. Other foodstuffs also contain it in small amounts.

Functions: 1. It functions as a coenzyme

2. It is essential for the synthesis of RNA.

3. Its main role is in the formation and maturation of red cells. Deficiency Symptoms

Deficiency in man causes megaloblastic anaemia during pregnancy.

Cyanocobalamine

The richest sources of this vitamin are liver, egg, milk, meat and fish.

Functions: 1. In the living cells B₁₂ is converted into a coenzyme called coenzyme B₁₂. It is involved in a number of metabolic reactions.

2. It is essential for the formation and maturation of RBC.

3. It is involved in the synthesis of nucleic acids

. 4. It stimulates bone marrow to produce WBC and platelets.

5. It helps in the growth of micro-organisms

. 6. It synthesizes lipids from carbohydrates

. 7. It helps in the synthesis of methyl group.

8. It is involved in transmethylation process.

9. It prevents hyperglycaemia

. 10. It prevents pernicious anaemia

Deficiency

It is characterized by a drastic decrease in blood cell count. Symptoms: 1. Deficiency of, causes pernicious anaemia. 2. Another deficiency sign is hyperglycaemia. 3. In pigs and rats, it causes slow growth, nervousness and irritation

Inositol

The main **sources** of this vitamin yeast, brain, stomach, kidney, spleen, liver, milk, blood, muscle soyabeans, citrus fruits, vegetables, grains, etc

Functions: Its function in man is not known.

1. It prevents the deposition of fats and accelerates the rated removal of fat from the liver. This phenomenon is called lipotrophie action.
2. It is essential for normal reproduction.
3. It promotes growth.

Deficiency Symptoms: It causes alopecia in mice and spect. cle eye in rats.

Vitamin C

Sources : It is found in abundance in Citrus fruits like orang lemon, tomato, pineapple, papaya , grapes, guava , apples, bananas , veg etables like cauliflower, cabbage, green peas , beans, tomatoes, spinach properly sprouted pulses , germinating grams, etc. Animal tissues contain only a small amount of this vitamin . Eg. Milk, liver , kidney, hear. meat, fish and glands like adrenal , thymus, pituitary, etc.

Function

Vitamin C is essential for the formation of fibroblasts, osteoblast etc. It plays a main role in wound healing by producing connective tissue. It involves in the maturation of RBC . It provides resistant powers against toxins and stress conditions . It is essential for the synthesis of intercellular cementing substances.

Deficiency of this vitamin causes scurvy. It is characterised internal bleeding. Bleeding is more common in the gums. It is duel fragility of capillaries. The symptoms of scurvy include swollen gun loosening of the teeth, haemorrhage , poor healing and increased susceptibility infections and poor tooth formation

