

VITAMINS TYPES AND FUNCTION {Part 2}

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☞ VITAMIN C :

- Ascorbic acid (reduced form), dehydroascorbic acid (oxidized form)
- Synthesized by most animals (not by human)
- This vitamin is also known as antiscorbutic vitamin because it was found to cure a deficiency disease called scurvy.

FUNCTIONS:

- Reducing agent (antioxidant)
- Iron absorption
- Collagen formation
- Bone formation
- Iron and hemoglobin metabolism
- Cholesterol metabolism
- Sparing action of other vitamins
- Immunological function
- Preventive action on cataract

RDA:

- For adult 60-70 mg/day
- During pregnancy and lactation increase 20%-40%
- Smoking , chronic alcoholism, use of contraceptive and administration of aspirin, lower serum levels of ascorbic acid

DIETARY SOURCE :

Citrus fruits , Gooseberry , Guava , Green vegetables , Tomatoes , Potatoes .High content of vit C is found in adrenal gland and gonads ,Milk is poor source.

DEFICIENCY :

- Non specific early symptoms are:- weakness , muscle pain
- Specific clinical features are:-
 - Keratosis of hair follicles with corkscrew hair , Perifollicular haemorrhages, Spontaneous bruising , Spontaneous haemorrhage , Anemia , Failure of wound healing
- BONY CHANGES IN SCURVY : Suppression of osteoblasts, resorption continues and osteoporosis results.....Cartilage formation is reduced, mineralization unaffected.....Zone of calcification appears wide and dense and extends beyond metaphyseal plate leading to formation of periosteal elevation, Subperiosteal haemorrhage
- Most commonly seen in:- Distal ends of femur,Distal ends of radius and ulna, Sternal ends of ribs,Proximal ends of humerus

- There is bleeding, swollen gingiva and loosened teeth, defective formation and maintenance of collagen, retardation of osteoid formation,
- Impaired osteoblastic function; increased susceptibility to traumatic hemorrhage, hyperactivity of contractile elements of peripheral blood vessels and sluggishness of blood flow.
- Low levels of ascorbic acid influence the metabolism of collagen in the periodontium thereby affecting the ability of the tissue to regenerate and repair itself.
- Increasing levels of ascorbic acid enhance : The chemotactic and migratory action of leukocytes without influencing their phagocytic activity apparently required to maintain the integrity of the periodontal microvasculature as well as vascular responses to bacterial irritation and wound healing.
- Depletion of vitamin C may interfere with ecologic equilibrium of bacteria in plaque and thus increases its pathogenicity.

TREATMENT AND PREVENTION :

- 250mg of ascorbic acid daily
- Encouraged to eat fresh fruit and vegetables

PREVENTION

- Orange juice should be given to bottle fed infants
- In elderly, eating fresh fruits and vegetables can prevent scurvy
- Ascorbic acid supplements can be given

👉 VITAMIN B1:(THIAMINE)

- It has a specific coenzyme TPP which is mostly associated with carbohydrate metabolism.
- RDA

1-1.5mg/day for adults

0.7-1.2mg/day for children

Requirement increase 2mg/day in pregnancy & lactation, old age & alcoholism

DIETARY SOURCE :

- Cereals, pulses, seeds oil, nuts and yeast
- Mostly concentrated in the outer layer (bran) of cereals.
- Also present in liver, heart, kidney, milk, in the parboiled and milled rice.

DEFICIENCY :

- Beri-beri :The early symptoms anorexia, weakness, nausea, mental depression, peripheral neuropathy, irritability. Numbness in legs
- Wet beri-beri
- Dry beri-beri
- Infantile beri-beri

TOXICITY :

- It is non-toxic

- Repeated intravenous injection leads to anaphylactic shock.

TREATMENT :

- Thiamine 50 mg i.m is given for 3 days followed by 25mg of thiamine daily orally
- The response in wet beriberi occurs in hours giving dramatic improvement but in dry beriberi improvement is slow to occur
- Infantile beriberi is treated by giving thiamine to mother which is passed to infant via breast milk

☞ **VITAMIN B2(RIBOFLAVIN)**

- Riboflavin through its coenzymes takes part of cellular oxidation-reduction reactions.
- Not stored in the body. It is excreted in feces and to a lesser extent in urine.

RDA

- For adult 1.2-1.7 mg.
- Higher intake by 0.2-0.5mg/day are advised for pregnant and lactating women.

DIETARY SOURCES:

- Milk and milk products, meal, eggs, livers, kidney are rich sources
- Cereals, fruits, vegetables and fish are moderate sources.

DEFICIENCY

- Cheilosis, glossitis and dermatitis
- Chronic alcoholics are more susceptible
- Intake of large dose of riboflavin (5-10mg/day) does not result any toxic symptoms

➤ TREATMENT

Riboflavin 5mg daily

☞ **VITAMIN B3 (NIACIN)**

- Vitamin B3 is required for cell respiration, helps in the release of energy and metabolism of carbohydrates, fats, and proteins, proper circulation and healthy skin.
- Functioning of the nervous system, and normal secretion of bile and stomach fluids.
- It is used in the synthesis of sex hormones, and other mental illnesses, and a memory-enhancer.

RDA

- For adult 15-20 mg
- For children 10-15 mg

DIETARY SOURCES

Rich natural sources are liver, yeast, cereals, pulses like beans and peanuts.

Milk, fish, egg and vegetables are moderate sources.

DEFECIENCY :

- Pellagra
- The symptoms of pellagra are commonly referred to as three Ds...
- DERMATITIS:-

Redness followed by cracks with ulceration in skin..Chronic thickening, dryness and pigmentation, Lesions are symmetrical and affect dorsal surfaces of hands , Perianal skin and vulva involved ,Casal's necklace/collar skin lesion around neck

➤ **DIARRHOEA:-**

Common feature along with painful, dry and raw tongue

➤ **DEMENTIA:-**

Depression, apathy, tremors, hallucinations and encephalopathy

THERAPEUTIC USES :

Niacin inhibits lipolysis in the adipose tissue and decrease the circulatory free fatty acids.

Megadose of niacin are useful for the treatment of hyperlipidemia.

Recommended RDA is 17-21 gm/day

HARMFUL SIDE EFFECTS :

- Glycogen and fat reserve of skeletal and cardiac are depleted
- There is a tendency for the increased levels of glucose and uric acid in the circulation.
- Prolonged use niacin results in elevated serum levels of certain enzymes, suggesting liver damage.
- High dose of niacin may produce resistance of insulin

TREATMENT :

- Nicotinamide 300mg daily orally with a maintenance dose of 500 mg daily is given with dramatic improvement in skin and diarrhoea
- Vitamin B complex is also given as other deficiencies are also present

☞ **VITAMIN B5 (PANTOTHENIC ACID)**

- Assist the metabolism, help to fight allergies and are beneficial in the maintenance of healthy skin, muscles and nerves
- Used in the release of energy as well as the metabolism of fat, protein and carbohydrates
- Used in the creation of lipids, neurotransmitters, steroid hormones and haemoglobin
- Helpful to fight wrinkles as well as graying of the hair

RDA:

- Daily intake of 5-10 mg for adults

DIETARY SOURCES

Rich sources are beef, egg, liver, yeast, fresh vegetables, mushrooms, nuts, pork, royal jelly, saltwater fish and milk

DEFECIENCY:

- Fatigue, headache, nausea, tingling in the hands, depression, personality changes and cardiac instability
- Frequent infection, abdominal pains, sleep disturbances
- Neurological disorders including numbness, paresthesia (abnormal sensation such as "burning feet" syndrome)

☞ **VITAMIN B6 (PYRIDOXIN):**

- Its collectively represent the three compounds namely pyridoxine, pyridoxal and pyridoxamine
RDA

For adult 2-2.2mg/day...During pregnancy, lactation and old age 2.5mg/day.

DIETARY SOURCES

Egg yolk, fish, milk, meat are rich source,,.Wheat, corn, cabbage, roots and tuber are good source

DEFECIENCY:

- It is associated with neurological symptoms.
- Convulsion and peripheral neuropathy are observed in severe deficiency.
- Decrease in hemoglobin levels associated with hypochromic microcytic anaemia

VITAMIN B7 (BIOTIN)

Involved in carbon dioxide transfer and therefore essential to the metabolism of carbohydrate and fat .Absorbed by facilitated transport (low concentrations) and passive diffusion (high concentrations) in the upper part of the small intestine.Excreted in the urine

RDA

Daily intake of 100-300 mg

DIETARY SOURCE:

- Found in liver, egg yolk, cereals and nuts
- Intestinal bacteria produce a small amount of biotin, which may be absorbed

DEFECIENCY :

- Feeding on raw egg whites, which contain a protein that binds biotin and prevents its absorption.
 - Long-term antibiotic use interfere with biotin production in the intestine and deficiency symptoms are dermatitis, depression, hair loss, anemia, and nausea.
 - Depression, lethargy, hallucination, and numbness and tingling of the extremities.
 - Impaired immune system function, including increased susceptibility to bacterial and fungal infections.

☞ **FOLIC ACID**

It is important for carbon metabolism & requires for the synthesis of amino acids.It is stored in liver.The body can store 10-12 mg of folic acid that will usually for 2-3 months

RDA

Daily requirement is 100µg

In women higher intakes are recommended 300µg/day during pregnancy

In lactation 150µg/day

DEFECIENCY :

- In the pregnant women

- In the lactating women
- Women on contraceptive
- alcoholics

☞ **VITAMIN B12**

It is known as anti-pernicious anemia vitamin. It is synthesized by micro-organism not by animals and plants. It is present in the diet in a bound form to proteins. It is believed that liver can store about 4-5mg, an amount sufficient to meet the body requirement of B12 for 4-6 years.

RDA:

- Daily intake of 3µg for adult
- 0.5-1.5µg/day for children
- 4µg/day during pregnancy and lactation

Dietary Sources

Rich sources are liver, kidney, milk, curd, eggs, fish, pork and chicken. Curd is better source than milk.

DEFICIENCY :

- Pernicious anaemia, nerve involvement, and malabsorption that can include:
 - Confusion , Diarrhoea , Dizziness , Fatigue, weakness , Loss of appetite , Paleness , Rapid heart rate , Shortness of breath , Sore tongue and mouth , Tingling, numbness, and/or burning in the feet, hands, arms, and legs.