

WEEK SEVEN

VITAMINS

Vitamins are organic molecules that function in a wide variety of capacity within the animal's body. The most prominent function is as co-factors for enzymatic reactions. The distinguishable feature of vitamins is that they generally cannot be synthesized by mammalian cells and therefore must be supplied in the diet.

WATER SOLUBLE VITAMINS

1. **Thiamine:** It is also known as vitamin B₁.

Functions

- a. Acts as catalyst in carbohydrate metabolism enabling pyruvate to be metabolized and carbohydrates to release their energy.
- b. Also plays an important role in synthesis of nerve regulating substances.

Deficiency symptoms

1. Constipation
2. Suppressed appetite
3. Mental depression
4. Peripheral neuropathy and fatigue.
5. Chronic thiamine deficiency leads to a more severe neurological symptom e.g mental confusion, lost of eye co-ordination.
6. Severe thiamine deficiency is known as beriberi.

Sources

1. Brewers yeast
2. Eggs
3. Leafy green vegetables
4. Whole or enrich cereals, wheat, nuts and legumes.

NOTE: Milling of cereals removes these portions of the grain rich in thiamine.

2. **Riboflavin:** Vitamin B₂, it serves as a co-enzyme i.e one that combines with a portion of another enzyme to be effective in the metabolism of carbohydrates, fats and especially respiratory protein. It also serves in the maintenance of mucus membrane.

Deficiency symptoms

1. Photophobia
2. Angular stomatitis

Sources

1. Eggs
2. Milk
3. Meat
4. Cereals

3. **Niacin:** Also known as vitamin B₃ or nicotinic acid (old name)

Functions

1. Required for the synthesis of active form of vitamins B₃ NAD (Nicotinamide adenine dinucleotide phosphate). Both NAD and NADP function as co-factors for numerous dehydrogenase systems examples include lactose maltose dehydrogenase, succinyl CoA dehydrogenase).

Deficiency Symptoms

1. Dermatitis
2. Weight loss
3. Diarrhoea
4. Depression
5. Dementia

Sources

1. Liver
2. Poultry
3. Meat
4. Salmon
5. Whole grain
6. Enriched cereal

7. Dried beans
8. Pea nuts

4. **Panhotenic Acid:** Also known as Vitamin B₅.

Function

For the synthesis of co-enzyme A and is a compound of the acyl carrier protein (ACP) domain of fatty acid synthase. Panhotenic is therefore required for the metabolism of carbohydrates via the TCA cycle and all fats and proteins.

Sources

1. Whole grain cereals
2. meat
3. Legumes

5. **Pyridoxine, pyridoxamine** are collectively known as vitamin B₆ all the 3 compounds are converted to the biological active form of vitamin B₆ called pyridoxal phosphate. This conversion is catalysed by the ATP requiring enzyme called Pyridoxal kinase.

Functions

1. Pyridoxal phosphate functions as a co-factor in enzyme involved in transamination reactions required for the synthesis and catabolism of the amino acids.
2. It also functions in glycogenolysis as a co-factor for glycogen phosphorylase.

Deficiency of vitamin B₆ are rare and usually related to overall deficiency of the B-complex vitamins.

6. **Biotin**

Function

It functions as a co-factor required of enzyme that are in carboxylation reaction e.g acetyl CoA carboxylase

Deficiency of the vitamin is very rare. Deficiency is generally seen after a long antibodies therapy which depleted the intestinal fauna or following excessive

consumption of raw eggs. The latter is given to the affinity of the egg white protein (avidine) for biotin preventing intestinal absorption of biotin.

Source

Biotin is found in numerous foods and synthesized by intestinal bacteria.

7. **Cobalamin:** is more commonly known as vitamin B₁₂.

Functions

1. As a co-factor
2. During the catabolism of fatty acid with an odd no of carbon atom and the amino acid; valine, iso-leucine and threonine, the resultant propanyl CoA is converted to succinyl CoA for oxidation in the TCA cycle. One of the enzymes on this pathway methyl malonyl CoA mutase require vitamin B₁₂ as a co-factor in the conversion of methyl B₁₂ to succinyl CoA.

Deficiency

Severe or alteration in the normal architecture of membranes of nerve cell.

Sources

Exclusively vitamin B₁₂ is synthesized by micro-organism found in the liver of animal.

8. **Folic Acid**

Function

Helps to remove some of the glutamate residues through the action of lysosome enzyme.

Sources

Obtained primarily from yeast and leafy vegetables

Deficiency

Results are complications nearly identical to those described from vitamin B₁₂.

9. **Ascorbic Acid**

Functions

- a. In the formation and maintenance of collagen. Collagen is the protein that supports the body structure and plays a major role in the formation of bone and teeth.

b. It enhances the absorption of iron (Fe) from food of vegetable origin.

Deficiency

Scurvy: These symptoms are due to loss of cementing action of collagen and it includes loss of teeth and cellular changes and long bone of young animals.

Sources

1. Citrus fruits
2. Fresh straw berries
3. Pineapple
4. Tomatoes
5. Green pepper
6. Cabbage
7. Spinach.