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Programme: M.Sc., Biochemistry

Course Title: Chemistry of Biomolecules

Course Code:BC101CR

Unit V

Water soluble Vitamins

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VITAMIN - B COMPLEX
VITAMIN - B1 (THIAMINE)

- ✓ Source: All plants and animal foods.
- ✓ Cereals, heart, liver and kidney are excellent sources.
- ✓ In cereals the outer layers of seeds are rich in thiamine.

Thiamine

- Requirements
- Adult : 1.0 mg
- Children: 0.4 – 1.3 mg

DEFICIENCY

- ✓ Beriberi- Disease of the nervous system leading to partial paralysis of the extremities, muscular atrophy, cardiovascular changes and gastrointestinal disorders.
- ✓ Symptoms of nervous system- dry beriberi
- ✓ Symptoms with edema and effusions- wet beriberi
- ✓ Symptoms involving heart- acute pernicious beriberi.

VITAMIN - B2(RIBOFLAVIN)

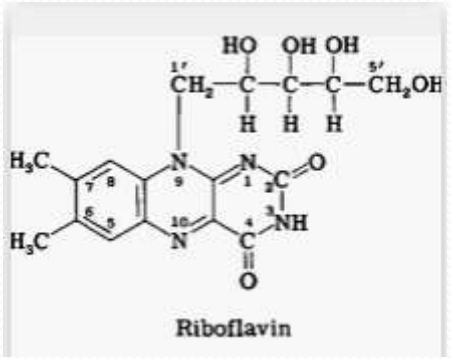
❖ Source

- ✓ Milk,cheese,egg,liver,kidney,heart and brewers yeast are excellent sources.
- ✓ Cows milk contains about 5 times much riboflavin as human milk.
- ✓ Leafy vegetables are good sources.
- ✓ Fruits and root vegetables contain moderate quantities.

VITAMIN - B2(RIBOFLAVIN)

- ✓ Grains,cereals and milled flour contain low riboflavin content.
- ✓ But riboflavin content increases during germination.
- ✓ The most important, ordinary cooking processes do not affect the riboflavin content of the food.

Riboflavin



Riboflavin

- Requirements
- Children : 1 – 1.8mg
- Adult: 1.5 – 1.8mg

DEFICIENCY

- ✓ Cheilosis (fissures at the corners of the mouth and lips)
- ✓ glossitis (inflammation of the tongue)
- ✓ corneal vascularisation (bloodshot eyes).

VITAMIN B3(NICOTINIC ACID)
OR
NIACIN

Source:

- ✓ Widely distributed in nature in plant and animal tissues.
- ✓ Dietary tryptophan can be converted to niacin.
- ✓ Liver,lean pork,salmon,poultry and red meat are good sources.

VITAMIN - B3(NICOTINIC ACID)
OR
NIACIN

Source:

- ✓ Cereals contain only small amounts.
- ✓ Vegetables and fruits are poor sources.
- ✓ But milk and egg as such they contain no niacin but contain tryptophan.

Requirements

- Adults : 17 – 21mg/day
- Infants: 6mg/day

DEFICIENCY

- ✓ Causes pellagra (skin rough) in man, black tongue in dogs.
- ✓ Pellagra is characterized by 3”Ds”-dermatitis of the exposed parts,diarrhoea and dementia.
- ✓ The lesions on hand have the appearance of a glove (Pellagrous glove) Pellagrous boot,
- ✓ casal necklace.

DEFICIENCY

- Coffee is particularly rich in niacin,heavy coffee drinkers do not develop pellagra,corn is deficient in tryptophan.Pellagra is greatly aggravated in persons kept on a corn diet.

VITAMIN - B5(PANTOTHENIC ACID)

- Source:

✓ widespread in nature,yeast,liver and eggs are the richest sources.

✓ Potatoes,sweatpotatoes,cabbage,cauliflower,tomatoes, peanuts contain less amount.

DEFICIENCY

- ✓ In rats depigmentation of hair.
- ✓ in human generally no definite deficiency syndrome has been ascribed to pantothenic acid.

VITAMIN - B6(PYRIDOXINE)

- Source

✓ Widely distributed in plants and animals.

✓ Rich in cereals (wheat ,rice), peas, carrot, potatoes, sweat potatoes, bananas, watermelons and yeasts.

✓ Egg yolk, salmon ,chicken ,fish, beef, pork and liver,human and cows milk.

Requirements

- Adults: 2mg/day
- Infants: 0.3 – 0.4 mg/day

DEFICIENCY

- ✓ In infants convulsion, anemia, dermatitis and gastrointestinal disorders such as nausea and vomitting.

- ✓ B6-deficient anemia iron utilization failure and hemoglobin synthesis affected.

VITAMIN - B7(BIOTIN)

- Source

- Wide range of distribution both in the animal and the vegetable kingdoms. Yeast, liver, kidney, milk are rich sources.

- Peanuts and eggs have lesser amount.

Requirements

- Adults: 25 – 30µg/day
- Children: 20 - 40µg/day

DEFICIENCY

- ✓ Is rare, but feeding egg white leads to dermatitis, loss of hair, decrease in weight and edema.

VITAMIN - B9(FOLIC ACID)

- Source

- Widely distributed. Liver, kidney, tuna fish, salmon, yeast, wheat, dates and spinach.

- ✓ Root vegetables, sweet potatoes, rice, corn, tomatoes, banana, pork and lamb contain little folic acid.

Requirements

- Adults: 400 – 500 µg/day
- Children: 100 – 300µg/day
- Pregnant Woman: 800µg/day

DEFICIENCY

- ✓ Leads to megaloblastic anemia, glossitis and gastro intestinal disorders.

VITAMIN - B12 (CYANOCOBALAMIN)

- Source
- Occur only in animals, chief source is liver.
- It is present in milk, meat, eggs, fish, oyster.
- In plants it is present in spirulina.
- Micro organisms synthesize vitamin B12.

Requirements

- Adults: 3µg/day
- Children: 1-2 µg/day

DEFICIENCY

- ✓ Juvenile pernicious anemia-Adult pernicious anemia, characterized by RBC becoming abnormally large and fewer in number.

- ✓ The patient weakens, loses weight and the nervous system is also gradually affected.

VITAMIN - C(ASCORBIC ACID)

- Source

✓ Present in all fresh fruits and vegetables.

✓ Citrus fruits (such as orange, lemon, lime) gooseberry, pineapple, guavas, tomatoes, melons, raw cabbage.

✓ New potatoes contain large amounts.

Requirements

- Adults: 75mg/day
- Infants: 30 mg/day
- Pregnant Women: 100mg/day

DEFICIENCY

- ✓ Scurvy
- ✓ It include skin changes, fragility of blood capillaries, gum decay, tooth loss and bone fracture.

References

- Text Book of Medical Biochemistry – Dr.MN Chatterjea & Dr.Rana Shinde
- Text Book of Biochemistry – Dr.G.R.Agarwal and Dr.O.P.Agarwal
- Internet sources