

LECTURE-2

VITAMINS

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- DATE-13-12-2018





Pantothenic Acid (VIT B-5)





Pantothenic Acid (Vit. B5)

Pantothenic acid, also called **pantothenate** or **vitamin B₅**

- Its name derived from the Greek ***pantothern*** , meaning "**from everywhere**"
- Small quantities of pantothenic acid found in every food
- Pantothenic acid is used in the synthesis of coenzyme A (CoA)

Food Sources & RDA of Pantothenic acid

Sources

- Meat
- Milk
- Mushroom
- Liver
- Peanut
- Eggs

RDA

Infants : 1-2 mg

Children : 4-5 mg

Adults: 5-12 mg



Functions of Pantothenic acid & Reactions

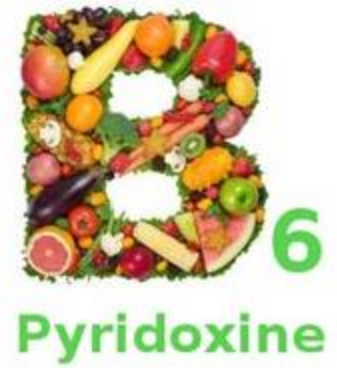
- Biological active form of Pantothenic acid is CoA, is present in tissue bound to protein (Apoenzyme)
- CoA has thiol group which is highly reactive called CoASH
- CoA is linked by thioester bond to compounds which play important role in reactions like;

CoA form of compounds	Enzyme	Reaction
Acyl CoA	Thiokinase	$\text{FA} + \text{CoASH} \rightarrow \text{Acyl CoA}$
Acetyl CoA	Pyruvate DH	$\text{Pyruvate} + \text{CoASH} \rightarrow \text{Acetyl CoA}$
Succinyl CoA	Thioporase	$\text{Succinyl CoA} + \text{Acetoacetate} \rightarrow \text{Acetoacetyl CoA} + \text{succinate}$

DEFICIENCY



- Rare : chronic alcoholics, renal dialysis pt
- Deficiency Symptoms
 - Vomiting, nausea and stomach cramps
 - Insomnia and fatigue
 - Depression, irritability, restlessness and apathy
 - **Gopalan's burning foot syndrome** –
paresthesia in lower extremities, sleep disturbances
- No reported toxicities



PYRIDOXINE

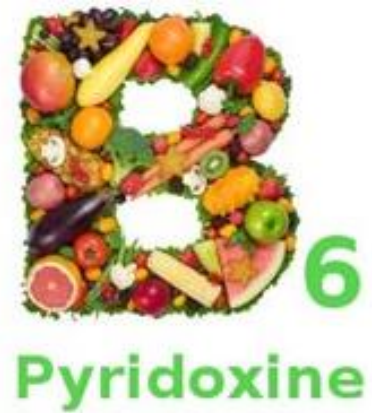
VIT – B₆



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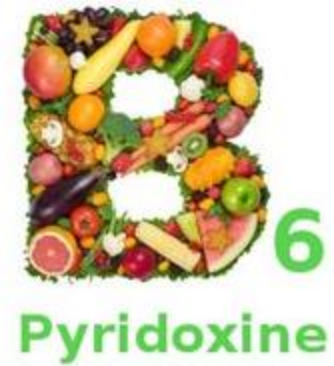
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VITAMIN B-6



- Other names
 - **Pyridoxine** (OH)
 - **Pyridoxal** (CHO)
 - **Pyridoxamine** (AMINE)

Pyridoxine



- Active form, Pyridoxal 5'-phosphate (PLP) serves as a **cofactor** in many enzyme reactions in amino acid, glucose and lipid metabolism.
- Also acts as **co-enzyme** needed for metabolism of CHO, fat & protein
- Synthesizes non-essential amino acid via transamination reaction
- Synthesizes neurotransmitters
- Synthesizes hemoglobin

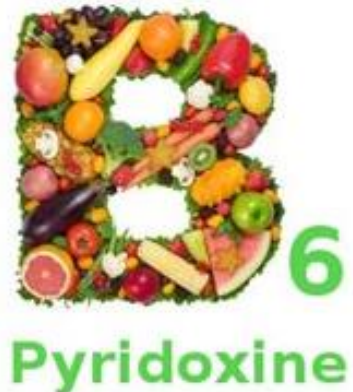
Food Sources of Vitamin B-6

- Meat, fish, poultry food
- Enriched cereals
- Potatoes
- Milk

Well absorbed in
intestine

- Fruits and vegetables: Banana,
- spinach, avocado

Less absorbed





RDA for Vitamin B-6

- 1.3 mg/day for adults
- 1.7 mg/day for men over 50
- 1.5 mg/day for women over 50
- Athletes may need more
- Alcohol destroys vitamin B6



Pyridoxal phosphate (PLP)

Required as **co-enzymes** for following reactions:

1. Decarboxylation of amino acids
2. Transamination
3. Transulfuration reactions
4. Conversion of tryptophan to niacin
5. Conversion of linoleic acid to arachidonic acid (prostaglandin precursor)
6. Formation of sphingolipids

B6 Deficiency

Widespread symptoms

- Depression
- Vomiting
- Skin disorders
- Nerve irritation
- Impaired immune system

B6 Toxicity

- Nerve damage
- Difficulty in walking
- Numbness in hands/feet



BIOTIN OR VIT B-7



SOURCES

- Widespread in foods
- Organ meats, fish
- Egg yolks
- Soybeans
- Whole grains
- *Biotin can also be synthesized by intestinal bacteria.*
- **RDA**
 - Adults: 30 µg/day
 - **Absorption** : Small intestine



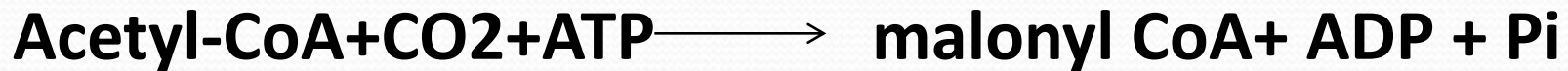
Biotin (B7)



- Biotin, also known as **vitamin H** or **coenzyme R**
- Involved in metabolism of CHO and fat
- Required for carboxylation reaction
- Synthesis of glucose, fatty acids, DNA
- Involved in catabolism of certain amino acids

FUNCTIONS : **Coenzyme** activity

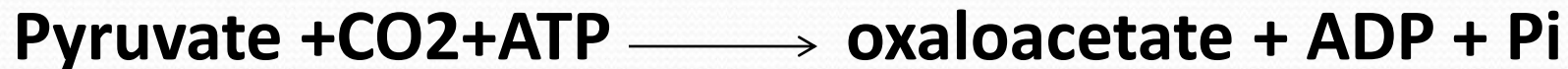
- 1) Acetyl CoA carboxylase - add CO₂ to acetyl CoA to form malonyl CoA, rate limiting step in fatty acid synthesis.



- 2) Propionyl CoA carboxylase-

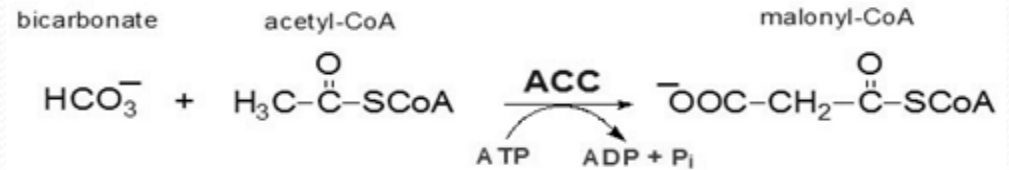


- 3) Pyruvate carboxylase-

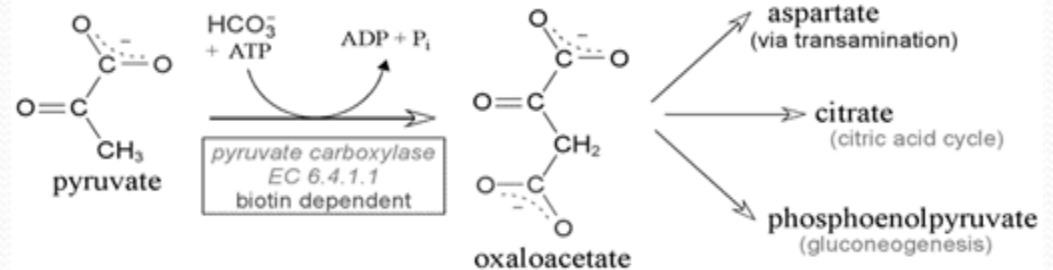


Biochemical functions of Biotin

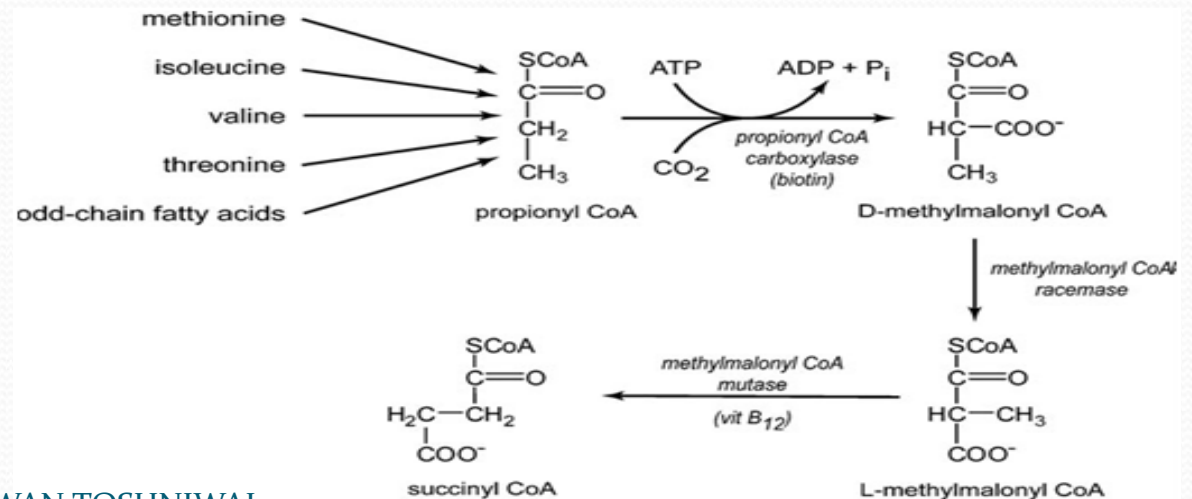
Acetyl Co-A Carboxylase



Pyruvate carboxylase



Propionyl Co-A Carboxylase



Biotin Deficiency

Avidin present in raw egg white binds to biotin, prevents absorption

Deficiency symptoms include:

- **Hair loss (alopecia)**
- **Conjunctivitis, Dermatitis in the form of a scaly, red rash around the eyes, nose, mouth and genital area.**
- **Neurological symptoms in adults, such as depression, lethargy, hallucination, and numbness and tingling of the extremities**
- **Poor appetite, nausea, vomiting**
- **Anemia**
- **Muscle pain and weakness**



Biotin toxicity

- Deficiency rare
- No Upper Level for biotin
- Relatively nontoxic

QUESTIONS



thank you



QUESTIONS ?????

- 1) Which vitamin is not water soluble ?
A) A B) B5 C) B6 D) B3
- 2) Gopalan's burning foot syndrome is seen in which vitamin deficiency ?
A) B5 B) B6 C) C D) B3
- Which vitamin is needed to treat carpal tunnel syndrome ?
A) B5 B) B6 C) B7 D) pantothenic acid
- Which vitamin is synthesized in the body ?
A) B12 B) B7 C) B6 D) B5
- RDA of biotin for the body is
A) 10 ug/m B) 50 ug/m C) 70 ug/m D) 30 ug/m

ANSWERS

- 1) Which vitamin is not water soluble ?
• **A) A** B) B5 C) B6 D) B3
- 2) Gopalan's burning foot syndrome is seen in which vitamin deficiency ?
• **A) B5** B) B6 C) C D) B3
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