

***DEFICIENCY  
DISEASES***

# INTRODUCTION

- **Vitamins are organic compounds required in the diet in small quantities to perform biological functions.**
- **We obtain them from :  
foods we eat or via vitamin supplements.**

# VITAMINS

- According to solubility vitamins are of:  
Fat-soluble &  
Water-soluble
- Thirteen vitamins are known of which:  
Four are fat-soluble : Vitamins A , D , E ,K  
Nine are water- soluble.

## Distinction between fat-soluble and water-soluble vitamins.

- **Fat soluble vitamins are readily stored in the body.**
- **Not readily excreted in urine.**
- **Excess consumption can lead to their accumulation and toxic effects.**

# VITAMIN SUPPLEMENTS

- ✓ **Synthetic or natural substances which can be purchased as pills, capsules, powders or liquids.**
- ✓ **Best when accompanied by a well balanced diet.**
- ✓ **Do not replace a healthy diet.**
- ✓ **Do not provide calories or energy.**

# RECOMMENDED DIETARY ALLOWANCES (RDA)

- **These are suggested levels of essential nutrients considered adequate to meet nutritional needs of healthy individuals.**
- **Requirements are influenced by physical characteristics , dietary habits, sex, pregnancy, lactation and age.**

# MULTIVITAMIN SUPPLEMENT

- A multivitamin should contain fat-soluble vitamins A,D,E ; water-soluble vitamins B<sub>1</sub>,B<sub>2</sub>,B<sub>6</sub>,B<sub>12</sub> , niacin, biotin , folic acid , pantothenic acid and vitamin C.
- Contains minerals :zinc, magnesium, copper, and calcium.

# VITAMINS

## Fat-soluble

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

## Non B-Complex

Vitamin C

## Water-soluble

## B-Complex

- Thiamine (B1)
- Riboflavin(B2)
- Niacin (B3)
- Pantothenic acid(B5)
- Pyridoxine(B6)
- Biotin(B7)
- Folic acid (B9)
- Vitamin B12



# FAT-SOLUBLE VITAMINS

# VITAMIN- A

- It is the name given to a group of related compounds :

Retinol (vitamin A alcohol)

Retinal ( vitamin A aldehyde)

Retinoic acid ( vitamin A acid)

- Its provitamin carotenes are found in plants.

# SOURCES:

- **Fish oil , liver, egg yolk, milk, cheese , butter.**
- **Vegetable sources contains provitamin A carotenes.**
- **Yellow and dark vegetables and fruits are sources of carotenes.**

**Carrots  
mango  
papaya  
spinach.**

# **FUNCTIONS OF VITAMIN A**

- **Maintenance of normal vision.**
- **Maintenance of normal cartilaginous and bone growth.**
- **Increased immunity against infections in children.**
- **Anti-proliferative effect.**

# VITAMIN- A DEFICIENCY

- ✓ May be due to :
  - inadequate dietary intake
  - impaired intestinal absorption
  - Chronic alcoholism.
- ✓ Impaired vision – Night blindness.
- ✓ Extremely dry skin ,hair or nails.
- ✓ Epithelial metaplasia and keratinization.
- ✓ Xerophthalmia ( dry eye ).

# VITAMIN D

**SUNSHINE VITAMIN.**

- **CALCITRIOL.**
- **Exists in two activated sterol forms:  
Vitamin D<sub>2</sub> - CALCIFEROL Vitamin  
D<sub>3</sub> - CHOLECALIFEROL.**

## SOURCES:

- Sunlight.
- Milk.
- Fish.
- Orange juice .
- Fortified cereals.

# **FUNCTIONS OF VITAMIN D**

- **Maintenance of adequate plasma levels of calcium and phosphorous.**
- **Metabolic functions.**
- **Bone mineralization.**
- **Neuromuscular transmission.**



# VITAMIN -D DEFICIENCY

➤ **May be due to:**

**Limited exposure to sunlight**

**Diet deficiency.**

**Renal disorders.**

➤ **Rickets.**

➤ **Osteomalacia ( in adults).**

➤ **Hypocalcaemictetanydue to neuromuscular dysfunction.**



# CAUSES

- Increased risk of:
  - Cancers
  - Autoimmune diseases
  - Hypertension

## WHO IS AT RISK ?

Covered and protected skin  
Elderly  
breast – fed infants

# VITAMIN E

- ✓ **Vitamin E describes a family of eight antioxidants:**
  - four tocopherols**
  - four tocotrienols.**
- ✓ **It is an antioxidant in cells.**

# SOURCES

- ❖ **Vegetables:**
  - spinach**
  - carrot**
- ❖ **Egg**
- ❖ **Bread**
- ❖ **Almonds**
- ❖ **Peanuts.**
- ❖ **vegetable oils**

# **FUNCTIONS OF VITAMIN-E**

- **Antioxidant.**
- **Inhibits platelets aggregation.**
- **Enhances vasodilation.**
- **Scavenger of free radicals.**

# VITAMIN -E DEFICIENCY

- **Increased risk of cardiovascular diseases.**
- **Hemolytic anaemia in children.**
- **Neurological symptoms (impaired coordination and muscle relaxation).**
- **RISK FACTOR : fat malabsorption syndrome.**

# THERAPEUTIC USES

- **DIABETES MELLITUS.**
- **CANCER PREVENTION.**
- **PREVENTION OF CARDIOVASCULAR DISEASES.**



# VITAMIN K

- **K** derived from the German word **KOAGULATION**
- **Two naturally occurring forms :**
  - Plants synthesize phylloquinone – Vitamin K<sub>1</sub>**
  - Bacteria synthesize menaquinone-3 – Vitamin K<sub>2</sub>**

# SOURCES

- ✓ **Vegetable oils**
- ✓ **Almonds**
- ✓ **Peanuts**
- ✓ **Spinach**
- ✓ **Body can produce its own(from bacteria in intestine).**

# **FUNCTIONS OF VITAMIN-K**

- ✓ Helps in clotting .**
- ✓ Assist in bone mineralization.**

# VITAMIN K DEFICIENCY

- ✓ It is common in adults.
- ✓ Biliary obstruction .
- ✓ Due to antibiotic therapy.
- ✓ Due to malabsorption syndrome.
- ✓ Hemorrhage.
- ✓ Deficiency may appear in infants or in people.
- ✓ Who take anticoagulants such as Warfarin.

# WATER-SOLUBLE VITAMINS

# VITAMIN C

- **Exist as L- ascorbic acid.**
- **Smokers and lactating mother needs higher range.**

# SOURCES

- **Fruits**
- **Vegetables**
- **Tomato juice**
- **Sweet potato**
- **Citrus fruit**
- **Orange juice.**

# FUNCTIONS OF VITAMIN C

- Collagen synthesis.
- Body to fight against infections.
- Keep gum's healthy.
- Aids in the prevention of heart disease and cancer.



# VITAMIN C DEFICIENCY

- ✓ Leads to scurvy.
- ✓ Weight loss.
- ✓ Slow healing of wound and fractured bone.
- ✓ Fatigue and joint pain.
- ✓ Skin rash .
- ✓ Anaemia.

# THERAPEUTIC USES

- **Cardiovascular diseases.**
- **Cataracts.**
- **Diabetes mellitus.**
- **Cancer prevention.**
- **Common cold.**
- **Lead toxicity.**

# VITAMIN B

- **Group of seven water-soluble vitamins :**

**Thiamine**

**Riboflavin**

**Niacin**

**Pyridoxine**

**Cobalamin**

**Biotin**

**Pantothenic acid**

**Folic acid**

- ✓ **Biotin and pantothenic acid deficiencies are rare.**
- ✓ **As it is found in numerous foods.**
- ✓ **Biotin deficiency may occur with prolonged antibiotic therapy.**

# VITAMIN B1-THIAMINE

## SOURCES

- ✓ Yeasts
- ✓ Cereals
- ✓ liver

# **FUNCTIONS OF THIAMINE**

- **ATP production.**
- **Stabilizing the appetite.**
- **Proper nerve function.**

# VITAMIN -B1 DEFICIENCY

- **BERI-BERI.**
- **WERNICKE –KORSAKOFF SYNDROME.**

## **RISK OF THIAMIN DEFICIENCY**

- **Excessive loss: hemodialysis and diuretics.**
- **Low intake and alcoholism.**

# THERAPEUTIC USE

✓ **CONGESTIVE HEART FAILURE.**

✓ **CANCER PREVENTION.**

✓ **ALZHEIMER'S DISEASE.**



# VITAMIN B2-RIBOFLAVIN

- Also called **YELLOW RESPIRATORY ENZYME.**
- **Cytochrome oxidase enzyme.**
- **Rapidly absorbed from the bowel and stored in tissues.**

# SOURCES

- **Eggs.**
- **Meat.**
- **Leafy green vegetables.**
- **Milk**

# **FUNCTIONS OF RIBOFLAVIN**

- **Energy production.**
- **Cell respiration.**
- **Maintenance of good vision ,skin ,nails.**
- **Carbohydrate ,fat and protein metabolism.**

# RIBOFLAVIN DEFICIENCY

- ✓ **Itching and burning eyes.**
- ✓ **Oily skin.**
- ✓ **Dermatitis.**
- ✓ **Digestive disturbances.**
- ✓ **Cracks and sores in mouth and lips.**

# VITAMIN B3-NIACIN

- Includes biologically active derivative:  
**NICOTINAMIDE**
- Essential for the formation of two oxidative coenzymes ( dehydrogenases ).

**NAD ( Nicotinamide adenine dinucleotide )**

**NADP.**

# SOURCES

- **Liver**
- **Kidney**
- **Meat**
- **Green vegetables**
- **Grain cereals.**

# **FUNCTIONS OF NIACIN**

- **Energy production.**
- **Improves circulation.**
- **Maintenance of skin and tongue.**
- **Maintenance of nervous system.**

# VITAMIN B3 DEFICIENCY

- ✓ Pellagra – rare in Western societies.
- ✓ Nervousness .
- ✓ irritability
- ✓ Fatigue .
- ✓ Head ache.
- ✓ Insomnia.
- ✓ Mental depression.



# VITAMIN B5-PANTOTHENIC ACID

## FUNCTIONS

- Produces energy.

## SOURCES

Fruits ,meats, poultry ,legumes .

# VITAMIN B6-PYRIDOXINE

Related to two naturally occurring  
substance:

pyridoxine , pyridoxal , pyridoxamine.

## SOURCES

Meat

Eggs

Green vegetables

# **FUNCTIONS OF VITAMIN B6**

- **Production of red blood cells.**
- **Nervous system function.**
- **Immunity.**
- **Reducing muscle spasm , cramps and numbness.**
- **Maintaining proper balance of sodium and phosphorous.**

# DEFICIENCY OF VITAMIN B6

- **Nervousness , Insomnia**
- **Skin lesions**
- **Loss of muscle control, muscle weakness.**
- **Arm and leg cramps.**

# VITAMIN B7-BIOTIN

## SOURCES

- **Meat**
- **Egg yolk**
- **Soya beans**

# **FUNCTIONS OF VITAMIN B7**

- **Produce energy.**
- **Helps produce body chemicals (insulin).**
- **In gene expression.**

# VITAMIN-B7 DEFICIENCY

- ✓ **Nausea.**
- ✓ **Anorexia.**
- ✓ **Mental and neurological symptoms :**
  - Hallucination**
  - Depression**

# VITAMIN B9-FOLICACID

## SOURCES

- ❖ Yeasts
- ❖ leafy vegetables

## FUNCTION

**Synthesis of nucleic acids**



# FOLIC ACID DEFICIENCY

- Neural tube defects.
- Anaemia.

## THERAPEUTIC USE:

**Chronic hemolytic anaemia.**

# VITAMIN B12-COBALAMIN

## FUNCTIONS

- **Proper nerve function.**
- **Production of red blood cells.**
- **DNA reproduction.**
- **Prevention of anaemia.**
- **Metabolizing fats and proteins.**

# VITAMIN- B12 DEFICIENCY

- ✓ **Anemia nerve damage hypersensitive skin.**