UNIT VI

PHYSIOLOGY

- The term of physiology French physician jean fernal (1542)
- The founder of physiology- william Harvey(circulation of blood)1578
- Gastric juice – spallanzani
- Respiration - Lavoiser
- Reflex action – Hall
- Concept of protein - Mulder
- Experiment on heart - Stannius
- The term enzyme – Kuhne (1878)
- Enzyme discovered – E. Buchner (1903)
- Immunity – Metchnikoff
- ECG – Einthoven
- Isolation of Insulin – Banting (1922)
- ATP Discovered – Lohman (1929)
- Antibodies discovered - Edleman & porter(1972)
- Mechanism of working of cell (noble prize) - clade, palade deduve.

NUTRITION

- Animal nutrition type - Holozoic.
- Intake of solid food material - Holozoic
- Plant nutrition - Holophytic

Types of holozoic nutrition:

1. SAPROPHYTIC - food from decaying material
2. PARASITIC - living in host.
   - i) Endoparasitic - Ascaris,taenia.
   - ii) Ectoparasitic – leech, Head louse.
3. SYMBIONTS - Organism living within other organism without making any damage on it
   Eg.E.COLI bacterium in intestaine.

TYPES OF FOOD:

1) Based on Function:

i) Energy producer – carbo hydrates fat.
ii) Body builders – protein, water.
iii) Regulators – Vitamin, minerals.

2) Based on chemical nature:

1. NITROGENOUS FOOD - protein(contain N,S)
2. NON NITROGENOUS FOOD - carbohydrates,fats.

3) Organic food (It contain carbon) - carbohydrates ,fat, protein

4) Inorganic food (donot contain carbon) - minarals,wate

CARBOHYDRATES: $Cn(H_2O)$

- ❖ Carbon,hydrogen,oxygen - 1:2:1 Ratio
- ❖ Polyhydroxy Qeldehyde or ketone or alcohol - carbohydrate.

Types of Corbohydrates:-

1. Mono saccharides
   1) Trioses 3 Carbon atoms.
   2) Tetroses 4 Carbon atoms.
   3) Pentose's 5 Carbon atoms.
   4) Hexpses 6 Carbon atoms.

Example:

1. Trioses – glyceraldehydes Intermediary, metabolism
2. Tetroses – Erythrism
3. Pentoses – Ribose, deoxy ribose (DNA, RNA)
4. Hexoses – glucose (dextrose) Fructose (laevulose) Mannose

2. Disaccharides :

❖ It gives two sugars on hydrolysis.

Eg. Maltose, Sucrose, Lactose.

3. **Oligo Saccharides:**

❖ It gives more than two sugars (3 to 10 sugar molecules)

Eg. Raffi nose, Stachyose

4. **Poly Saccharides:**

❖ It gives nearly 3,000 units of sugar.(10 to 3,000)

Two types:

1. Homopoly Saccharides – Formed of only one type of mono Saccharides .
   Eg. Starch, glycogen, cellulose, dextrin, Insulin, Chitin.
2. Hetero poly Saccharides – It gives of more than one types of Mono Saccharides.
   Eg. Glucosamine, galactosamine

❖ Undigested part of carbohydrates – Roughage. Eg, Cellulose diet.

Protein :

- ❖ Term Protein derived from –Greek word "Protes"
- ❖ Protest – Prime or first importance.
- ❖ High molecular weight polymers – Proteins.
- ❖ Amino acids are building stones of proteins.
- ❖ Amino acids contain acidic and basic groups – Amphoteric Compounds.

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- ❖ Formula of amino acids -- NH2–CH-COOH
- ❖ Aliphatic amino acids (nucleus) - (GAAG) Glycine, Alanine, Aspartic acid Glutamic acid.
- ❖ Aromatic amino acids (PHT) – Phenyl alanine, histidine, Tyrosine.
- ❖ Hetero cyclic Amino acid – Tyrosine.
- ❖ Acidic groups Amino acid – Glutamic acid, Aspartic acid. (more acidic than amino)
- ❖ Basic amino groups Amino acid – Lysine, Arginine. (LA)
- ❖ Neutral amino acids 6 – Lysine, alanine, valine.

- 22 amino acids are known at present.
- Essential amino acids –PHILLMA TVT – Phenyl alanine, histidine, Isoteusine, leusine, Lysine, Methionine, Argenine, Threonine veline, tryptophan.
- Simple proteins – Albumins, globulins, his tones, keratins, globins, elastins, collagens
- Elastin found in – Tendons, Arteries.
- Keratins found in –Skin, nails, horn, hoof, feathers.
- Collagens found in – Skin, Tendons, bones.
- Conjugated protein – DNA, RNA, Pepsin, Caseinogens of milk, Hemoglobin, Haemocyanine, myoglobin, Lipoviteline.
- (Tyrosinase containing metal Ca)
- (Arginase containing metal Mn or Mg)

FATS OR LIPIDS

- Fat solvents (ABCE) – Ether, Chloroform, boiling alcohol, benzene
- Chemical form of Lipids – Esters (Fatty acid & glycerol)
- I gram of Lipid Provide energy – 9.3 calories
- I gram of carbohydrate provide energy – 4.1
- Simple Lipids or Neutral lipids – Fats, oils
- Fats contain larger of saturated fatty acids
- Oil contain larger of unsaturated fatty acids
- Simple fat meaning – all the fatty acids in a lipid are similar.
- Mixed fat- fatty acid in a lipid are different.
- Basic unit of lipids & fats – Fatty acids.
- Fatty acid formula – $CH_3 (CH_2) N COOH$.
- Saturated fatty acids – Palmitic acid, stearic acid.
- Unsaturated fatty acids – Oleic acid.
- Essential fatty acids – Lanoleic acid, Arachidonic acid (LA).

Essential fatty acids:

- Found in coconut oil, cotton seed oil, sunflower oil.
- Deficiency of essential fatty acids cause – Hyperkeretosis or Pherenoderma.
- Conjugate Lipids – Phospho Lipids, Glycolipids, Lipoprotelins, Salto Lipids.
- Phospholipids essential to – Coagulation of blood.
- Phospho Lipids contain fatty acids, phosphoric acids, glycerol and nitrogenous base.
- Derived Lipids – Fatty acids, alcohols, sterols, ergosterols, cholesterol, – hydrocarbon – carotene, olive & shark Liver oil → Vitamin D,E.K.
- Lipids Responsible for – cell permeability & cell organization

MINERALS:

- Animal tissue contain 29 elements
- Essential elements divided into two types:
  1) Macro elements (more than 1mg) 60-80% Calcium, Hydrogen, (60-80%) Oxygen, Nitrogen,Phosphorus, Sulphur, Chorine,Megnesium, Sodium, Pottasium,Iron.

2) Micro elements or Trace elements – (CCMMZF) - (required very small micrograms)
Copper, Cobalt, Manganese, Molybdenum, Zinc, Iodine, Fluorine.

- Non – essential elements – Bromine, boron, vanadium, titanium, Silicon, arsenic, lead, Aluminium Nickle.

1) CALCIUM:-

- 50-70 Kg Man contain – 1400 gm calcium.
- 99% in bones.
- 100ml blood contain 10mg Calcium.
- Cow milk 1 lit. – 1200 mg Calcium.
- Human milk 1 lit. -300 mg Calcium.
- I Sitaphal containing – 800mg Calcium.

FUNCTION:-

- Formation of bones
- Coagulation of blood
- Muscle contraction
- Transmission of Impulse.
- Calciuam phosphorus Absorption ratio in intestine – 1:1 or 1:2 or 2:1
- Low Ph increase the calcium Absorption.
- 30% dilatory Calcium absorbed
- Calcium is below normal level – Tetany. (Hypocalcaemia) (Paratharmone hormone)
- Hypocalcaemia – Lack of appetite, Constipation,, Depression of Nervous System.

IRON:-

- Total amount of Iron in body – 3-4 gm
- 75% is found in blood.
- Milk do not contain Iron.
- Absorption takes place in duodenum and upper part of small intestine.
- Daily absorption – 06 – 1.5 Mg
- Iron is absorbed in ferrous form.
- Iron is stored in the form ferretin in Liver, spleen and intestinal mucosa.

FUNCTIONS:-

1. Transport of O_2 & CO_2.
2. Enzyme – cytochrome, catalase, Peroxidases.
3. Involved in Metabolic Oxidation.

- Iron deficiency leads – Anaemia.

3. Phosphorus:

- Deficiency rare.
- 1% of total weight.
- Milk, cheese, butter.

Function:-

- Energy stored in form of ATP, ADP
- Important role in metabolism, phosphorylation
- Form other components, nucleic acids, RNA, DNA

4. Magnesium:-

- Activator's of enzyme like phosphorlase, enolase, Peptidase, RNA Polymerase, DNA polymerase.
- Transmission of impulse.

5. Sulphur:-

- Synthesis of Insulin and anti pituitary hormones
- Tissue respiration
- Formation of protein such as keratin, coenzyme A

6. Pottasium:-

- Sources of potassium – Coffee, tea, Cocoa, milk.
- Na, Cl – Common salt.
- Function of Na, Cl, K – Osmatic pressure, Buffer system (PH)
- Transport of O_2.
- Gastric HCL derived from Nacl.
- Viscosity of blood.

7. Copper:-

- Human body contain 100 – 150 mg.
- Components of certain enzymes – Cytochrome, ascorbic acid.
- Bone formation.
- Components of hemoglobin in gastropods, Arthropods, Cephalopods.
- Disease of copper abnormal – Wilson's disease.
- Wilson's disease – Copper accumulates in Liver, Brain.

8. Flourine:- Presents in water

- Found in bones, teeth, hard tissues
- Fluorine increasing disease – Dental flourosis.
- Fluorine decreasing disease – Dental caries.

} Edge sword effect.

9. Cobalt:-

- Occur in human Liver.
- It is a component of B12 vitamin.
- Deficiency _ Anaemia.
- Excess of Cobalt – Polycythemia (over production of RBC.
- Iodine involve –Thyroxin hormone secretion.
- Manganese, Copper, Zinc _ Involved in Intermediary Metabolism.
- Potassium, Sodium – Cardiac regulation & Transmission of impulse. (function of heart)
- Clorine – Acid base balance.

10. Zinc:-

- Found in RBC, hair, bone, Liver.
- Source – Sea oyster, Liver.
- It is component of carbonic anhydrase, Insulin.

11. Molybdenum :-

- Component of xanthenes, Oxidize, hydrogenise

VITAMINS

- A Vitamin is something that makes as sick when we do not eat it – Szent Gyorgyi.
- Vitamin do not provide energy for animals.
- Term " vitamin" introduced – Dr.Funk, Later it called Vitamin.

VITAMIN – A (Retinal) Types : A1, A2

- Discovered by Mc.COLLUM in 1913.
- Carotene is called Pro vitamin A

Deficiency Disease:-

- Retards growth in children.
- Night blindness or Nyctalopia
- Xeropthalmia
- Keratomalasia (cornea destroyed)
- Xerosis
- Over doses – Headache, vomiting, peeling of skin.

VITAMIN – D

- Calciferol or Antirachitic vitamin
- Discovered by COLLUM in 1922
- Steroid vitamin.

Types: D1, D2, D3, D4, D5.

- Ergocalciferol –D2
- Chole caliciferol _ D3
- Skin cholesterol (ergesterols) converted into vitamin D on exposure of the skin to sunlight.
- Calcium, phosphate absorption, Metabolism of Ca, Phospharus.
- It is called sun shine vitamin.

DEFICIENCY:-

- Rickets in children (Age 6 - 18)
- Osteomalacia in Adults
- Spinal curvature

VITAMIN – E (15- 20 gm daily requirement)

- Tocopherol or Ant sterility Vitamin.
- Tocos – child birth, pharoeo – to bear ------ Tocopheral Greek words

- Discovered by Matill and condin in 1920
- Three forms tocopherols. They are α, β, χ tocopherals.
- Tocopherols is potent form
- Source: wheat germ oil, cotton seeds
- It is an antioxidant (Prevent Oxidation of Vitamin A)

Deficiency: -

- Resorption sterility in rat.
- Loss of ability to conceive.
- Degeneration of testis, sterility.
- Necrosis of heart muscles.
- Embryonic mortality in chick.
- Encephalo malasia (motor in co ordination, death)
- Muscular dystrophy.

VITAMIN – K

- Antihaemorragic vitamin.
- Discovered by DAM in 1935.
- Essential for coagulation (coagulation of blood)

FUNCTION:

- Synthesis of prothrombin in blood
- Respiratory Chain & Oxidative Phosphorylation.

DEFICIENCY:

- Coagulation of blood prevented leads to death.

VITAMIN – Q

- Discovered by Quick in 1922
- It is Phospholipid

FUNCTION: Blood clotting in man

VITAMIN –D: Isolated from curd

VITAMIN " B" COMPLEX (water soluble vitamin)

VITAMIN – B1

- Thiamine
- Isolated by JANSEN & DONATH in 1936
- Synthesized by WILLIAMS (1936)

FUNCTION:

- Formation of Thiamin Pyrophosphate (Co – enzyme in kreb's cycle)
- Oxidation of Pyruvic acid, Lactic acid.