Transportation Chap 14

DIFFUSION

The movement of ions or molecules from the region of higher concentration to the region of lower concentration is known as diffusion.

EXAMPLES

1. If a bottle of perfume is opened in a corner of a room, it can be smelt in the entire room.
2. Leakage of gas pipes can be smelt from a farther point.
3. If we drop a KMNO4 crystal in clean water, then after sometime the crystals will dissolve and colour of water changes from colorless to purple.

FACTORS ON WHICH RATE OF DIFFUSION DEPENDS

1-SIZE

Small molecules move faster than larger ones.

2-TEMPERATURE

Rate of diffusion will be high at high temperatures.

3-CONCENTRATION GRADIENT

Greater the difference in concentration and shorter the distance between two regions, greater will be the rate of diffusion.

FACILITATED DIFFUSION

Diffusion of the substances across the cell membrane through the specific carrier proteins is known as facilitated diffusion. These membrane transport proteins are channel proteins, receptors, cell pumps or carriers, made up of usually proteins and don't require energy for transport.

PASSIVE TRANSPORT

Movement of substances in and out of the cell, caused by simple kinetic motion of molecules, doesn't require energy of ATP is known as passive transport, e.g. Simple diffusion and facilitated diffusion.

OSMOSIS

The movement of water molecules from the region of higher concentration to the region of lower concentration through a semi-permeable membrane, is known as osmosis.

TYPES OF OSMOSIS

A- ENDOSMOSIS

The movement of water molecules into the cell, when it is placed in hypotonic solution is called as Endosmosis.

B- EXOMOSIS

The movement of water molecules out of the cell when the cell is placed in a hypertonic solution.

ACTIVE TRANSPORT

The movement of ions or molecules across the cell membrane against the concentration gradient i.e. from lower concentration to higher concentration with the help of specific transport proteins in the cell membrane, at the expense of cell's metabolic energy – ATP is called active transport.

EXAMPLES

1. Sodium-Potassium pump in nerve cells which pump Na+ out of the nerve cell, and K+ into the cell against the concentration gradient.
2. Cells lining the intestine can transport glucose actively from a lower concentration in the intestinal contents to higher concentration in blood.
3. In plants phloem loading is an ex. Of active transport.

IMBIBITIONS

Adsorption of water and swelling up of hydrophilic (water loving) substances is known as imbibitions.

HYDROPHILIC SUBSTANCES

Those which have great affinity for water are hydrophilic e.g. starch, gum, protoplasm, cellulose, proteins, e.g. seeds swell up when placed in water.

- Wrapping up of wooden framework during rainy seasons.
- Dead plant cells are hydrophilic colloids.
- The chemical potential of water is a quantitative expression of the free energy associated with the water.
- UNIT: Joules/mole
- This term has been replaced by water potential

MEGA LECTURE

WATER POTENTIAL (PSI)

It is the difference between the fee energy of water molecules in pure water and energy of water in any other system, or solution. Water potential is a relative quantity, depends upon gravity and pressure.

Q = Q* + f (concentration) + f (pressure) + f (gravity)

B* is standard water potential or pure water potential of valve O Mpa.

Unit : Megapascal's – MPa

(1 Mpa = 9.87 atmospheres)

USES

The direction of water flow across cell membrane can be determined. It is a measure of water status of the plant.

OSMOTIC PRESSURE

The pressure exerted upon a solution to keep it in equilibrium with pure water when the two are separated by a semi permeable membrane is known as Osmotic pressure. It prevents the process of osmosis.

OSMOTIC POTENTIAL

The tendency of a soln to diffuse into another, when two solutions of different concentrations are separated by a differentially permeable membrane.

- It is represented by βs for pure water βs = 0
- The βs decreases as the osmotic concentration increases
- Osmotic concentration is the number of osmotic-ally active particle per unit volume.
- Osmotic potential has been replaced by solute potential.
- The concentration of solute particles in a solution is know as solute potential βs. It value is always negative.

PRESSURE POTENTIAL BP

When a cell is placed in pure water or in aqueous solution with higher water potential than the cell sap water follows into the vacuole by endosmosis thru cell membrane and

tonoplast. Due to this inflow of water, the tension developed by the cell wall causes an internal hydrostatic pressure to develop, which is called as pressure potential.

$B = \beta s + \beta p$ or $Qp = Q - Qs$

In turgid cells βp is equal and opposite to βs

TURGID CELL

When the cell is fully stretched with maximum pressure potential, the water cannot flow into it. This condition is called turgidity and the cell is turgid.

PLASMOLYSIS

If a cell is placed in a hypertonic solution, which has more negative solute and water potentials then water will come out of the cell, by exosmosis and protoplasm starts separating from cell wall leaving a gap between cell wall and cell membrane. This withdrawal of protoplasm from cell wall is known as plasmolysis.

The point where protoplasm just starts separating from cell wall is known as “Incipient plasmolysis” when it is completely separated, full plasmolysis occurs.

In plasmolysis cell $\beta p = 0$ therefore $\beta w = \beta s$

DEPLASMOLYSIS

When a cell is placed is a hypotonic solution or pure water, there will be an inflow of water by endosmosis. Protoplasm starts expanding and presses cell wall due to which pressure potential develops and water potential becomes less negative. This swelling of cell is known as deplasmolysis.

WATER AND MINERALS UPTAKE BY ROOTS

1. Absorption of water and mineral salts takes place through root system.
2. Roots are provided with enormous number of tiny root hairs.
3. These root hairs are more in number in tap root system.
4. Roots hairs are out growths of epidermal cells.
5. Roots hairs increase the surface area for absorption.
6. Most of the absorption takes place at root tips.

7. From hairs and epidermal cells water flows thru cortex, endodermis, pericycle and them enters xylem.
There are 3 pathways for water to enter xylem.

A- CELLULAR PATHWAY

In this route water flows through cell to cell. Water enters the root hairs or epidermal cells down a concentration gradient: it flows through cell wall and cell membrane and enters the adjacent cell from where water may again flow towards the deeper cells by osmosis.

B- SYMPLAST PATHWAY

Cytoplasm of the cortical cells are interconnected by small pores in the cell wall known as plasmodesmata.
These pores provide another way of transporting water and solutes across the plasma membrane at root hairs.

C- APOPLAST PATHWAY

The cell walls of cortical and epidermal cells are hydrophilic and form a continuous matrix. Soil solution flows freely through these hydrophilic walls. The movement of soil soln.through extra cellular pathway provided by continuous matrix of cell walls is known as "Apoplast pathway".
Simplast and apoplast usually both occur concurrently.
Endodermis forms a waxy barriers against the flow of water and salts known as "casparion strip". So, water cannot enter endodermis via apoplast pathway. Symplast is the only way to cross the barrier. Endodermal cells actively transport salts to pericycle resulting in high osmotic potential which causes inflow of water by osmosis salts. Form pericycle water flows in to xylem via both symplast and apoplast pathways.

TRANSPIRATION

The loss of water in the form of vapours from aerial parts of the plant is called transpiration.

TYPES OF TRANSPIRATION

Following are the three types of transpiration.

A- STOMATAL TRANSPIRATION

It is a type of transpiration in which the water vapours

escape through the stomata. 90% of the total transpiration occur thru this method. In isobilateral leaves the stomata are present in both upper and lower epidermis e.g. lily and maize leaves. In dorsiventral leaves, the stomata are only confined to lower epidermis e.g. Brassica and sunflower.

B- CUTICULAR TRANSPIRATION

The loss of water in the form of vapours through the cuticle of leaves is called Cuticular Transpiration. About 5-7% of total transpiration takes place thru this route cuticle is a waxy layer which covers the leaves and tis is not completely impermeable to water.

C- LENTICULAR TRANSPIRATION

It is the loss of water vapours through lenticles present in the stems of dicot plants. Lecticles are aerating pores present in the bark formed as a result of secondary growth. It accounts for only 1-2% of total transpiration.

MECHANISM OF STOMATAL RESPIRATION

STRUCTURE OF STOMATA

Stomata are microscopic pores present in the epidermis of leaves and herbaceous stems. Number of stomata are variable in different leaves and depend upon the availability of water and climate of the region. Each stomata is surrounded by 2 specialized epidermal cells, as guard cells, they are bean shaped or kidney shaped and unlike other epidermal cells, they contain chlorophyll, hence perform photo-synthesis. The inner wall of guard cell is thick while the outer wall is thin and elastic. This structural difference is important for opening and closing of stomata.

STAGES OF TRANSPIRATION

There are two processes involved in stomata transpiration.

+ EVAPORATION

In the first step, water evaporates from the wet surfaces of turgid mesophyll cells and collected in the intercellular air spaces.

+ DIFFUSION

In this stage water vapours diffuse out from intercellular spaces where they are in higher concentration to the outer atmosphere where they are in lower concentration through the stomata.

MECHANISM OF OPENING AND CLOSING OF STOMATA

The opening and closing of stomata depends upon the turgidity of guard cells, which is due to increase or decrease in the osmotic potential of the guard cells. When water enters the guard cells by osmosis, they swell up. Since their outer walls are thin and elastic, they stretch and bulge out. The inner thick walls cannot stretch and so arch in and become crescent shaped thus the gap between the two guard cells widens, opening the stomata when the guard cell lose water, they become flaccid and the inner wall of two guard cells meet each other, closing the stomata.

Generally the stomata remain open during day time and close at night. Thus light appears as the primary factor which control the opening and closing of stomata.

FACTORS REGULATING OPENING AND CLOSING OF STOMATA

There are two main factors which greatly influence the opening and closing of stomata these are

1- LIGHT

In the presence of light, chlorophyll containing guard cells synthesize sugars which is turn increase the osmotic potential of guard cells. This increase Qs results in endosmosis and ultimately to turgidity. While in darkness these guard cells consume carbohydrates (sugars) by respiration for energy production or transported to other neighbouring cells for respiration and different purposes. This decreases the osmotic potential of guard cells leading to flaccidity because of exomosis of water.

2- CONCENTRATION OF K+ IONS

Turgidity of guard cells of many plants is regulated by K+ ion

concentration. During daytime, guard cells actively transport K+ions into them from neighbouring cells. Accumulation of K+ ions lowers the water potential of guard cells. This causes on inflow of water by endosmosis from epidermal cells. During night when they lose K+ ion, water potential increases. Water flows out of the guard cells by exosmosis causing them to become flaccid which result in closure of pore.

FACTORS AFFECTING TRANSPIRATION

Rate of transpiration is very important for a plant because transpiration stream is necessary to distribute dissolved mineral salts through out the plants. Water is transported to photosynthesizing cells of leaves. Transpiration is also very important as it cools the plant. This is especially important in higher temperatures. If the rate of transpiration is very high, there would be much loss of water from the plant. So at high temperatures the stomata almost close and reduction in the rate of transpiration is effected. This stops witting of the leaves and of herbaceous stems of plants.

Following are some important factors which affect the rate of transpiration.

1. LIGHT

Light affects the transpiration in two ways:

a. Light regulates the opening and closing of stomata. During sunshine the stomata are open, losing water vapours thus rate of transpiration is high and during night, the stomata are closed, so the rate of transpiration is low.

b. Greater intensity of light, increases the temperature and warms the leaf, so leaves lose heat by evaporating water molecules to cool themselves.

2. TEMPERATURE

Plants transpire more rapidly at higher temperature than at low. Rise in temperature has two effects:

i. It increases kinetic energy of water molecules, which results in rapid evaporation of water and decreases the rate

of transpiration.
ii. High temperature reduces the humidity of surrounding air. Due to this, evaporation from surfaces of mesophyll cells increase and hence rate of transpiration.

3. WIND

The air in motion is called wind. The area around the stomata is saturated with water vapours due to transpiration. During high velocity wind the area around leaves is quickly replaced by fresh drier air which increases diffusion of water molecules from air spaces to outside atmosphere and increases the rate of transpiration.
When air is still, the rate of diffusion of water molecules is reduced and the rate of transpiration is also reduced.

4. HUMIDITY

When air is dry, the rate of diffusion of water molecules, from the surfaces of mesophyll cells, air spaces and through stomata, to outside the leaf increases. So more water is lost, increasing the rate of transpiration.
In humid air, the diffusion of water molecules is reduced. This decreases the rate of transpiration.

5. SOIL WATER

A plant can't continue to transpire rapidly if its moisture loss is not made up by absorption of fresh supplies of water from the soil. When absorption of water by roots fails to keep up with rate of transpiration, loss of turgor occurs and wilting of leaf takes place.

DISADVANTAGES OF TRANSPIRATION

1. Transpiration is said to be necessary evil because it is an inevitable, but potentially harmful, consequence of the existence of wet cell surfaces from which evaporation occurs.
2. High rate of transpiration causes water deficiency and thus the excessive transpiration leads to wilting and death of plants.
3. There is good evidence that even mild water deficiency

results in reduced growth rate of plants.
4. Excessive transpiration effects the protein synthesis, sugar synthesis and other metabolic activities of plants.

ADVANTAGES OF TRANSPIRATION

1. Water is conducted in most parts of plants due to transpiration pull or ascent of sap.
2. It causes absorption of water and minerals from the soil.
3. Minerals dissolved in water are conducted throughout the plant body by transpiration stream.
4. Evaporation of water from the exposed surface of cells of leaves has cooling effect on plant.
5. Excess water is removed.
6. Wet surface of leaves allow gaseous exchange.

GUTTATION

It is the loss of water in the form of droplets from the ends of large leaf-veins. It take place through special openings called hydathodes.

DIFFERENCES BETWEEN TRANSPIRATION AND GUTTATION

TRANSPIRATION

Water escapes in the form of wapours.
Escape water is pure and does not contain solutes.
It takes place through stomata, and cuticle.
It is regulated by stomata.
Normally takes place in light

GUTTATION

Water escapes as liquid.
Escaped water contain solutes.
It takes place through hydathodes and end of veins.
It is not a regulated process.
Takes place at night.

TRANSLOCATION OF ORGANIC SOLUTES

Transport of organic products of photosynthesis, like sugars from mature leaves to the growing and storage organs in plants is called translocation. This movement of photo

assimilates and other organic materials takes place via the phloem and is therefore called "Phloem Translocation."
The phloem is generally found on the outer side of xylem and constitutes the bark. The cells of phloem that take part in phloem translocation are called sieve elements. Phloem tissue also contains companion cells, parenchyma cells, fibres like sclereids latex containing cells. But only sieve tube cells are directly involved in tansport of organic solutes.

SOURCE TO SINK MOVEMENT

The translocation of photosynthesis always takes place from source to sink tissues, therefore, the phloem transport is also referred as "source to sink movement."

SOURCE

The part o plant which forms the sugars or photoynthates is known as source. For example Mature Leaves.

SINK

Sinks are the areas of active metabolism or storage of food e.g: Roots, Tubers developing fruits, immature leaves, growing tips of roots and shoots. Some source and sinks are interconvertible during the process of development of plants. For example: developing and mature leaves, developing and germinating seeds, root of sugar beets etc.

MUNCH HYPOTHESIS (MECHANISM OF PHLOEM TRANSLOCATION)

Phloem translocation is mainly explained by a theory called the "Pressure flow hypothesis" proposed by Ernest munch in 1930 which explains the steps involved in the movement of photosynthates from mesophyll chloroplasts to the sieve elements of phloem of mature leaves.

STEPS

The following steps explain flow theory:

1. The glucose formed during photosynthesis in mesophyll cells, is used in respiration or converted into non-reducing sugar i.e. sucrose.
2. the sucrose is actively transported to bundle sheath cells

and then to companion cell of the nearest smallest vein in the leaf. This is called “short distance transport” because solutes cover only a distance of two or three cells.

3. Sucrose diffuse into sieve tube cell or sieve elements by symplast pathway or apoplast pathway. This is called phloem loading, this raises the conc. of sugars in sieve elements, which causes osmosis of water from nearby xylem in the leaf. It causes an increase in the hydrostatic pressure or tugor pressure.

4. The increase hydrostatic pressure moves the sucrose and other substances in the sieve tube cells, and moves to sinks. The photo-assimilates (sugars etc) can be moved a long distance i.e. of several meters, therefore this is known as “Long distance transport.”

5. In the sink tissues, present at the other end of pathway, sugars are delivered by phloem by an active process called “Phloem Unloading.” It produces a low osmotic pressure in sieve elements of sink, as a result of this water potential begins to rise in the phloem and causes an exosmosis of water molecules from the sieve tubes. This causes a decrease in turgor pressure of the sieve tubes (phloem).

6. The presence of sieve plates in the sieve elements greatly increases the resistance along the pathway and results in the generation and maintenance of a substantial pressure gradient in the sieve elements between source and sink. The sieve elements contents are physically pushed along the traslocation pathway by bulk flow, much like water flowing through a garden house.

SIGNIFICANCE OF TRANSLOCATION

1. Food can be formed or stored as in sugar beet’s root or stem of sugar cane.

2. Sucrose is transported to sink where it is converted to glucose and used as energy.

3. Productivity of crop can be increased by accumulation of photo-synthates in edible sink tissues like cereal grains,

pulses, ground nuts etc.
4. Fruit is forme by this process e.g. Apples, Mango etc.

ASCENT OF SAP

The upward movement of water and dissolved mineral salts from the roots to the leaves agains the downward pull of gravity is known as "Ascent of Sap."

PATH OF MOVEMENT

The distance traveled by water is small and easy in plans like herbs and shrubs and longest in tall trees like pinus, red wood, eucalyptus etc. For transport different tissues of xylem is used for conduction of water in different plants. These are open ended cells called "Vessels" and porous cells called "tracheids" (Fig. From book).

A. VESSELS

1. These are thick walled tube like structures which extend through several feet of xylem tissue.
2. They range in diameter from 20µm to 70µm.
3. Their walls are lignified and perforated by pits. At the pit, cell wall is only made up of cellulose. Pits of adjacent cells match up with each other, so that their cavities are interconnected.
4. Xylem vessels arise from cylindrical cells, which placed end to end. They die at maturity forming a continuous duct, providing a channel for long-distance transport of water.
5. Rate of flow of water is 10 times faster than tracheids.

OCCURANCE

VESSELS are mostly found in Angiospermic plants.

B. TRACHEIDS

1. These are individual cells about 30µm in diameter. They are several mm long and tapered.
2. Like vessels, they are also dead, made up of thick lignified walls.
3. Their walls are perforated by small pits, which are of two types, simple and bordered.

4. The Tracheids are connected by pits and forming a long channel for conduction of water.

OCCURANCE

In Ferns and Conifers.

MECHANISM OF ASCENT OF SAP

Water and dissolved mineral salts present in xylem, flow in upward direction at the rate of 15m/hour. Xylem sap ascends because of two reasons:

1. Push from below – Root Pressure Theory
2. Pull from above – Dixon's Theory

1. ROOT PRESSURE THEORY

According to Stephen Hales:

"The force which is responsible for the upward movement of water molecules in xylem is by the pushing effect from below (i.e. roots) and is known as "Root Pressure." Root Pressure is created by active secretion of sals and other solutes from the other cells into xylem sap.

This lowers the water potential of xylem sap. Water enters by osmosis, thus increasing the level of sap. Water also take apoplast or symplast pathway to enter the xylem cells, this increased level causes a pressure effect in xylem and pushes the water upwards.

OBJECTIONS/FAILURE OF THEORY

1. This force is unable to push water in tall plants.
2. It is seasonal.
3. Completely absent from Cycads and Conifers, so how they transfer water.
4. When a cut shoot is placed in water, the water rises in shoots although roots are absent.
5. It is also present in plant which donot have well developed root system.

2. TRANSPIRATION PULL (DIXON'S THEORY) OR ADHESION-COHESION-TENSION THEORY

Dixon and Jolly proposed this theory for ascent of sap. It provides a reasonable explanation of flow of water and minerals from the roots to leaves of plants. It depends on:

ADHESION

Adhesion is the sticking together of molecules of different kinds. Water molecules adhere to the cell walls of xylem cells, so that the column of water in xylem tissue doesn't break. The cellulose of cell wall has great affinity for water, which helps in the process.

COHESION

Cohesion is the attraction among molecules of same kind, which holds water molecules together, forming a solid chain-like column within the xylem tubes. Extensive hydrogen bonding in water gives rise to property of cohesion. The molecules of water in xylem tube form a continuous column.

TRANSPIRATION PULL

The loss of water from the aerial parts of the plant especially through stomata of leaves is called transpiration.

During daytime the leaf after absorbing sunlight, raising its temperature starts transpiration. When a leaf transpires, the water potential of its mesophyll cells drop. This drop causes water to move by osmosis from the xylem cells of leaf into dehydrating mesophyll cells.

The water molecules leaving the xylem are attached to other water molecules of tube by H-bonding.

Therefore, when one water molecules moves up the xylem, the process continues all the way to the root, where water is pulled from the xylem cells, i.e. tracheids or vessels.

Due to this pulling force or transpiration pull, water in xylem is placed under tension which is transmitted to root through vessels. Tension is due to H-bonding and strong cohesive forces between water molecules, and is strong enough to pull water upto 200 metres or even more.

ASCENT OF SAP IS SOLAR POWERED

To transport water over a long distance, plants do not use

their metabolic energy or ATPs. It is done only by forces like adhesion, cohesion, evaporation and presence of sunlight. Thus ascent of sap is "Solar Powered."

SIGNIFICANCE OF ASCENT OF SAP

- Water can be transported to the different parts of the plant.
- Transpiration is regulated.
- Food is formed in presence of water.
- Photosynthesis requires water.
- Salts and minerals are also absorbed along water by roots.

- Circulation of Blood

CARDIAC CYCLE

Sequence of events which take pace during completion of one heart beat is called "Cardiac Cycle"

PHASES

(I) DIASTOLE

It is resting period of heart chambers.

II) SYSTOLE

During which heart's chambers contract. In cardiac cycle, blood is circulated in whole body.

TYPES OF CIRCULATION

PULMONARY CIRCULATION

In pulmonary circulation following events take place.

RT. ATRIAL SYSTOL

First the blood from whole systems of body, except lungs enter in right Atrium through superior and Inferior vena cavae into the right atrium by atiral systole, blood comes into right ventricle from right atrium via Tricuspid valve.

RT. VENTRICLE SYSTOLE

After coming of blood into the Rt. Ventricle, it goes to the lungs via pulmonary trunk by ventricular systole, for

oxygenation of blood by passing through pulmonary valve.

SYSTEMIC CIRCULATION

In systemic circulation, following events take place.

LEFT ATRIAL SYSTOLE

When oxygenated blood comes into left atrium, then left atrial sytole causes blood to enter left ventricle through bicuspid valve

LEFT VENTRICULAR SYSTOLE

When blood reaches here it sends into aorta through aortic valve to provide blood to body systems.

CARDIAC OUTPUT

The blood volume pump per minute by left ventricle into the systemic circulation

HEART BEAT

The contraction of heart chambers are known heart beat which are regular, rhythmic.

Ventricular systole is LUB

Ventricular diastole is DUB

TIME FOR HEART BEAT

0.8 sec is time for one heart beat.

CONDUCTING SYSTEM OF HEART

It consists of

1.AV-NODE

2.SA-NODE

3)AV-BUNDLE

4) PURKINJI FIBERS.

1. SA-NODE

SA NODE found near upper end of superior vena cava in RT. atrium

PARTS

1. Specialized cardiac Muscles.
2. Autonomic Nerve endings.

MEGA LECTURE

FUNCTIONS

It Initiates the contraction of heart chambers through impulses & also transmit to AV node.

2. AV- NODE

It is found in lower end of RT. Atrium. Structurally it is smilar to SA-NODE

FUNCTION

It transmit nerve impulses to ventricles for contraction rhythmically.

3. AV-BUNDLE

AV BUNDLE are the fibers originate from AV node. The bundle divided into Right AV bundle, Left AV bundle

FUNCTION

It transmit nerve impulses to ventricles.

4. PURKINJI FIBERS

AV bundles red divided into small fibres which penetrate the ventricle wall also known as purkinji fibers / Bundle of His small thin fibers.

LEUKEMIA

DEFINATION

"The malignant disorder of increase number of abnormal leucocytes in blood."

CAUSE

The cause of leukemia is unknown.

FACTORS

Factors associated with leukemia are

- Ionizing Radiation
- Cytotoxic drugs.
- Retroviruses.
- Genetic

EFFECTS OF DISEASE

- In result of leukemia, normal leucocytes counts become less.
- This is progressive, and fatal condition which leads to heamorrhage or infection

MEGA LECTURE

THALASSEMIA

DEFINITION

"Genetically impaired globin chains formation leads to impaired or defected formation of hemoglobin."

GENETIC DISEASE

Thalassemia is a genetic disorder, it may be

1. Hetrozygous /Mild thalassemia:
2. Homozygous.

TYPE

BETA – Thalassemia

α – Thalassemia

BETA-THALASSEMIA

When globin chain is impaired or defected. It is most common one.

ALPHA-THALASSEMIA

when α-thalassemia globin chain of (HB) hemoglobin is defected.

KINDS OF THALASSEMIA

THALASSEMIA MINOR

When thalassemia is of heterozygous type with mild anemia.

THALASSEMIA MAJOR

When thalassemia is of homozygous type with profound hypochromic anemia. It is more common in children & results with enlargement of kidney.

REMEDY

The only remedy is transfusion of blood at regular intervals.

CVD CARDIOVASCULAR DISEASE

Diseases of heart, blood vessels and blood circulation are generally term as CVD.

ATHEROSCLEROSIS

The disease of arterial wall with lose of elasticity, thickness of inner wall causing narrowing of lumen, results in impairing of blood flow.

MEGA LECTURE

ATHEROMATOUS PLAQUES

The narrowing is due to formation of fatty lesions called atheromatous plaque in inner lining of arteries.

COMPONENTS OF PLAQUE

These plaques consist of

- LDL-LOW DENSITY LIPO PROTEINS
- DECAYING MUSCLES CELLS
- FIBROUS TISSUE
- PLATELETES
- CLUMP OF BLOOD

CAUSES

Smoking, Hypertension, Obesity, Diabetes (Severe), family history of arterial disease

EFFECTS

Atherosclerosis produces no symptoms until the damage to artery is so severe that it restricts blood flow.

ANGINA PECTORIS

If blood flow to heart muscles is restricted causes (cell damage) necrosis called angina pectoris. Pain in chest, arm, or jaws usually during exercise.

THROMBUS FORMATION

The formation of blood clot with in the intact blood vessel initiated by atheromatous plaque.

REASON FOR THROMBUS FORMATION

Due to formation athromatous plaque loss of elasticity, intact blood vessel get destroyed, blood from vessel wall comes out & later change to blood clot and blocks the lumen of small arteries.

RESULT OF THROMBUS FORMATION

Initially thrombus block the lumen partially result in decrease blood flow to organs & leading to impairment of physiology of organs. Later on, thrombus blocks the lumen completely so due to complete loss of blood supply, cells damage occur.

CORONARY THROMBOSIS