Blood I lecture

Blood :- Spicalized C.T in which cells are suspended in fluid extra cellular material called plasma . 5L in adult

Function of Blood :-

1) Acid - Base Balance maintance
2) Control Body tempreture
3) Defince agnist infection
4) Transport O_2 , Co_2 , hormone
5) Removal of waste prouduct of cell metabolism

Component of Blood
- Cell
  - RBC's " erthrocytes "
  - WBC's " leucocytes "
  - platelet " thrombocytes "
- plasma " yellow fluid "
  - water 90% , pp 7%
  - small amount [Co_2 , Nacl, Co^- , ph$^-$]

Blood cells
- true → WBC's 1%
- not true → RBC's , platelets

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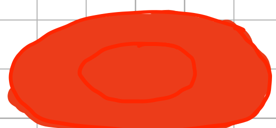
erthrocytes : lacking nuclei , completly filled with O_2 Carrying protein " hemogloben"
function doesn't required them to leave the vasculature.

Anima :- Decrease in the number of RBC's
poly cythemia :- Increase in the number of RBC's



shape ⇒ biconcave disce

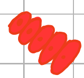
size of RBC's ⇒ 7.2 diameter
1.9 thick ness

Colour ⇒ single RBC's → greenish yellow
due to ⇒ their content of hemoglobin

Hemoglobin
- Hem → iron
- globin → O_2 transport protein

• why RBC's are quite flexible ?
ans: permits them to bend and adapt to the irregular turns and small diameters of Capillary

rouleaux ⇒ larger blood Vessels RBC's often adhere one to anther loosely in stacks



Abnormal shape & size of RBC's " Abnormal شكل وحجم "

size of RBC
- • Macrocytic anemia ⇒ diameter of RBC's increase
- • Microcytic anemia ⇒ diameter of RBC's decrease.
- • Anisocytosis anemia ⇒ abnormal size of RBC's may appear in the circulation.

depend on Hb% amount
- RBC's are darkly stained and contain more Hb% than normal
- RBC's are faintly (lightly) stained and contain less Hb% than normal

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plasmalemma of the erythrocyte
- lipid 40%
- Carbohydrate 10%
- protein 50%
  - most of them integral proteins
    include ⇒ glycophorin [antigenic sites that form the basis for the ABO blood system]
  - , several preipheral protein ⇒ assoated inner surface
    including ⇒ spectrin & ankyrin ⇒ fun
    1. provide cell elasticity required for passage through Capillaries
    2. stabilizes the membrane
    3. maintane the cell shape.

function of biconcave shape of RBC's ? provide more surface area for Carrying respiratory gases.

mechanism of transport O_2 and CO_2?

O_2 ⇒ Iron molecule in hemoglobin bind with O_2 and carried it to the tissue in the form of oxyhemoglobin

CO_2 ⇒ from cells and tissue carried to the blood with Hb (Carbamino hymoglobin)

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life span of RBC's ⇒ (100 - 120 days)

old RBCs removed from circulation mainly by macrophages of the spleen and bone marrow

Function of Hb: transport of O_2 from lung to tissue
& CO_2 from tissue to lung.

- Reticulocytes ⇒ immature "young" erthrocytes

their cytoplasm basophilic having no nuclei, some ribosomes and few mitochondria are present, their diameter 8 µm

نسبتها قليلة جدًا
Blood في 1%

⇒ stained By supravital stains (brilliant cresyl blue)

- What Indicate a demand of increase the number of reticulocytes? increased Oxygen Carrying Capacity as in hemorrhage and in high altitude

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platelet ⇒ def

origin ⇒ Megakaryocytes (B.M)

shape ⇒ cytoplasmic fragments

size ⇒ 2-5 micron ✕ Count ⇒ (150,000 - 400,000)

life span ⇒ in about 10 days

Function ⇒ 1. promote blood clotting so preventing loss of Blood
2. wound healing

L.M

Stained blood smears, appear in clumps

hyalomere ⇒ peripheral light blue stained transparent zone

granulomere ⇒ central zone containing purple granules

E.M

platelet are surround by cell membrane covered by thick glycocalyx (coat coat)

- hyalomere ⇒ electron dense tubular system
  - two system of membrane → open canalicular system of vesicles (invagination of plasma membrane)
  - → irregular tubular vesicle (derived from the ER and stores Ca^{++} ions)
- bundle of microtubules ⇒ maintain disk shape
- microfilament ⇒ help in platelet movement and aggregation

Granulomere

- one or two mitochondria
- vesicles
- glycogen
- membrane bounded dense granules
  - alpha
    - growth factor (PDGF)
    - platelet factor 4
  - delta
    - ADP
    - ATP
    - serotonin
  - lambda

Blood I lecture

- leukocytes (WBC's) ⇒ true cell with a nucleus and cytoplasm. They leave the blood and migrate to the tissues where they become functional and perform various activities related to immunity

- Total count ⇒ (4000 - 11000)

Abnormal Causes of WBC's

Leukocytosis

increase number of leukocytes above 11000

physiological

- during pregnancy, lactation, after muscular exercise and after cold baths.

pathological

- acute pyogenic infections (abscess, acute follicular tonsillitis and acute appendicitis)

itis ⇒ infection.

Leucopenia

decrease in the number of WBC's below 4000

- occure in 3-

1. Influenza and typhoid fever
2. Exposure to irradiation & x-ray

Classification of leukocytes according to the type of cytoplasmic granules.

Granular Leukocytes ⇒ Cytoplasm is rich in fine granule

- specific → bind natural, basophilic or acidophilic component of the dye mixture
- non specific → lysosomes

Life span ⇒ in few days
dies in apoptosis
nucleiet with 2 or more lobes

- Neutrophils
- Eosinophis
- Basophils

Non Granular Leukocytes

don't have specific granules, but contain azurophilic granules (lysosomes)

- Lymphocytes
- Monocytes

	Neutrophils	Eosinophils	Basophils
Shape	rounded cell	rounded cell	rounded cells
surface	pseudopodia	—	—
size	10 - 12 microns	diameter ranging from (10-12)	diameter ranging from (10-12)
life span	3-5 days	8-12 days	12-15 days
Abnormal structure	neutrophilia ⇒ increase the percentage of neutrophils above normal (acute pyogenic infection) neutropenia: decrease in the percentage of neutrophils below normal (viral infection)	Eosinophilia ⇒ allergic and parasitic diseases Eosinopenia ⇒ after cortisone treatment	X
Function	• phagocytosis & digestion of micro-organism • Release of macrophages chemotatic factor to stimulate attraction of macrophages at the site of inflammation. • Release of fibroblast chemotatic factor to stimulate fibroblasts to form new collagen leading to healing. • Dead neutrophils, bacteria, semidigested material and tissue fluid from a viscous usually yellow collection of fluid called pus	1. phagocytose antigen - antibody complexes 2. attracted to the sites of allergic reactions by eosinophil chemotactic factor which released by mast cells to reduce their effects by releasing antihistamine (histaminase) 3. killing parasitic worms by major basic protein.	• secretion of eosinophil chemotactic factor • secretion of heparin (anticoagulant). • secretion of histamine (initiates allergic reations) • Basophilia means increase of basophils above 1% as in liver cirrhosis.
structure	nucleus ⇒ single, segmented in many lobes Body Barr ⇒ appear as a drumstick-like appendage on one of the lobes of the nucleus cytoplasm ⇒ two type of granules specific → small & numerous stained faint pink and cannot be seen with LM E.M ⇒  vesicles contains alkaline phosphate + bactericidal enzymes non specific ⇒ large, less numerous stained purple and can be seen with LM E.M  contain ⇒ hydrolytic enzyme lysosomes	nucleus ⇒ single, bilobed connected by thin chromatin thread (hourse shoe shaped) cytoplasm ⇒ specific ⇒ large elongated with central crystalline dense core formed of protein major basic protein (MBP). this core surrounded by less dense material consists of enzyme, eg arylsulfatase & histaminase non specific ⇒ lysosomes contain hydrolytic enzyme Glycogen & poorly developed endoplasmic reticulum mitochondria and Golgi body are present	nucleus ⇒ large & often bent into U or S shape cytoplasm ⇒ specific ⇒ large, basophilic and obscure the nucleus. They stained by toluidine blue and contain heparin & histamine like mast cells non specific ⇒ lysosomes • varying amount of glycogen, small Golgi apparatus a few mitochondria and poorly-developed endoplasmic reticulum. respector for plasma (IgE) contact with the antigen in the blood they form antigen-antibody complex fun of this complex degranulation of basophils and release of its mediators

Lymphocytes • they are present in the C.T, lymph nodes, spleen, thymus, tonsils and tissue fluids

Large lymphocytes ⇒ small lym. activated by the specific antigens.

diameter ⇒ 12-15 µm & percentage 5-10% of circulation WBC's

structure
- nucleus: large & lightly stained [active chromatine] with apparent nucleolus
- cytoplasm: abundant, more basophilic [containing ribosomes] & non-granular. It also contains a few azurophilic granules

Small lym. ⇒ the commonest.

• diameter: 7-9 µm • percentage: 15-20% of circulating WBC's

structure "spherical in shape"
- nucleus: large, rounded & darkly stained (condensed chromatin) with a little indentation at one side
- Cytoplasm: scanty, and appears a narrow rim around the nucleus. It is lightly basophilic and non-granular containing a few azurophilic granules, mitochondria, a small Golgi complex and a pair of centrioles and abundant ribosomes.

So! there are two types of small lym.

	B-lym. (25% lym. circulation)	T-lym (65%-75% lym. circulation)
origine	bone marrow in man.	originated in the bone marrow and migrate to the thymus. where they proliferate and carried to the blood to other lymphoid tissue
Function	responsible for humoral immunity	responsible for cellular immunity.

mechanism!

1. B-lym stimulated by specific antigen
2. B-lym differentiate into plasma cells to produce anti-bodies
3. generate B-memory cells
   - ⇒ function rapidly to a second exposure to the same antigen

Monocytes

shape: rounded cells

size: 12-20 micro in diameter

life span ⇒ circulate in blood in 3 days after leave blood to C.T & other they differentiated into macrophages.

structure

nucleus ⇒ oval in shape with deep indentation sometimes take kidny shape. chromatin is less condensed than that of lymphocytes

cytoplasm ⇒ abdunt in pale blue. Contains very fine azurophilic granules (lysosomes), well developed Golgi

Function ⇒ highly phagocytic cells. They increase in number in malaria, typhoid and monocytic leukemia in C.T