

Blood (Exam 3)

Overview:

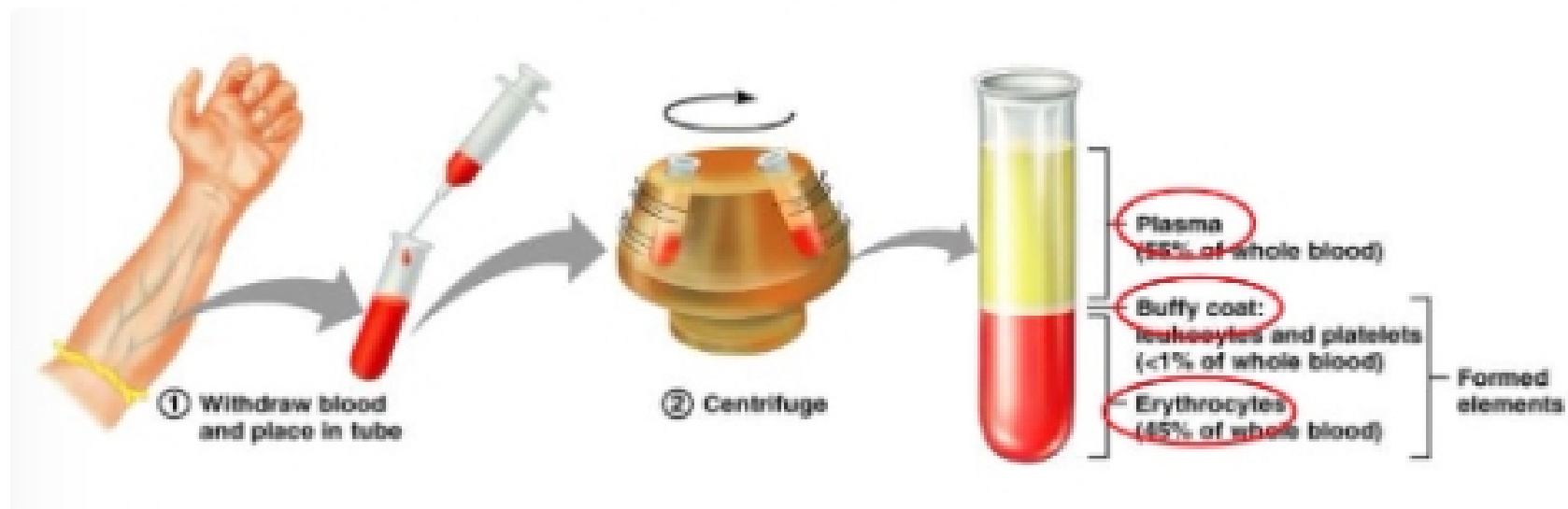
- blood flows through a closed circuit of hollow tubes
 - Two Circuits: 1) *pulmonary* & 2) *systemic*
- powered by pumping action of heart
- functions of blood:
 - carries *respiratory gasses, nutrients, wastes, and hormones*
 - helps body *regulate temperature*
- blood volume
 - males: 5-6 liters
 - females: 4-5 liters

Composition of Blood:

- specialized connective tissue
 - *blood cells*: formed elements
 - *plasma*: fluid portion
 - serum=plasma minus clotting proteins
 - *Hematocrit*: % of red blood cells
 - males= 47% +/- 5%
 - females: 42% +/- 5%
 - avg 45 %

Blood Plasma:

- Straw-colored, sticky fluid portion of blood
 - *55% of blood*
- 90% water
- contains ions, nutrients, wastes, and proteins
- Proteins:
 - *Albumins*: most abundant; maintain osmotic pressure
 - *Globulins*: transport of ions, lipids, hormones, antibodies
 - alpha and beta globulins
 - gamma globulins
 - *Fibrinogen*: converted to fibrin, blood clotting



Staining:

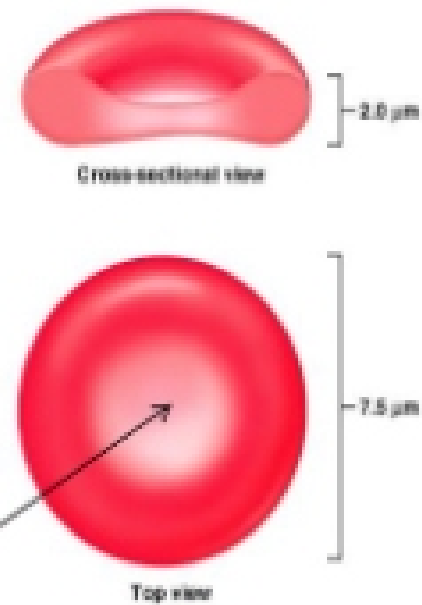
- acidic dye=eosin=stains pink
- basic dye=hematoxylin or methylene blue=stains blue/purple

Erythrocytes (RBC):

- ▶ 7.5 μm in diameter
- ▶ hemoglobin= oxygen-carrying protein
- ▶ mature cells have no organelles or nuclei

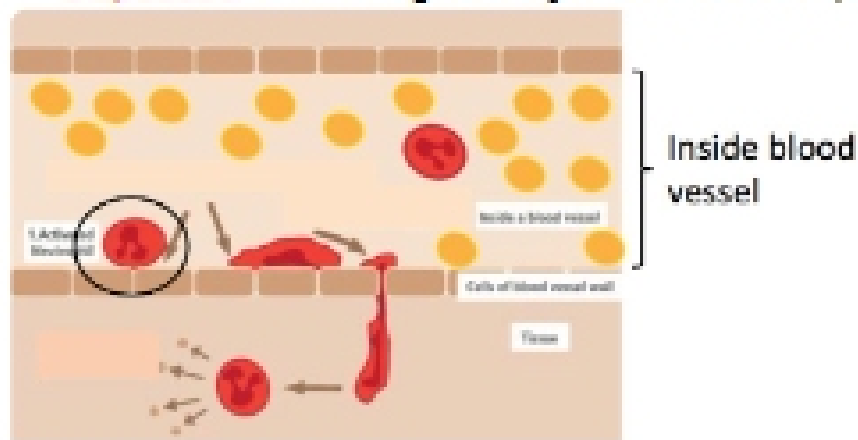
- biconcave shape= 30% more surface area
- originate in bone marrow
- live 100-120 days

light staining center



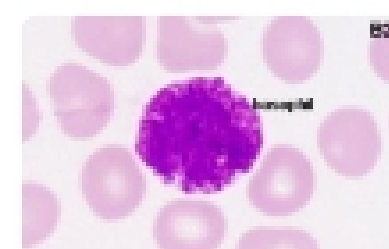
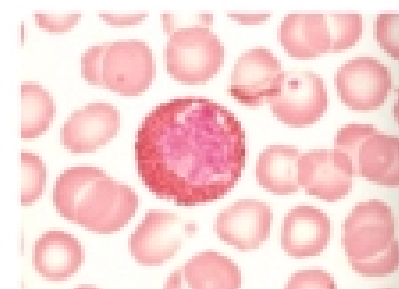
Leukocytes (WBC):

- avg 7500 per cubic millimeter
- protect body from infectious microorganisms
- function outside the bloodstream in loose connective tissue
- **Diapedesis**: circulating leukocytes leave the capillaries by squeezing between endothelial cells



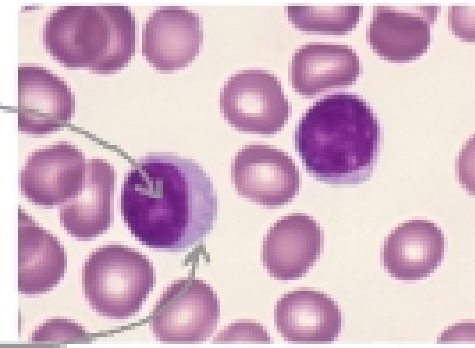
◦ 2 types of leukocytes:

- ▶ **Granulocytes**: contain enzyme filled vesicles in cytoplasm
 - **Neutrophils**: most numerous
 - phagocytize bacteria & release enzymes
 - destroy bacteria
 - nucleus is multi-lobed 2-6 lobes
 - ▶ AKA polymorphonucleated granulocytes
 - ▶ immature cells don't have multi-lobed nuclei=band cells
 - granules appear neutral in color/nuclei stains blue
 - **Eosinophils**: 1-4% of all WBCs
 - stained by eosin
 - play roles in:
 - ▶ turning off allergic reactions
 - ▶ helping to fight off parasitic infections
 - **Basophils**: 0.5% of all WBCs
 - nucleus has 2 lobes
 - granules stained by basic purple dye
 - secrete histamine
 - function in inflammation mediation
 - ▶ similar to mast cells



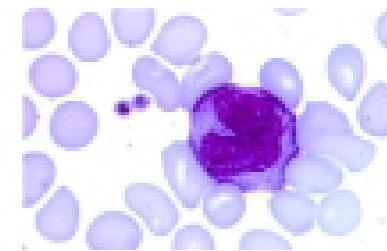
- ▶ **Agranulocytes:** lack vesicles
- **Lymphocytes** (20-45% of WBCs)

- most important in immune system
- cytoplasm looks smooth, nucleus stains purple
- fight infectious organisms
 - ▶ **T Cells:** attack foreign cells directly
 - ▶ **B Cells:** multiply to become plasma cells
 - secrete antibodies
- visually: small silver cytoplasm to one side



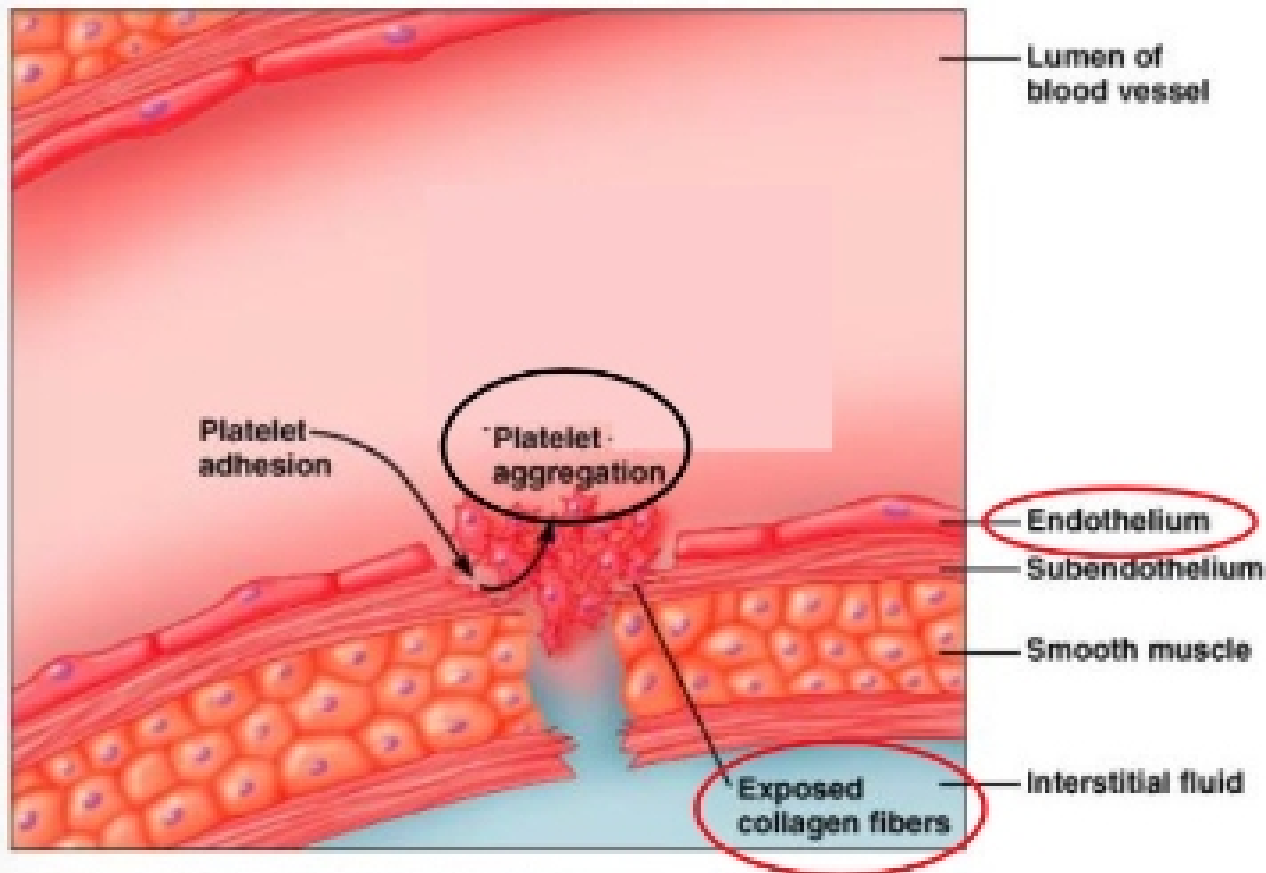
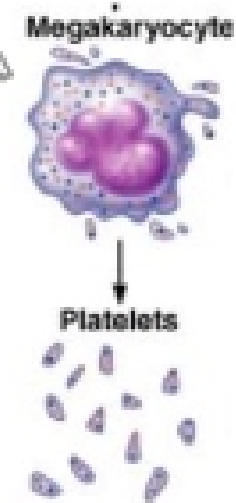
- **Monocytes** (4-8% of WBCs)

- largest leukocytes
- nucleus is kidney shaped
- transform into macrophages, and leave bloodstream and enter loose (areolar) connective tissue
 - ▶ Phagocytic cells



Platelets:

- ▶ Not whole cells, but cell fragments
 - break off from **megakaryocytes** in bone marrow
 - up to 500,000 per microliter of blood
- Have **vesicles** containing molecules that help initiate the clotting of blood
- form **platelet plug** to prevent loss of blood from injured blood vessel



(a) Damaged blood vessel endothelium