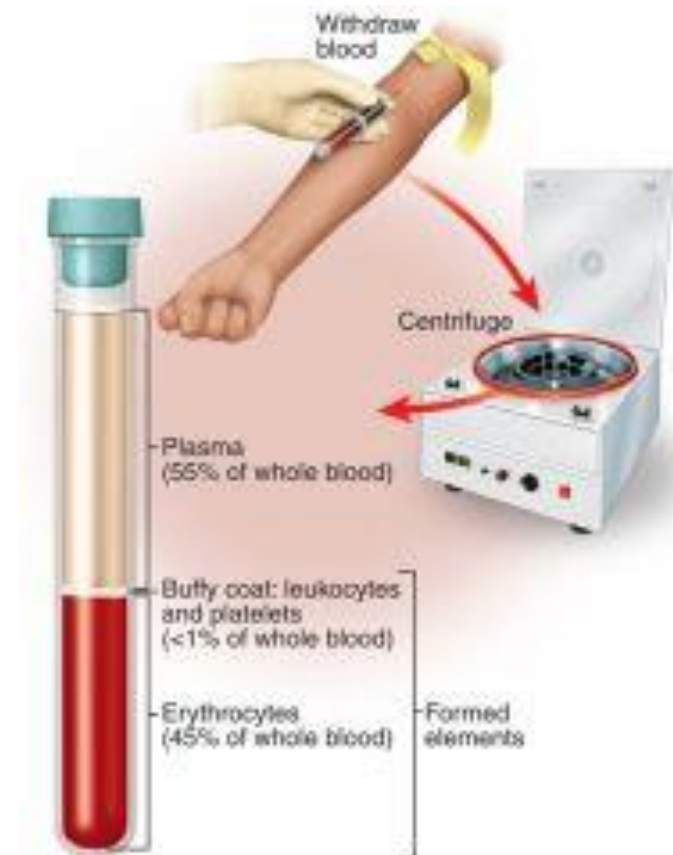
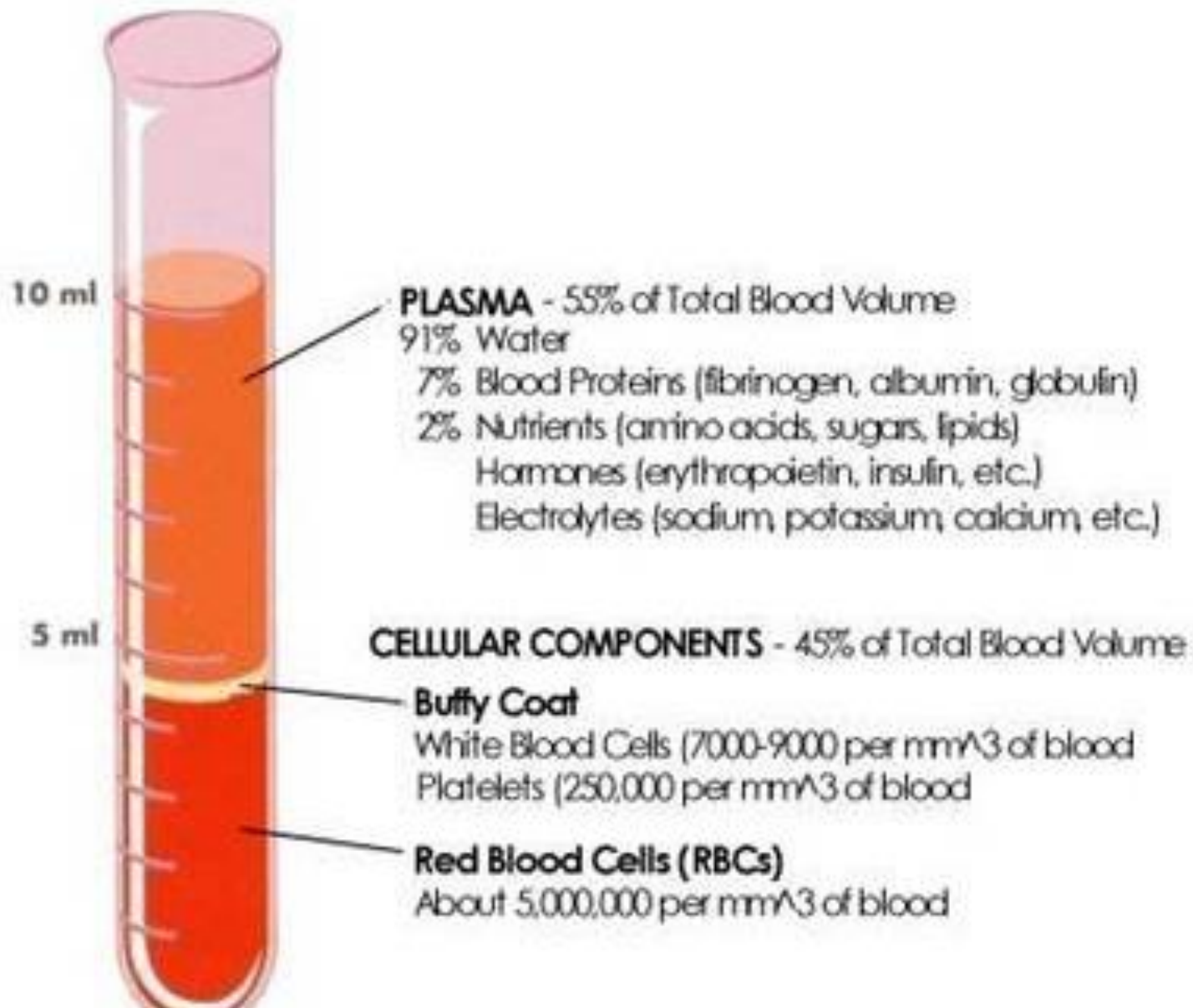


Blood Notes

Hematocrit

- Hematocrit = using a centrifuge to separate out the parts of blood
- Plasma
- Formed elements:
 - Buffy Coat = Leukocytes and Platelets
 - Erythrocytes





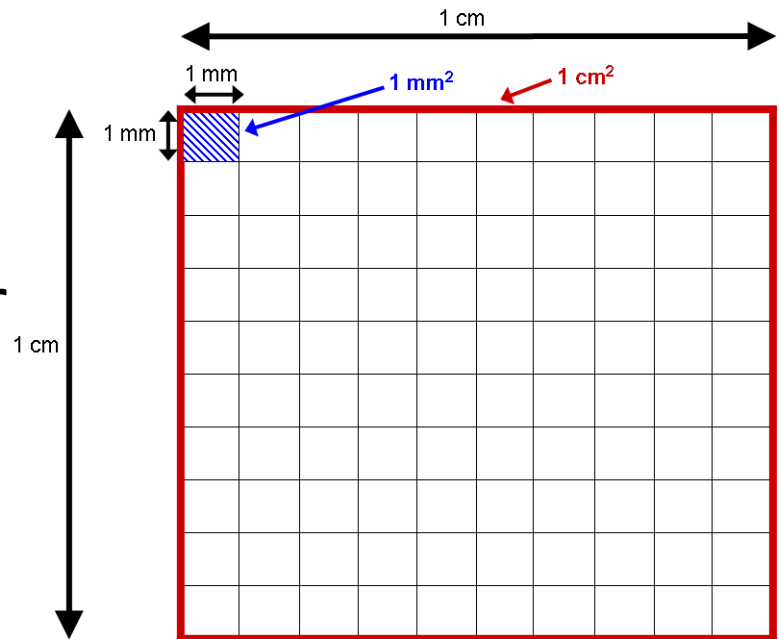
- General Facts
 - Blood pH = 7.4
 - Volume = 5-6 L
 - 8% of body weight
- Color
 - Bright red = O₂ rich
 - Dark/Dull red = O₂ poor
- Characteristics of Blood
 - Sticky (viscous)
 - Opaque

Plasma

- 90% water
- Nonliving
- Contains proteins, gases, wastes, hormones, nutrients (amino acids, sugars, lipids), vitamins, electrolytes (Na, K, Ca) and water
- Proteins stay relatively the same despite changes in diet

Buffy Coat

- Leukocytes – WBC
 - About 4,000-11,000 per mm^3
 - Living cells
 - Function = defense
- Platelets
 - About 250,000-500,000 per mm^3
 - Fragments of cells
 - Function = blood clotting



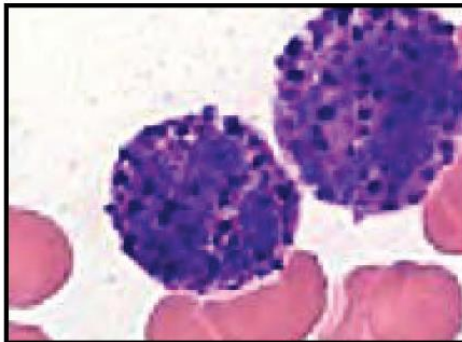
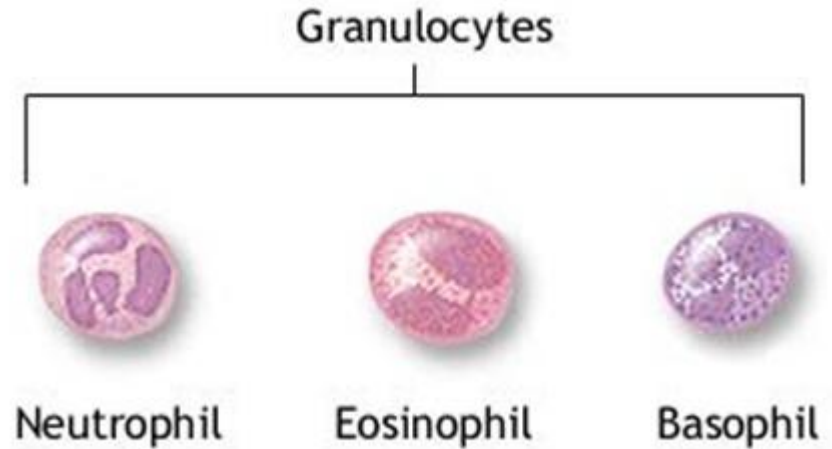
Erythrocytes - RBC

- About 4-6 million per mm^3
- 1 RBC = 250 million hemoglobin
- 1 Hemoglobin = 4 O_2

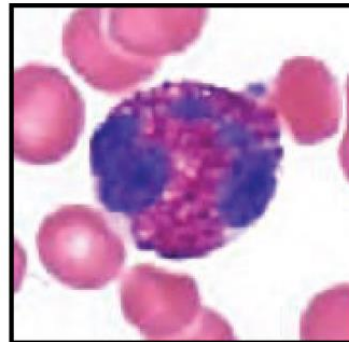
- Function: carries oxygen
- Contains the protein hemoglobin
- Anaerobic respiration – no mitochondria
- Lack a nucleus at maturity
- Lives 120 days

Leukocytes

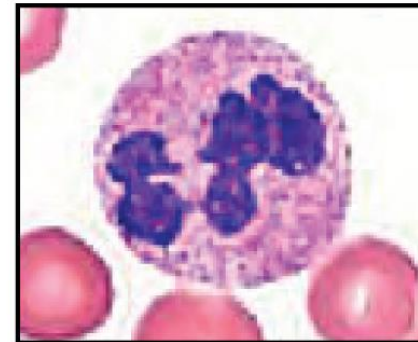
- Granulocytes
 - Neutrophils
 - Eosinophils
 - Basophils



Basophil



Eosinophil



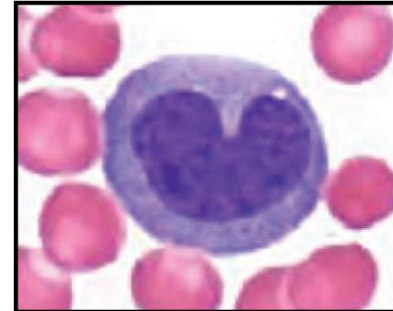
Neutrophil

Leukocytes

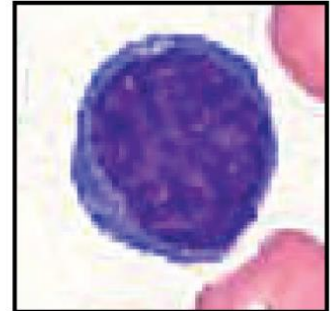
- Granulocytes – have visible granules in the cytoplasm
 - Multi-lobed nucleus
 - Neutrophils = avid phagocytes at sites of acute infections
 - Eosinophils = increase with allergies and infections from parasitic worms
 - Basophils = rare and has histamine (inflammatory chemical)

Leukocytes

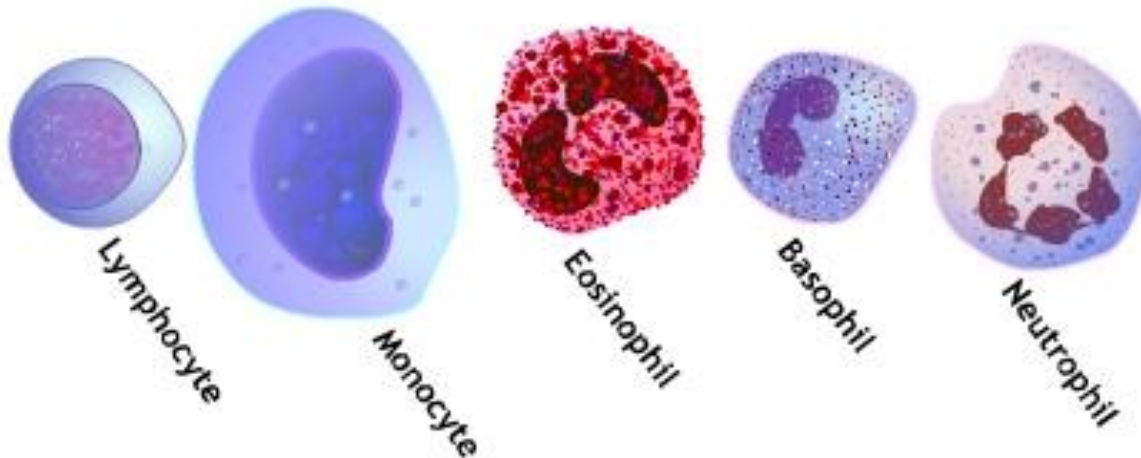
- Agranulocytes
 - Lymphocytes – B and T cells
 - Monocytes – Macrophages



Monocyte



Lymphocyte

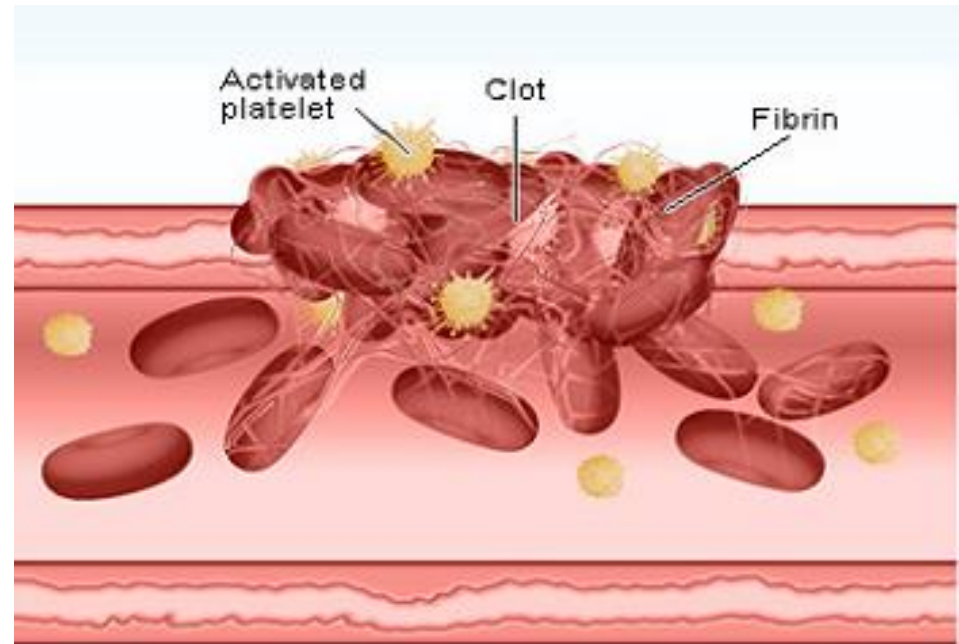
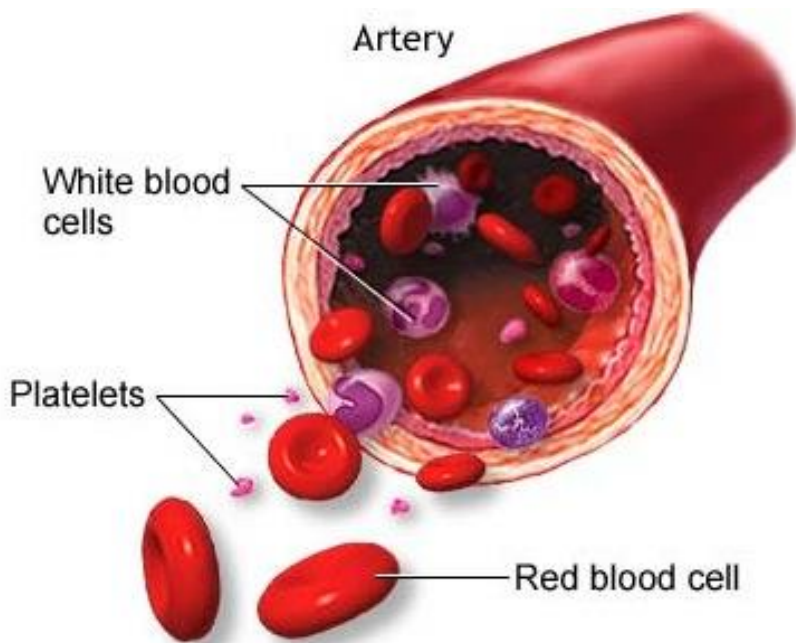


Leukocytes

- Agranulocytes – lack visible granules in the cytoplasm
 - Nuclei are lobe shaped
 - Lymphocytes = lymphatic cells that deal with immune response
 - Monocytes – largest WBC that turns into macrophages and starts the immune response

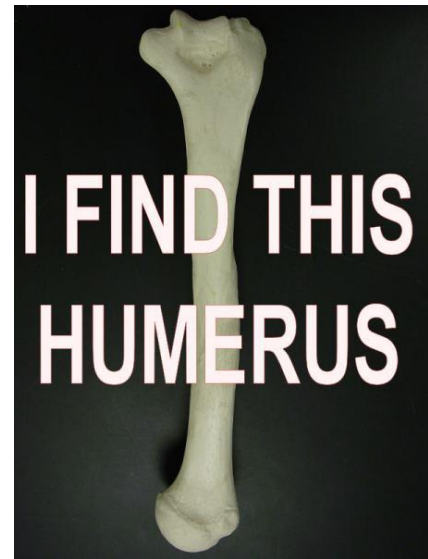
Platelets

- Fragments of cells that are needed for the clotting process



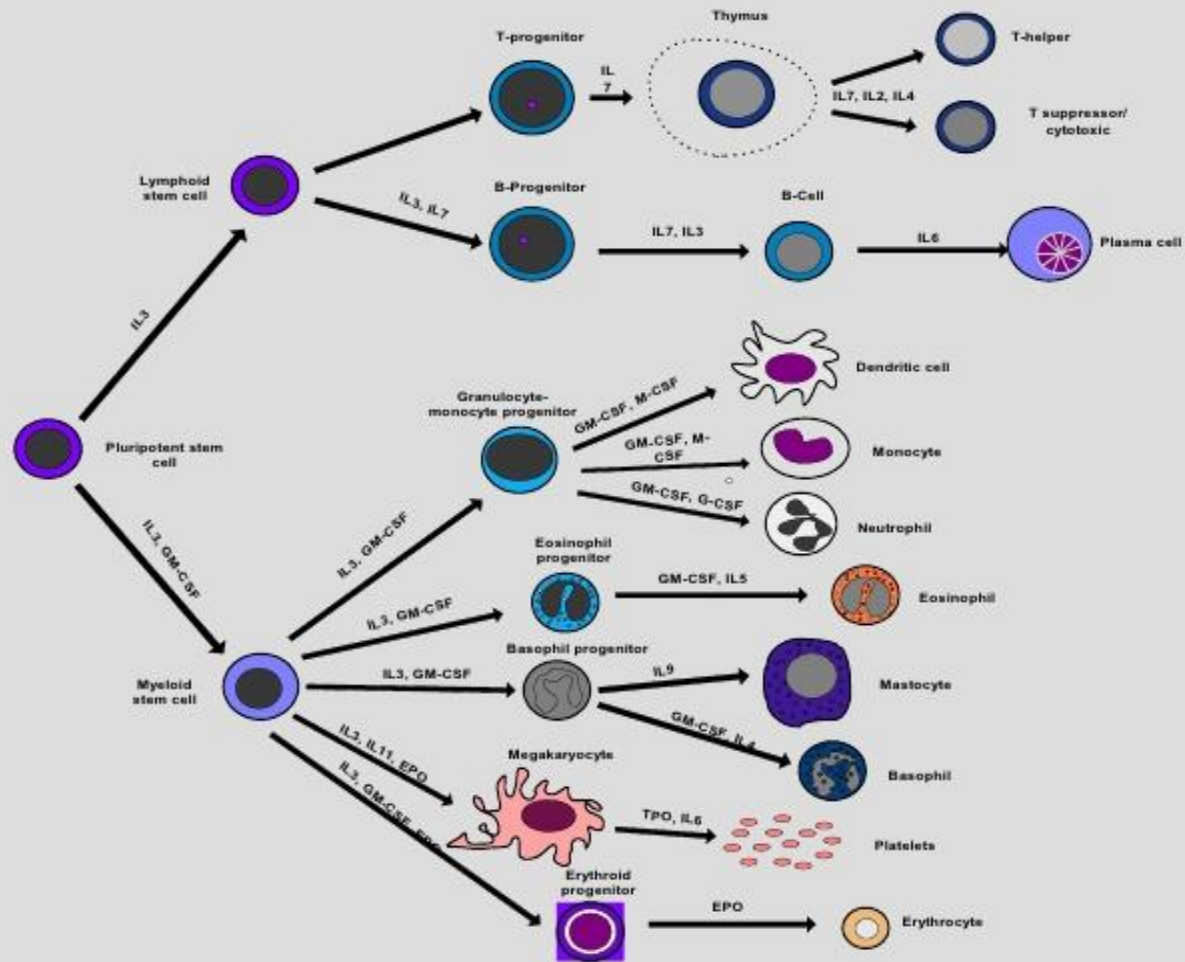
Hematopoiesis

- Hematopoiesis = blood cell formation



- All formed elements are made from red bone marrow
 - Located in flat bones of skull and pelvis, ribs, sternum, and proximal epiphyses of humerus and femur
- Form from a common stem cell – **hemocytoblast**
- Controlled by the hormone **erythropoietin**

The normal pathways of hematopoiesis



Hemostasis

- Hemostasis = stoppage of blood flow
- 3 phases
 - Vascular spasm
 - Platelet plug formation
 - Coagulation – blood clotting

Review Wound Healing

- Injury
- Blood vessels spasm and constrict
- Then, increase of clotting proteins to the area to **form the clot**
- Scab forms where wound is exposed to the air
- Under the scab, granulation tissue forms
- Fibroblasts make scar tissue, phagocytes break down the clot and regeneration of epithelial cells occurs

Hemostasis

1. Tear or interruption of blood vessel lining
2. Platelets anchor to damaged site and release chemicals to attract more platelets
3. Spasm closes blood vessel to decrease blood loss
 - Also from pain receptors and direct injury to smooth muscles

Hemostasis

4. Injured tissues release chemicals at the same time to bring in more proteins for blood clotting
5. Blood clotting proteins (platelets) form fibrin which traps the RBCs and forms a clot
6. Clot gets broken down when the vessel is repaired

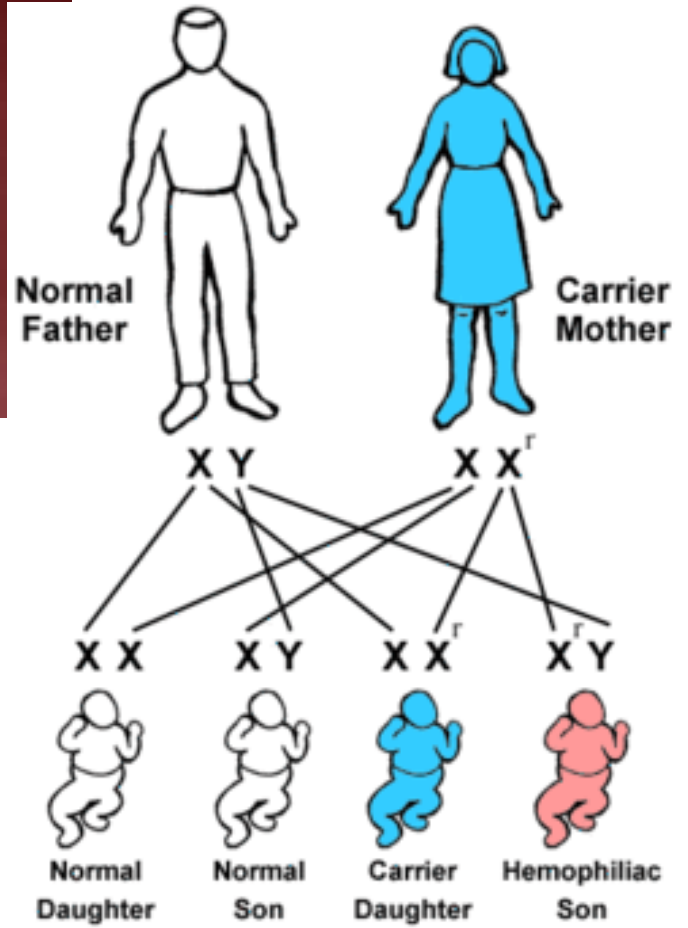
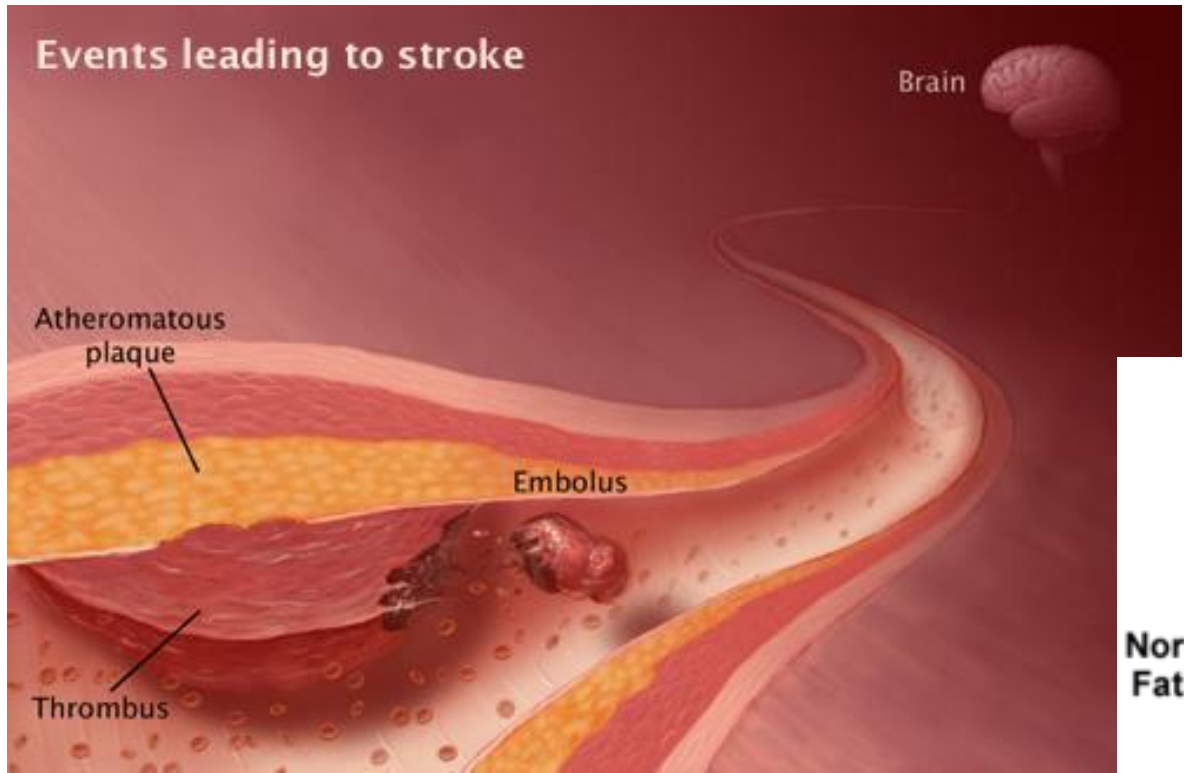
Hemostasis

- Clots form in 3 to 6 minutes
- Pressure and sterile gauze increases the clotting process to help form clot faster
- [Video](#)

Problems and Disorders

- Thrombus = when a clot fails to break down
- Embolus = when a thrombus breaks away and floats freely in the blood
 - Can take blood thinners (aspirin, Advil, ect) to decrease the clotting processes or risk of developing a thrombus
- Hemophilia = lack of any clotting factors
 - [Video](#)

Events leading to stroke

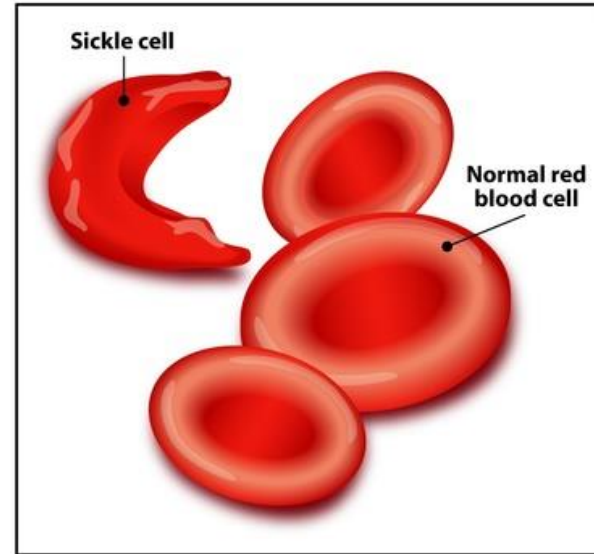


- Jaundice = RBC are destroyed and the liver can't break down the excess hemoglobin (which contains the yellow chemical bilirubin) which turns the skin a yellowish color
- Anemia = decrease in the oxygen-carrying capacity of the blood
 - Decrease in RBC or hemoglobin number
 - Can be caused by an insufficient iron intake
 - Sickle-cell anemia – misshapen RBC

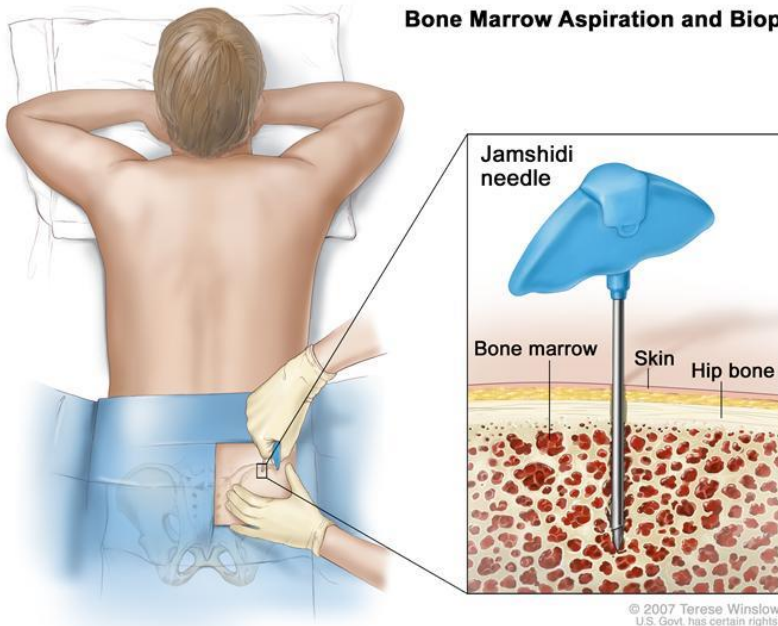
- Sickle-cell anemia = misshapen RBC due to a genetic mutation
 - RBC die after 20 days
 - Pain, vision problems, swelling, delayed growth, and frequent infections
 - [Video](#)
- Leukemia = increase in the number of abnormal or immature WBC
- Loss of 30% of blood can lead to severe shock and can be fatal



Sickle cell anemia



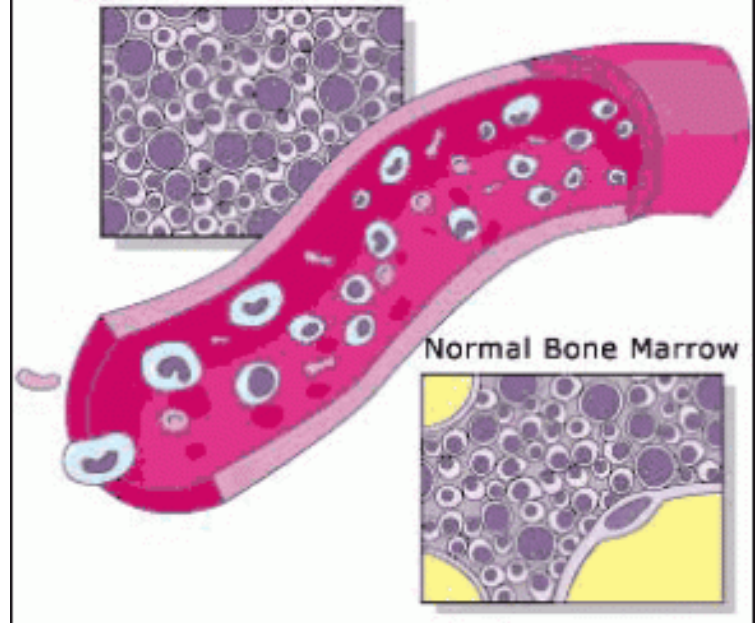
Bone Marrow Aspiration and Biopsy



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Leukaemia

Abnormal Proliferation
of Cells in Bone Marrow



Blood Types and Transfusions

- Blood types are classified based on proteins or carbohydrates (antigens) on RBC membranes
- We tolerate our own antigens, but if blood is transfused then our body's own antibodies will destroy the foreign antigens

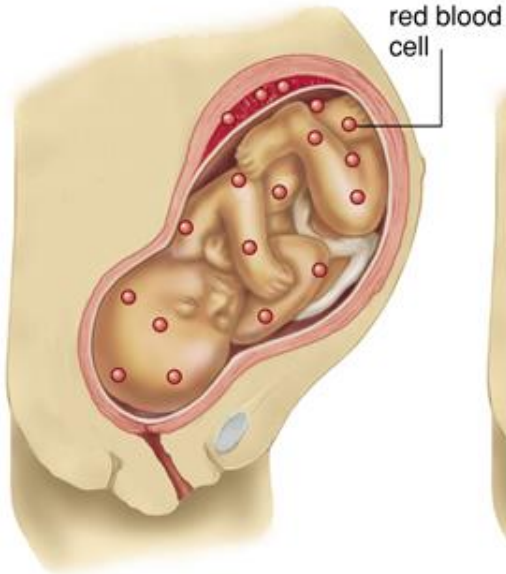
Blood Types

Blood Group	RBC Antigen	Plasma Antibodies	Blood that can be received
AB	A and B	None	A, B, AB, O
B	B	Anti-A	B,O
A	A	Anti-B	A,O
O	None	Anti-A and Anti-B	O

Blood Types

- Rh Blood Groups:
 - Rh+ has the Rh antigen and the person will have a positive blood type
 - Rh- does not have the Rh antigen and the person will have a negative blood type
 - If a Rh+ man has a baby with a Rh- women, then the second child will have it's blood destroyed by the mother's antibodies that built up in the first pregnancy
 - [Video](#)

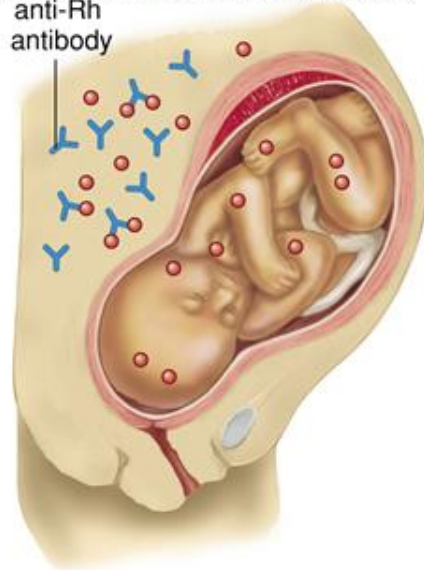
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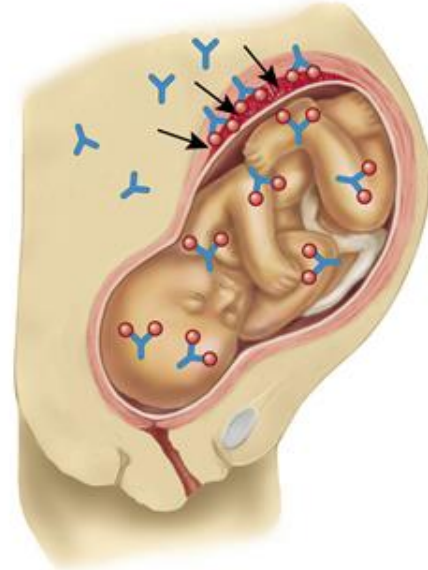
Child is Rh positive;
mother is Rh negative.



Red blood cells leak
across placenta.



Mother makes anti-Rh
antibodies.



Antibodies attack Rh-positive
red blood cells in child.