

MODULE 2 L02

Red Blood Cells

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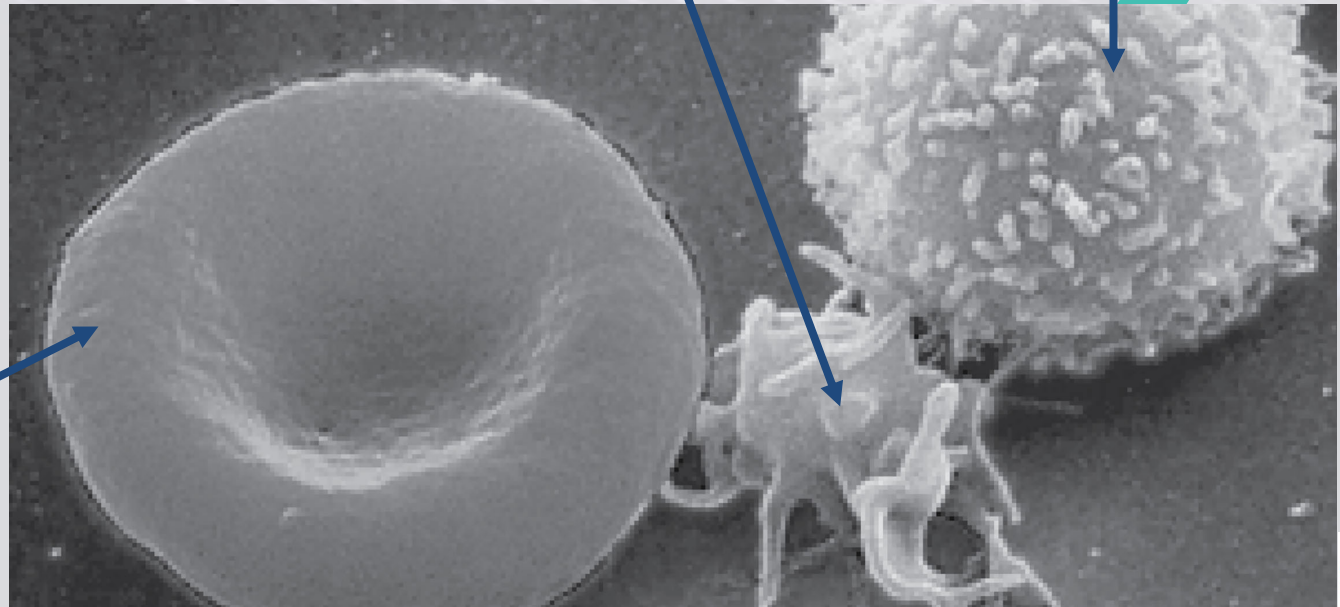
B. Formed Elements of Blood

- Major cellular components:
 - a. Erythrocytes (RBCs)
 - b. Leukocytes (WBCs)
 - Granular
 - Agranular
 - c. Noncellular formed elements
 - Platelets

Erythrocyte

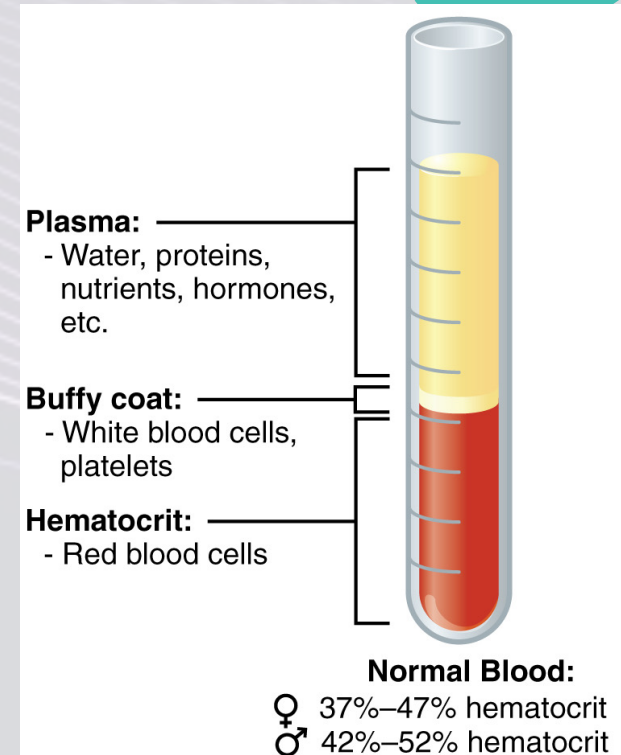
Platelet

Leukocyte



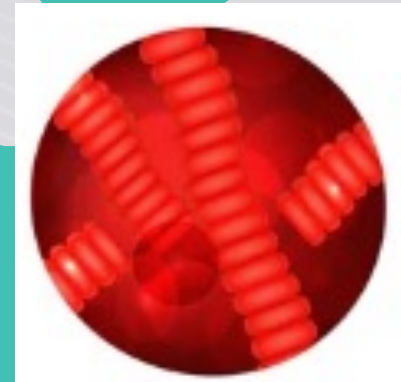
a. Red Blood Cells (RBCs)

- Also known as erythrocytes
- Hematocrit:
 - ❖ Value that indicates % of whole blood contributed by formed elements
 - Males = 45%
 - Females = 42%
- Number of RBCs
 - ❖ 1000 RBCs : 1 WBC
 - ❖ Hematocrit reported as:
 - Volume of Packed Red Cells (VPRC)
 - Packed Cell Volume (PCV)
 - ❖ Total number of RBCs
 - Males = 5.4 million erythrocytes/ μL
 - Females – 4.8 million erythrocytes/ μL
 - 1 drop = 260 million RBCs
 - Average adult = 25 trillion RBCs



RBCs Structure and Function

- Anatomy:
 - ❖ Biconcave disc
 - Thin central region
 - Thick outer margin
 - Importance of this shape
 - Strength
 - Flexibility
 - ✓ Bend and flex with ease
 - Increases surface area
 - ✓ Rapid diffusion
 - Able to form stacks of cells
 - ✓ Rouleaux
 - ✓ Move more easily through blood vessels
- Function:
 - ❖ Transport oxygen and carbon dioxide



RBCs Life Span and Circulation

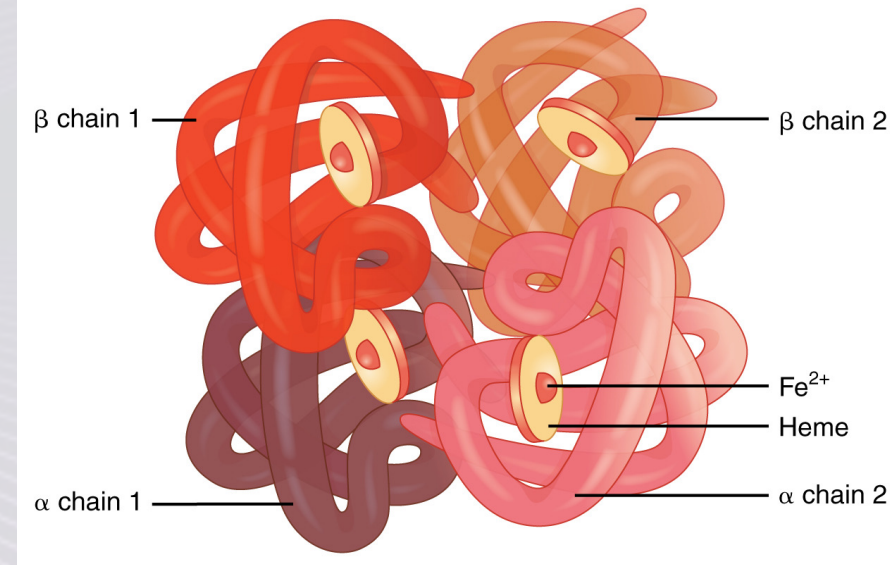
- Differentiation and maturation
 - ❖ RBCs lose most of their organelles
 - Keep:
 - Extensive cytoskeleton
 - Lack:
 - Mitochondria
 - Obtain energy through anaerobic metabolism
 - Rely on glucose from surrounding plasma
 - Endoplasmic reticulum
 - Ribosomes
 - Nuclei
- Life span
 - ❖ 120 days
 - Travel 700 miles
 - A single circuit of the circulatory system
 - 30 seconds
 - Stack in rouleaux
 - Contort and squeeze through capillaries
 - Join others back to the heart



1% of RBCs are replaced daily =
3 million new erythrocytes/second

RBCs and Hemoglobin

- Cell composition:
 - ❖ Plasmalemma surrounding cytoplasm that contains:
 - Water (66%)
 - Proteins (33%)
 - Hemoglobin (95%)
 - Hemoglobin
 - ❖ Responsible for O₂ and CO₂ transport
 - ❖ It is a red pigment
 - Oxygenated – bright red
 - Deoxygenated – deep red
- } Color difference in arteries and veins
- ❖ Each molecule:
 - Four polypeptide subunits
 - Two alpha (α) chains
 - Two beta (β) chains
 - Four heme
 - 1 in each subunit
 - Each holds an iron ion



Erythrocyte Hemopoiesis

- Hemopoiesis

- ❖ Definition:

- Process of blood cell formation
 - Pluripotential stem cells (PPSC) or hemocytoblasts

- Erythropoiesis

- Refers specifically to erythrocyte formation
 - Controlled by erythropoietin
 - ✓ Hormone secreted by the kidneys

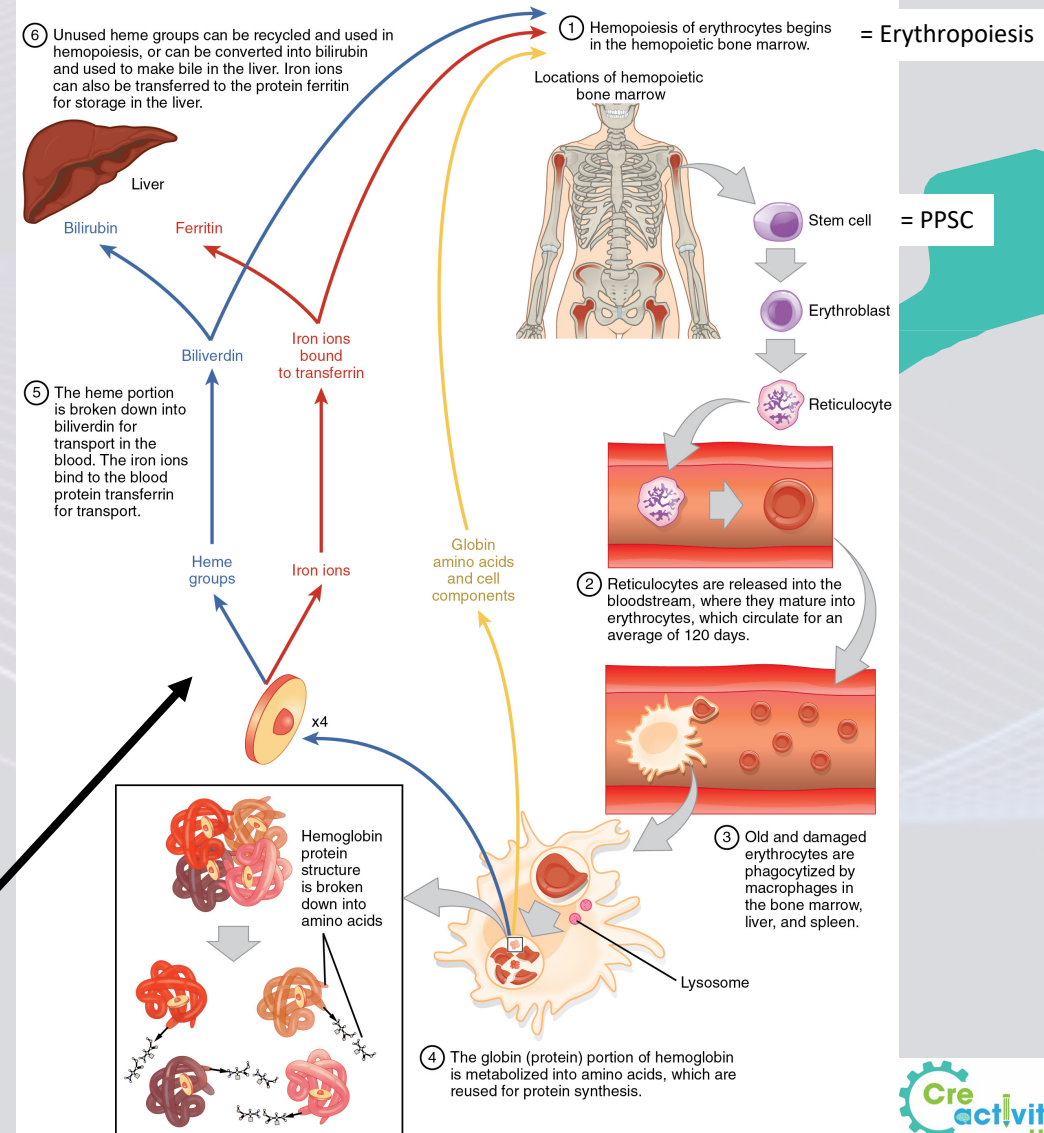
- Erythrocytes - produced in bone marrow

- Sent into the circulation

- At the end of their lifecycle

- ❖ Destroyed by macrophages

- ❖ Hemoglobin components are recycled



Sickle Cell Anemia

- Caused by mutation in hemoglobin gene
- Erythrocytes produce abnormal type of hemoglobin
 - ❖ Causes cell to take on a sickle or crescent shape

Mutated RBC

