



HEMATOLOGY - FIRST COURSE

LAB -4- NORMAL VALUE OF ALL BLOOD COMPONENTS ACCORDING TO AGE

Sawa University

جامعة ساوة الاهلية

College of health and medical techniques

كلية التقنيات الصحية والطبية

Department of Medical Laboratories

قسم تقنيات المختبرات الطبية

Third Stage

المرحلة الثالثة

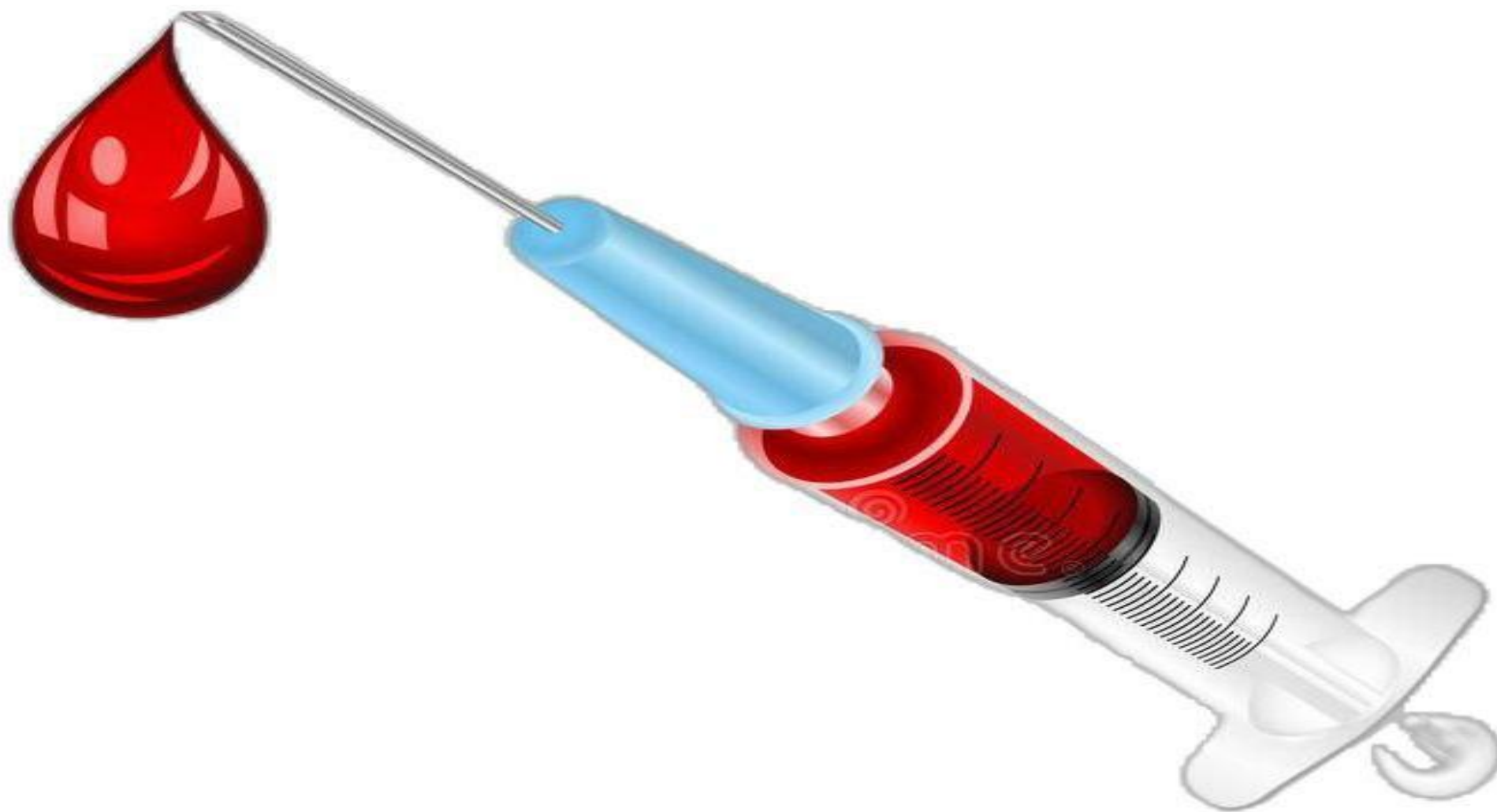
محاضرة رقم 4

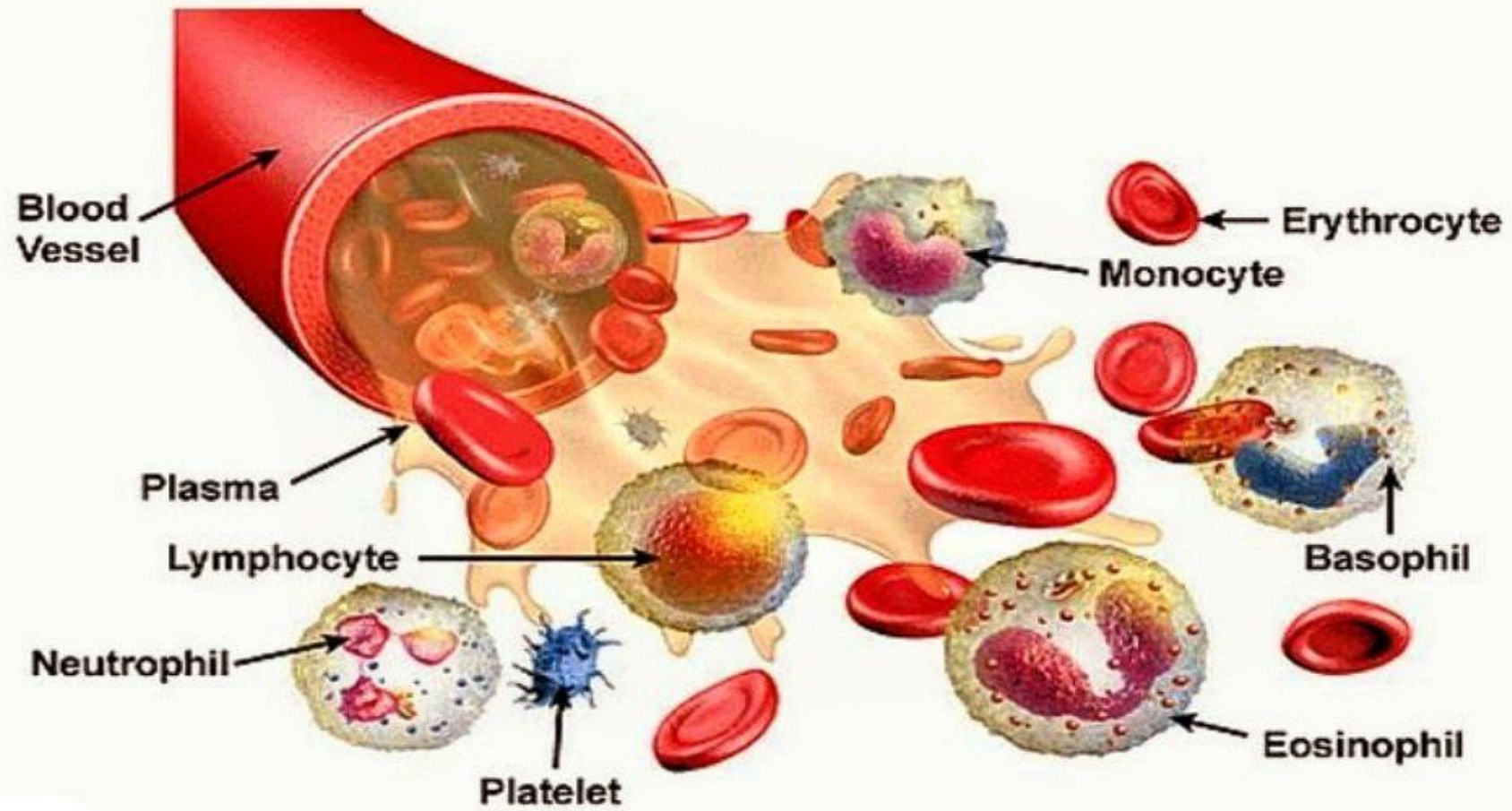
Lecture No. 4

الجانب العملي

Practical

علي أياد أبو جعيلة تدريسيين المادة : م. م.
م. م. خلود عايد حسين





Blood



- ❖ **Blood is a critical fluid in the human body, composed of various cellular and plasma components that perform essential functions like oxygen transport, immune defense, and clotting.**
- ❖ **The normal values of blood components can vary significantly depending on age, sex, and physiological conditions.**
- ❖ **Understanding these reference values is crucial for diagnosing and managing hematological disorders.**

1. Red Blood Cells (RBCs)

- **Function:** Transport oxygen from the lungs to tissues and return carbon dioxide to the lungs.
- **Causes of High Levels:** Dehydration, smoking, living at high altitude, certain tumors.
- **Causes of Low Levels:** Anemia, bone marrow disorders, chronic kidney disease.

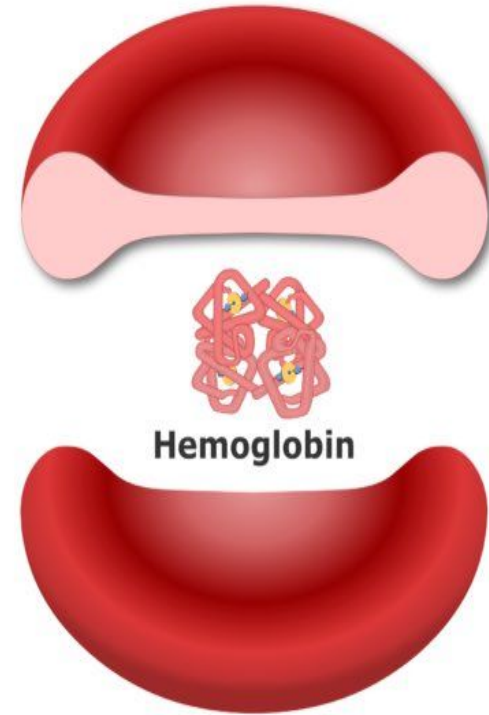


2. Hemoglobin (Hb)

· **Function:** Carries oxygen in the blood and gives blood its red color.

• **Causes of High Levels:** Dehydration, smoking, living at high altitude.

• **Causes of Low Levels:** Anemia, bleeding.



3. White Blood Cells (WBCs)

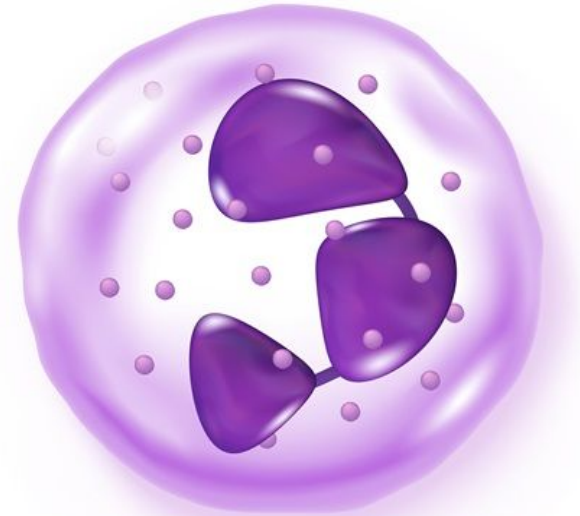
- **Function:** Fight infections and play a role in the immune response.
- **Causes of High Levels:** Infection, inflammation, stress, leukemia.
- **Causes of Low Levels:** Bone marrow disorders, autoimmune diseases.



4. Neutrophils

- **Function:** First line of defense against infections, particularly bacterial infections.
- **Causes of High Levels (Neutrophilia):**
 - Bacterial infection
 - Rheumatoid arthritis.
- **Causes of Low Levels (Neutropenia):**
 - Aplastic anemia
 - Autoimmune diseases (e.g., lupus)
 - Viral infections.

Neutrophil



5. Basophils

- **Function:** Involved in allergic reactions and inflammatory responses.
- **Causes of High Levels (Basophilia):**
 - Allergic reactions
 - Chronic myeloid leukemia
 - Hypothyroidism
- **Causes of Low Levels (Basopenia):**
 - Hyperthyroidism
 - Stress response



6. Eosinophils

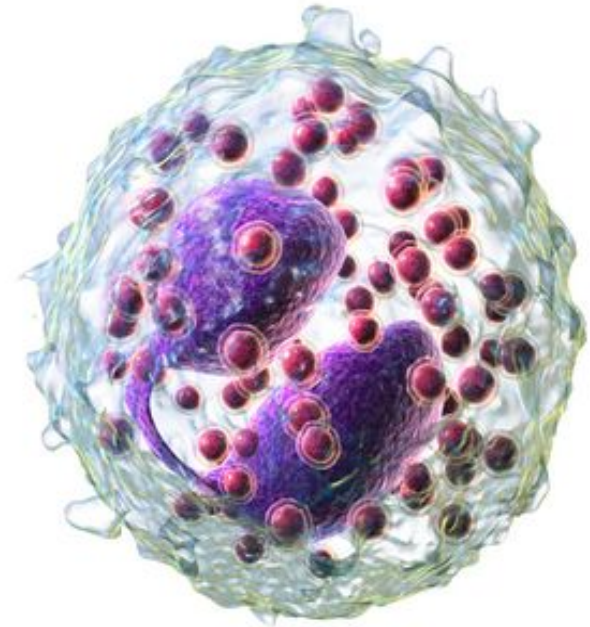
- **Function:** Play a key role in parasitic infections and are involved in allergic reactions.

- **Causes of High Levels (Eosinophilia):**

- Allergic reactions (asthma, eczema)
- Parasitic infections
- Hodgkin's lymphoma

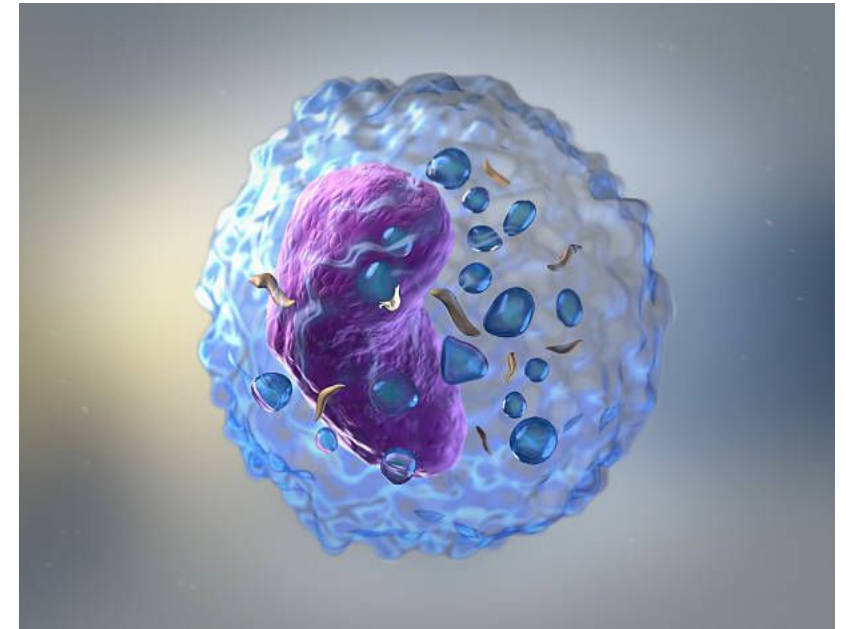
- **Causes of Low Levels (Eosinopenia):**

- Corticosteroid use
- Stress response



7. Lymphocytes

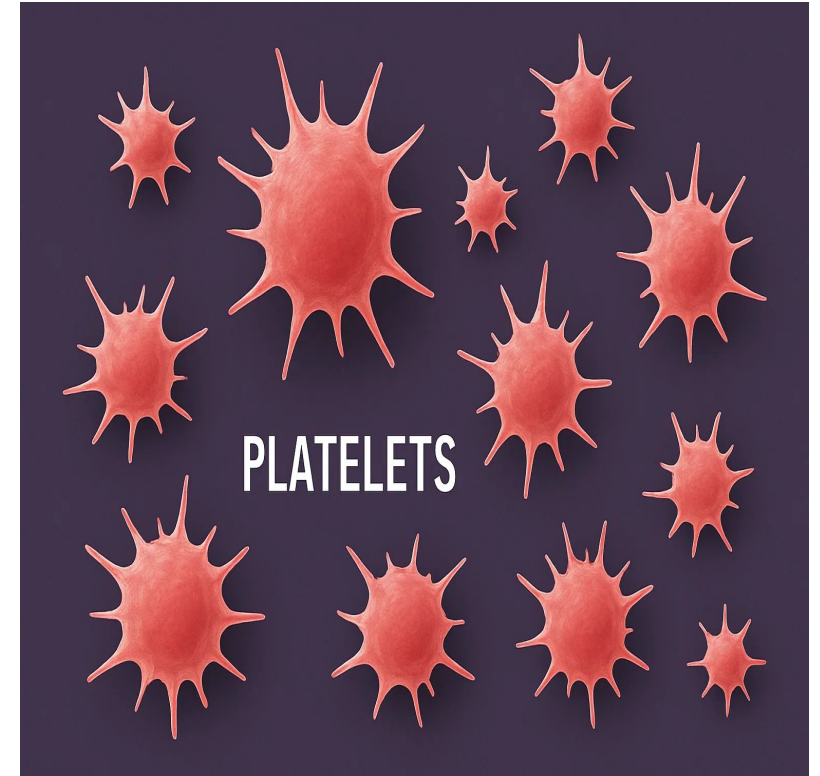
- **Function:** Essential for the adaptive immune response.
- **Causes of High Levels (Lymphocytosis):**
 - Viral infections
 - Lymphoma
- **Causes of Low Levels (Lymphopenia):**
 - HIV/AIDS
 - Bone marrow disorders



8. Platelets (PLT)

· **Function:** Help in blood clotting and wound healing.

- **Causes of High Levels:** Infections, inflammation, bone marrow disorders.
- **Causes of Low Levels:** certain medications, autoimmune diseases.



Red Blood Cell Indices:

1. Mean corpuscular hemoglobin:-

- **Function:** Measures the average amount of hemoglobin per RBC.
- **Causes of High Levels:** Macrocytic anemia.
- **Causes of Low Levels:** Microcytic anemia

2. Mean Corpuscular Volume (MCV):-

- **Function:** Measures the average size of RBC.
- **Causes of High Levels:** Macrocytic anemia.
- **Causes of Low Levels:** Microcytic anemia.

3. Mean Corpuscular Hemoglobin Concentration (MCHC):-

- **Function:** Measures the average concentration of hemoglobin in RBC.
- **Causes of High Levels:** Spherocytosis.
- **Causes of Low Levels:** Hypochromic anemia, iron deficiency.

4. Hematocrit (Hct):-

- **Function:** Measures the proportion of blood volume occupied by RBC
- **Causes of High Levels:** Dehydration, polycythemia vera.
- **Causes of Low Levels:** Anemia, blood loss.

5. Red Cell Distribution Width – Standard Deviation (RDW-SD):-

- **Function:** Measures the variation in size of red blood cells.-
- **Causes of High Levels:** Anemia, blood loss.
- **Causes of Low Levels:** Rarely clinically significant.

Platelet Indices:

1. Mean Platelet Volume (MPV):

- **Function:** Indicates the average size of platelets; larger platelets are usually younger and more active.
- **Causes of High Levels:** Inflammation.
- **Causes of Low Levels:** Aplastic anemia.

2. Platelet Distribution Width (PDW):

- **Function:** Measures the variability in size of platelets.
- **Causes of High Levels:** Inflammation.
- **Causes of Low Levels:** Rarely significant

3. Plateletcrit (PCT):

- **Function:** Indicates the volume percentage of platelets in the blood
- **Causes of High Levels:** Thrombocytosis
- **Causes of Low Levels:** Thrombocytopenia.

4. Platelet Large Cell Ratio (P-LCR):

- **Function:** Represents the percentage of large platelets in the total platelet count.
- **Causes of High Levels:** recovery from thrombocytopenia.
- **Causes of Low Levels:** Thrombocytopenia.

5. Platelet Large Cell Count (P-LCC):

- **Function:** Indicates the absolute number of large platelets.
- **Causes of High Levels:** Similar to P-LCR
- **Causes of Low Levels:** Similar to P-LCR

Normal blood component values by age :-

Component	Newborn	Infants	Children	Adolescents	Adults
RBC (million cells/mcL)	4.1 - 6.1	4.1 - 5.5	4.0 - 5.5	Boys: 4.5 - 5.9, Girls: 4.1 - 5.5	Men: 4.7 - 6.1, Women: 4.2 - 5.4
Hb (g/dL)	14 - 24	10 - 20	11 - 16	Boys: 13 - 16, Girls: 12 - 15	Men: 13.5 - 17.5, Women: 12 - 15.5
WBC (cells/mcL)	9,000 - 30,000	6,000 - 17,500	5,000 - 15,000	4,500 - 13,000	4,500 - 11,000
Neutrophils (%)	40 - 60	30 - 60	40 - 70	40 - 60	40 - 70
Basophils (%)	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
Eosinophils (%)	0 - 4	0 - 4	0 - 4	0 - 4	1 - 4
Lymphocytes (%)	20 - 40	40 - 70	20 - 50	20 - 45	20 - 40
MCH (pg)	-	-	-	-	27 - 31
MCV (fL)	-	-	-	-	80 - 100
MCHC (g/dL)	-	-	-	-	32 - 36
Hct (%)	43 - 63	-	-	-	Men: 38.3 - 48.6, Women: 35.5 - 44.9
RDW-SD (fL)	-	-	-	-	39 - 46
PLT (cells/mcL)	150,000 - 450,000	150,000 - 450,000	150,000 - 450,000	150,000 - 450,000	150,000 - 450,000
MPV (fL)	-	-	-	-	7.5 - 11.5
PDW (%)	-	-	-	-	9.6 - 15.1
PCT (%)	-	-	-	-	0.1 - 0.4
P-LCR (%)	-	-	-	-	13 - 43
P-LCC	-	-	-	-	Not standardized

Quiz

- ✓ What are the main causes of high and low levels of each?
RBCs, neutrophils, platelets, and hemoglobin
- ✓ What do we mean?
Basopenia, Eosinophilia, Lymphocytosis

Any questions?



THANK YOU!