



# BLOOD DONATION

Biologist . Ronak Abdulrahman

# Introduction

- ❖ Blood function
- ❖ **Why you donate blood?**
- ❖ **Health benefits of blood donation**
- ❖ **Blood donation eligibility**
- ❖ **How much blood can be taken?**
- ❖ **Instruction to blood donors**
- ❖ **Blood type & matches**

## Composition of Blood

- Blood makes up 6–8% of our total body weight.
- Normal adult blood volume is 5 L.
- Life span of about 120 day

## Blood function

- Blood is responsible for.....
  - Transporting gases (oxygen & carbon dioxide)
  - Transporting waste products
  - Transporting nutrients
  - Helping remove toxins from the body.
  - Temperature regulation.
  - Supporting the water electrolytic balance .

## Why You Should Donate Blood?

- There is no substitute for Blood
- Every 3 second Someone needs a blood transfusion
- Your donation will help save the life of up to 3 people
- Blood is the most precious gift that can give to another person – **The Gift of Life**

## Who can donate blood

- Age, > 18 years.
- weight, at least 50 Kg.
- Health, must be in good health at the time of donate.
- woman must have a hemoglobin level of at least 12.5 g/dL, 16.0 gm/dl and a man must have a hemoglobin level of at least 13.5 g/dL. not greater than 18 g/dL.

## Instructions To Blood Donors Before blood Donation

- Take light refreshment / food before donation.  
(2hours before)
- Person who has consumed alcohol should avoid giving blood for next 24 hours..
- Person who has undergone major surgery should avoid blood donation for one year

## Types of Blood Donations

-Whole **Blood Donation**.  
Whole **blood** is the most flexible **type** of **donation**. ...



-Power Red **Donation**. During a Power Red **donation**, you give a concentrated dose of red cells.

-Platelet **Donation**. ...



Fresh Frozen Plasma (FFP)

- Plasma **Donation**.



Whole Blood

Every 12 weeks

Platelets

Ever 7 days, up to 24 times  
a year

Plasma

Ever 28 days, up to 13  
times a year

Double red cells

Every 112 days, up to 3  
times a year

## Post Donation Advice

1. Drink lots of fluids for next 24 hours.
2. Avoid smoking for one hour & alcohol till after a meal.
3. Don't use elevator to go up immediately after donation.
4. Avoid highly strenuous exercises & games for a day.
5. If you feel dizzy , lie down & put your feet up . You will be alright in 10-20 minutes.
6. Remove band-aid after 4 hours . If it bleeds , apply pressure & reapply band-aid.

- A person has 5 liter of blood in their body
- Body recovers the blood very quickly
  - blood plasma volume – within 24-48 hours
  - Red blood cells – in about 21 days
  - platelets and white blood cells – within minutes.

## BLOOD DONATION

Safety of blood donor & blood recipient because safe blood gives life, Unsafe blood gives infections.

To ensure blood safety

- Strict donor screening
- Testing of collected blood to WHO specified standards.
- Strict cross matching of blood samples to ensure safe transfusion to patient.

## Blood products/ Components and their uses

### -Whole blood

1. For exchange transfusion in babies.
2. Accident victims
3. Complicated delivery cases
4. Some specific surgeries

### Blood Components

1. Red cells concentrate (for anemia)
2. FFP ( for clotting disorders, burns)
3. Platelet concentrate ( for cancer)
4. Cryoprecipitate ( for clotting disorders)
5. Cryo poor plasma ( for Burns)

## Men make good blood donors

- Men can donate more often than women
- Men can give blood every 12 weeks
- Women have to wait 16 weeks to protect their iron levels.
- Men's blood often contains fewer antibodies

## What can you do

- Make blood donation a HABIT.
- Donate regularly – commemorate special days like birthdays, .....
- Motivate other to donate

## Benefits to Donor of Blood Donation

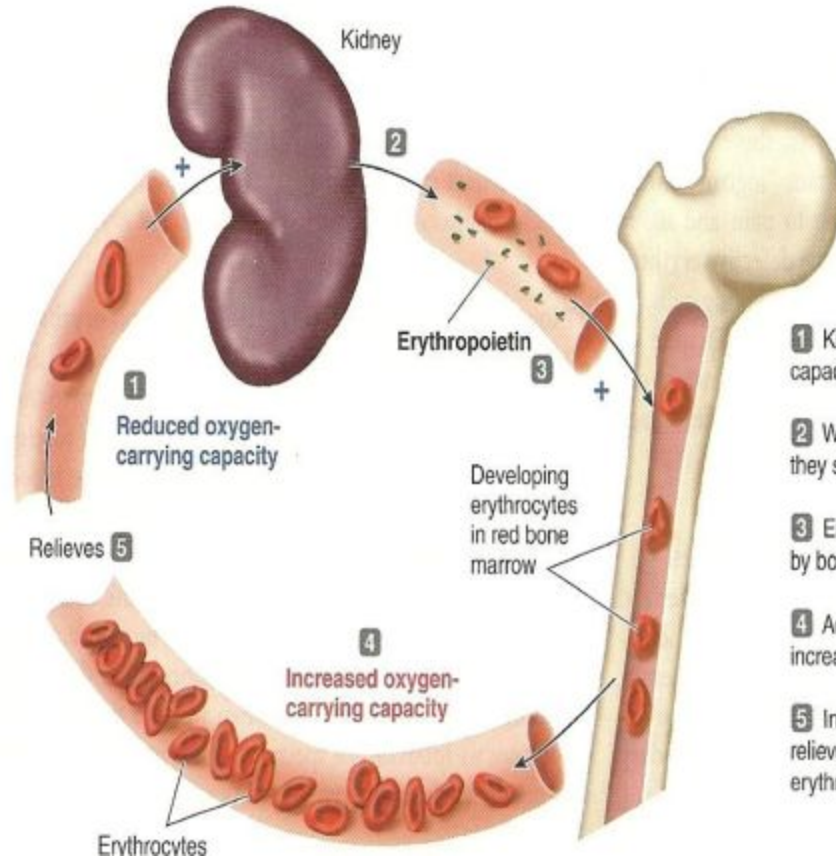
- Health benefits:

Regular donation (2-3 times a year....)

- Lower Cholesterol
- Lower lipid level
- Decreases incidence of heart attacks.
  - Lowering heart rate
  - Lowering blood pressure

What happens to your body when you donate blood?

- Special cells **in the** kidneys, called peritubular cells, sense that the level of oxygen **in the blood** has decreased (due to the loss of red cells) and start secreting a hormone called erythropoietin.



- 1** Kidneys detect reduced O<sub>2</sub>-carrying capacity of blood.
- 2** When less O<sub>2</sub> is delivered to the kidneys, they secrete erythropoietin into blood.
- 3** Erythropoietin stimulates erythropoiesis by bone marrow.
- 4** Additional circulating erythrocytes increase O<sub>2</sub>-carrying capacity of blood.
- 5** Increased O<sub>2</sub>-carrying capacity relieves initial stimulus that triggered erythropoietin secretion.

Can I donate blood every month?

# Anticoagulants Used for WB?

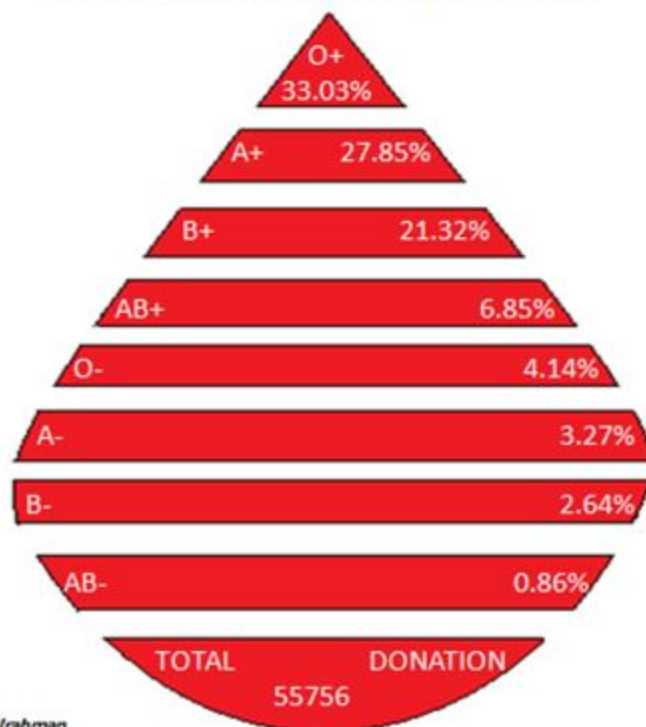
- ACD & CPD preserve the unit for 21 days at 1-6°C.
- CPDA-1 (anticoagulant/preservative for 35 days).
- C = Citrate → to prevent clotting
- P = Phosphate → to maintain pH
- D = Dextrose → ATP generation
- A = Adenine-1 → substrate from which RBC produce ATP

**Anticoagulant ratio is 1.4 ml:10ml blood (63ml / 450ml)**





## Directorate of Blood Transfusion Center/Erbil Statistics of Blood Group For 2015





*Tears of a mother cannot save her  
child but your **blood**  
can*

# References

1. American Red Cross Blood Services.
2. M. E. Brecher, Editor (2005), AABB Technical Manual, 15th edition, Bethesda, MD: AABB,
3. Blood donation From Wikipedia,
4. "[Autologous \(self-donated\) Blood as an Alternative to Allogeneic \(donor-donated\) Blood Transfusion](#)". AABB
5. "[Giving Blood -> What to Expect](#)". Australian Red Cross Blood Service. Archived from [the original](#) on 2007-08-29. Retrieved 2007-10-06.
6. [Tips for a Good Donation Experience](#). American Red Cross. Archived from [the original](#) on 2006-12-14.
- 7 . BLOOD DONATION & ITS IMPORTANCE By Janglin solaman c, ppt.

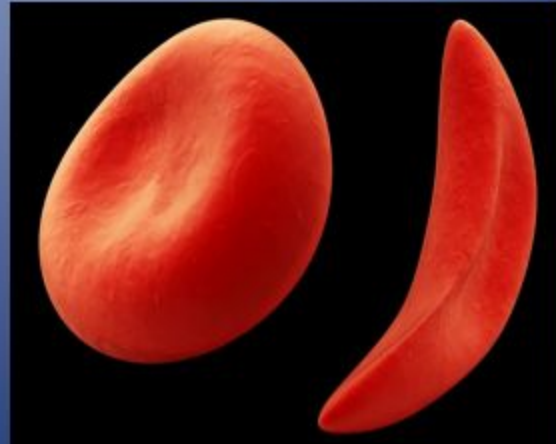
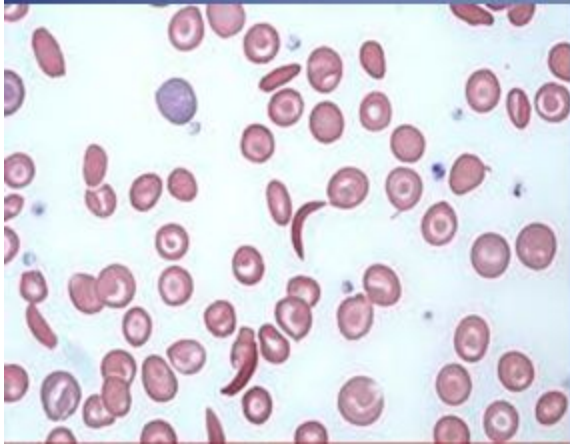
## Hormonal Control of Erythropoiesis

- Causes of hypoxia
  - Hemorrhage or increased RBC destruction reduces RBC numbers
  - Insufficient hemoglobin (e.g., iron deficiency)

## RBC Diseases

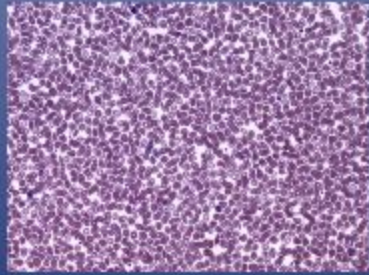
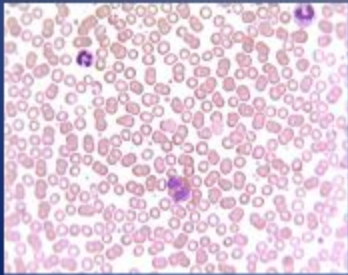
### Sickle-cell anemia-

- HbS results from a change in just one of the 287 amino acids in the  $\beta$  chain in the globin molecule.
- Found in 1 out of 400 African America



## RBC Diseases

**Polycythemia**- excess of erythrocytes, ↑ viscosity of blood;  
8-11 million cells/mm.

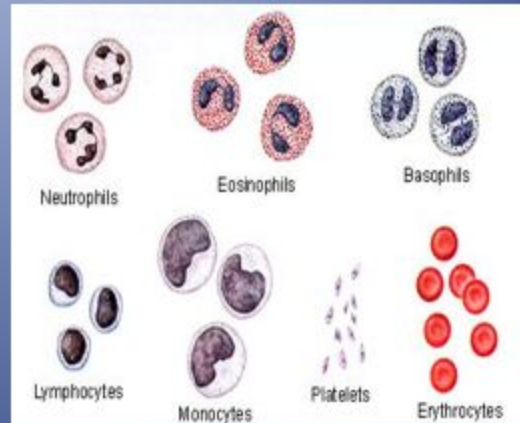


# White Blood Cells

- Leukocytes or WBCs
  - Largest sized blood cells
  - Lowest numbers in the blood (4,000 – 11,000 per microliter).
  
  - Formed in the bone marrow and some in lymph glands
  - Primary cells of the immune system
  - Fights disease and foreign invaders
  - Contain nuclei with DNA.

# White Blood Cells

- the shape depends on type of cell
- Certain WBCs produce antibodies.
  - Life span is from 24 hours to several years.
  - Size is 8-20 micrometers in diameter.
- There are five different types of WBCs
1. Neutrophils
  2. Eosinophils
  3. Basophils
  4. Lymphocytes
  5. Monocytes



# WBC diseases

## Leukopenia

- Abnormally low WBC count.

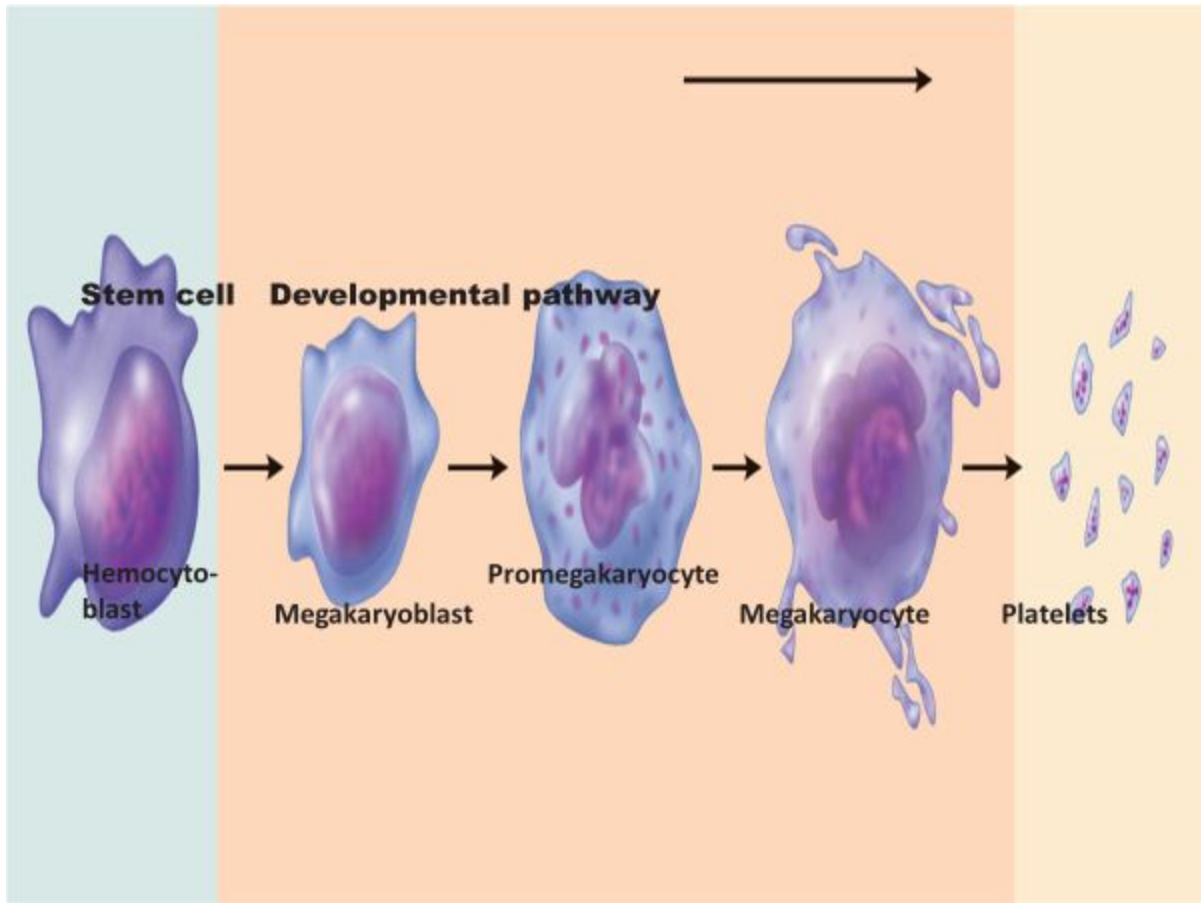
## Leukemias

- Cancerous conditions WBCs
- Named according to the abnormal WBC clone involved

# Platelets

- Thrombocytes or PLTs
- Formed in the bone marrow
- Fragments from the cytoplasm of megakaryocytes
- Smallest of the blood cells
- 1-4 micrometers in diameter
- Shape can be round, oval, or appear spiky
- Life span of around 8-12 days





# Bleeding Disorders

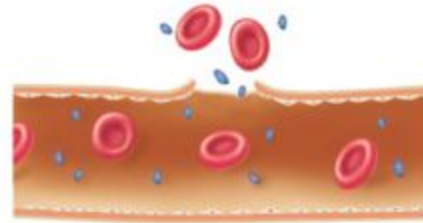
Thrombocytosis- too many platelets due to inflammation, infection or cancer

Thrombocytopenia- too few platelets

- causes spontaneous bleeding
- due to suppression or destruction of bone marrow (e.g., malignancy, radiation)
  - Platelet count  $<50,000/\text{mm}^3$  is diagnostic
  - Treated with transfusion of concentrated platelets

# Hemostasis:

1. Vessel injury
2. Vascular spasm
3. Platelet plug formation
4. Coagulation



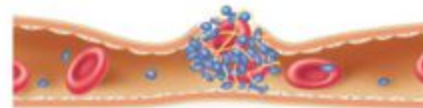
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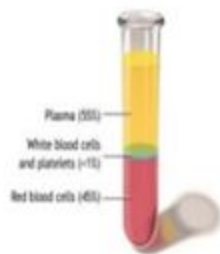
Abbreviation	Test Name	Definition	Associated Disorders
WBC	White blood cells	WBCs fight infection. The 5 different types of WBCs are listed to the left.	Infection, leukemia
WBC Diff	WBC differential Neutrophils Lymphocytes Monocytes Eosinophils Basophils		
RBC	Red blood cells	RBCs (with the help of hemoglobin) carry oxygen throughout the body	<p>↓ Anemia, bleeding, malnutrition, kidney disease</p> <p>↑ Polycythemia, heart and lung disease, dehydration</p>
Hb or Hgb	Hemoglobin	Protein that carries oxygen	<p>↓ Anemia, bleeding, malnutrition, cirrhosis, cancer</p> <p>↑ Dehydration, polycythemia</p>
Hct	Hematocrit	Amount of space in the blood that is occupied by RBCs	<p>↓ Anemia, bleeding, malnutrition, cirrhosis, cancer</p> <p>↑ Dehydration, polycythemia, hemochromatosis</p>
MCV	Mean corpuscle volume	Average size of the RBCs	Anemia, thalassemia, malnutrition
MCH	Mean corpuscle hemoglobin	Average amount of Hb in each RBC	Anemia, thalassemia, malnutrition
MCHC	Mean corpuscle hemoglobin concentration	Average amount of Hb in the RBCs compared to the average size of the RBCs	Anemia, thalassemia, malnutrition
RDW	Red cell distribution width	Amount of variation in size of the RBCs	Anemia, thalassemia, malnutrition
Plt	Platelet count	Platelets are sticky cells that help to form blood clots	Bleeding and clotting disorders
MPV	Mean platelet volume	Average size of the platelets	Bleeding and clotting disorders

# Differences between Serum and Plasma

## 2. Plasma vs. serum

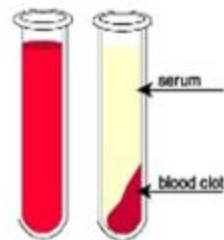
• **Plasma** is the liquid, cell-free part of blood, that has been **treated with anti-coagulants**.

Anticoagulated



**Serum** is the liquid part of blood **AFTER coagulation**, therefore devoid of clotting factors as fibrinogen.

Clotted



• serum = plasma - fibrinogen

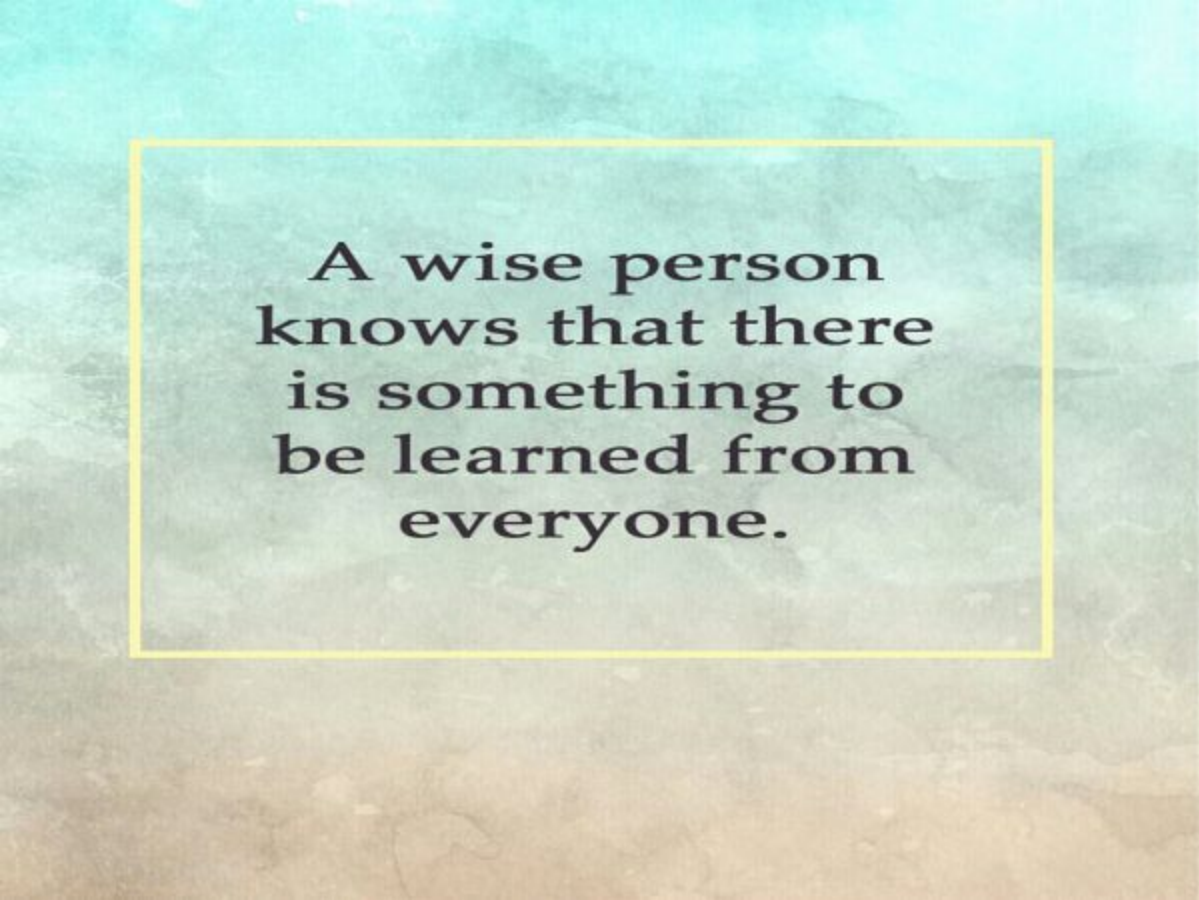
## Sahli's Acid Hematin Method

- Place N/10 HCl into Hb tube upto 2 grams.
- Blood sample in Sahli's Hb pipette upto 20 micro litre.
- Add blood sample to acid solution.
- Mix with a stirrer.
- Allow to stand for 10 minutes.
- Add distilled water drop by drop till the colour of the solution matches to brown glass standard.
- Take the reading of the lower meniscus from the graduated tube in grams.



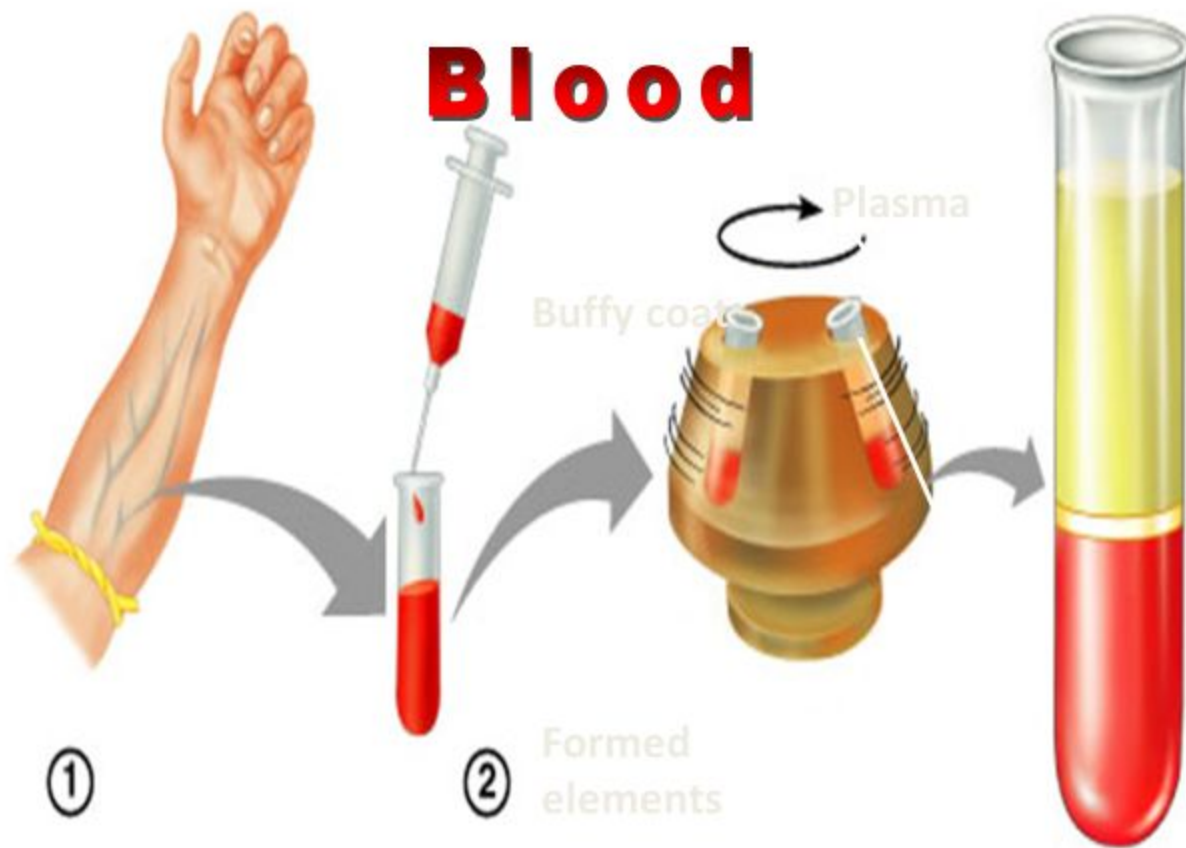
# References

- ["Definition of BLOOD"](#). [Archived](#) from the original on 23 March 2017. Retrieved 4 March 2017.
- [^ The Franklin Institute Inc. "Blood – The Human Heart"](#). Archived from [the original](#) on 5 March 2009. Retrieved 19 March 2009.
- [^ Alberts B \(2012\). "Table 22-1 Blood Cells"](#). Molecular Biology of the Cell. NCBI Bookshelf. [Archived](#) from the original on 27 March 2018. Retrieved 1 November 2012.
- [^ Jump up to:<sup>a</sup> <sup>b</sup> Elert G \(2012\). "Volume of Blood in a Human"](#). The Physics Factbook. Archived from [the original](#) on 3 November 2012. Retrieved 1 November 2012.
- [^ Shmukler, Michael \(2004\). "Density of Blood"](#). The Physics Factbook. Archived from [the original](#) on 19 September 2006. Retrieved 4 October 2006.
- [^ "Composition of the Blood | SEER Training"](#). training.seer.cancer.gov.
- [^ "Medical Encyclopedia: RBC count"](#). Medline Plus. [Archived](#) from the original on 21 October 2007. Retrieved 18 November 2007.
- [^ Tallitsch RB, Frederic M, Michael J T \(2006\). Human anatomy \(5th ed.\). San Francisco: Pearson/Benjamin Cummings. p. 529. ISBN 978-0-8053-7211-3.](#)

The image features a quote centered on a textured background. The background is a mix of light teal and brownish-tan colors, resembling marbled paper or stone. A thin yellow rectangular border frames the text. The text is in a black, serif font and is arranged in five lines.

**A wise person  
knows that there  
is something to  
be learned from  
everyone.**

# Blood



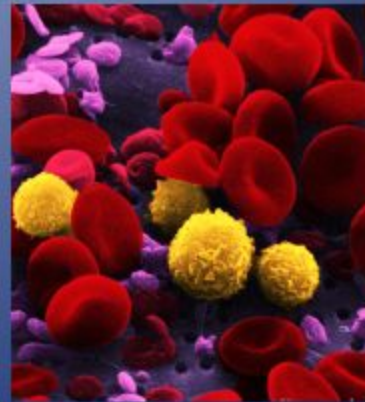
# Blood Plasma Components-55%

## 90% Water

- Proteins
  - Albumin (60 %)
  - Alpha and Beta Globulins
  - Gamma Globulins
  - fibrinogen
- Electrolytes
- Amino acid \*Lipids \*Vitamins \*Carbohydrat.
- Hormons
- Co2\* urea .

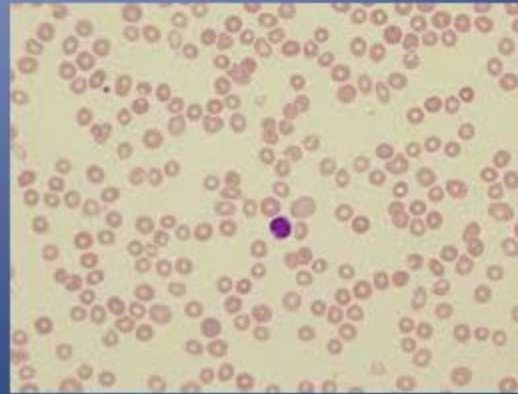
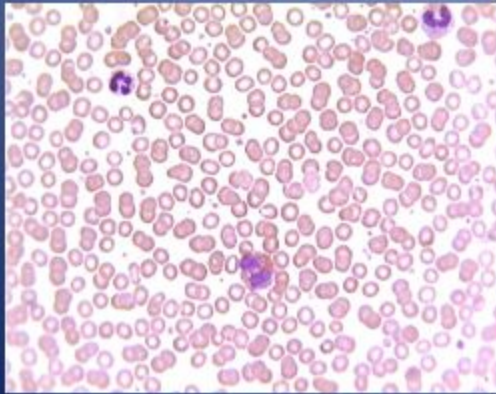
## Formed Elements of the Blood-45%

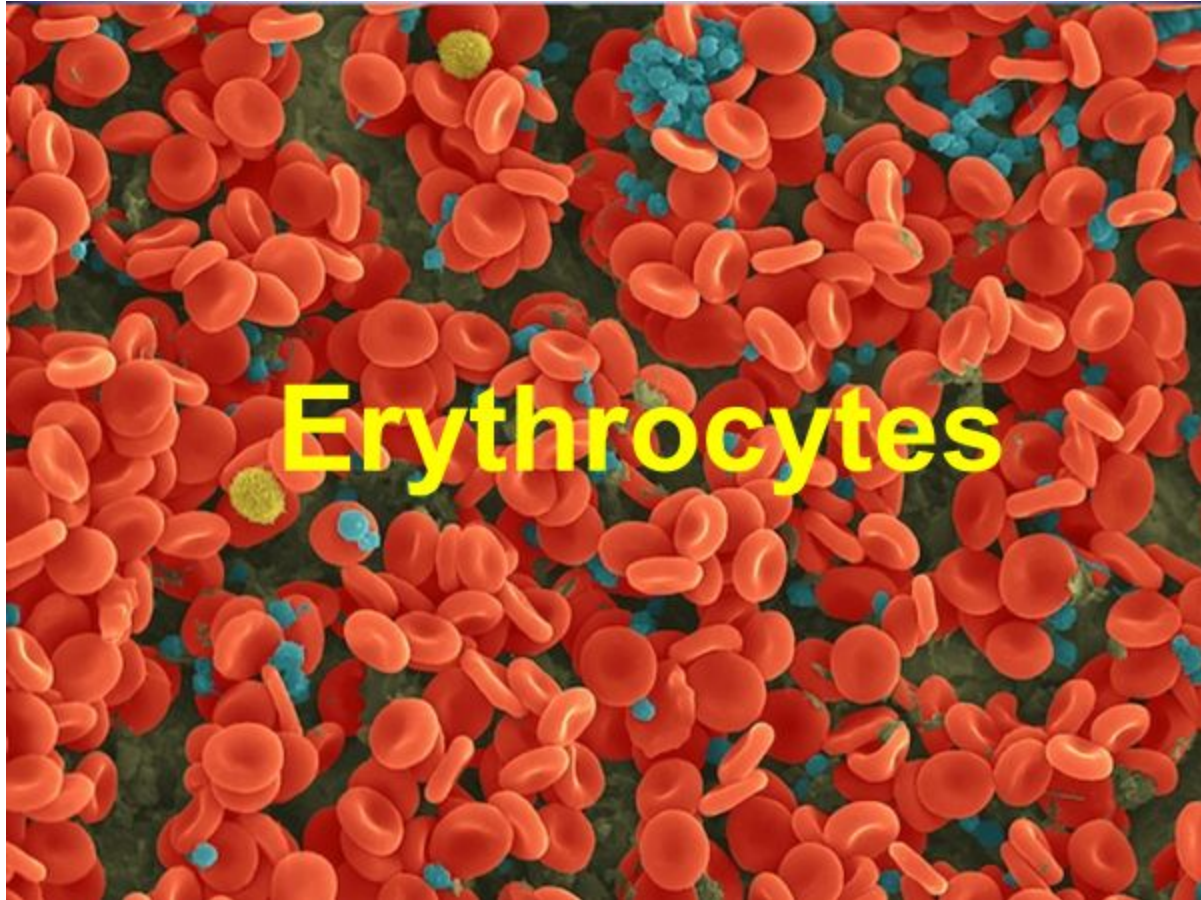
- Erythrocytes (red blood cells)
- Leukocytes (white blood cells)
- Platelets (thrombocytes)



## RBC Diseases

**Anemia**- when blood has low O<sub>2</sub> carrying capacity; insufficient RBC or iron deficiency.  
Factors that can cause anemia- B12 deficiency





**Erythrocytes**

## Erythrocyte

- Anucleate
- Hematopoiesis- production of RBC
- Function- transport respiratory gase
- Lack mitochondria. Why?
- 1 RBC contains 280 million hemoglobin molecules
- Life span 100-120 days and then destroyed in spleen (RBC graveyard)

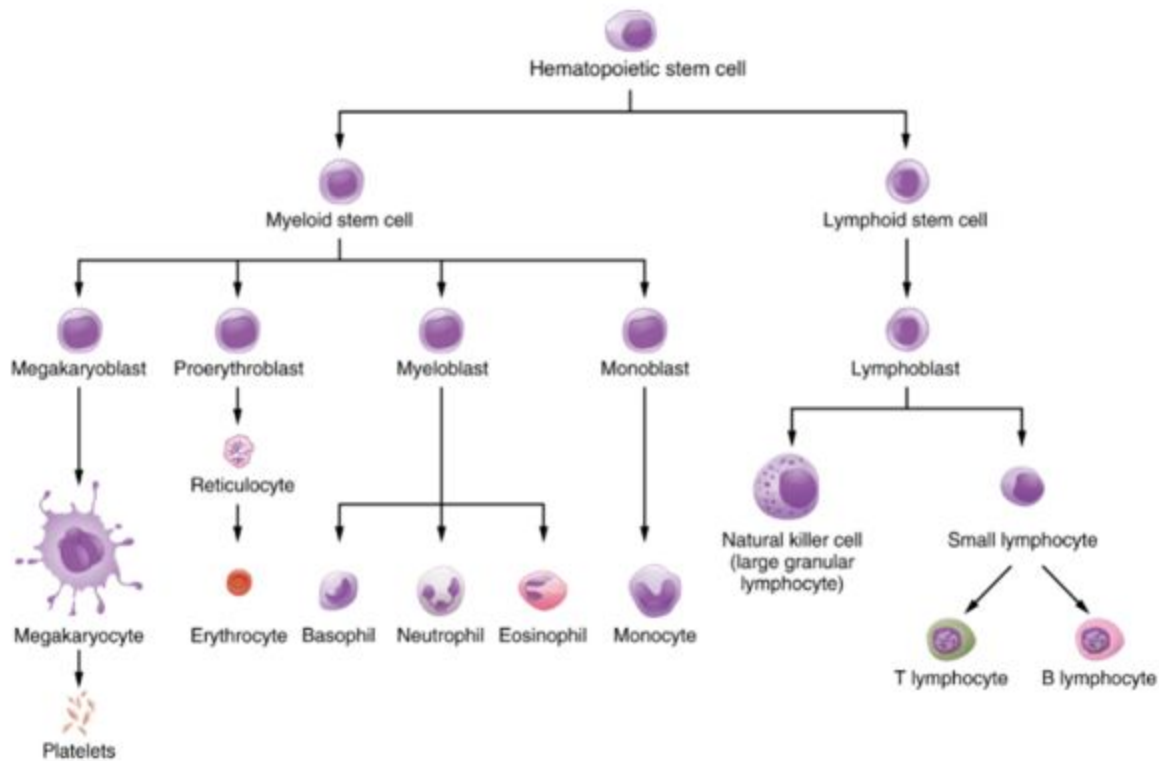


Image modified from "Hematopoietic system of bone marrow," by OpenStax College, Anatomy & Physiology (CC BY 3.0).

# Function of Blood

- Deliver O<sub>2</sub>
- Remove metabolic wastes
- Maintain temperature, pH, and fluid volume
- Protection from blood loss- platelets
- Prevent infection- antibodies and WBC
- Transport hormones

# Types of Leukocytes

4,000-11,000 cells/mm<sup>3</sup>

## Granulocytes

Neutrophils- 40-70%

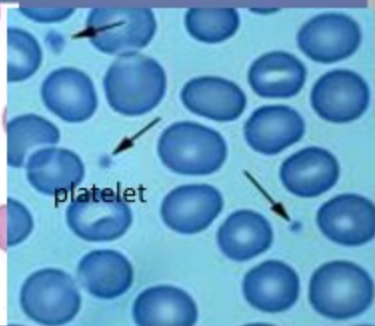
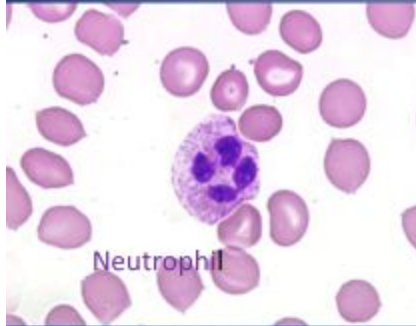
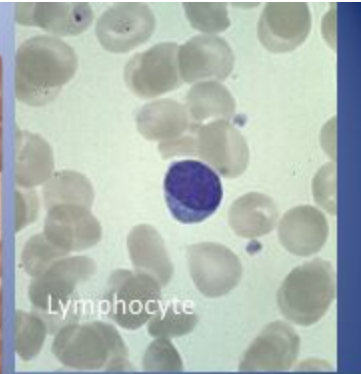
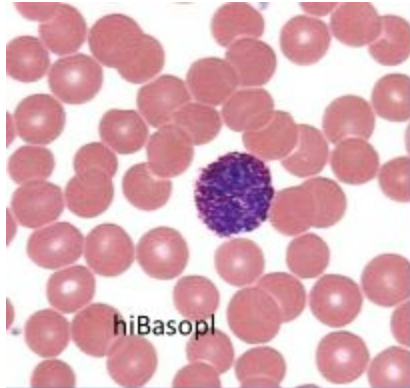
Eosinophils- 1-4%

Basophils- <1%

## Agranulocytes

Monocytes- 4-8%

Lymphocytes- 20-45%



# Platelets

- Small fragments of megakaryocytes
- Formation is regulated by thrombopoietin
- Blue-staining outer region, purple granules

# Hemostasis

(+ feedback)

Clotting Factors

thromboplastin

Prothrombin

Thrombin

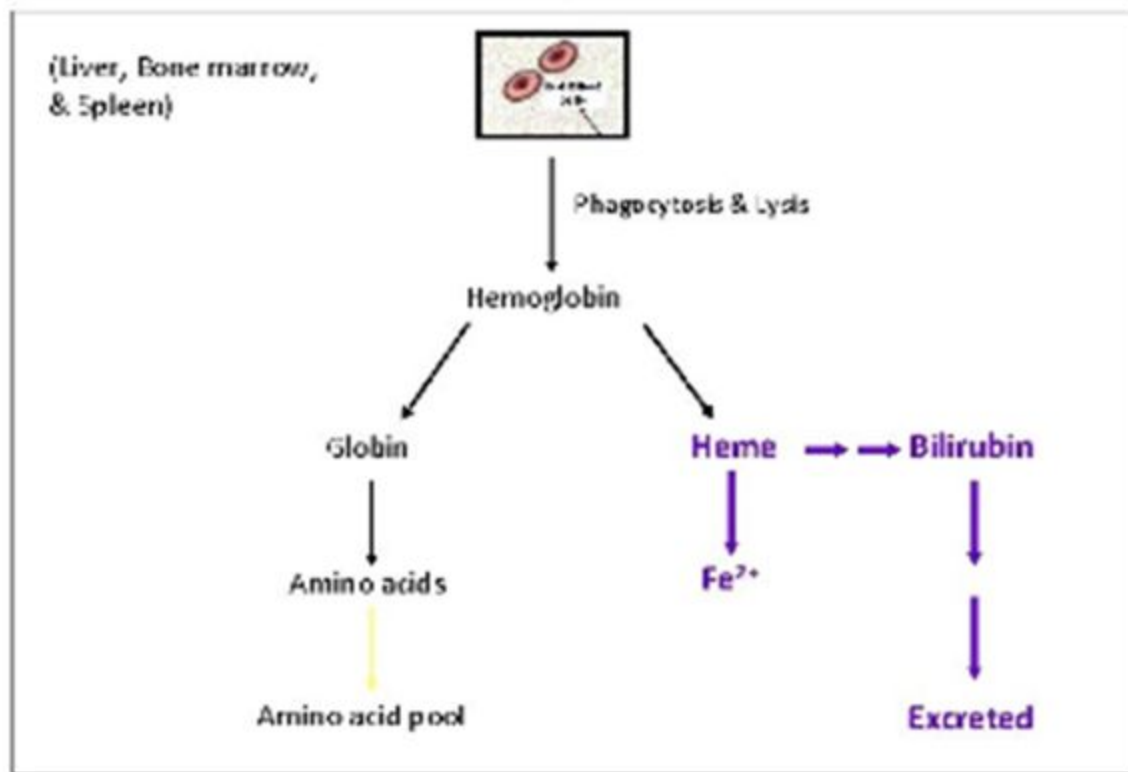
Fibrinogen

Fibrin

Traps RBC & platelets

Platelets release thromboplastin

## Extravascular Pathway for RBC Destruction



## What is the function of blood?

Blood carries the following to the body tissues:

- Nourishment.
- Electrolytes.
- Hormones.
- Vitamins.
- Antibodies.
- Heat
- Oxygen.

Blood carries the following away from the body tissues:

- Waste matter.
- Carbon dioxide.

