

Blood

What is it and why is it
important?

Blood

- The average adult has about five liters of blood living inside of their body, coursing through their vessels, delivering essential elements, and removing harmful wastes.
- Without blood, the human body would stop working

Blood functions

- Blood is the fluid of growth, transporting nourishment from digestion and hormones from glands throughout the body.
- Blood is the fluid of health, transporting disease fighting substances to the tissue and waste to the kidneys.

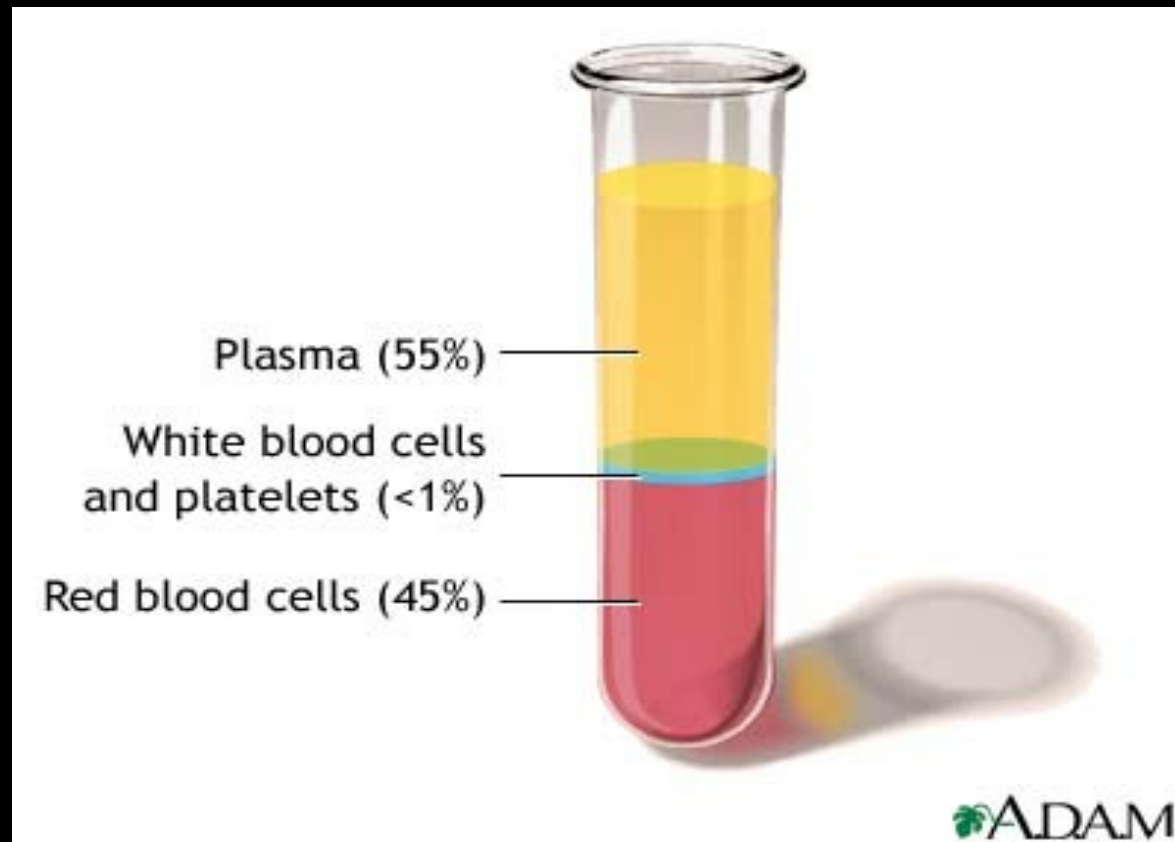
Bloods Major Function

- Blood is the fluid of life, transporting oxygen from the lungs to body tissue and carbon dioxide from body tissue to the lungs.

Blood Percentages

- 55 % plasma
 - **Plasma** is the straw-colored liquid in which the blood cells are suspended.
- 45 % formed elements
 - Red blood cells (Erythrocytes)
 - White blood cells (leukocytes)
 - Platelets (thrombocytes)

Blood Components



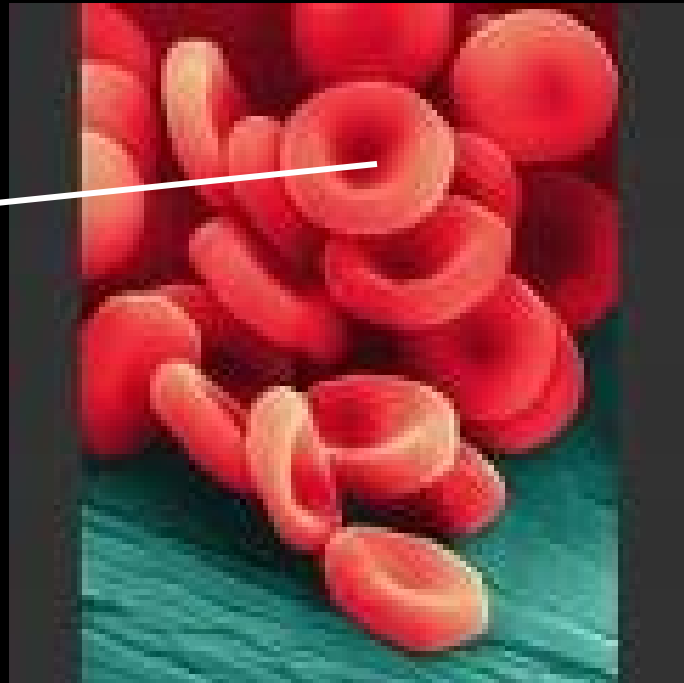
Plasma

- Plasma is the relatively clear liquid water , sugar, fat, protein and salt solution which carries the red cells, white cells, platelets, and some other chemicals.
- Normally, 55% of our blood's volume is made up of plasma. About 95% of it consists of water.
- As the heart pumps blood to cells throughout the body, plasma brings nourishment to them and removes the waste products of metabolism

Red blood cells (erythrocytes)

- Red blood cells are biconcave discs

erythrocytes



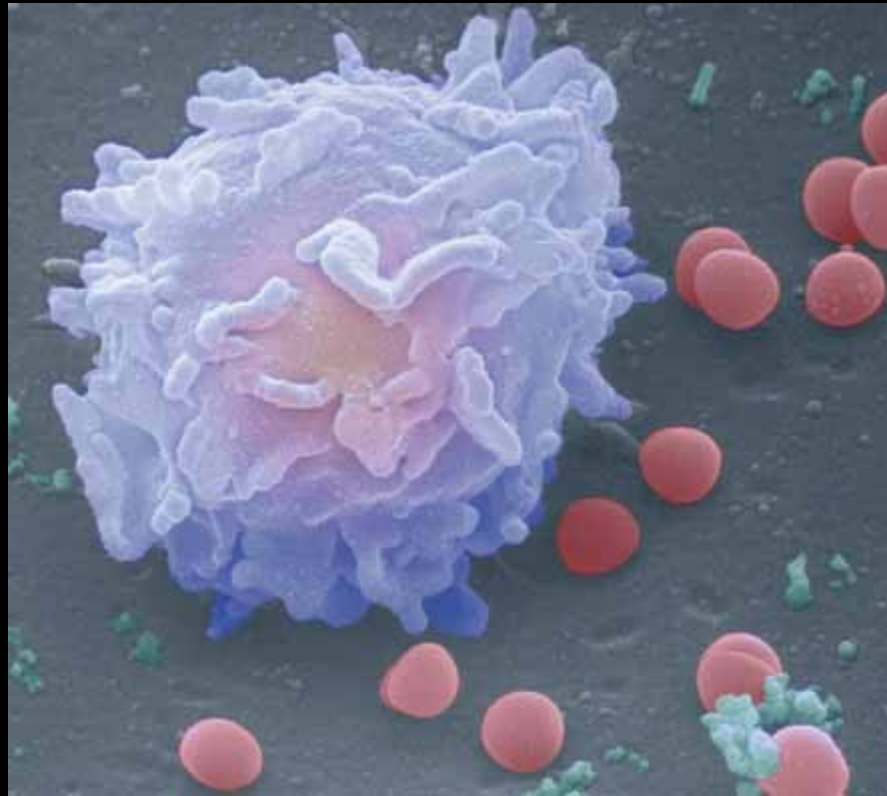
Red Blood Cells

- Red cells, or **erythrocytes** , are relatively large microscopic cells without nuclei.
- Red cells normally make up 40-50% of the total blood volume.
- They transport oxygen from the lungs to all of the living tissues of the body and carry away carbon dioxide.
- The red cells are produced continuously in our bone marrow from stem cells at a rate of about 2-3 million cells per second.

Cont.

- **Hemoglobin** is the gas transporting protein molecule that makes up 95% of a red cell.
- Each red cell has about 270,000,000 iron-rich hemoglobin molecules.
 - People who are anemic generally have a deficiency in red cells.
- The red color of blood is primarily due to oxygenated red cells.

White Blood Cell (leukocytes)



White Blood Cells

- White cells, or **leukocytes** , exist in variable numbers and types but make up a very small part of blood's volume--normally only about 1% in healthy people.
- Leukocytes are not limited to blood.
 - They occur elsewhere in the body as well, most notably in the spleen, liver, and lymph glands.
- Most are produced in our bone marrow from the same kind of stem cells that produce red blood cells and others are produced in the thymus gland, which is at the base of the neck.

Cont.

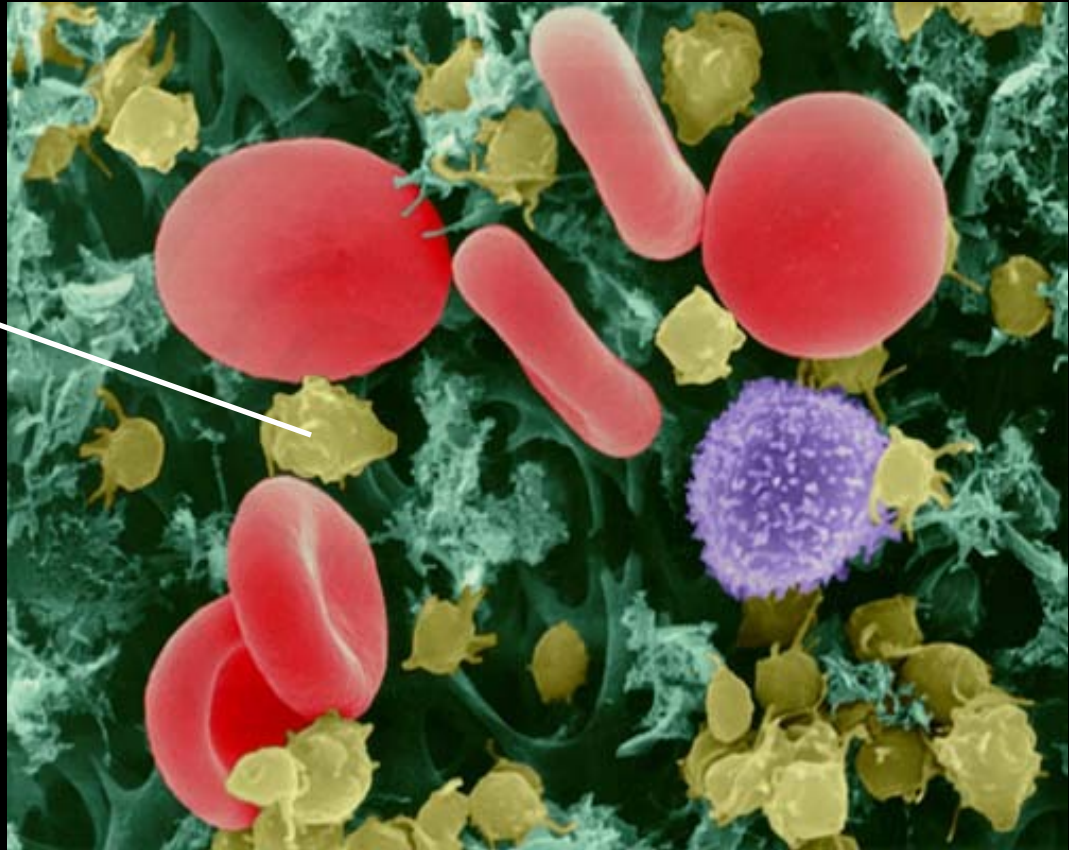
- Some white cells (called lymphocytes) are the first responders for our immune system.
 - They seek out, identify, and bind to alien protein on bacteria, viruses, and fungi so that they can be removed.
 - Other white cells (called granulocytes and macrophages) then arrive to surround and destroy the alien cells.

Cont.

- They also have the function of getting rid of dead or dying blood cells as well as foreign matter such as dust.
- Individual white cells usually only last 18-36 hours before they also are removed, though some types live as much as a year.
 - Red cells remain viable for only about 4 months before they are removed from the blood and their components recycled in the spleen.

Platelets (thrombocytes)

Platelets



Platelets

- Platelets , or **thrombocytes** , are cell fragments without nuclei that work with blood clotting chemicals at the site of wounds.
 - They do this by adhering to the walls of blood vessels, thereby plugging the rupture in the vascular wall. They also can release coagulating chemicals which cause clots to form in the blood that can plug up narrowed blood vessels.
- There are more than a dozen types of blood clotting factors and platelets that need to interact in the blood clotting process.

Cont.

- Recent research has shown that platelets help fight infections by releasing proteins that kill invading bacteria and some other microorganisms.
 - In addition, platelets stimulate the immune system.
- Individual platelets are about 1/3 the size of red cells.
- They have a lifespan of 9-10 days.
- Like the red and white blood cells, platelets are produced in bone marrow from stem cells.

Blood Components

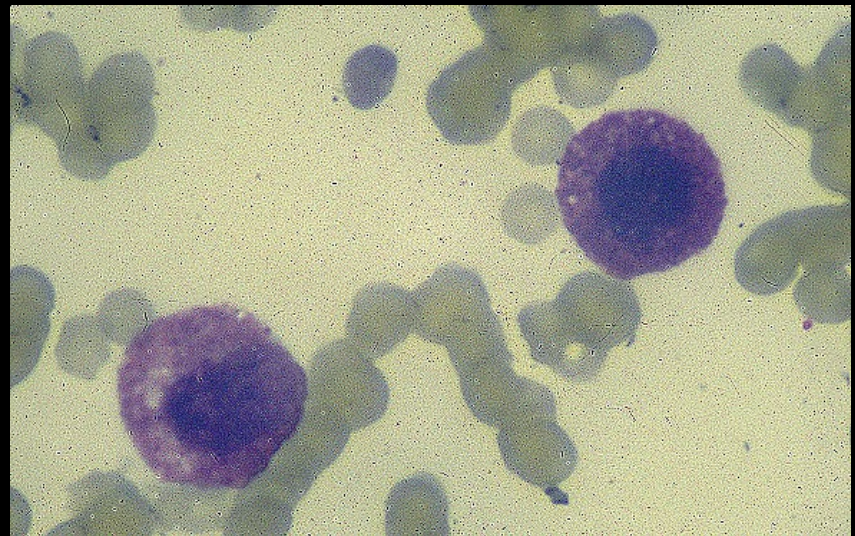
- Because it contains living cells, blood is alive.
- Since the cells are alive, they too need nourishment.

Granulocytes

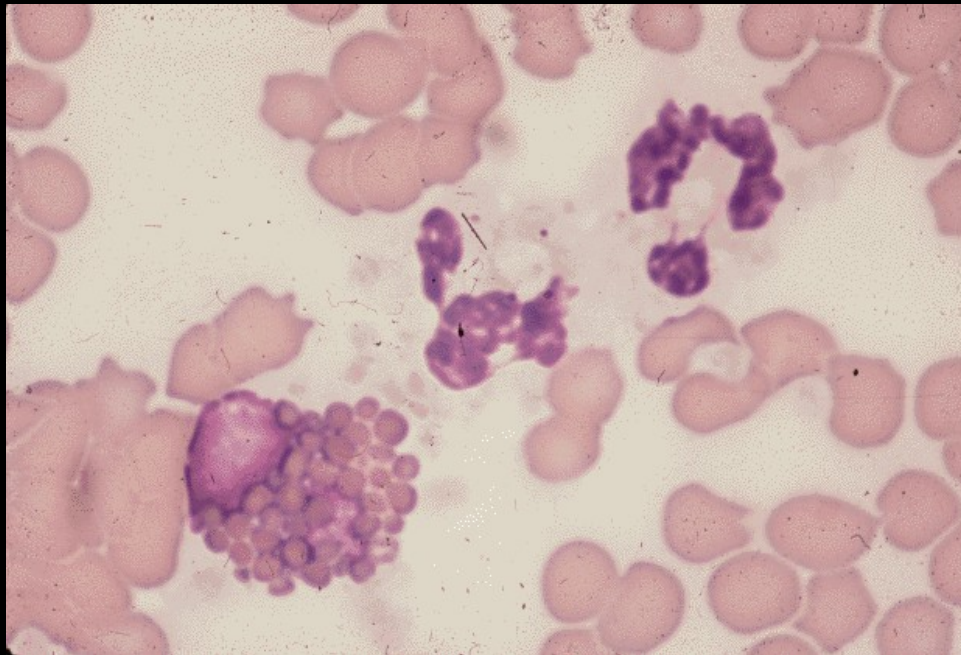
- Granulocytes are white blood cells whose cytoplasm contains tiny granules. The cells are named according to the staining characteristics of the granules.
- **Neutrophils** - the granules do not stain with normal blood stains so we generally see just the multilobed nucleus.
 - Neutrophils are phagocytic cells; they engulf foreign material
- **Eosinophils** have red-staining granules.
 - They seem to be attracted to allergic reactions in the body.

Basophils

- Basophils have dark blue-staining granules.
- They are the least numerous blood cells.
- They help initiate the inflammatory process at sites of injury.



Cont.



neutrophils (upper two
cells)

eosinophil (lower left cell)

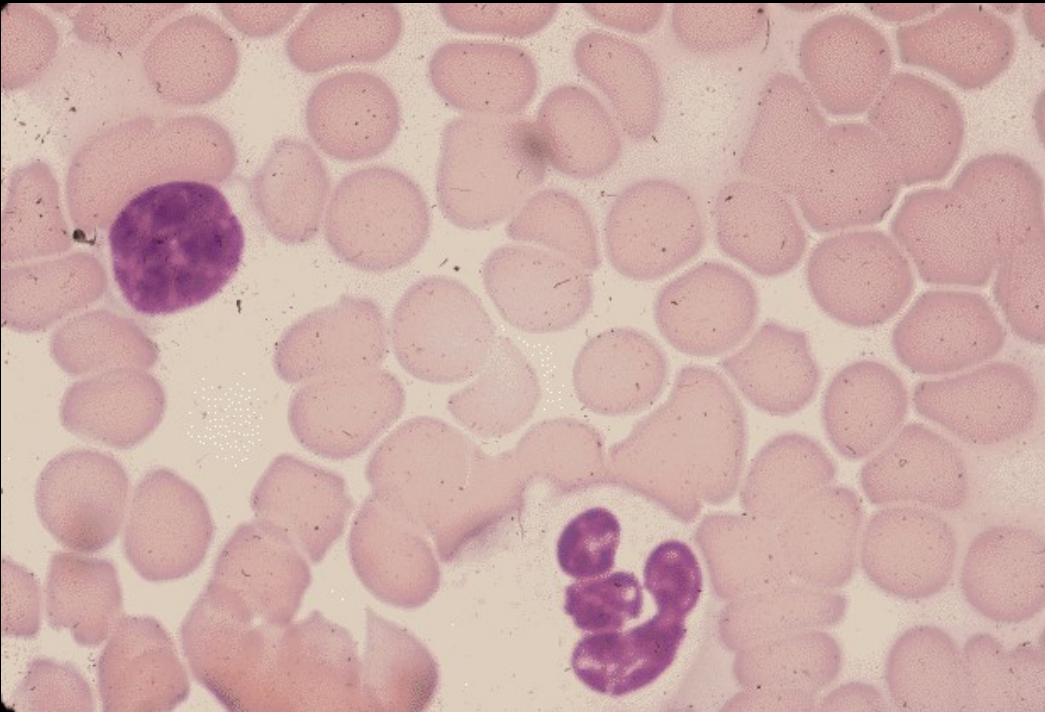
Leukocytes(wbc's) Total

- Neutrophils 60-70% (N)EVER
- Lymphocytes 20-25% (L)ET
- Monocytes 3-8% (M)ONKEYS
- Eosinophils 1-3% (E)AT
- Basophils $\frac{1}{2}$ to 1% (B)ANANAS

Agranulocytes

- Agranulocytes are white blood cells that have no distinct granules in their cytoplasm.
- **Lymphocytes** have large single nuclei that occupy most of the cells.
 - They are an important part of the body's immune system.

Lymphocyte

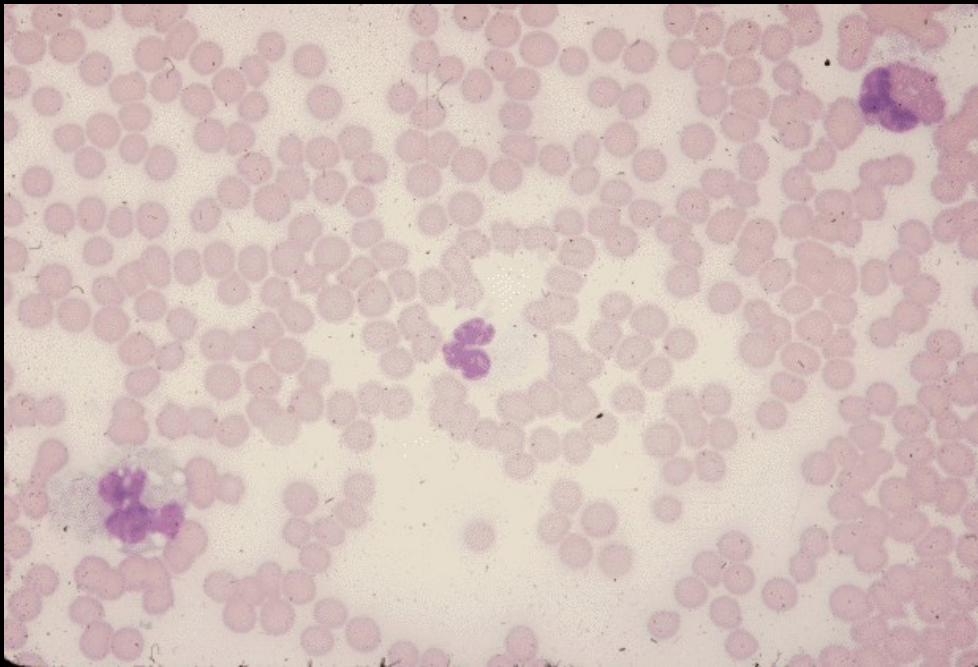


Lymphocyte (left)

Cont

- **Monocytes** are the largest of the white blood cells.
- They have large pleomorphic (variously shaped) single nuclei and function mainly as phagocytic (engulfing) cells.
- They are important in the long-term cleanup of debris in an area of injury.

Cont.



Monocyte (left)

Leukocytes

white blood cells ~ WBC

agranular

granular

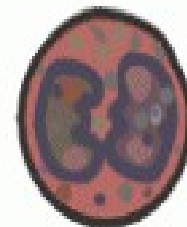
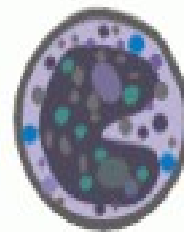
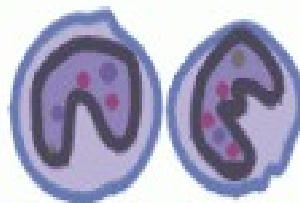
lymphocytes
20 - 25 %

monocytes
3 - 8%

basophils
.5 - 1%

neutrophils
60 - 70%

eosinophils
2 - 4%



T-cell, B-cell, NK Cell

Blood what does it need?

- Vitamins and Minerals keep the blood healthy.
- The blood cells have a definite life cycle, just as all living organisms do.

Blood loss

- When the human body loses a little bit of blood through a minor wound, the platelets cause the blood to clot so that the bleeding stops.
- Because new blood is always being made inside of your bones, the body can replace the lost blood.

Blood replacement

- When the human body loses a lot of blood through a major wound, that blood has to be replaced through a blood transfusion from other people.

