



Lecturer . Zhiyan Ibrahim



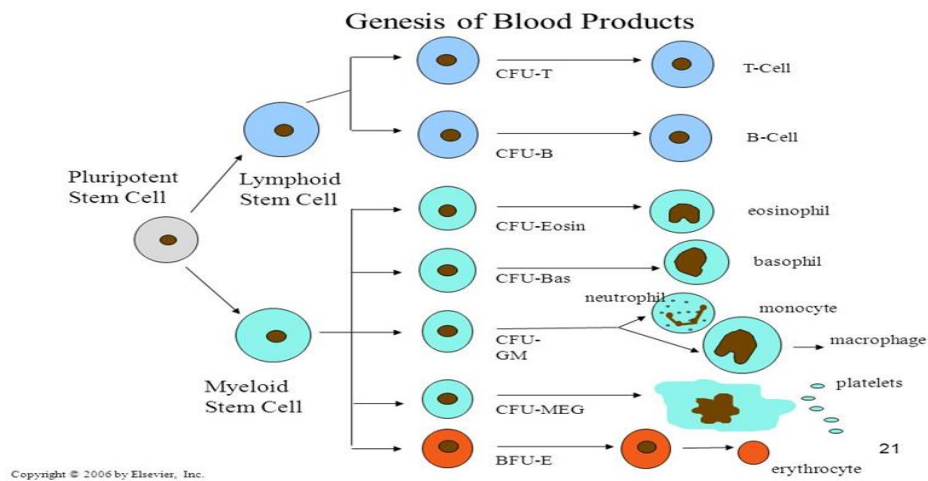
### What is Blood?

Blood is a fluid connective tissue that consists of plasma, blood cells and platelets. It circulates throughout our body delivering oxygen and nutrients to various cells and tissues. It makes up 8% of our body weight. An average adult possesses around 5-6 litres of blood.

- Blood is a connective tissue in fluid form.
- It is considered as the **'fluid of life'** because it carries oxygen from lungs to all parts of the body and carbon dioxide from all parts of the body to the lungs.
- It is known as **'fluid of growth'** because it carries nutritive substances from the digestive system and hormones from endocrine gland to all the tissues.
- The blood is also called the **'fluid of health'** because it protects the body against the diseases.

## Genesis of Blood Cells

The blood cells begin their lives in the bone marrow from a single type of cell called the pluripotential hematopoietic stem cell, from which all the cells of the circulating blood are eventually derived



## Formation of Blood

- Hematopoiesis □ the formation and development of blood cells
- In adults the cellular elements are produced in the bone marrow.
- Some WBCs are produced in the lymphatic tissue and bone marrow.
- Blood cells need certain nutrients to form properly.
- Examples include ( Iron , Folic acid , Vitamin B12)

## Physical Characteristics:-

- 1- Blood is a fluid that is technically considered connective tissues .
- 2- It is made up of cellular elements and an extracellular matrix. The cellular elements—referred to as the formed elements—include red blood cells (RBCs), white blood cells (WBCs), and cell fragments called platelets
- 3- The extracellular matrix, called **plasma**.
- 4- Blood appears **red** because of the high amount of **hemoglobin**, a molecule found on RBCs.

## PROPERTIES OF BLOOD

1. **Color:** Blood is red in color. Arterial blood is scarlet red because it contains more oxygen and venous blood is purple red because of more carbon dioxide.
2. **Volume:** Average volume of blood in a normal adult is 5 L. In a newborn baby, the volume is 450 ml. It increases during growth and reaches 5 L at the time of puberty. In females, it is slightly less and is about 4.5 L. It is about 8% of the body weight in a normal young healthy adult, weighing about 70 kg.
3. **Reaction and pH:** Blood is slightly alkaline and its pH in normal conditions is 7.4.
4. **Viscosity:** Blood is five times more viscous than water. It is mainly due to red blood cells and plasma proteins

## FUNCTIONS OF BLOOD

1. Supply of oxygen to tissues (bound to hemoglobin, which is carried in RBC's)
2. Supply of nutrients such as glucose, amino acids, and fatty acids
3. Removal of waste such as carbon dioxide, urea, and lactic acid
4. Immunological functions, including circulation of white blood cells, and detection of foreign material by antibodies
5. Coagulation (=clotting). Self-repair of damaged tissues.

6. Messenger functions: transport of hormones and the signaling of tissue damage

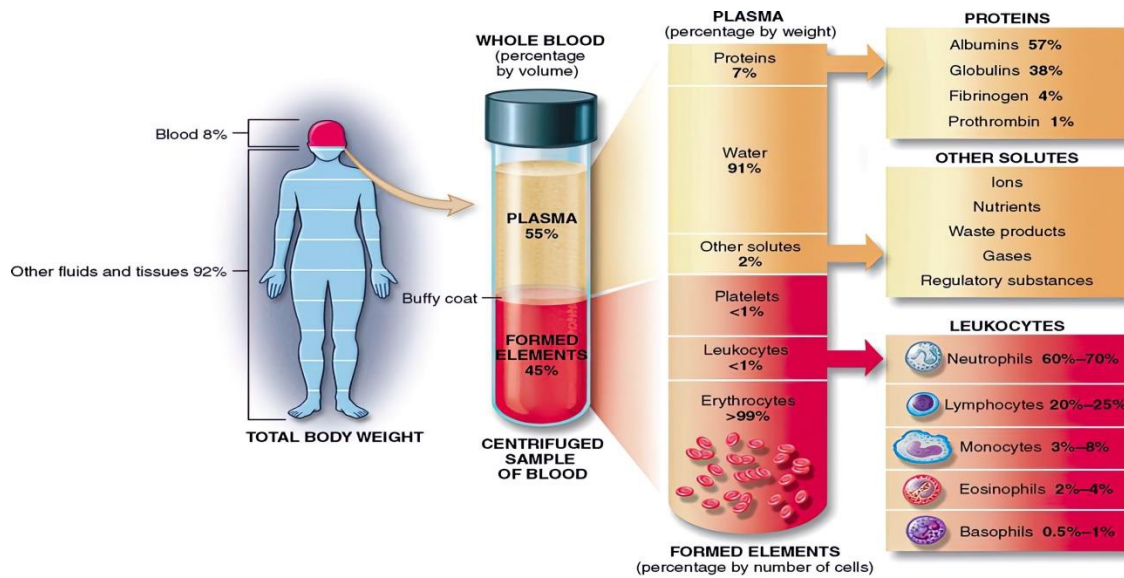
7. Regulation of body pH

8. Thermoregulation: Regulation of core body temperature

9. Hydraulic functions

### **Composition of Blood**

- The blood is made up of cells that are suspended in liquid called plasma.
- Plasma makes up 55% of the blood.
- Plasma is made of 90% water and 10% proteins, lipids, carbohydrates, amino acids, antibodies, hormones, electrolytes, waste, salts, and ions
- Blood cells make up the remaining 45% of the blood.
- Red blood cells make up 99% of the blood cells.
- White blood cells and platelets make up the other 1%.
- Each type of blood cell performs a different function.
- Red blood cells (Erythrocytes)
- White blood cells (Leukocytes)
- Platelets (Thrombocytes)



## PLASMA

Plasma is the liquid portion of blood. About 55% of our blood is plasma, and the remaining 45% are red blood cells, white blood cells and platelets that are suspended in the plasma.

- Blood plasma is a **pale yellow-colored fluid** and its total volume in an adult is approximately 2.5–3 L.
- Plasma constitutes approximately **55% of blood's volume**.
- It contains **91% to 92% of water and 8% to 9% of solids**.
- The solids are the organic and the inorganic substances

## **Plasma serves four important functions in our body:**

1. Helps maintain blood pressure and volume.
2. Supply critical proteins for blood clotting and immunity.
3. Carries electrolytes such as sodium and potassium to our muscles.
4. Helps to maintain a proper pH balance in the body, which supports cell function

## **. Plasma proteins:**

- make up about 7% of plasma.

1- **Albumins** (about 60% of total plasma protein) they are responsible for maintain normal plasma osmotic pressure. Also act as carrier molecules for free fatty acids, some drugs and steroid hormones.

2 **Globins their main functions are: as antibodies** (immunoglobulins), transportation of some hormones, (e.g. thyroglobulin carries the hormone thyroxin) and mineral salts (e.g. transferrin carries the mineral iron).

3- **Clotting factors.** These are responsible for coagulation of blood.

4. **Inorganic salts** (electrolytes) like Ca, Na, Po<sub>4</sub> which are responsible for muscle contraction, transmission of nerve impulses (action potential).

5. **Nutrients:** glucose, amino acid, fatty acids and glycerol

6- **Waste products like urea,** creatinine and uric acid they are carried in the blood to the kidney for excretion.

7-. **Hormones and gases.**

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