# Blood Composition

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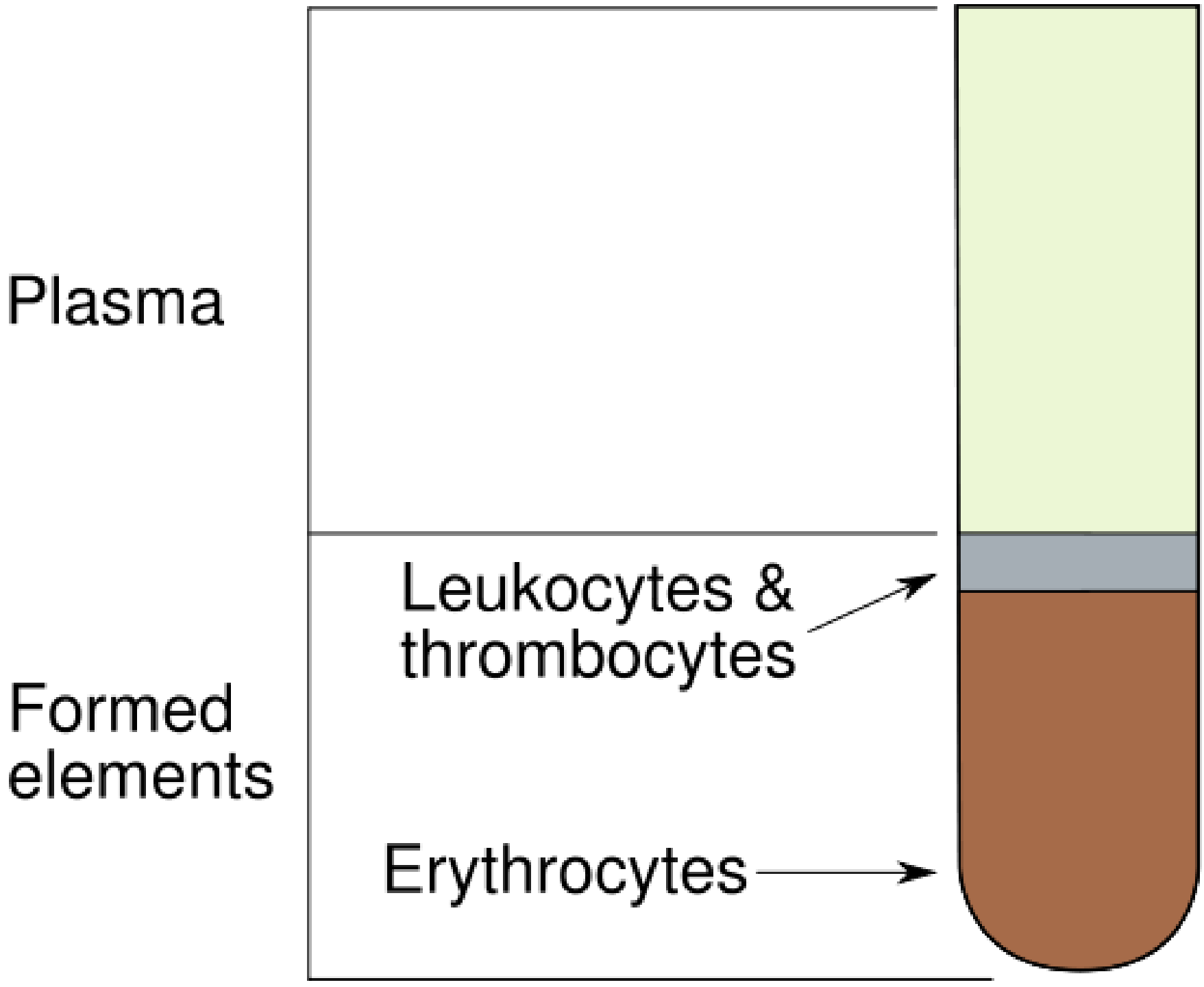
# (1) What is Blood?

- Type of connective tissue.
- Contains Living & Nonliving components.
- **Purpose:** Transport nutrients & waste throughout body.


Plasma
Formed elements
Leukocytes & thrombocytes
Erythrocytes

# (2) Blood Cells

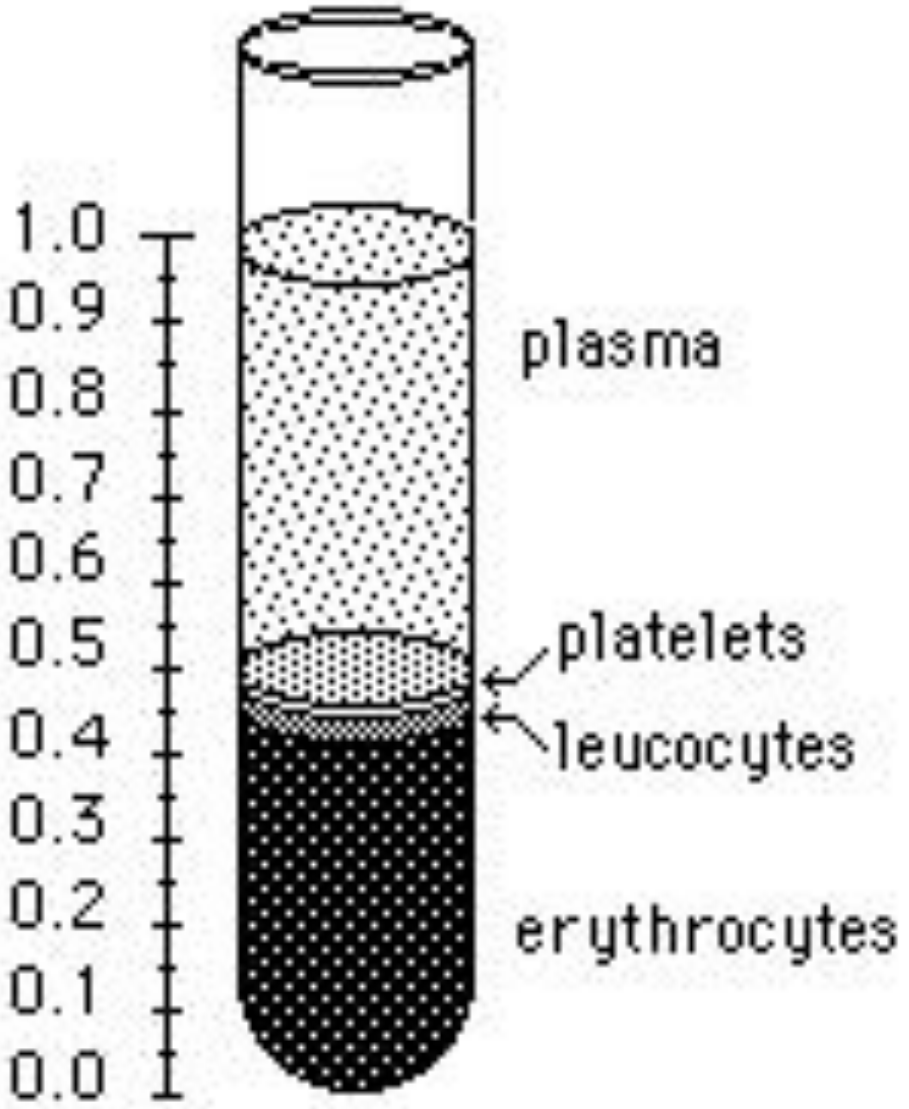
- Cells make up 45% of volume.

- **<u>Types:</u>**
  - ***Erythrocytes*** = Red Blood Cells = RBC's
  - ***Leukocytes*** = White Blood Cells = WBC's
  - ***Platelets*** = Not actually cells…Clotting Factors

# (3) Plasma

- Liquid part of blood.

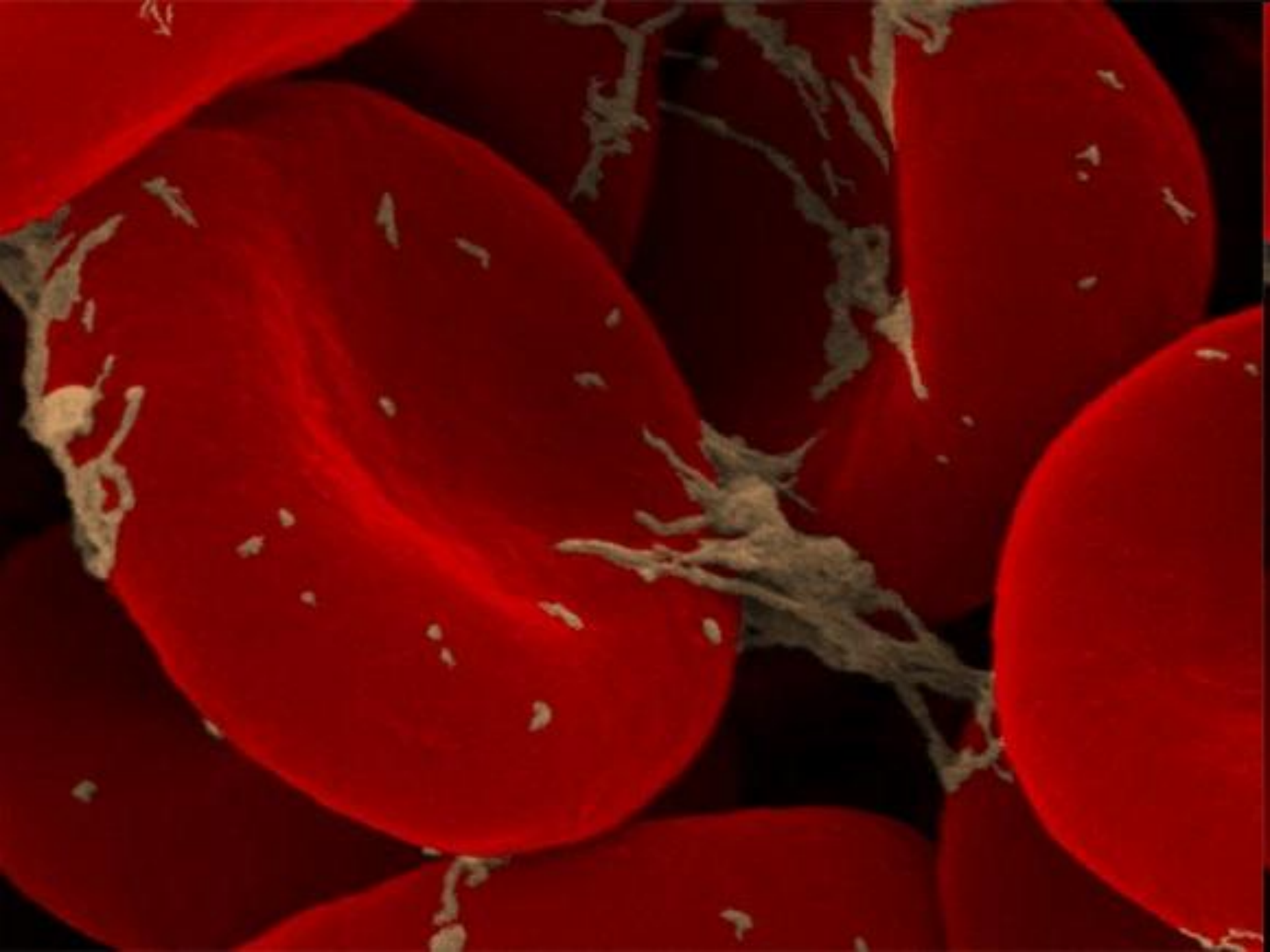
- **<u>Contains:</u>**
  - ***Plasma Proteins:***
    - Albumin → Maintains osmotic pressure.
    - Fibrinogen & Globulin → Clotting Factors
  - Water (*THE liquid solvent*)
  - Salts (*to maintain osmotic pressure*)
  - Nutrients carried in blood

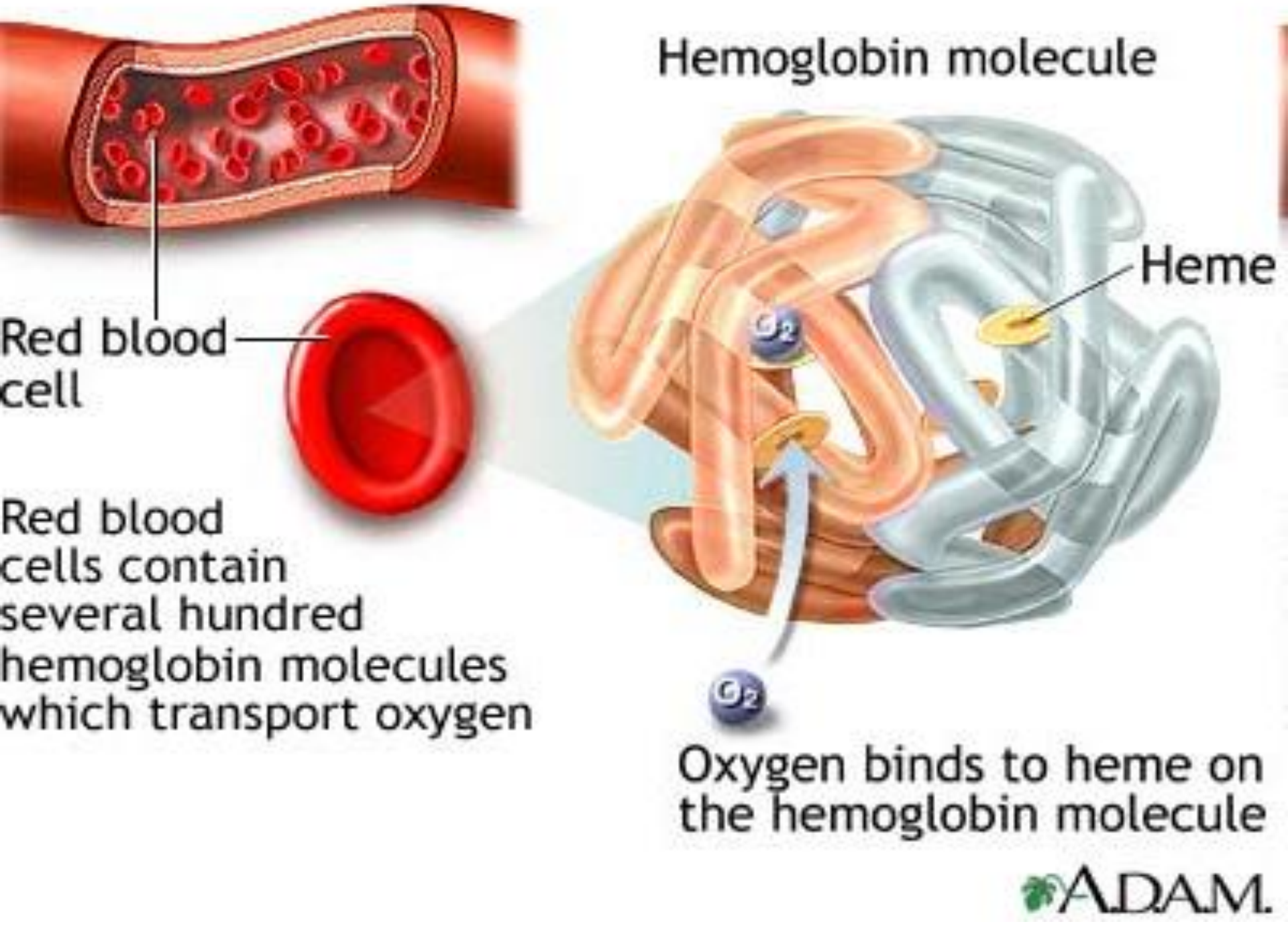

1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
plasma
platelets
leucocytes
erythrocytes

# (4) Erythrocytes (RBC's)

- **Purpose:** Carry oxygen to tissues.

- **Hemoglogin:**
  - Type of Protein
  - Contains Iron which binds with Oxygen
  - Concentration determines availability of Oxygen to cells




Hemoglobin molecule
Heme
Red blood cell
Red blood cells contain several hundred hemoglobin molecules which transport oxygen
Oxygen binds to heme on the hemoglobin molecule
A.D.A.M.

# (5) Anemia

- Type of RBC Disease/Disorder

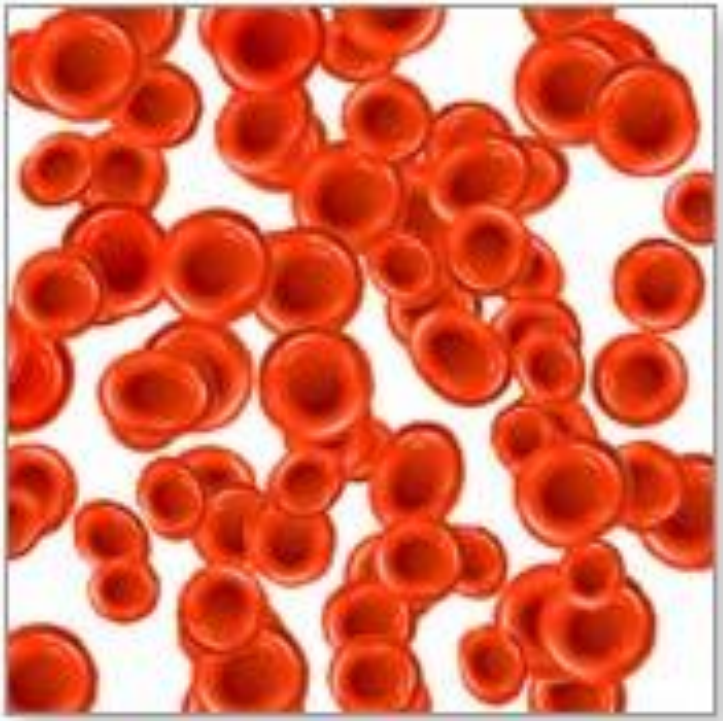
- **Cause:**
  - Low RBC count
  - Low hemoglobin concentration
  - Deformed RBC

- **Result:**
  - Decreased Oxygen availability

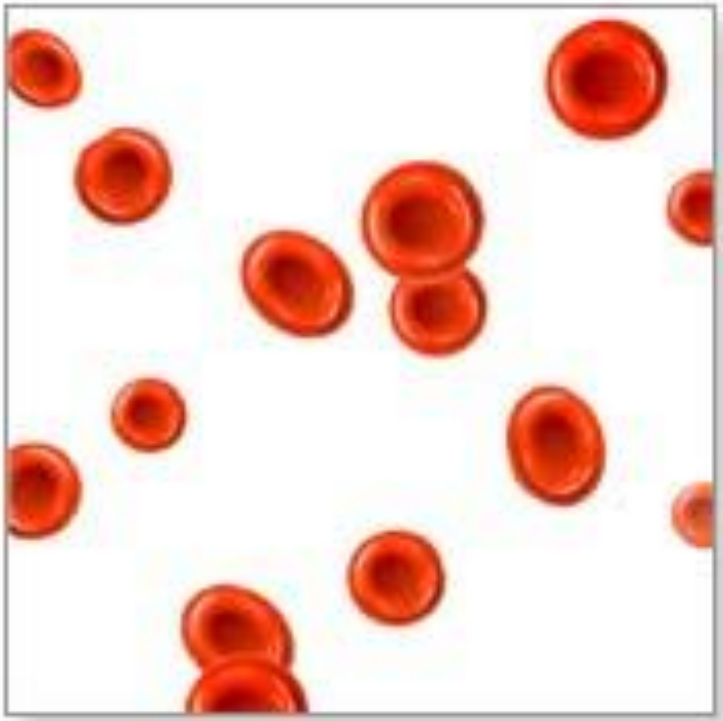
- ***Special Case = Sickle Cell Anemia***
  - Deformed RBC does not allow Oxygen to bind
  - Sickled cells can also clog blood vessels

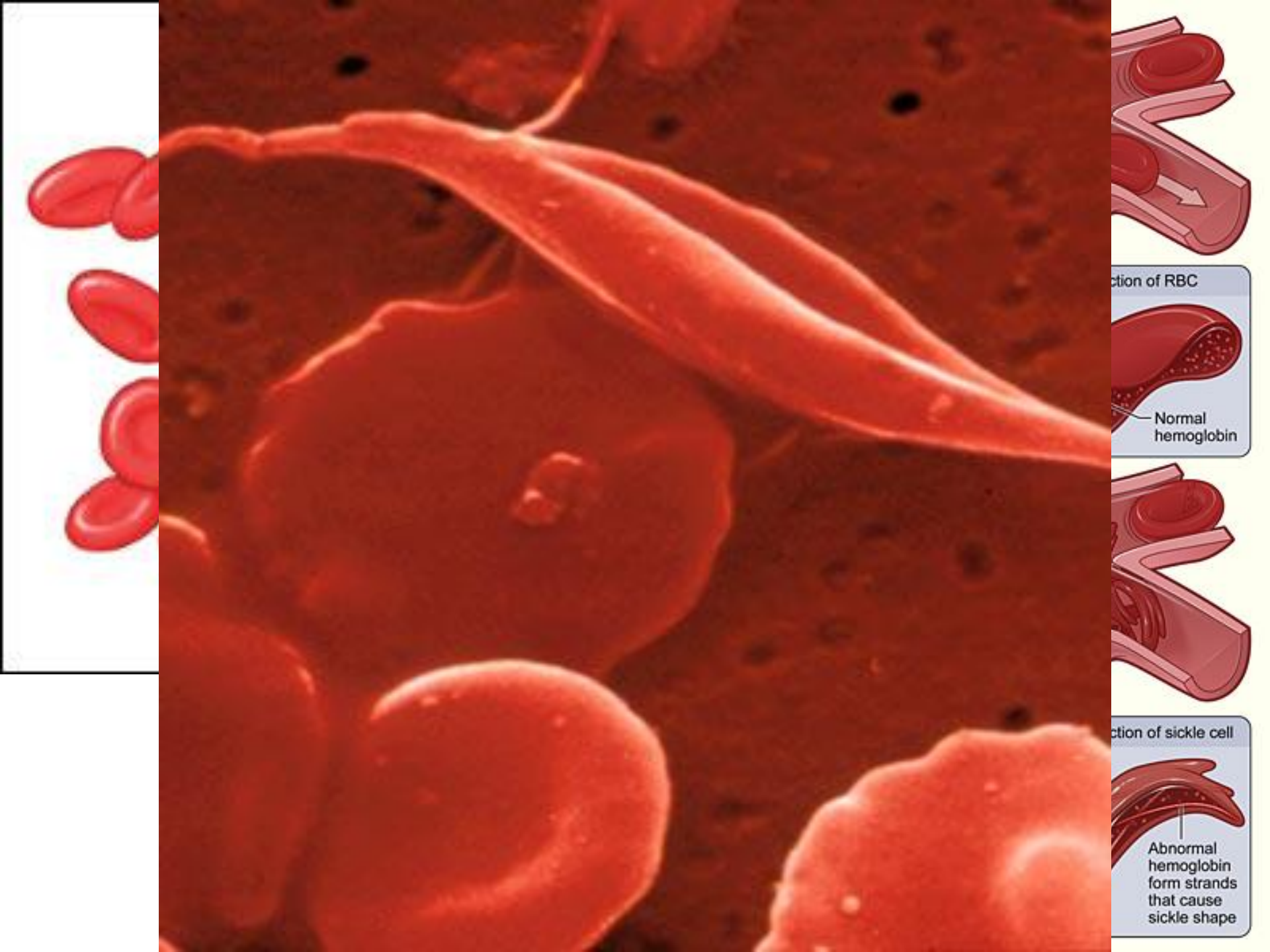
- **Treatments:**
  - Iron & Vitamin Supplements
  - Blood Transfusions / Bone Marrow Transplant
  - Goal → Solve & Fix Underlying Problem, not "cover up"

Normal amount of red blood cells



Anemic amount of red blood cells

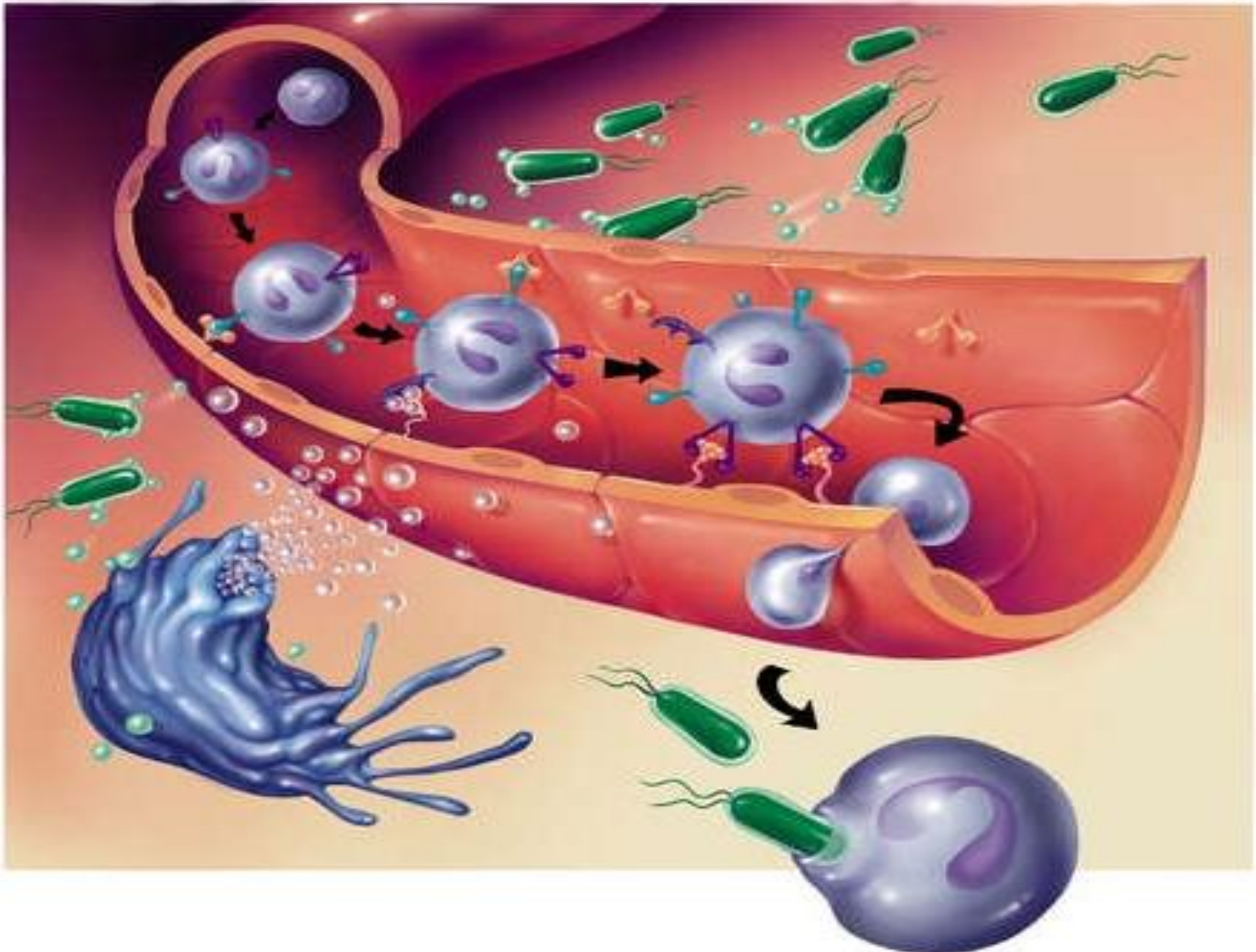


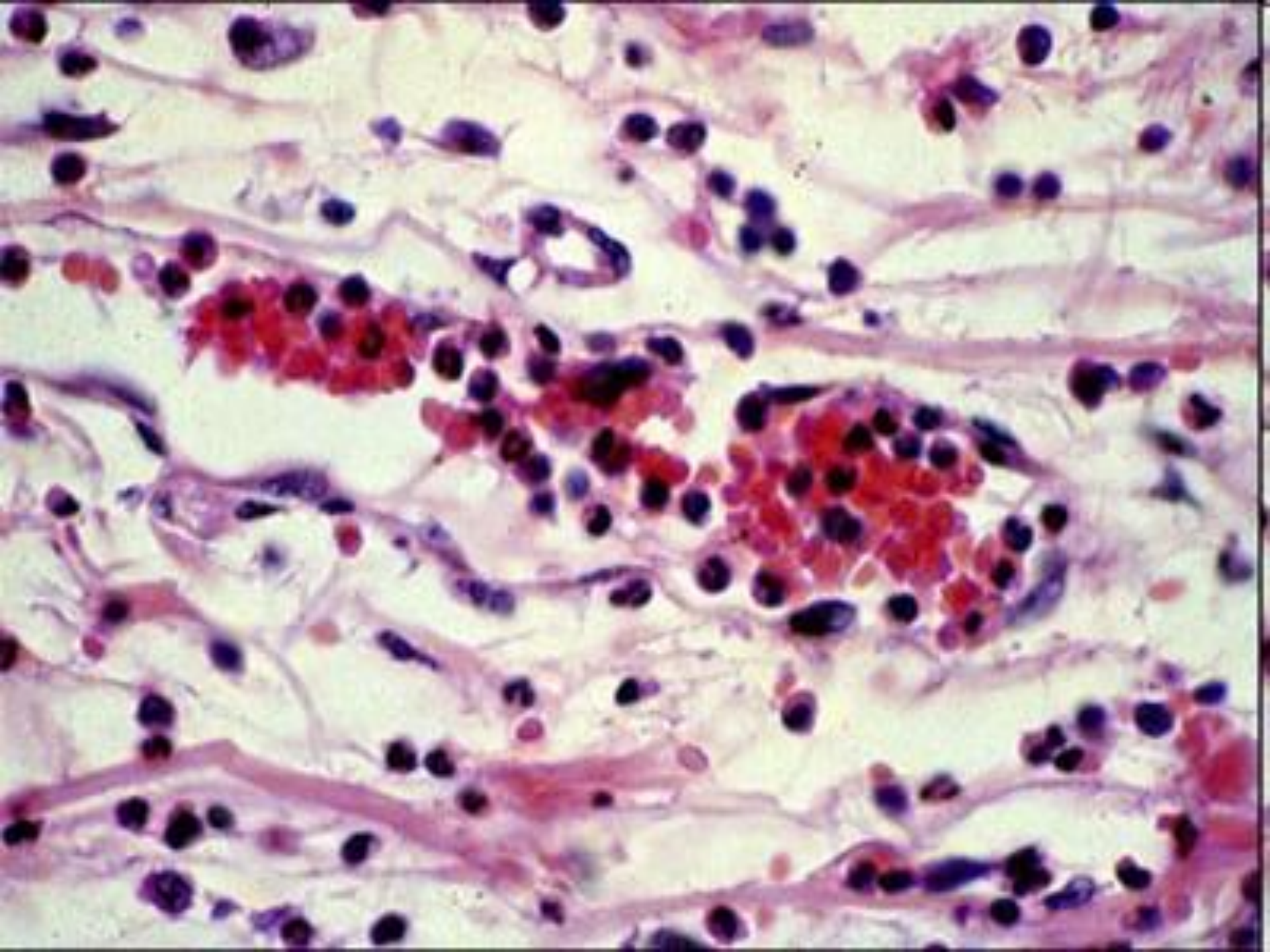

ction of RBC
Normal hemoglobin
ction of sickle cell
Abnormal hemoglobin form strands that cause sickle shape

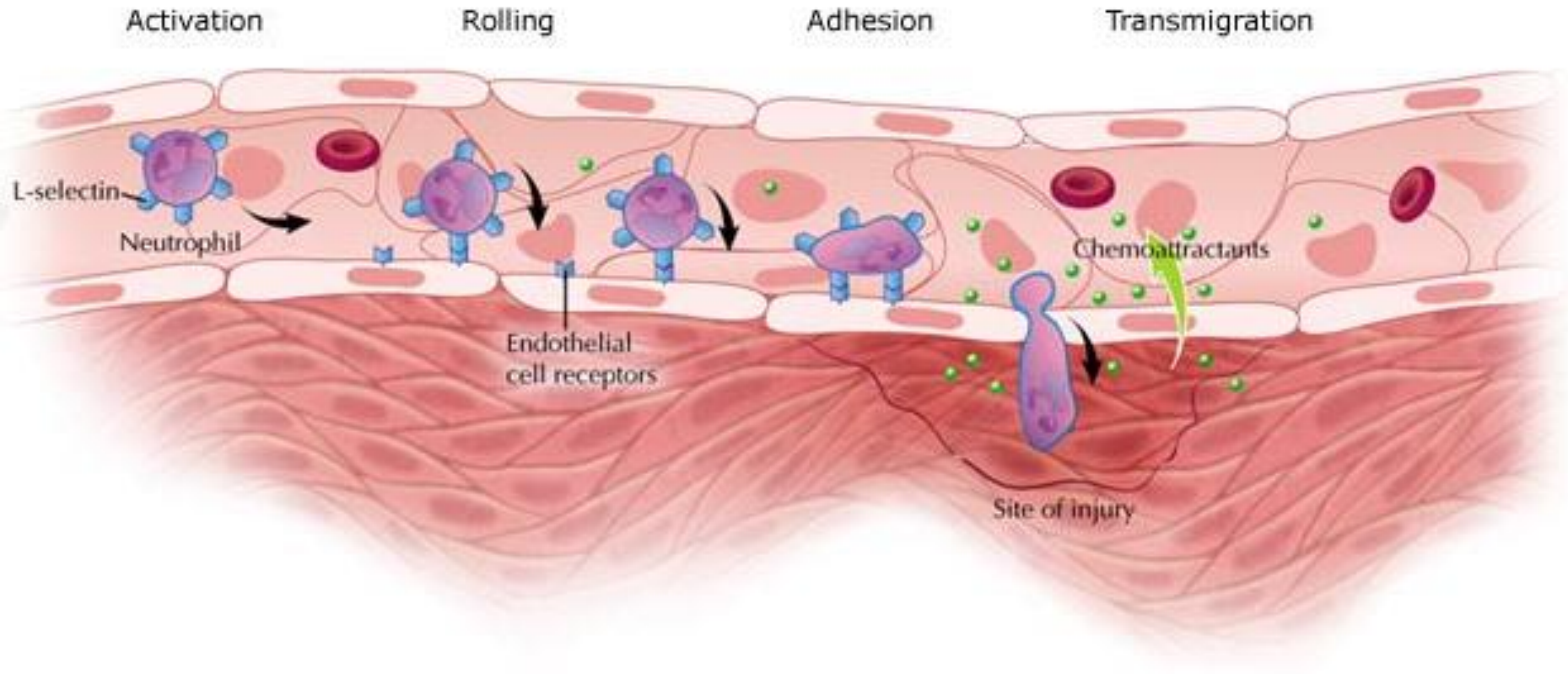
# (6) Leukocytes (WBC's)

- **Purpose:** Defend against infectious agents (bacteria, viruses, parasites, etc.)

- **Mechanisms:**
  - ***Diapedesis…***
    - Have ability to move across/through blood vessels
    - Use circulatory system as highway
  - ***Positive Chemotaxis…***
    - Can locate area of damage/infection by responding to released immune/bacterial chemicals






Activation
Rolling
Adhesion
Transmigration
L-selectin
Neutrophil
Endothelial
cell receptors
Chemoattractants
Site of injury

# (7) Types of Leukocytes

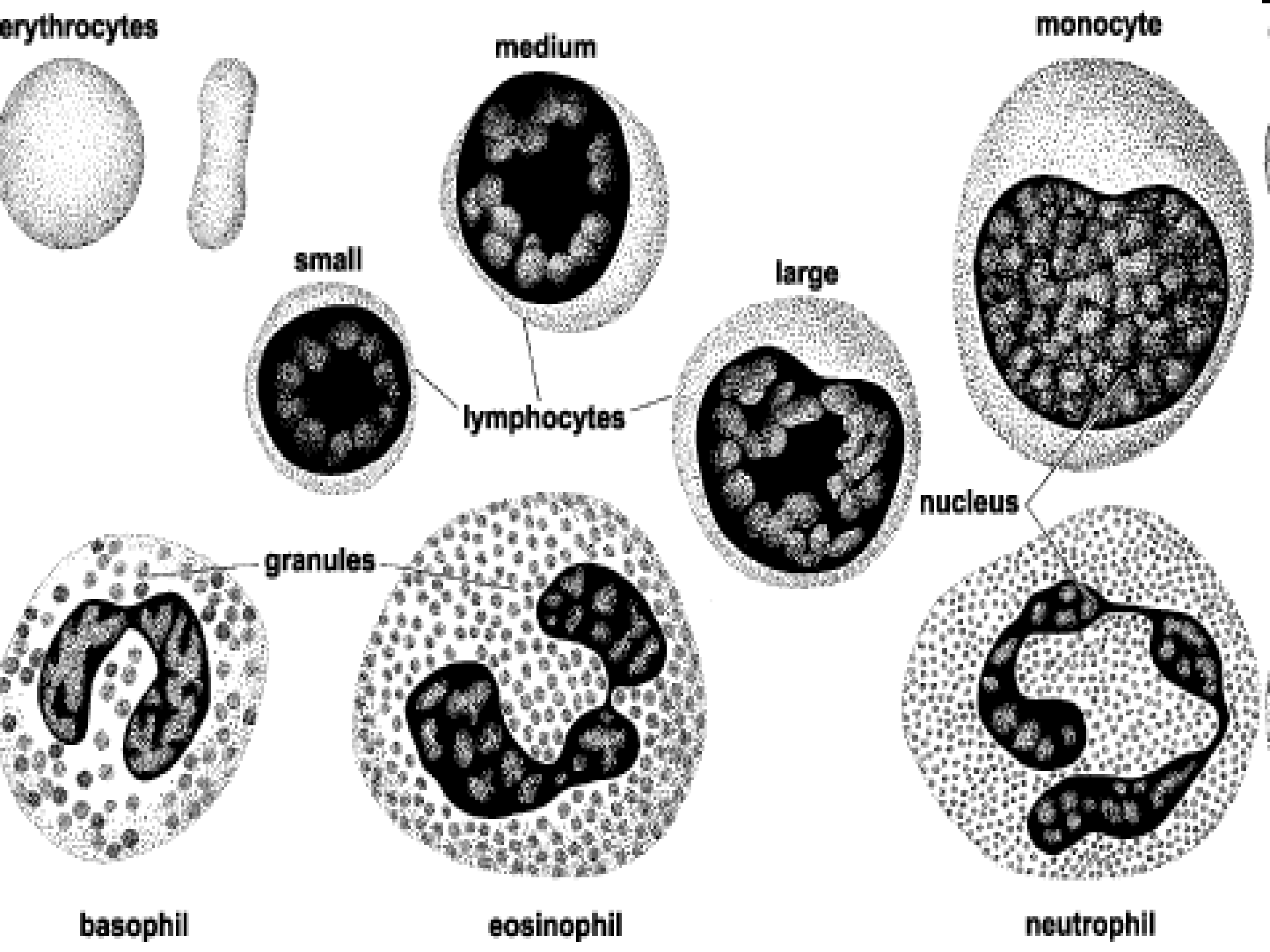
- ***Neutrophil:***
  - Active Phagocyte & 1st Responder
  - Increase in number during infection

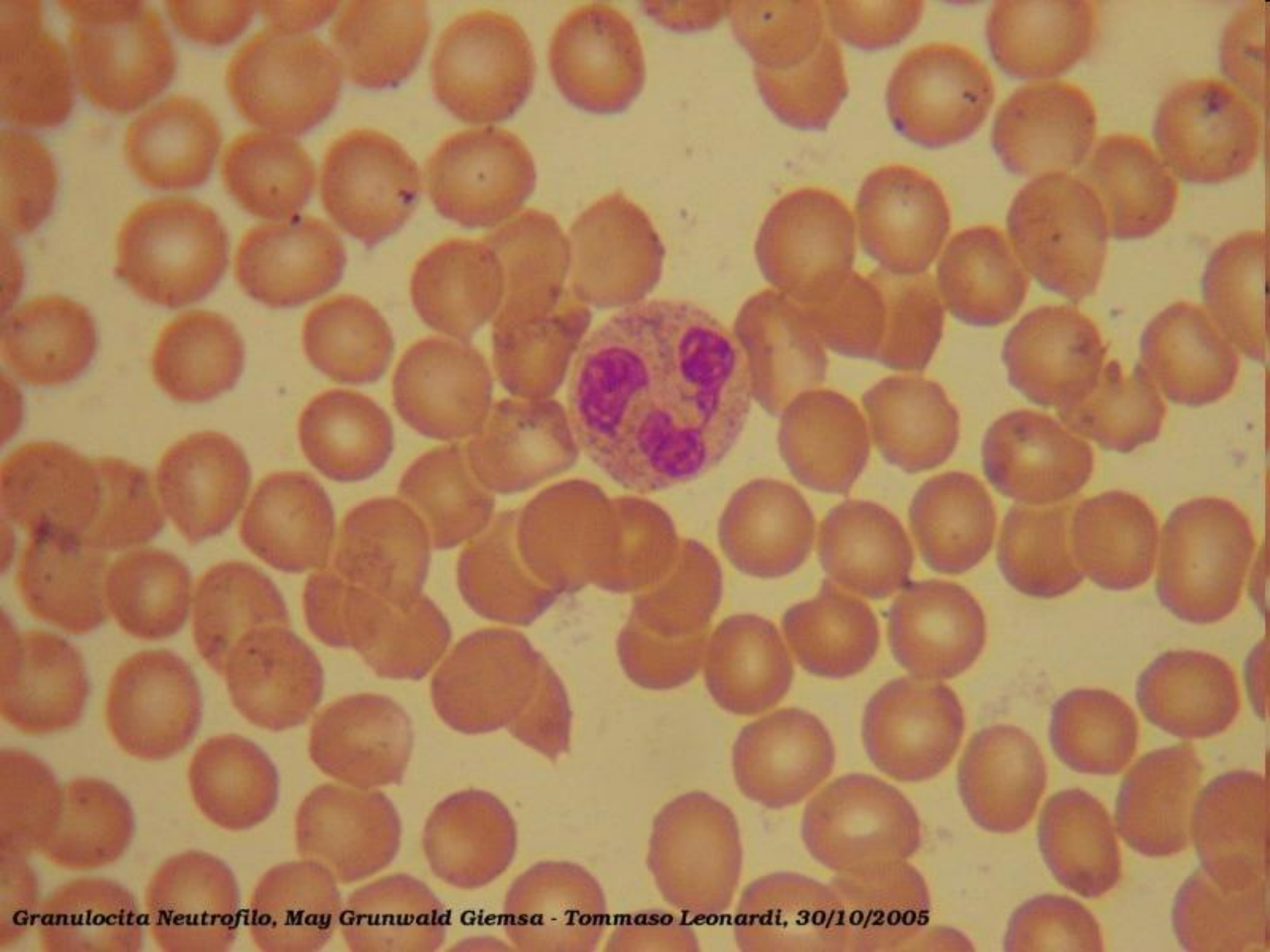
- ***Eosinophil:*** Kill larger parasites + allergins

- ***Basophils:*** Cause Infection Response
  - Release Histamine → Dilating Blood Vessels

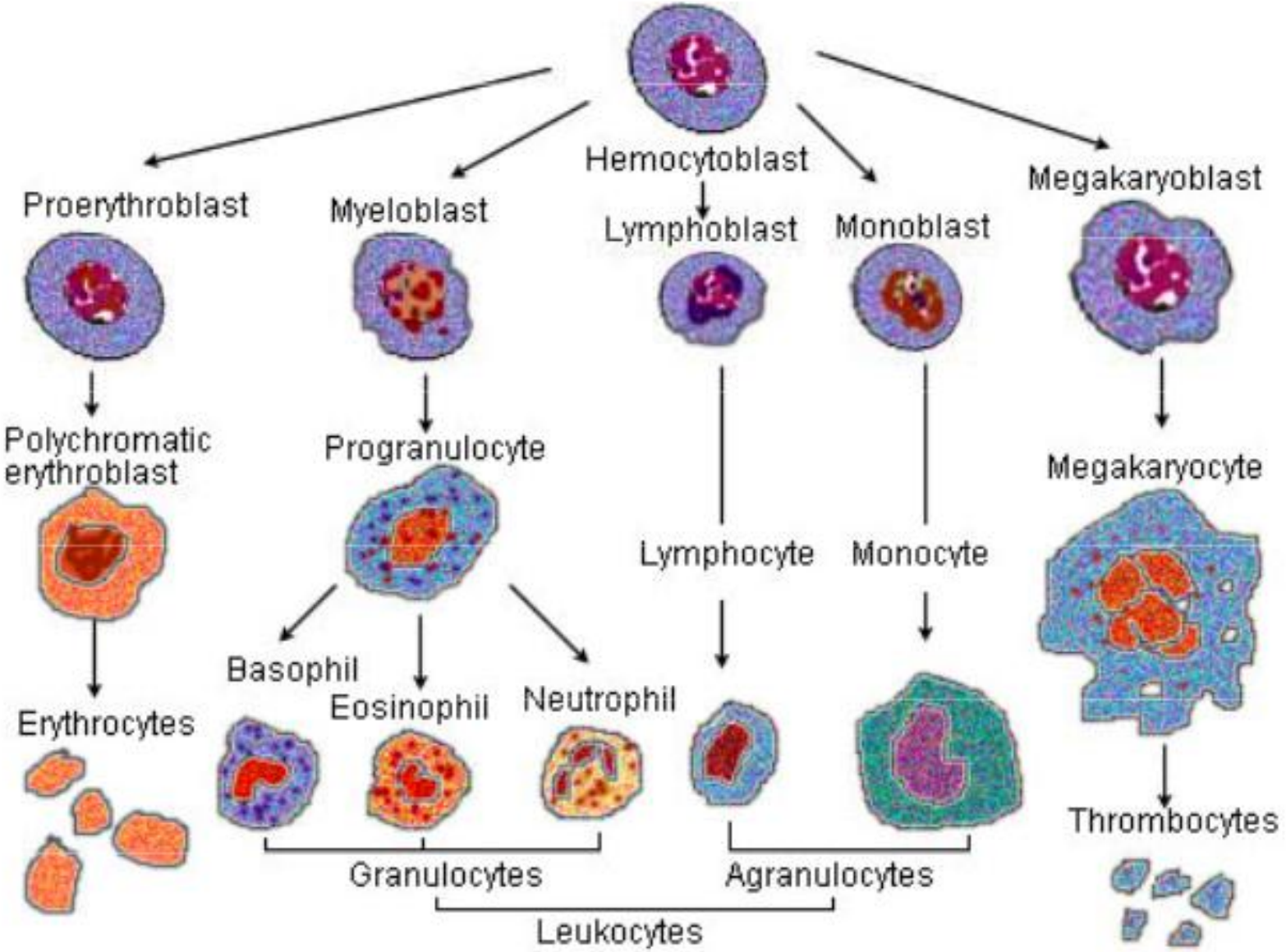
- ***Lymphocytes:***
  - B = produce antibodies
  - T = respond to antibodies on foreign tissue

- ***Monocytes:***
  - Largest + Most Active phagocytes
  - Used for chronic, widespread infections


erythrocytes
medium
monocyte
small
large
lymphocytes
nucleus
granules
basophil
eosinophil
neutrophil



*Granulocita Neutrofilo, May Grunwald Giemsa - Tommaso Leonardi, 30/10/2005*


Hemocytoblast
Proerythroblast
Myeloblast
Lymphoblast
Monoblast
Megakaryoblast
Polychromatic erythroblast
Progranulocyte
Megakaryocyte
Lymphocyte
Monocyte
Basophil
Eosinophil
Neutrophil
Erythrocytes
Thrombocytes
Granulocytes
Agranulocytes
Leukocytes

# (8) Platelets

- Fragments of multinucleate cells
- Irregular shape (Necessary in Clotting)
- Initiate Clotting Cascade by clinging to broken vessel walls