

General

Plasma	matrix of blood, clear light yellow fluid 55%
Buffy Coat	made of leukocytes and platelets <1%
Erythrocytes	RBC's, 45%
Hematocrit	percentage of blood volume composed of RBC's
Hemoglobin	protein in RBC that carries oxygen, 4 protein chains (globins) that bind co2 and 4 heme groups that bind o2 to iron
Hemostasis	the cessation of bleeding, stopping fatal leaks
Hemorrhage	excessive bleeding

Interior of the Heart

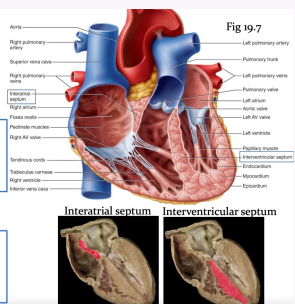
The Chambers

Interatrial septum

• Wall that separates atria

Interventricular septum

• Muscular wall that separates ventricles

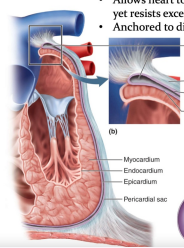


Walls of the Heart

The Pericardium

= Double-walled sac that encloses the heart

- Allows heart to beat without friction, provides room to expand, yet resists excessive expansion
- Anchored to diaphragm inferiorly and sternum anteriorly



- Outer Parietal pericardium**
 - Pericardial sac
 - Superficial fibrous layer of connective tissue
 - Deep, thin serous layer
- Inner Visceral pericardium (epicardium)**
 - Serous membrane covering heart
- Pericardial cavity**
 - space inside the pericardial sac filled with pericardial fluid

Fig. 19.3

Left Arterial Supply

- Left coronary artery (LCA) branches off the ascending aorta**
- Anterior interventricular branch**
 - Supplies blood to both ventricles and anterior 2/3 of interventricular septum
 - Circumflex branch**
 - Supplies left atrium and posterior left ventricle
 - Passes around left side of heart in coronary sulcus
 - Gives off left marginal branch and then ends on the posterior side of the heart

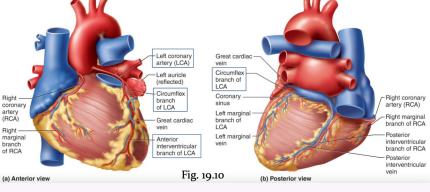


Fig. 19.10

Erythrocyte Disorders



- Erythrocyte Disorders:**
- Anemia:**
 - Deficiency in RBCs or Hb
 - Polycythemia:**
 - Excess RBCs

Fig. 18.10

Electrical Conductivity

The Cardiac Conduction System

- Coordinates the heartbeat
- Internal pacemaker – **sinoatrial (SA) node**

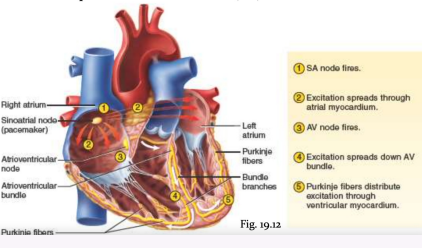
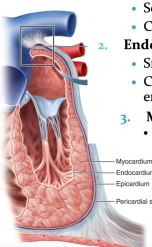


Fig. 19.12

Layers of the Heart (Epi, Endo, Myo)

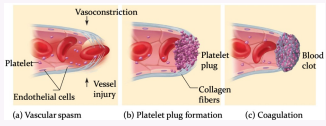
Layers of The Heart Wall

- Epicardium (visceral pericardium – outer lining)**
 - Serous membrane covering heart
 - Coronary blood vessels travel through this layer
- Endocardium (inner lining)**
 - Smooth inner lining of heart and blood vessels
 - Covers the valve surfaces and is continuous with endothelium of blood vessels
- Myocardium**
 - Middle layer of cardiac muscle
 - proportional to work load
 - Thickest layer



The myocardium in the left ventricle is thicker than the right ventricle. Why?

Platelets and Hemostasis



Exterior of the Heart

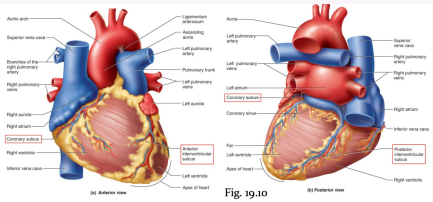


Fig. 19.10

Erythrocytes

Erythrocytes (Red Blood Cells)

- Functions**
 - Carry oxygen from lungs → cell tissues
 - Pick up CO₂ from tissues → lungs
- Disc-shaped (biconcave) cell with thick rim**
 - Lose nearly all organelles during development
 - Lack mitochondria
 - Anaerobic fermentation to produce ATP
 - Lack nucleus and DNA
 - No protein synthesis or mitosis
 - ↑ surface area/volume ratio



Fig. 18.4

Position, Size, and Shape of Heart

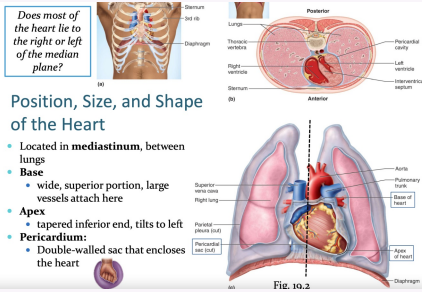
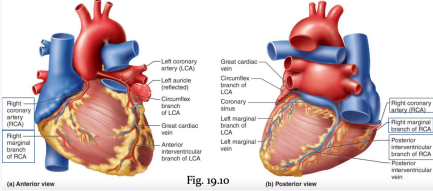


Fig. 10.2

Right Arterial Supply

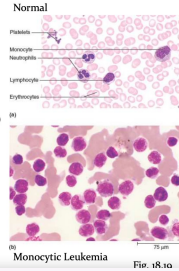
- **Right coronary artery (RCA)** branches off the ascending aorta
 - Supplies right atrium and sinoatrial node (pacemaker)
- 1. **Right marginal branch**
 - Supplies lateral aspect of right atrium and ventricle
- 2. **Posterior interventricular branch**
 - Supplies posterior walls of ventricles



WBC Disorders

White Blood Cells

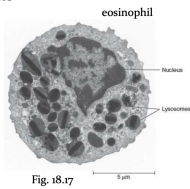
- White Blood Cell Disorders:**
- **Leukopenia:**
 - low white blood cell count (<5000/uL)
 - Lead, arsenic, mercury poisoning
 - Radiation sickness
 - Infectious diseases (i.e. AIDS)
 - **Leukocytosis:**
 - high white blood cell count (>10000/uL)
 - Infection, allergy
 - **Complete Blood Count (CBC):**
 - # RBCs, # WBCs, platelets and relative %s of WBCs
 - Hematocrit, Hb content, RBC size
 - **Leukemia:**
 - Cancer of hemopoietic tissues
 - abnormally high number of circulating leukocytes



Leukocytes WBC

Leukocytes (White Blood Cells)

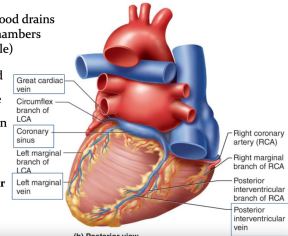
- Least abundant formed elements
 - Conspicuous nuclei
 - violet to dark purple in blood stains
 - Retain their organelles
 - More abundant in connective tissues
1. Granulocytes
 2. Agranulocytes



Venous Heart Drainage

Heart Venous Drainage: Route by which blood leaves the heart

- 5-10% of coronary blood drains directly into heart chambers (mostly right ventricle)
- Most coronary blood returns to right atrium by way of the **coronary sinus** which has three main inputs:
 1. **great cardiac vein**
 2. **posterior interventricular (middle cardiac) vein**
 3. **left marginal vein**

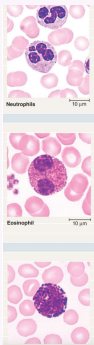


Granulocytes

Granulocytes

- Contain **specific granules** that stain conspicuously and distinguish cell types

1. **Neutrophils (60-70%):**
 - Polymorphonuclear leukocytes
 - Barely visible granules in cytoplasm
 - 3-5-lobed nucleus
2. **Eosinophils (2-4%):**
 - Large rosy-orange granules (eosin)
 - bilobed nucleus
3. **Basophils (<1%):**
 - Large, abundant, violet granules (methylene blue) (obscure a large S-shaped nucleus)



Blood Flow through the Heart

Blood Flow Through the Chambers

- 1 Blood enters right atrium from superior and inferior vena cavae.
- 2 Blood in right atrium flows through right AV valve into right ventricle.
- 3 Contraction of right ventricle forces pulmonary valve open.
- 4 Blood flows through pulmonary valve into pulmonary trunk.
- 5 Blood is distributed by right and left pulmonary arteries to the lungs, where it unloads CO₂ and loads O₂.
- 6 Blood returns from lungs via pulmonary veins to left atrium.
- 7 Blood in left atrium flows through left AV valve into left ventricle.
- 8 Contraction of left ventricle (simultaneous with step 3) forces aortic valve open.
- 9 Blood flows through aortic valve into ascending aorta.
- 10 Blood in aorta is distributed to every organ in the body, where it unloads O₂ and loads CO₂.
- 11 Blood returns to right atrium via venae cavae.

Agranulocytes

Agranulocytes

Do not contain specific granules

1. **Lymphocytes**
 - 25-33%
 - Variable bluish cytoplasm
 - Ovoid/round
 - Uniform dark violet nucleus
2. **Monocytes**
 - 3-8%
 - Usually largest WBC
 - Ovoid
 - Kidney-, or horseshoe-shaped nucleus
 - Differentiate into **macrophages** in tissue

