Chapter 12: The Circulatory System

BIO 105
Spring 2016

Cardiovascular System
1. Heart
2. Blood
3. Blood vessels

The Heart
The heart is a hollow, muscular organ about the size of a clenched fist that is located in the thoracic (chest) cavity.

Layers of the heart wall
Endocardium
Myocardium
Epicardium
Pericardium
Heart pump

- Left and right pumps are separated by a muscular septum

Atrioventricular (AV) valves

(a) Bicuspid valve open  (b) Bicuspid valve closed

(g) Superior view of aortic valve

Semilunar cusp
Cardiac Cycle

- The cardiac cycle is the sequence of atrial and ventricular muscle contraction (systole) and relaxation (diastole) during each heartbeat.
- The mechanical activity of the cardiac cycle is initiated by electrical activity in the heart, which is produced by autorhythmic cells.
Pulse Points

- What you feel when you take a pulse is the expansion/recoil of an artery near body surface.

Muscular (Distributing) Arteries

http://www.siumed.edu/~dking2/cur/CR025b.htm

Aneurysm

- Aneurysms are caused by a weakening of the arterial wall. The pressure inside the blood vessel may cause the vessel wall to bulge out and potentially rupture.
Arterioles

- These are the smallest arteries; they have a thick smooth muscle layer.
  1) regulate blood pressure
  2) "gate keepers" of the capillaries

Precapillary Sphincters

Capillaries

- Site of gas, nutrient, and waste exchange at the cellular level

(a) Substances are exchanged between the blood and tissue fluid across the plasma membrane of the capillary.

(b) At the arterial end of a capillary, blood pressure forces fluid out of the capillary to the fluid surrounding tissue cells. At the venous end, fluid is drawn back into the capillary by osmotic pressure.
How does blood make it back to the heart?

1) Unidirectional valves
2) Skeletal muscle pump
3) Respiratory activity

Varicose veins

Blood Pressure
Cardiovascular Disorders

- **Hypertension** – high blood pressure
- **Myocardial Infarction** – part of heart muscle dies due to lack of $O_2$
- **Stroke** – part of brain tissue dies due to lack of $O_2$
- **Atherosclerosis** – buildup of cholesterol in the arteries, impedes blood flow

Lymphatic System

1) Lymphoid tissues
2) Lymph
3) Lymphatic vessels

Lymph Formation
Functions of the Lymphatic System

- Help defend against disease-causing organisms (spleen, red bone marrow, thymus, tonsils, lymph nodes)
- Transport products of fat digestion into the bloodstream (lacteals)
- Return excess interstitial fluid to the bloodstream