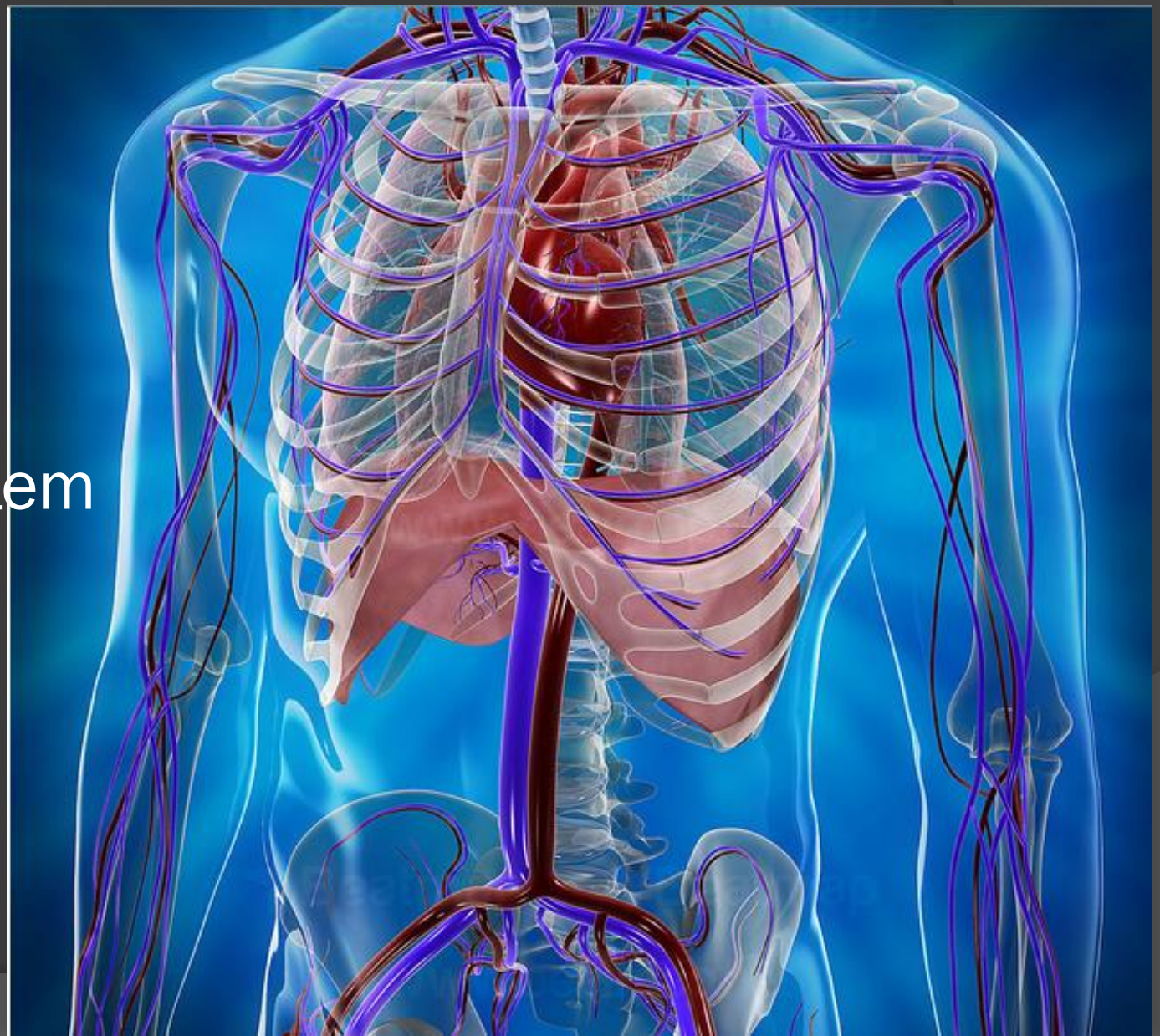
Chapter 16: Circulation

Section 1:

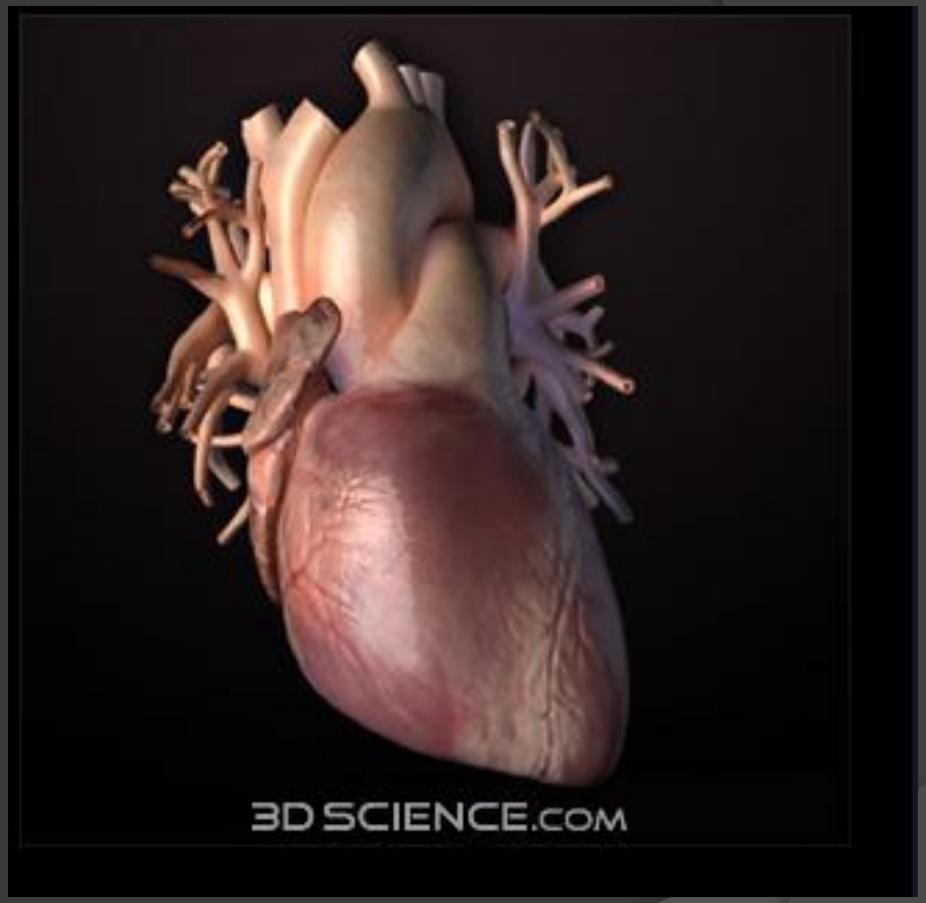
The Body's Transport System



Beating Heart

Cardiac muscle is

- Striated and branched
- Under involuntary control by the brain stem



Functions of the Cardiovascular System

1. Carry nutrients and Oxygen to cells
2. Carry carbon dioxide and waste away from cells
3. Fight disease
4. Maintain body temperature

Blood flow:

Deoxygenated blood from the body cells→ through Superior and Inferior Vena Cava

Right atrium → through Tricuspid valve

Right ventricle → through the Pulmonary valve to the Pulmonary Artery →

to the Lungs to pick up O_2 and release CO_2→

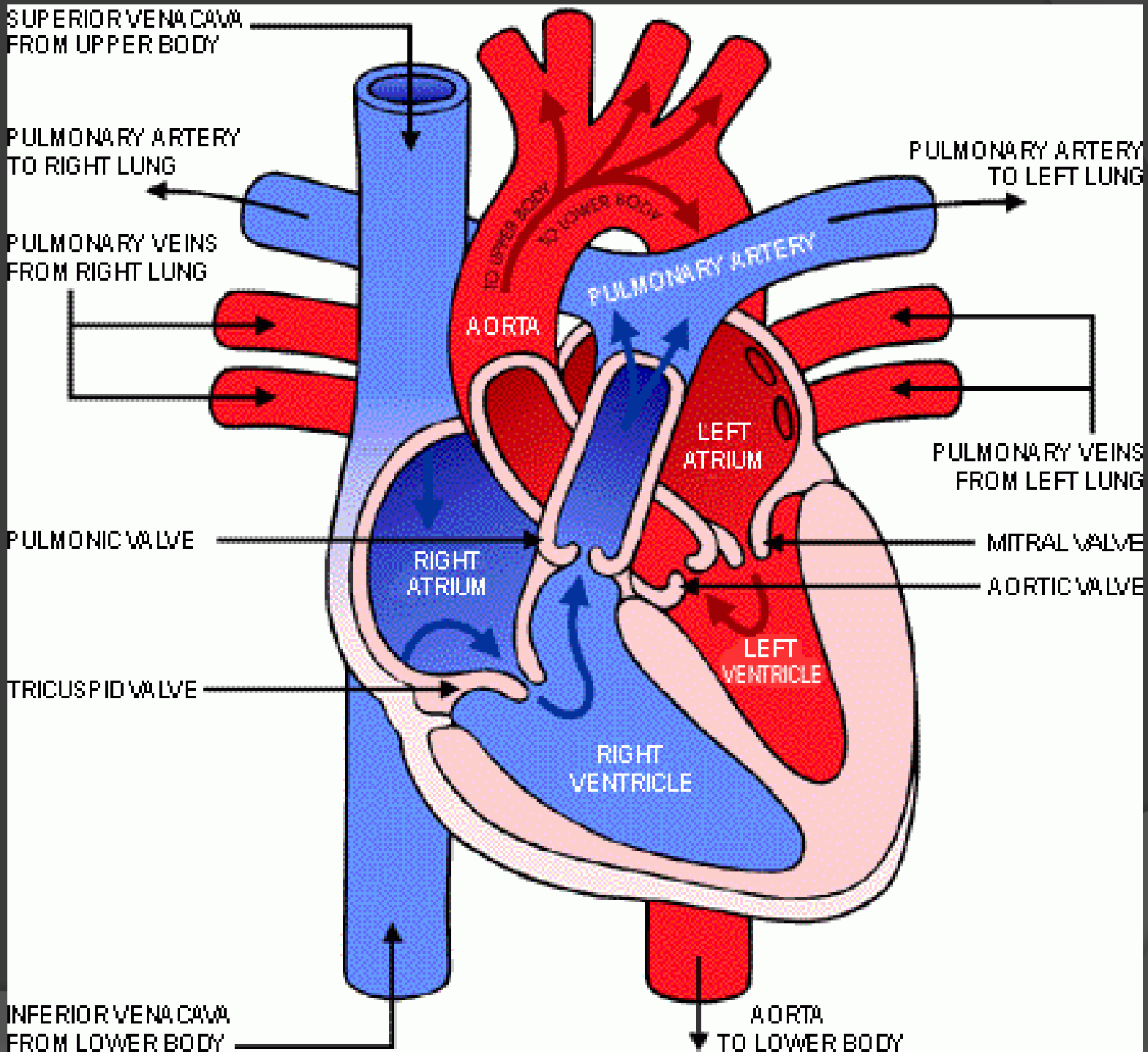
Back to the heart with oxygenated blood

through (R & L) Pulmonary Veins → to the Left Atrium →

Through the Bicuspid valve →

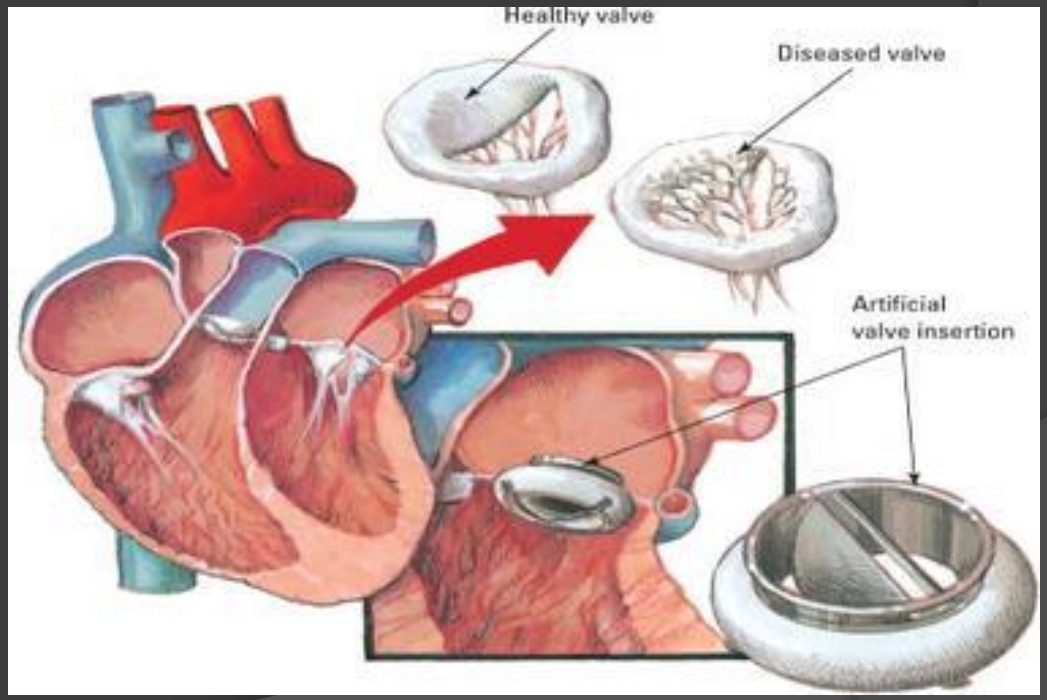
Left Ventricle → through the aortic valve

Aorta → to the rest of the body with oxygenated blood

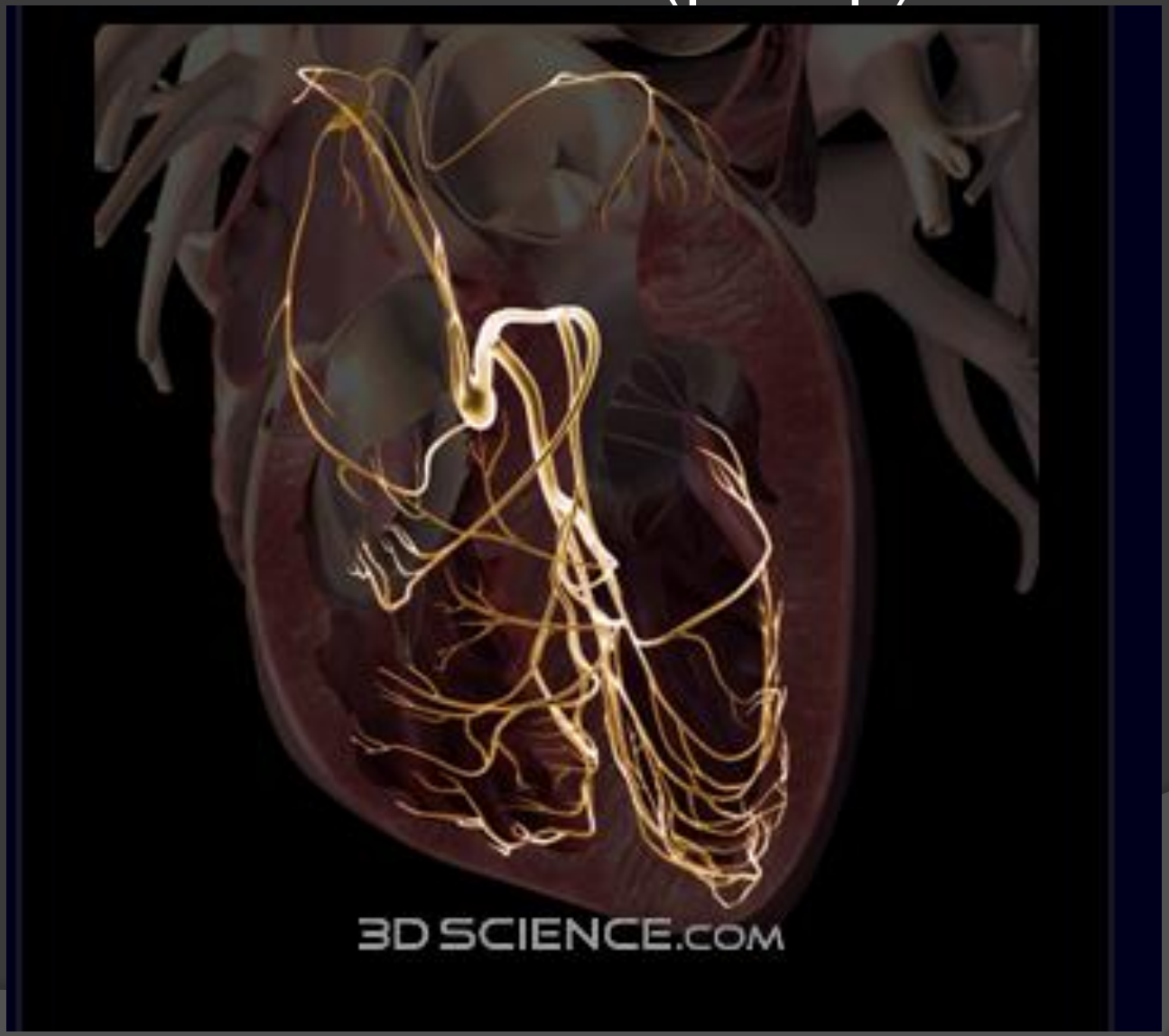

SUPERIOR VENA CAVA
FROM UPPER BODY
PULMONARY ARTERY
TO RIGHT LUNG
PULMONARY VEINS
FROM RIGHT LUNG
PULMONARY ARTERY
TO LEFT LUNG
PULMONARY VEINS
FROM LEFT LUNG
TO UPPER BODY
TO LOWER BODY
PULMONARY ARTERY
AORTA
LEFT
ATRIUM
PULMONIC VALVE
MITRAL VALVE
AORTIC VALVE
RIGHT
ATRIUM
LEFT
VENTRICLE
TRICUSPID VALVE
RIGHT
VENTRICLE
INFERIOR VENA CAVA
FROM LOWER BODY
AORTA
TO LOWER BODY

Heart Valves- Flap of tissue that prevents backward flow of blood

- AV Valves
  - Tricuspid (Right)
  - Bicuspid (Left)
- Pulmonary Valve
  - between RV + lungs
- Aortic Valve
  - Between LV + body

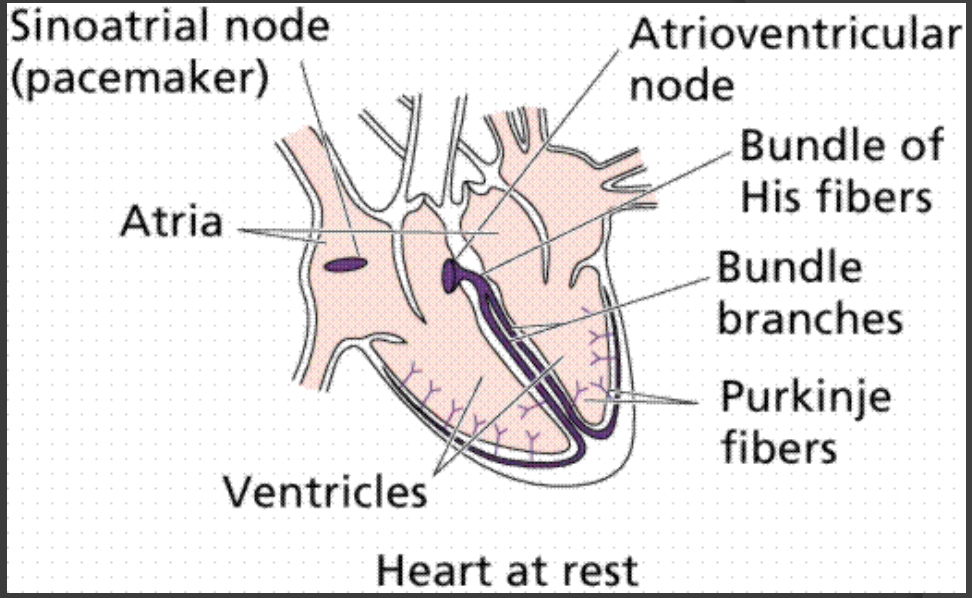


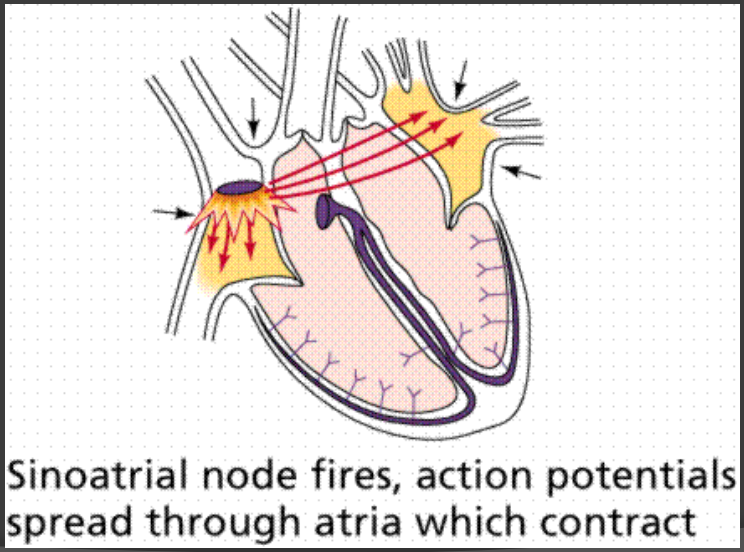
Pacemaker -cells that stimulate heart muscle to contract (pump)

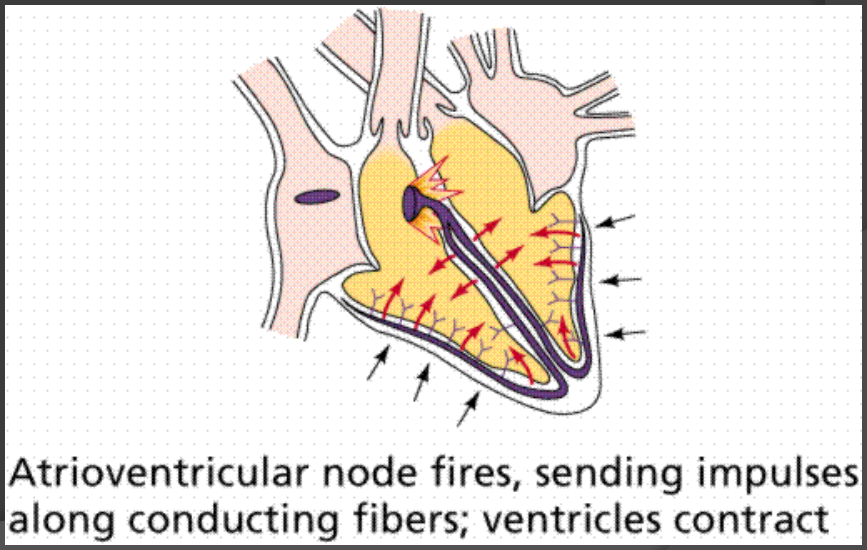


Pacemaker

cells that stimulate heart muscle to contract (pump)

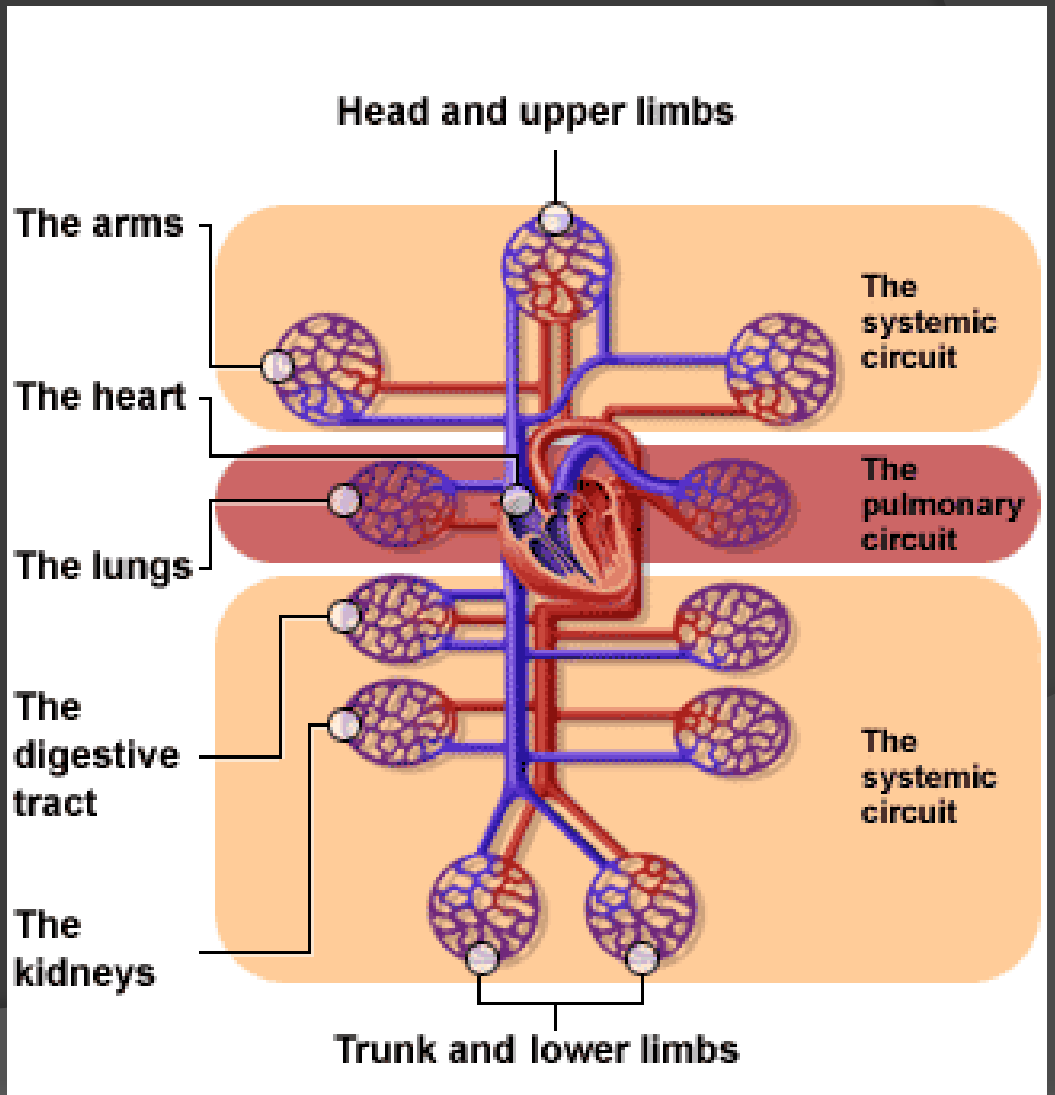



Sinoatrial node fires, action potentials spread through atria which contract


Atrioventricular node fires, sending impulses along conducting fibers; ventricles contract

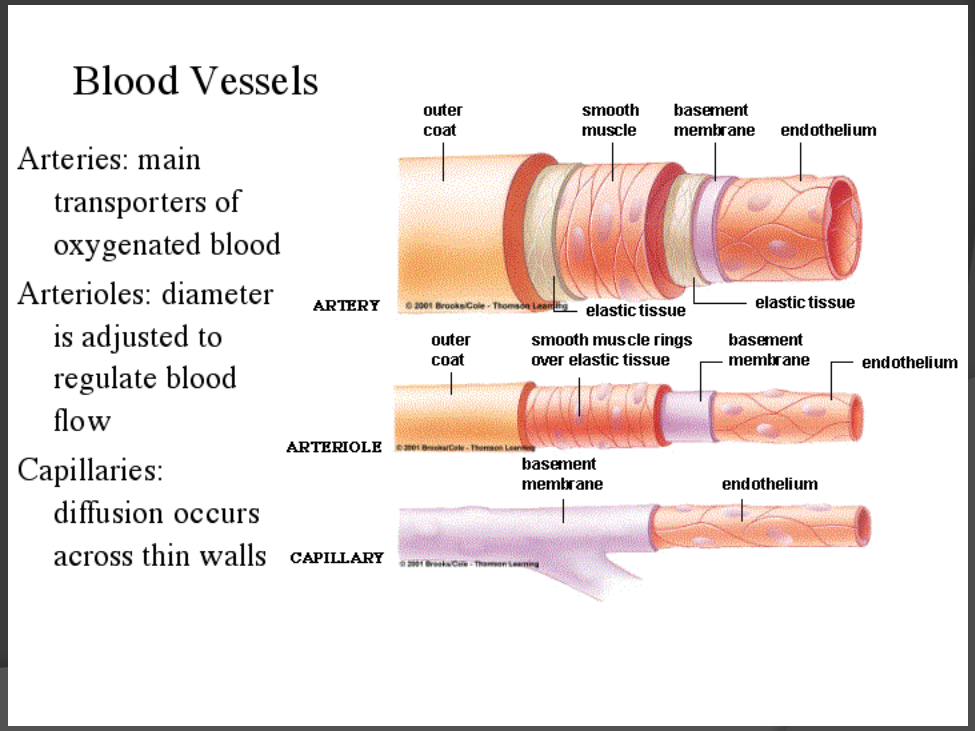
Circulatory Pathways

1. Pulmonary - lungs and heart
2. Coronary - heart itself
3. Systemic - all other systems



Arteries

- Carry blood *Away* from heart
- Thick, elastic walls lined with smooth muscle
- Pulse
  - alternating expansion + contraction of artery walls



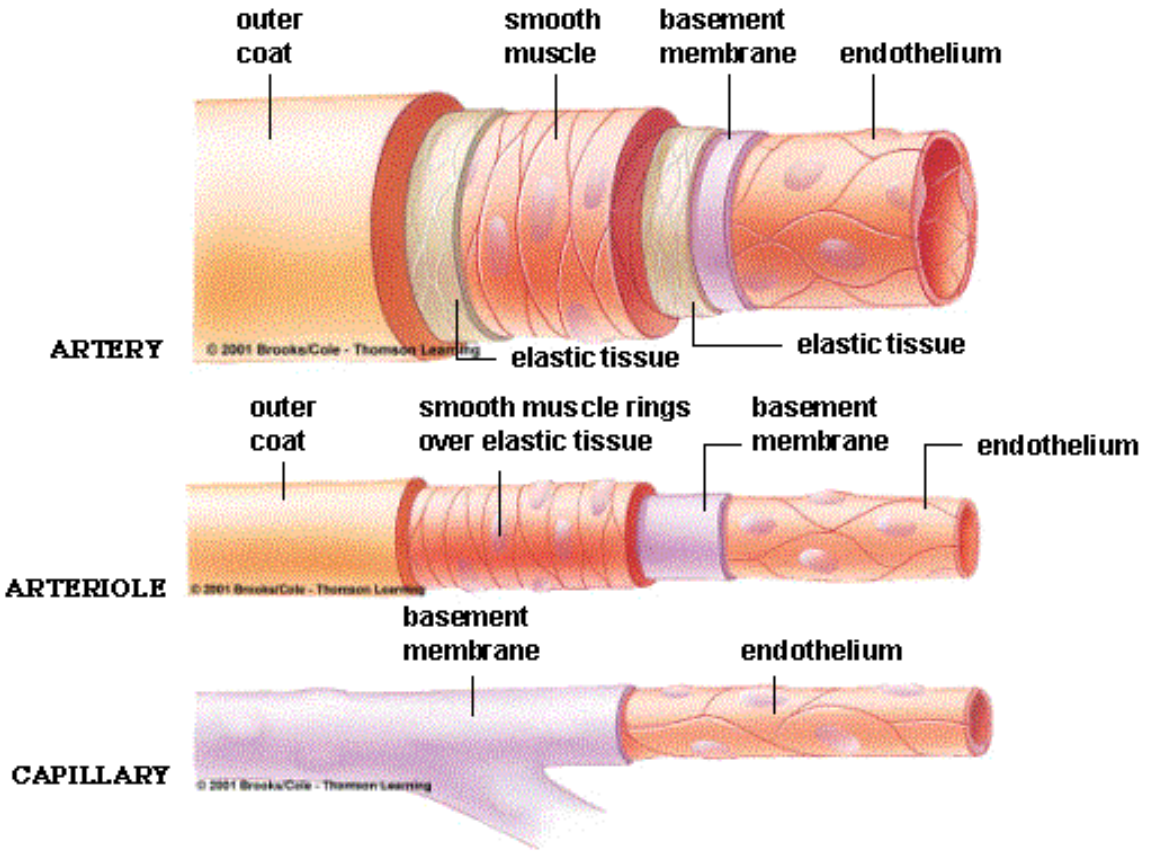
Arteries

Blood Vessels

Arteries: main transporters of oxygenated blood

Arterioles: diameter is adjusted to regulate blood flow

Capillaries: diffusion occurs across thin walls



Veins

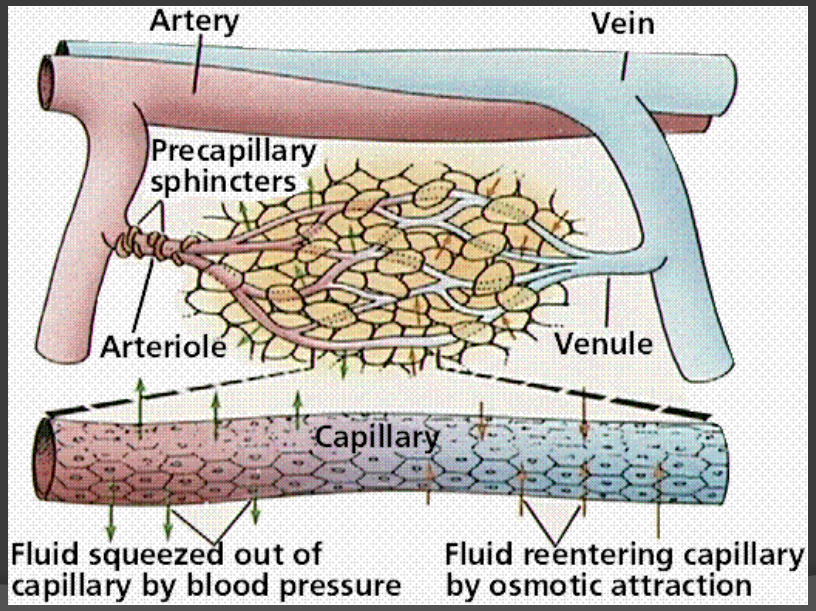
Carry blood *TO* the heart

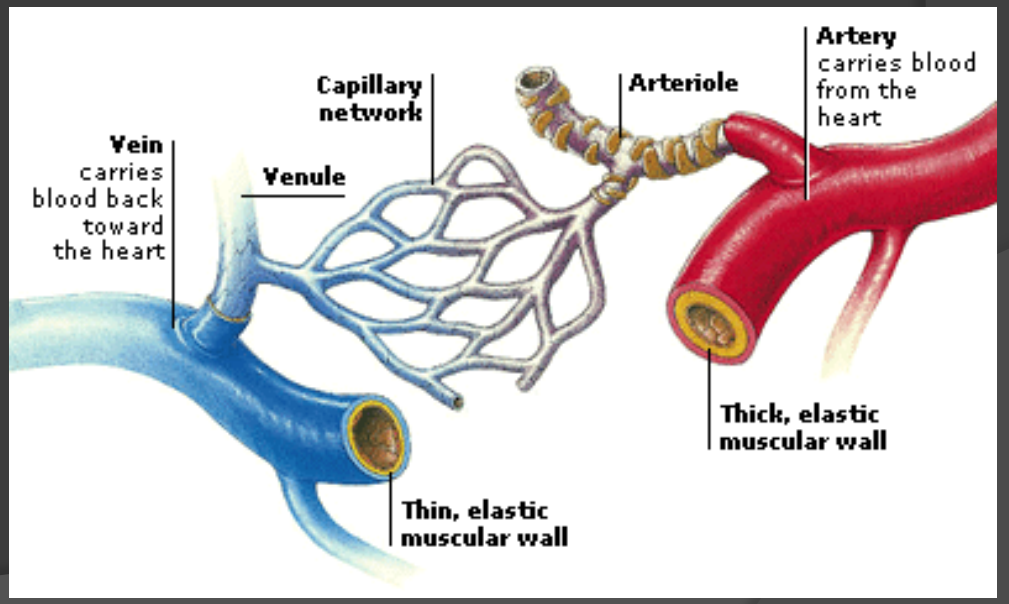
Thin walls, little muscle

Contain valves

Capillaries

- Connect arterioles and venules
- Walls only one cell thick
- Provide surface for material exchange
- Most Common blood vessel
- Diffusion- Molecules move from high concentration areas to low

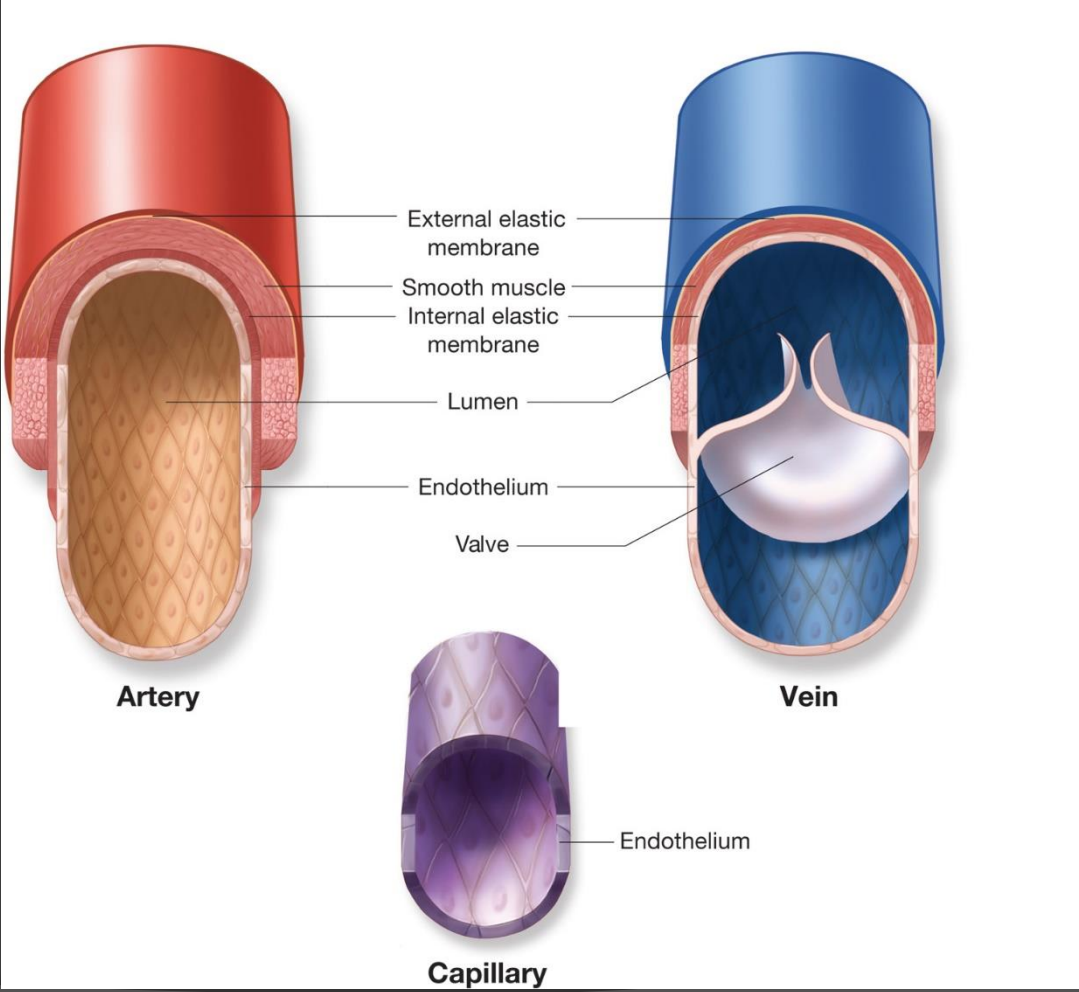




Capillaries

Quiz:

- Test your knowledge on vessels:



Choose (A) for arteries, (B) for veins, and (C) for capillaries

_____Carry blood to the heart

_____Carry blood away from the heart

_____Allow oxygen to diffuse (pass) into cells

_____Blood vessels with the thickest walls

_____Blood vessels with valves

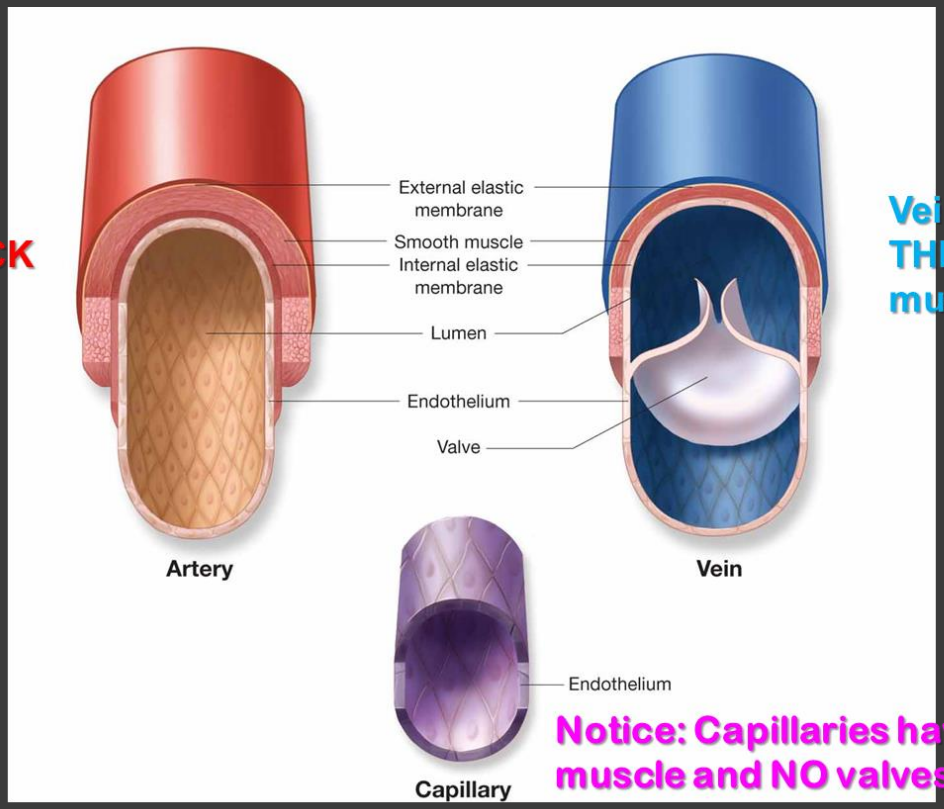
_____Most common blood vessel

_____ Blood vessels with the highest pressure

_____ Blood vessels that are only one cell thick

Answers

Arteries have THICK muscle



Veins have THIN muscle

Notice: Capillaries have NO muscle and NO valves

Veins Carry blood to the heart

Arteries Carry blood away from the heart

Capillaries Allow oxygen to diffuse (pass) into cells

Arteries are the Blood vessels with the thickest walls

Veins are the Blood vessels with valves

Capillaries are the Most common blood vessel

Arteries are the Blood vessels with the highest pressure

Capillaries are the Blood vessels that are only one cell thick and they connect arterioles and venules

Blood Pressure

Pressure on walls of arteries due to high pressure of muscular walls

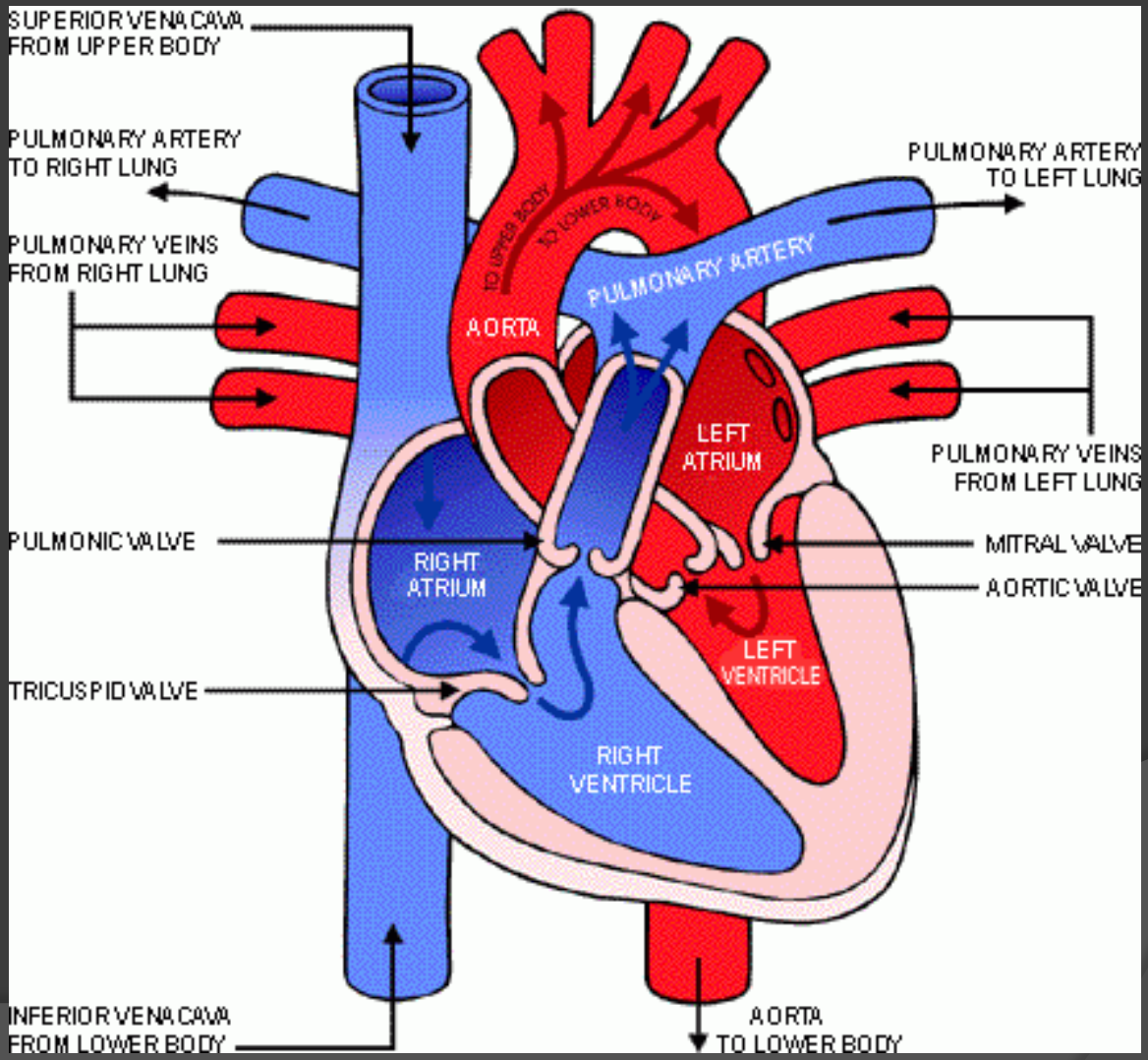
Systolic = pressure when *ventricles* are contracting

Diastolic = pressure when *ventricles* are relaxed

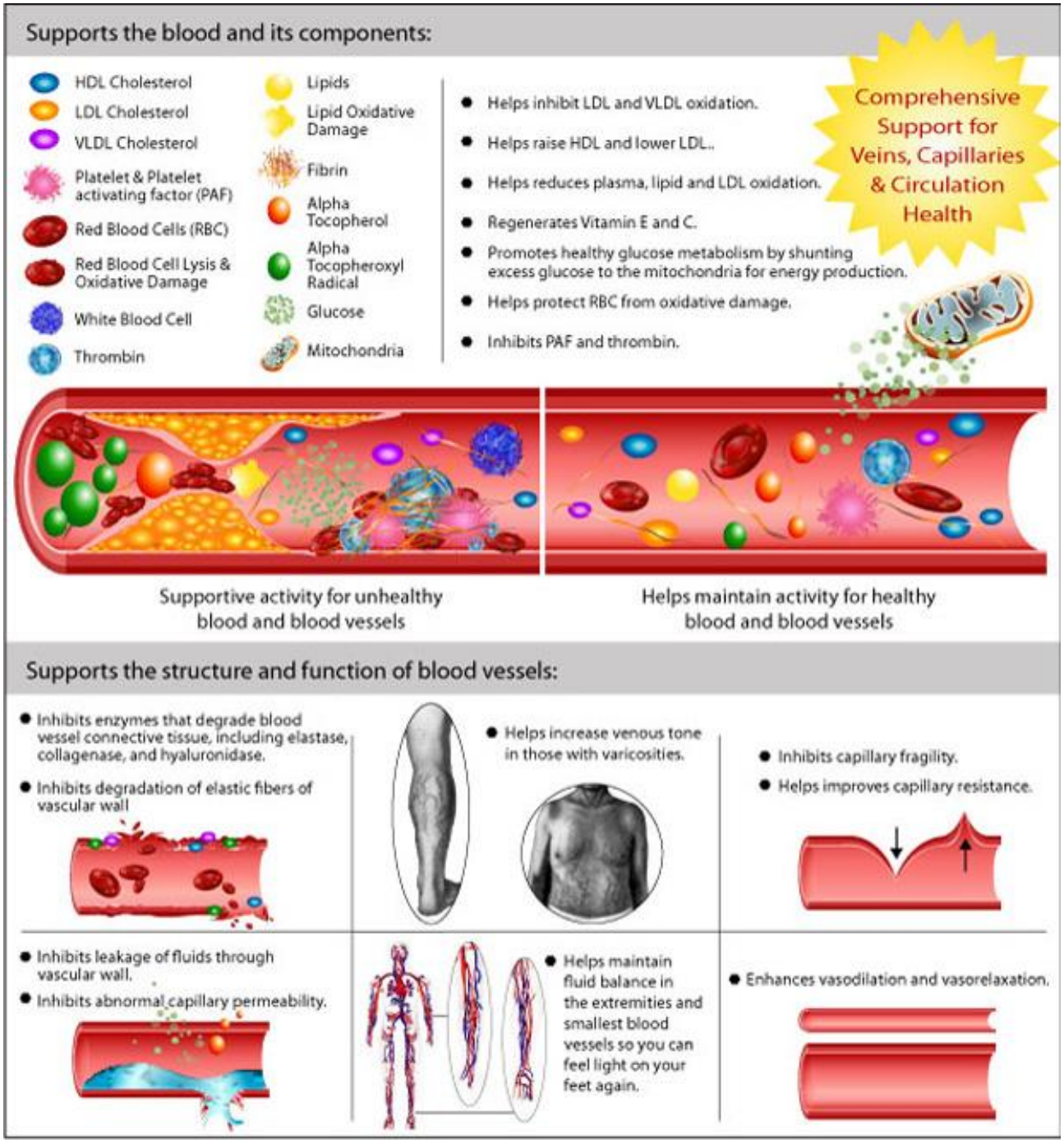
Normal = 120/80

(systolic/ diastolic)

Circulatory System Song



Section 2
Blood
+ Lymph



Plasma

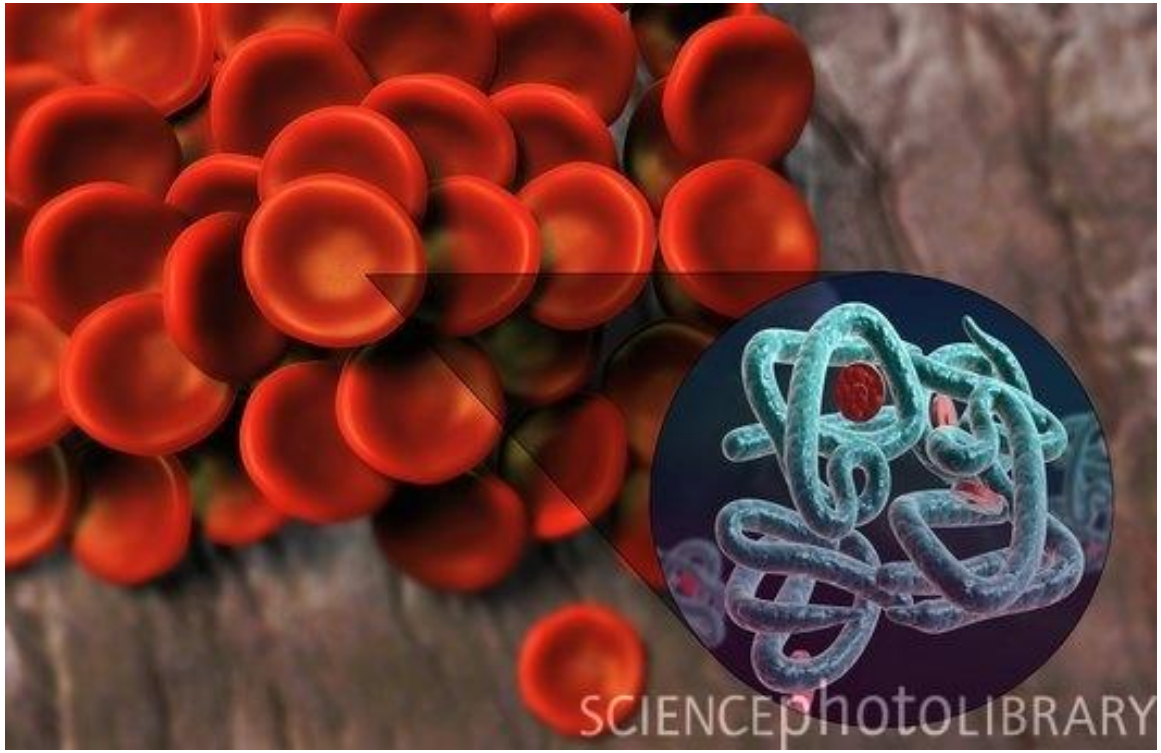
Liquid part of blood

- 90% of plasma is made up of water
- Contains nutrients, hormones, clotting factors, & wastes
- Cells = Red blood cells and white blood cells

*Red blood cells, platelets, and plasma

Red Blood Cells

- Carry oxygen
  - hemoglobin = protein that carries iron (Fe) a chemical that binds oxygen (O_2)
- Live 120 days
- Made in red marrow of spongy bone
- Broken down by liver & spleen



White Blood Cells

- Fight disease

pictured: white blood cell attacking Staphylococcus (Staph) bacteria

- Contain a nucleus
- Made in red bone marrow

& lymph glands

- Can live hours, days, months

and even years

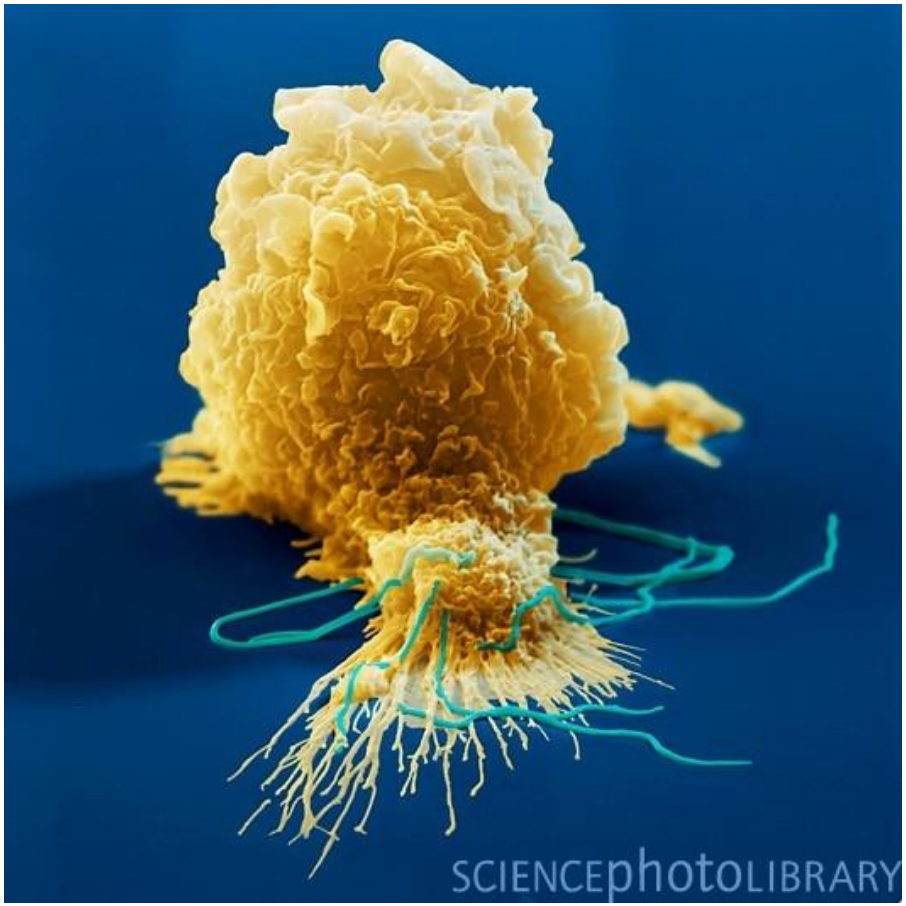
Types of White Blood Cells:

Phagocytes

Lymphocytes

Types of White Blood Cells

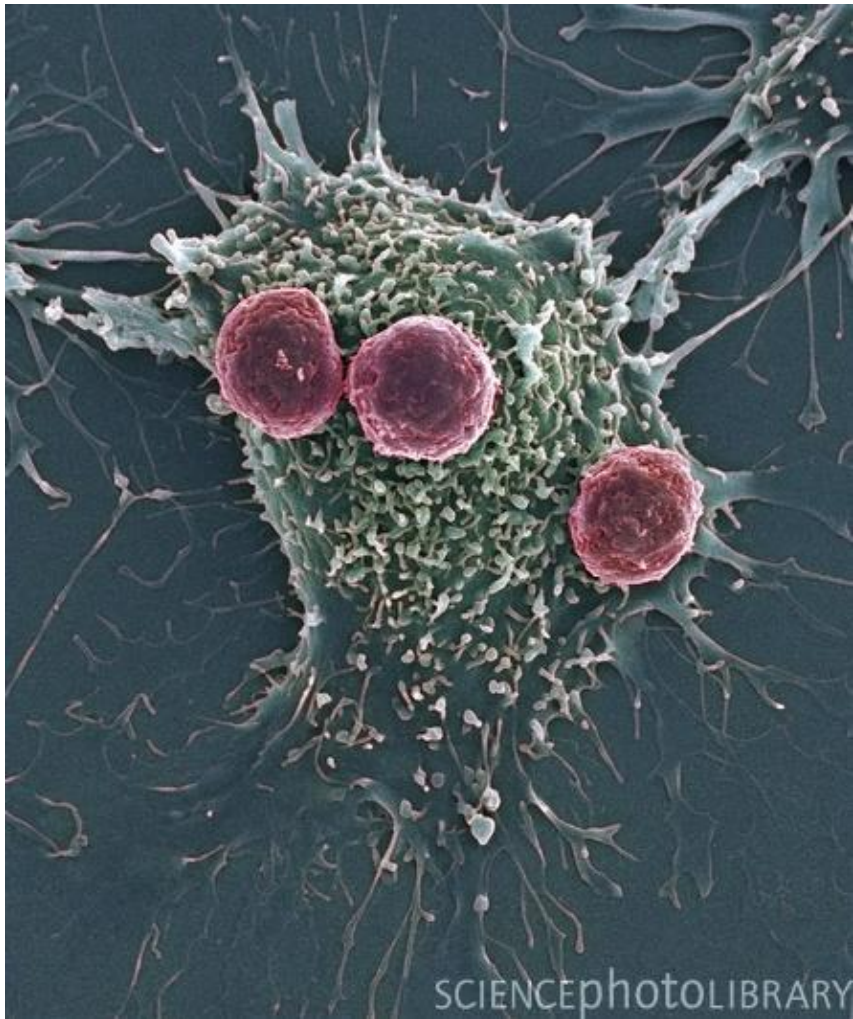
Phagocytes (Pac-men)
eat up foreign materials



**pictured: Macrophage eating bacteria*

Types of White Blood Cells

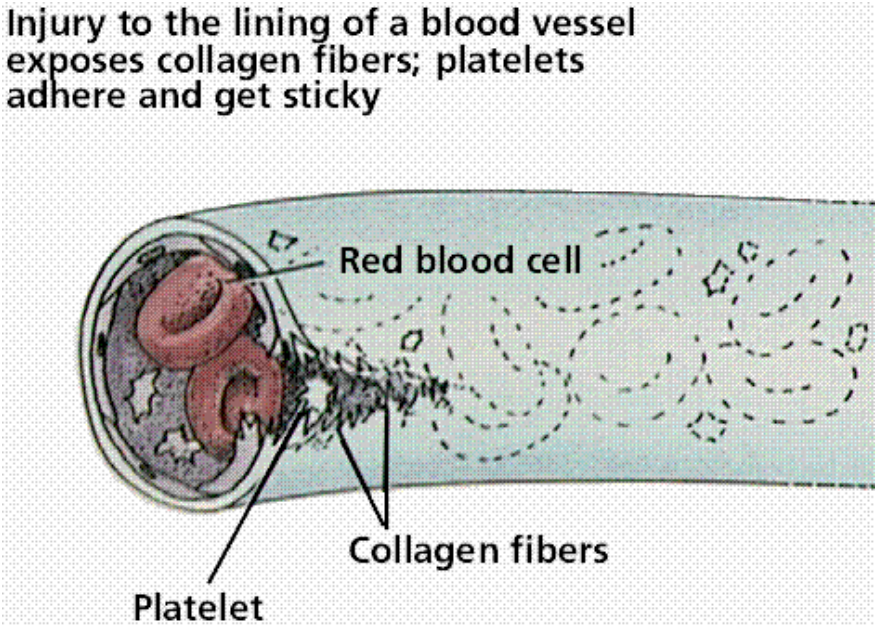
- Lymphocytes
  - B cells - make antibodies that destroy antigens(germs)
  - T cells - help phagocytes and B cells and remember antigens

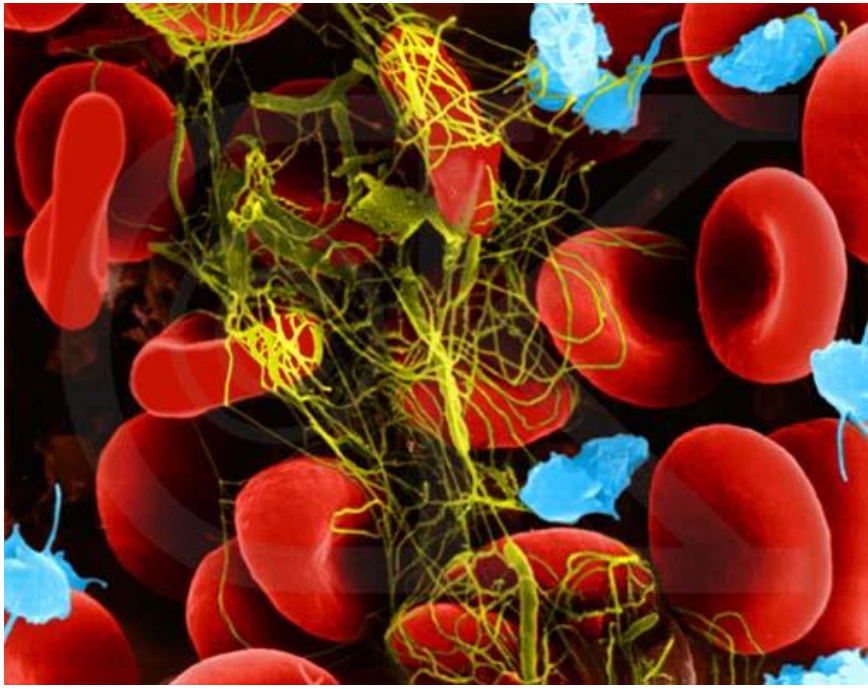


**Pictured: T lymphocytes attacking cells*

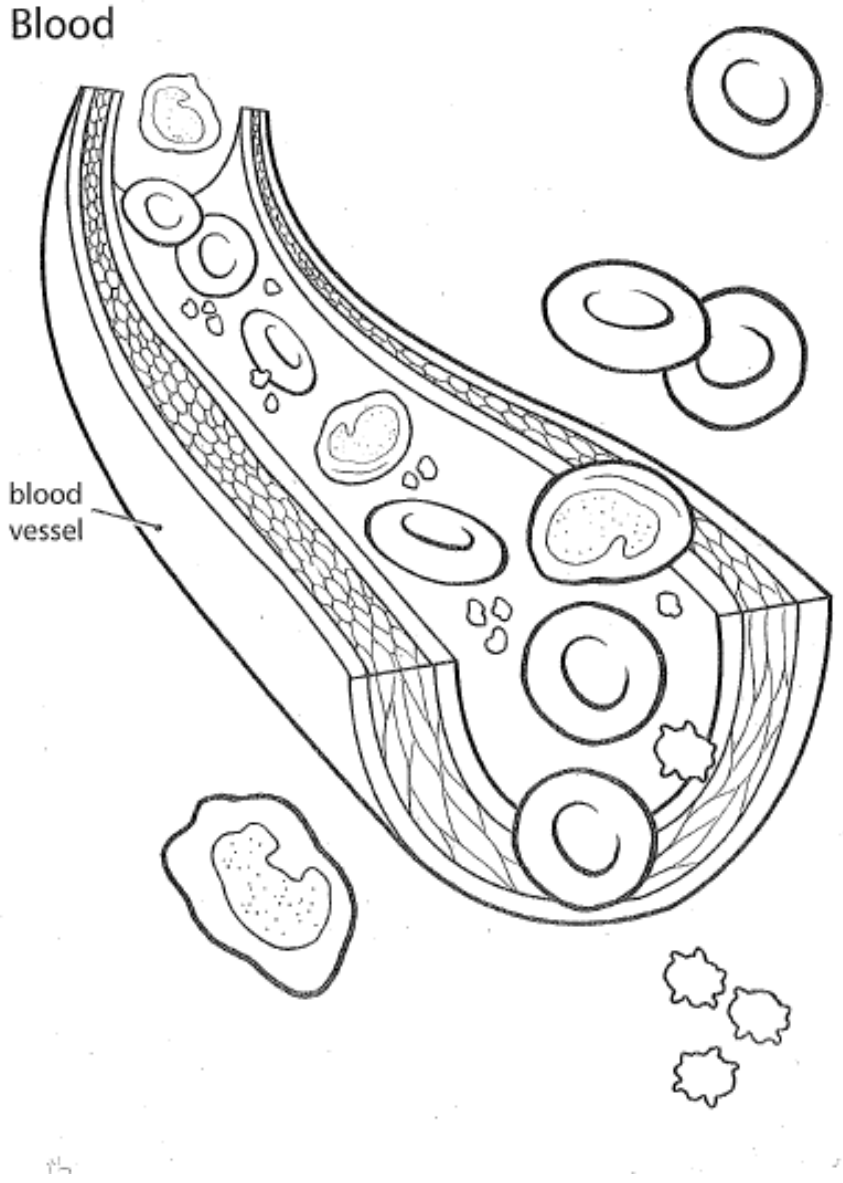
Platelets

- Clot blood
- 4 Steps involved:
  1. platelets gather
  2. fibrin produced
  3. net traps cells
  4. clot forms



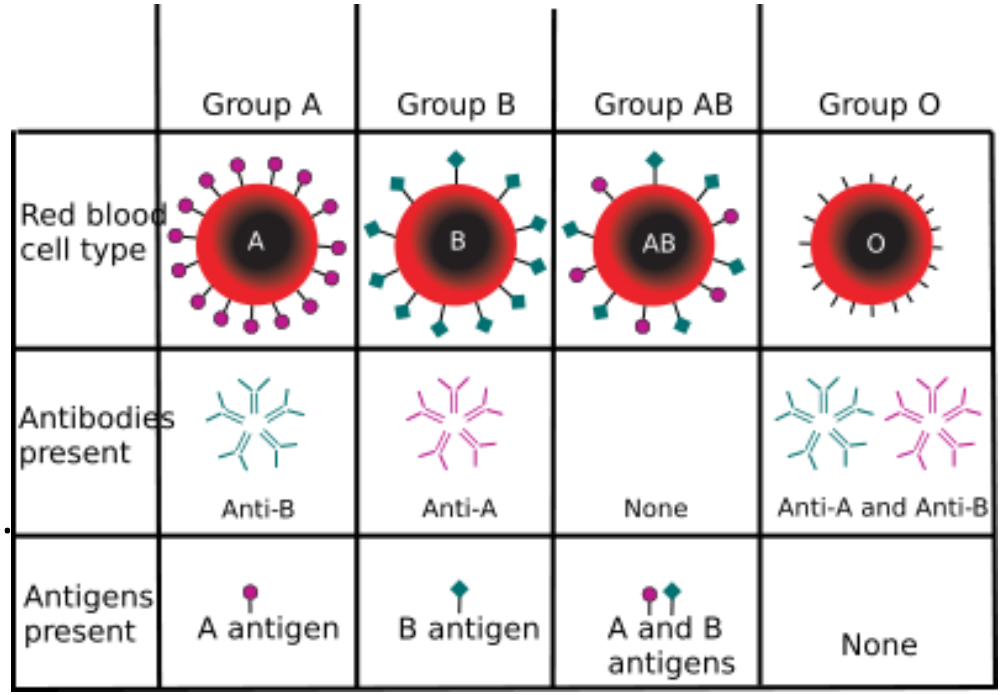


Label components:



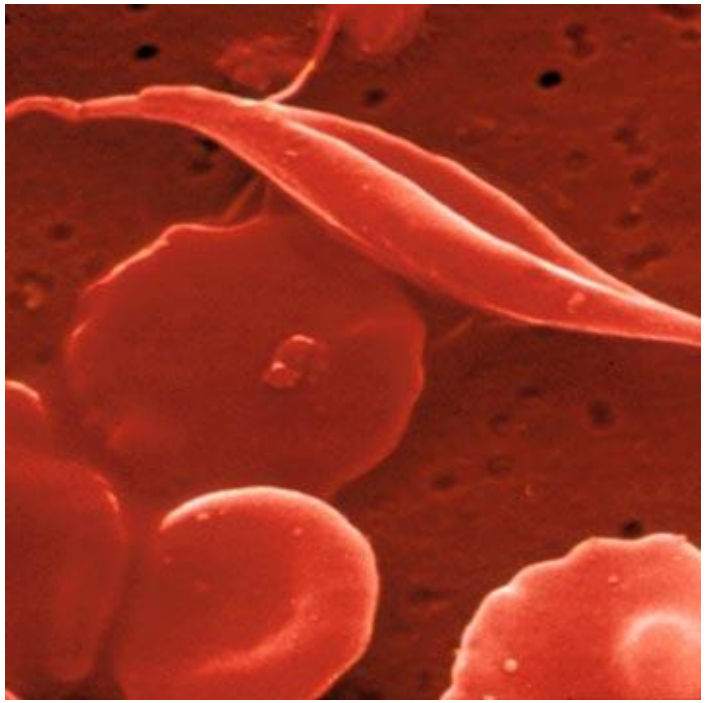
Blood Types and Transfusions

- Blood types determined by presence of cell surface proteins on RBCs
  - A, B, AB, and O
- Rh Factor
  - additional protein determines positive or negative (+ or -)
- Foreign proteins cause clot formation.
- Transfusion video from CancerCenter
- Blood Detectives



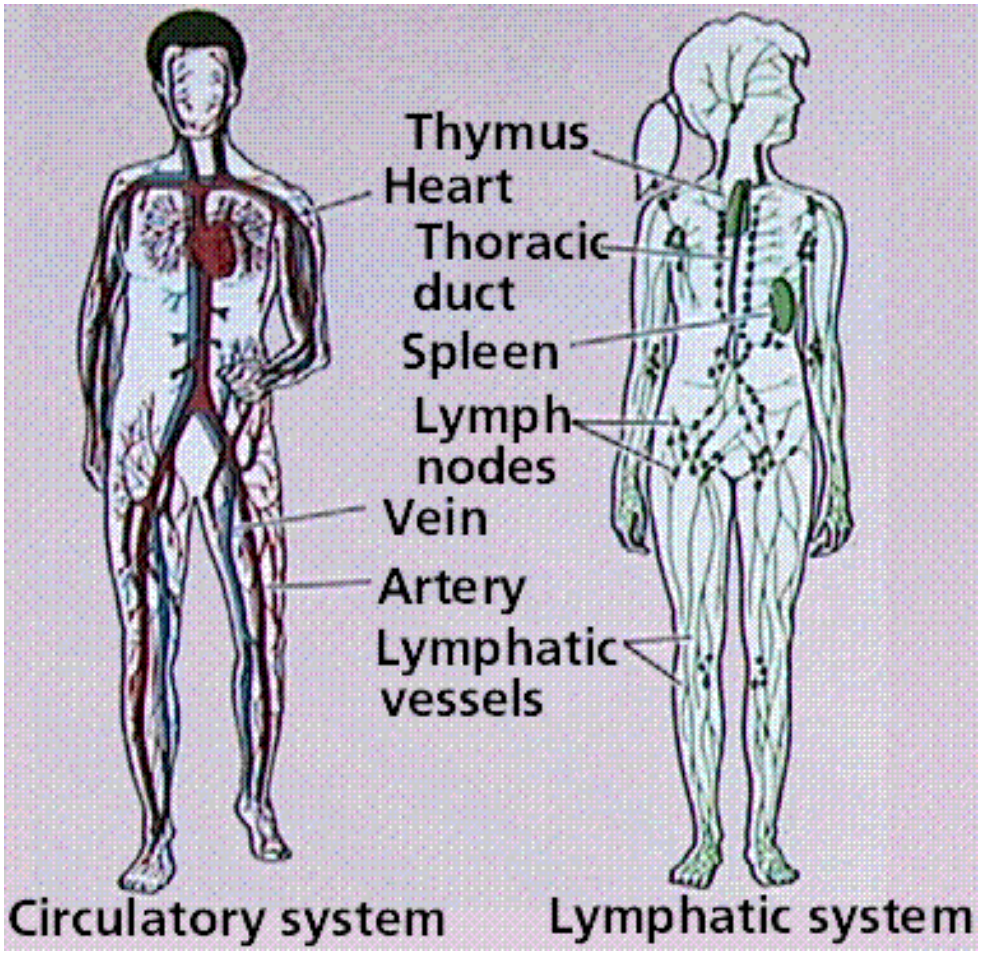
Diseases and Disorders

- Anemia - not enough oxygen
  - low or defective RBC or hemoglobin
- Leukemia - cancer of WBC means too many WBCs
  - bone marrow transplants
- Sickle-cell Anemia
  - misshapen RBC
- AIDS
  - virus infects T-cells



Lymphatic **System**

- Collects fluid from tissue & returns it to blood
- Lymph
  - fluid contains water, glucose, WBC
- Lymph Nodes
  - Filters lymph and traps bacteria



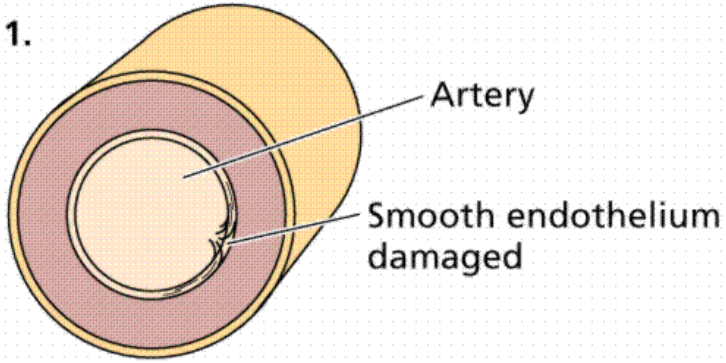
Section 3 Cardiovascular Health

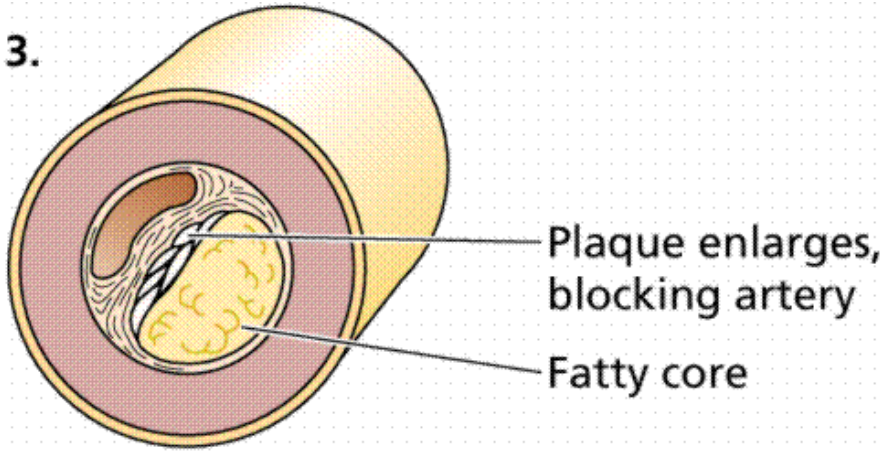
Heart Disease

- Major cause of death in US
- Hypertension
  - Called the "silent killer" WHY?
    - Hypertension is high blood pressure against artery walls
      - Why is this a problem?
    - One indicator of possible heart disease

Atherosclerosis

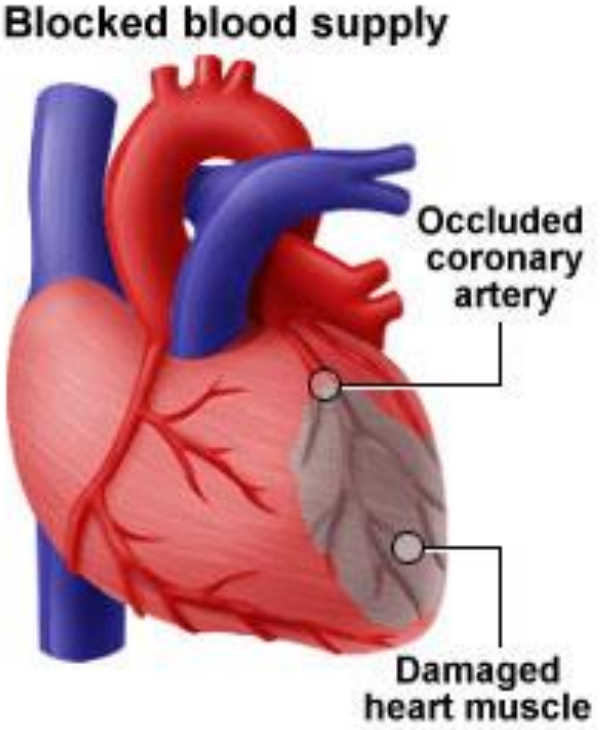
- build up of plaque (hardened fat) on artery walls:
  - block in coronary arteries - heart attack
  - block in brain arteries - stroke

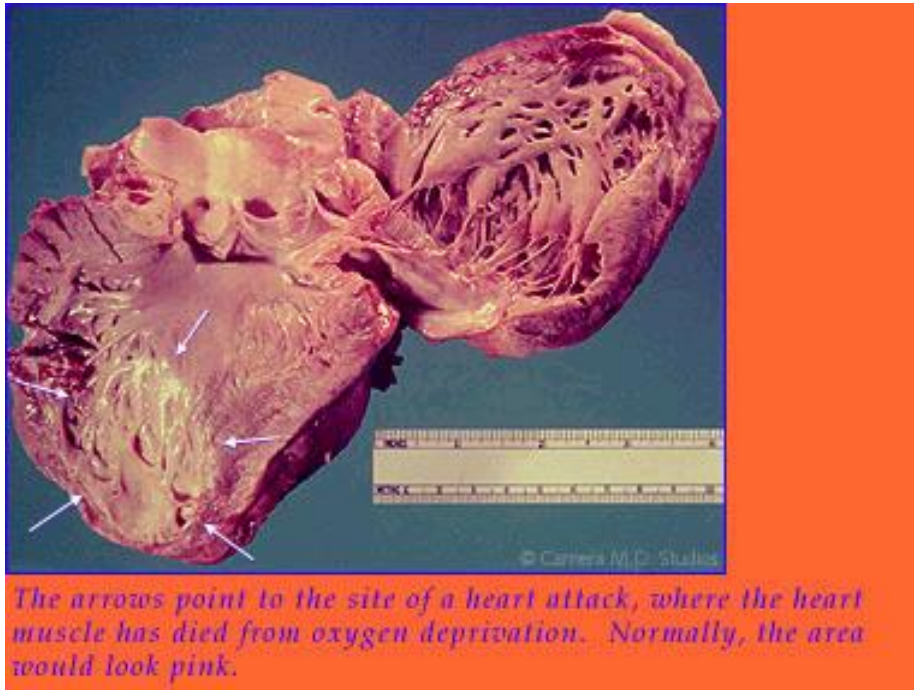




Heart Attack

- Blood flow to part of the heart muscle becomes blocked
- Causes permanent damage, but not always death

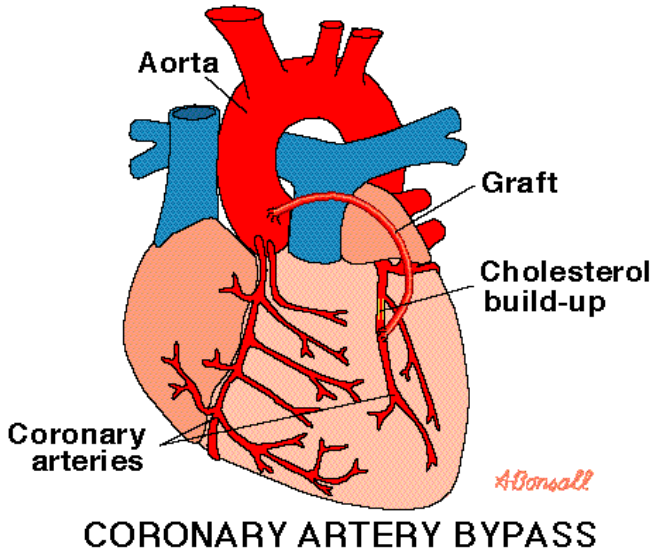




The arrows point to the site of a heart attack, where the heart muscle has died from oxygen deprivation. Normally, the area would look pink.

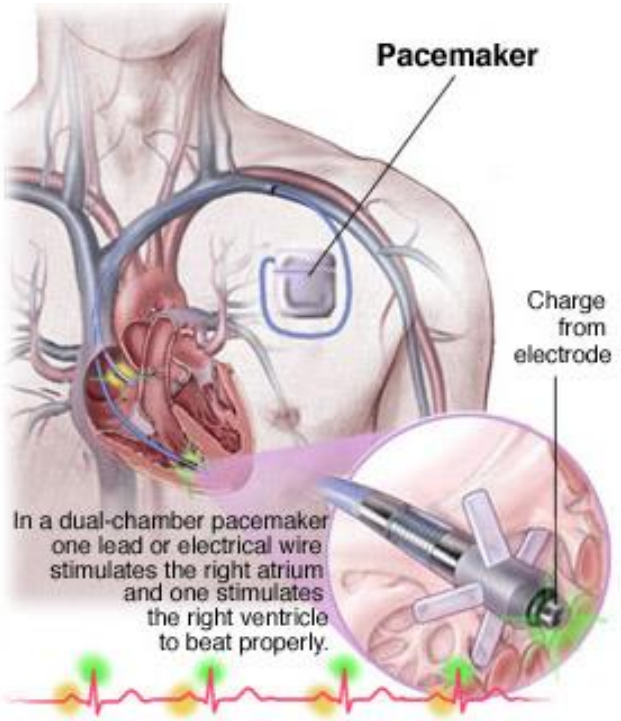
Bypass Surgery

- Surgery to create a detour past blocked arteries



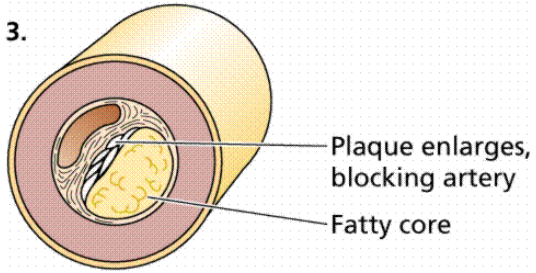
Pacemaker

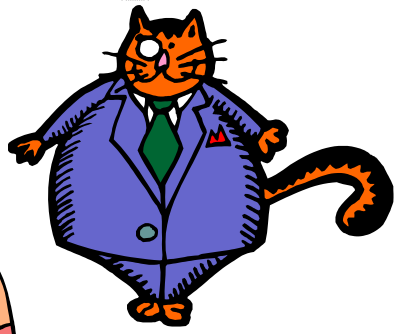
- **Artificial heart beat stimulator**



Controllable Risk Factors

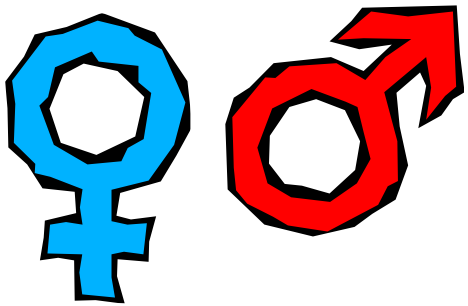
- high blood pressure
- high blood cholesterol
- smoking
- obesity
- physical inactivity
- stress





Uncontrollable Risk Factors

- gender
- heredity
- age



Quiz:

- What causes a heart attack?
- What is a indicator of heart disease?
- True or false: An artificial pacemaker replicates what nerve cells in the heart should do.
- True or false: People can control some risks of heart disease.
- A _____ is caused by a blockage in the brain, which means the brain tissue isn't getting oxygen.
- Bypass surgery uses a patient's own vessels to _____ a blocked coronary artery.

Quiz:

- What causes a heart attack? Blocked coronary arteries
- What is a indicator of heart disease? Hypertension
- True or false: An artificial pacemaker replicates what nerve cells in the heart should do.
- True or false: People cannot control some risks of heart disease.
- A stroke is caused by a blockage in the brain, which means the brain tissue isn't getting oxygen.
- Bypass surgery uses a patient's own vessels to go around a blocked coronary artery.