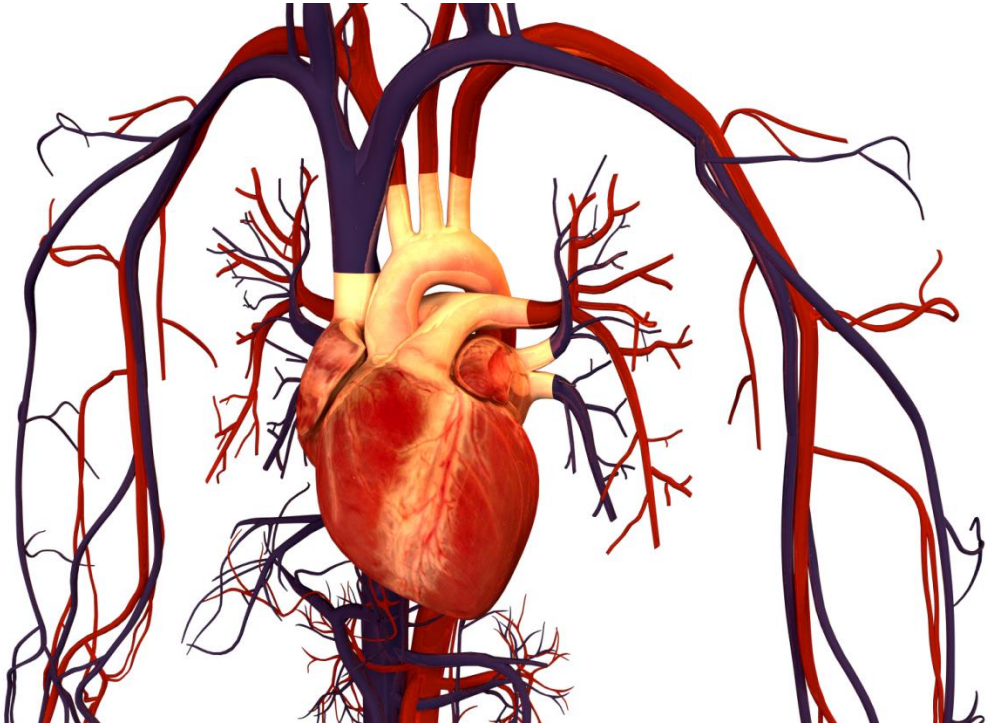
Cardiovascular and Circulatory System

The Heart and Blood Vessels



Circulatory Learning Outcomes

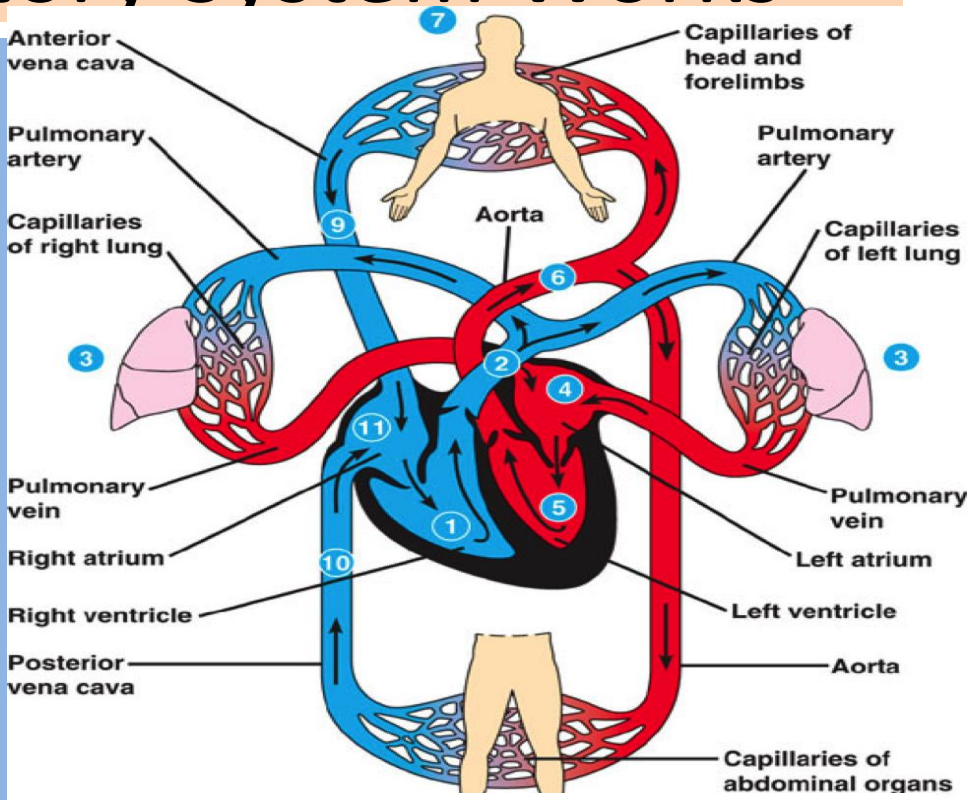
1. Identify and explain the functions of the vessels of the Circulatory system.
2. Explain the functions of the four parts of the blood.
3. Identify the difference between systolic and diastolic blood pressure.
4. Identify the four types of blood and which blood type each can receive and donate.

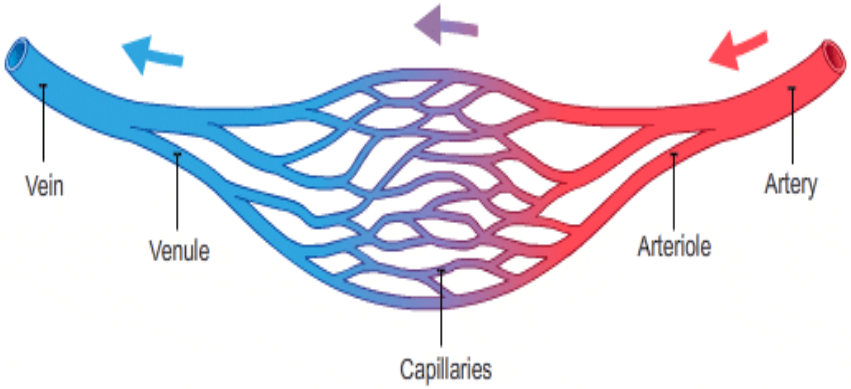
Highway System of the Body

How the Circulatory System Works

The Circulatory system keeps the body <u>working well by delivering essential materials to the cells and removes waste products from the cells.</u>

1. <u>Arteries :</u> Carries blood away from the heart-oxygen rich
2. <u>Arterioles:</u> Smaller arteries that go to the capillaries.
3. <u>Veins:</u> Carries blood to the heart- CO_2
4. <u>Venuoles:</u> smaller arteries that take oxygen poor blood to the Veins.
5. <u>Capillaries:</u> Carries blood from the arterioles to the cell then to the venules.



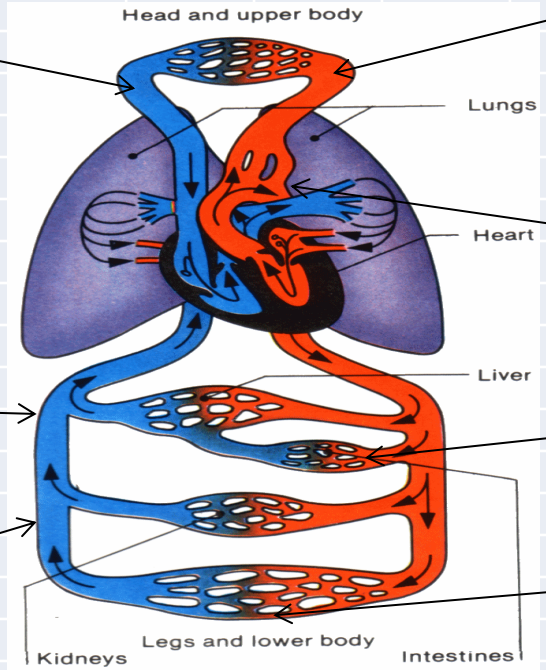


Blood Pathways

A
artery
capillary
vein

B
artery
capillary
vein

C
artery
capillary
vein



D
artery
capillary
vein

artery
capillary E
vein

artery
capillary F
vein

artery
capillary G
vein

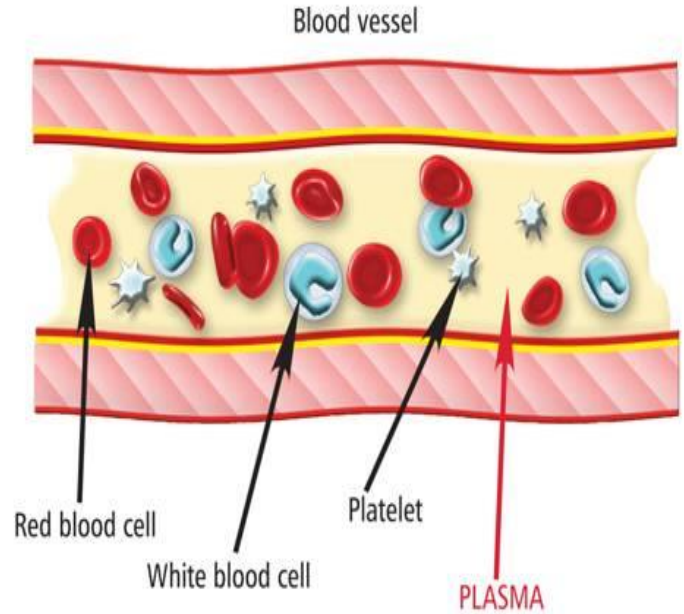
There are Four Parts of the Blood.

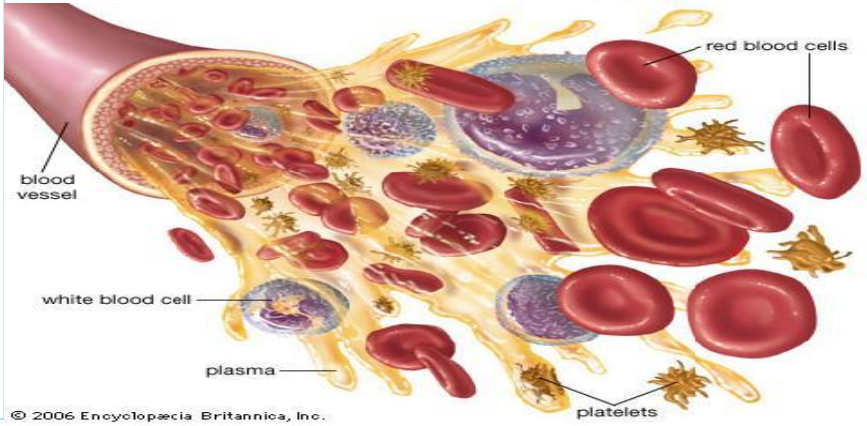
A. Plasma

a. Transports blood solids, nutrients, hormones, and other materials.

1. 60% of total volume of blood is plasma
2. 90% of plasma is water
3. 10% are dissolved substances (glucose, small protein molecules, hormones)

Four parts of blood





B. Red Blood Cells (Erythrocytes)

Function and Disorders

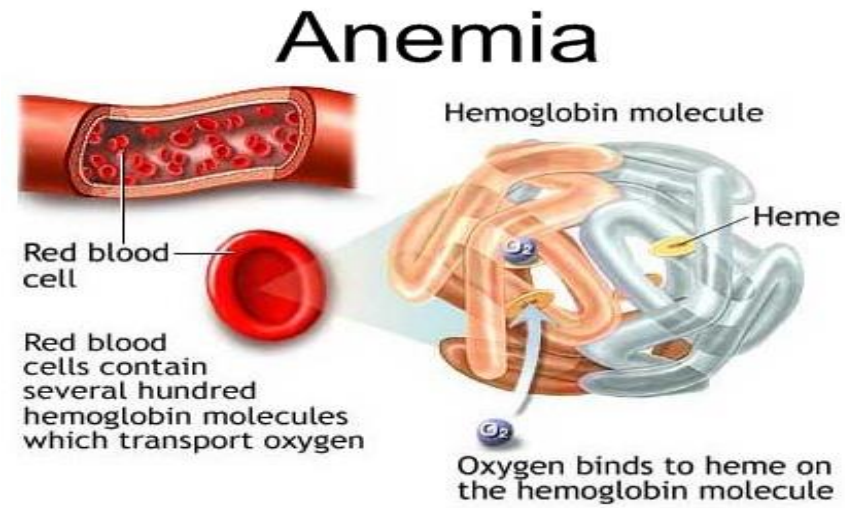
1. Carries O2(oxygen) to cells and CO2 (carbon dioxide) away from cells.
2. They are also known as erythrocytes and most of the RBC is hemoglobin which is and iron containing protein that helps to transport O2 to the cells in the body.

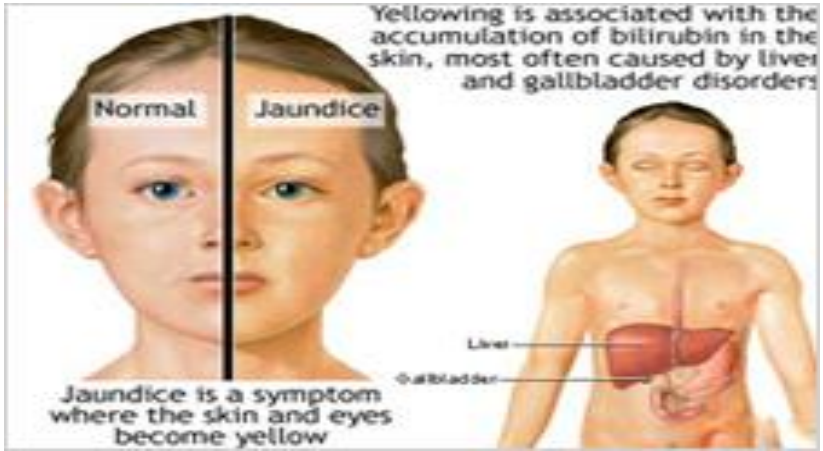
RBC disorders:

*Anemia (Lack of hemoglobin.) Fatigue will result.

*Jaundice- skin yellowish due to excess Bilirubin in the blood. The liver fails to excrete.

RBC





White Blood Cells (Lymphocytes)

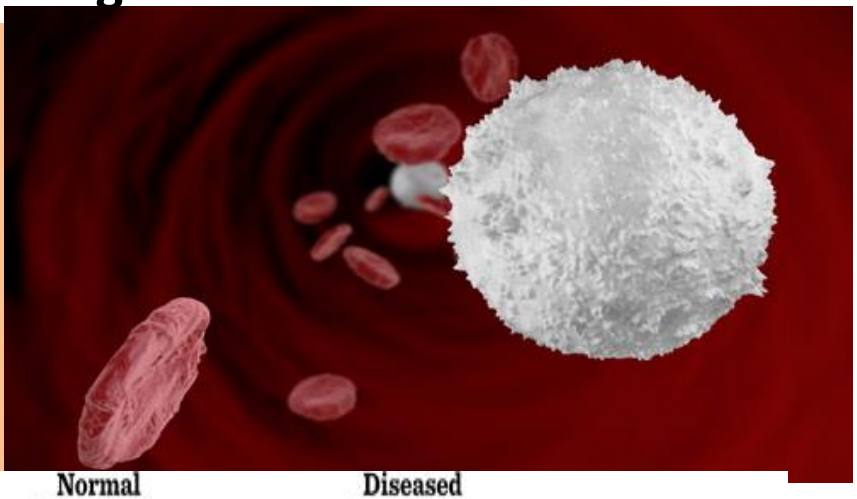
Function and Disorder

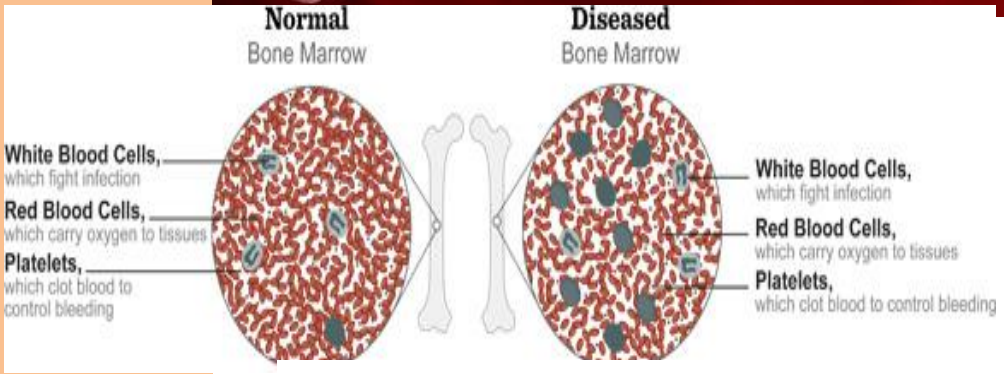
1. Helps to fight disease and infections.
2. They are also known as Lymphocytes
3. Disorders:

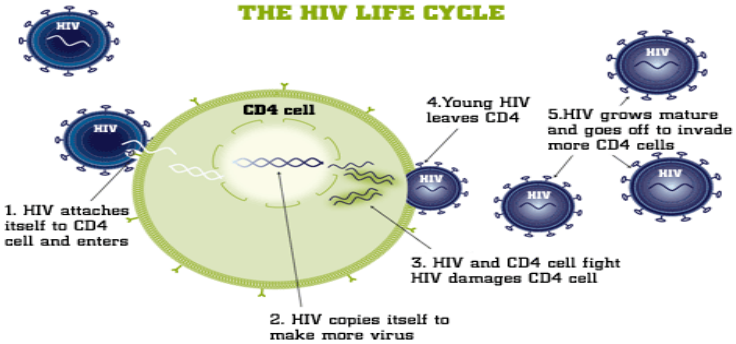
a. Leukemia- abnormal lymphocytes produced.

b. HIV- destroys the T-helper cells by converting it to an HIV cell

Fights infections and viruses



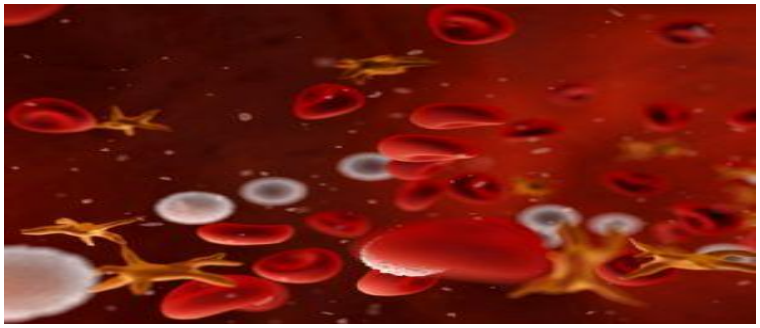


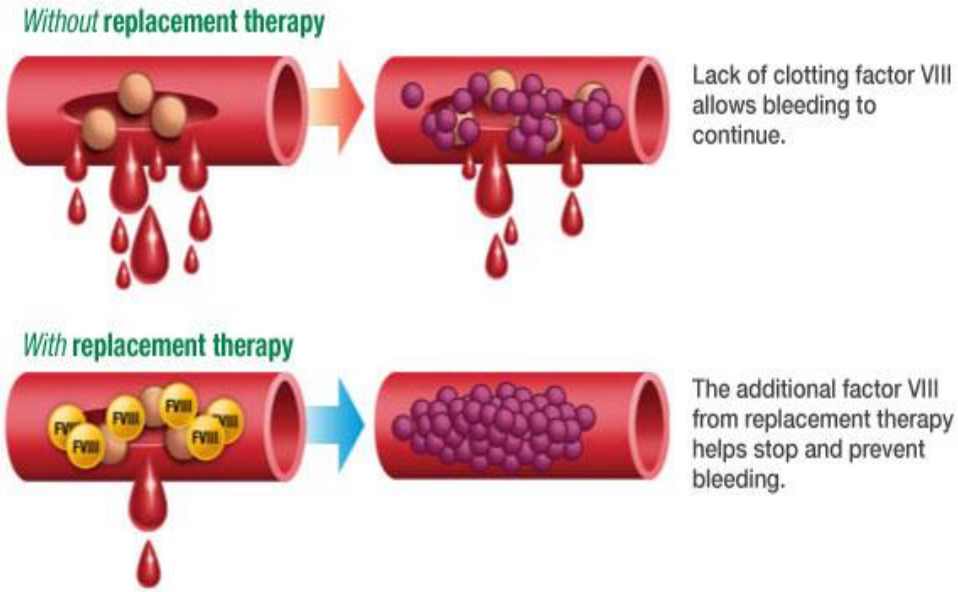


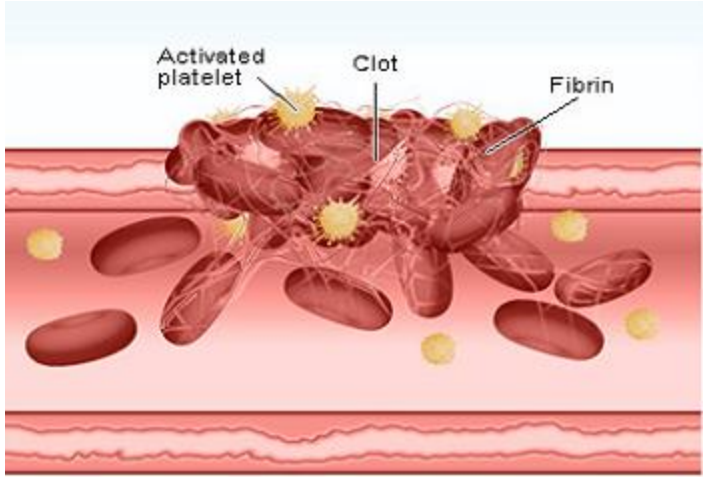
Platelets (Thrombocytes)

Function and Disorder

1. They help blood to clot which seals cuts and they prevent blood loss from a wound.
2. Disorder- Hemophilia







Parts of the Blood compared to trucks

What is Blood Pressure

Pressure against the walls of the arteries.

Systolic Pressure: The MAXimum pressure against the wall of the arteries when the heart is pumping blood out to the body.

Diastolic Pressure: The Lowest pressure against the wall of the arteries when the heart is at Rest.

Measurements of Blood Pressure

Teenagers Average:

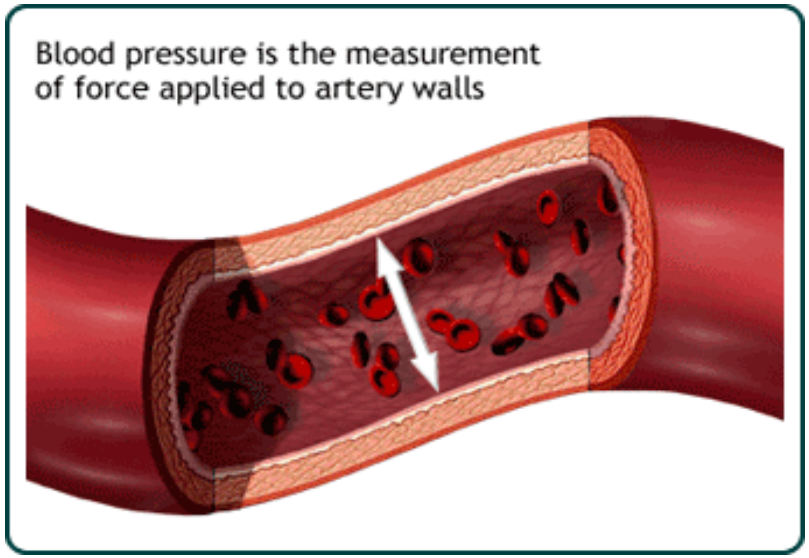
110 systolic

70 diastolic

Adults Average:

115 systolic

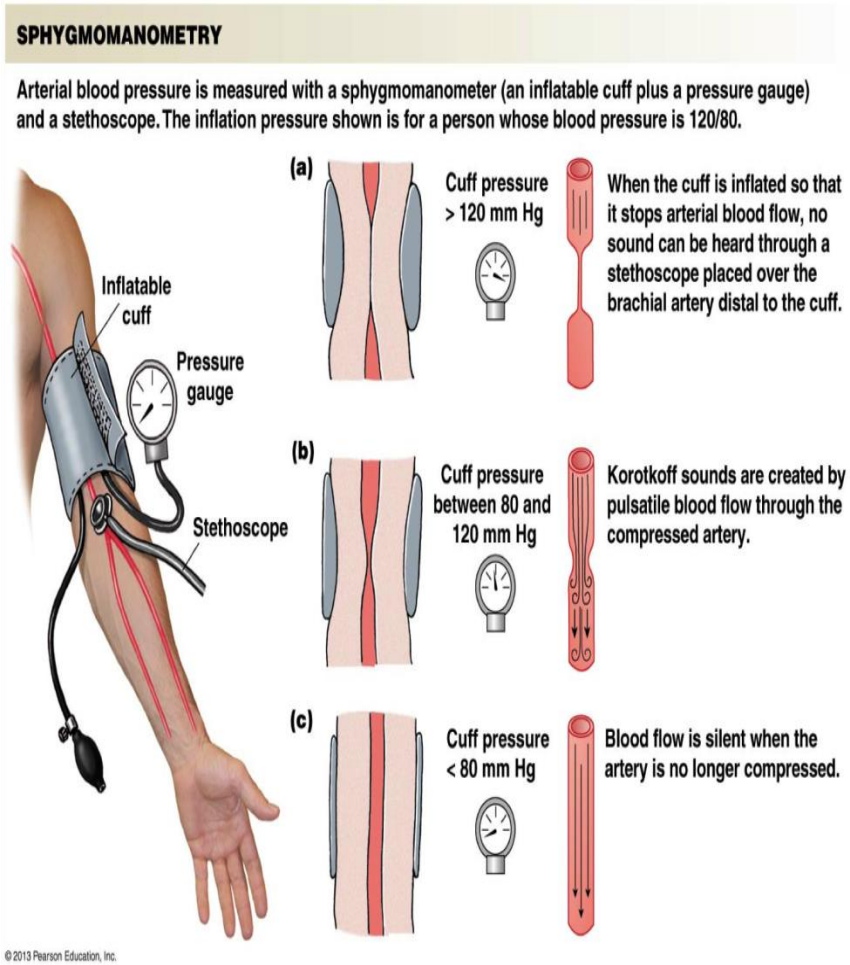
75 diastolic



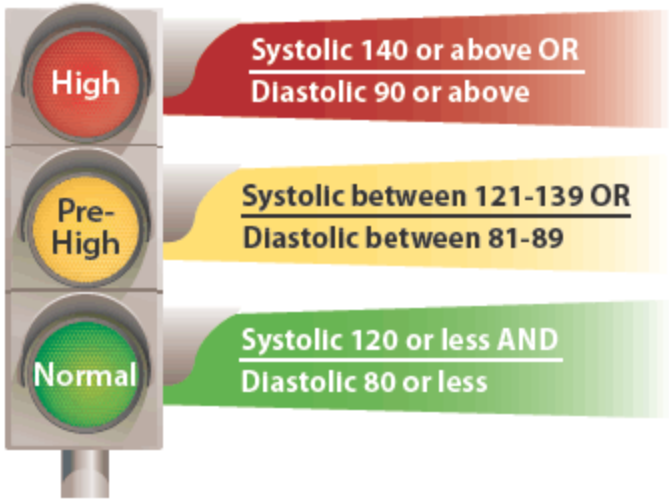
Sphygmomanometer

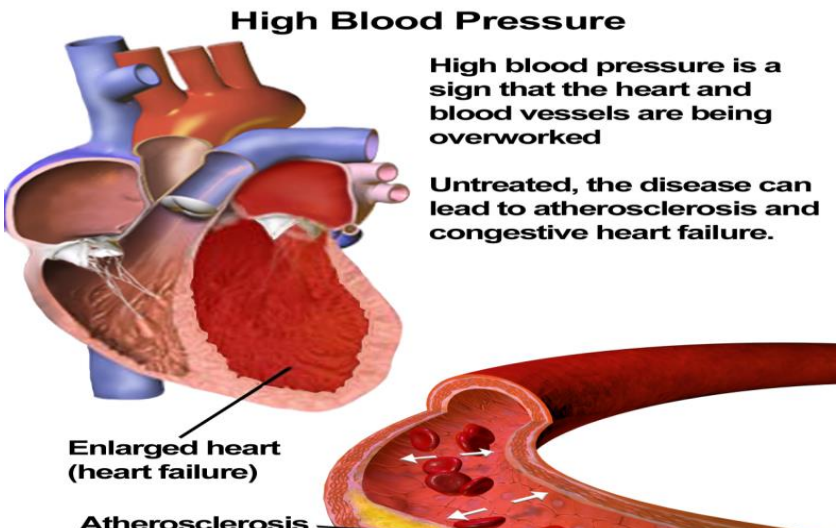
Instrument that measures blood pressure.

- How it works.



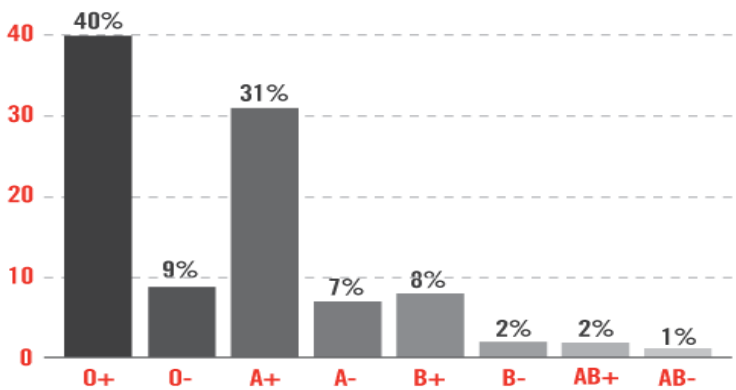
Norms for blood pressure



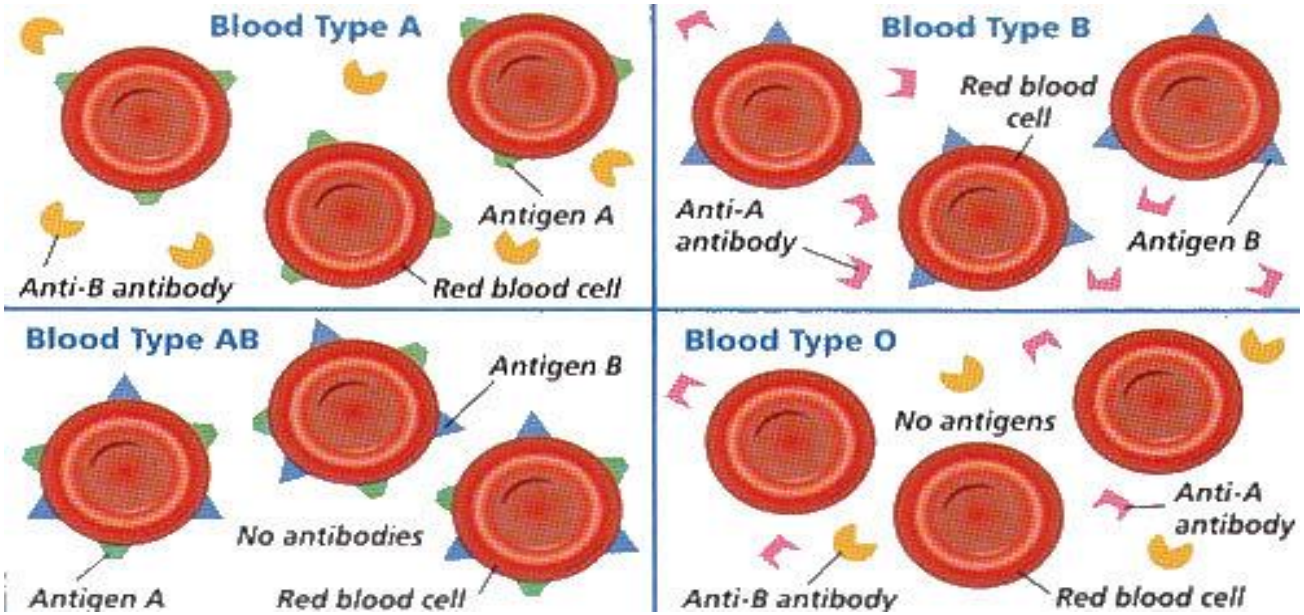


Blood Types

Donors and Recipients



The **Rh factor** is a type of protein on the surface of red blood cells. Most people who have the **Rh factor** are **Rh**-positive. Those who do not have the **Rh factor** are **Rh**-negative.



Circulatory System Questions

1. What does the circulatory system do?
2. Explain the functions of the four parts of the circulatory system .

a. Plasma:

b. Red Blood Cells (RBC):

c. White Blood Cells (WBC):

d. Platelets:

3. Identify which direction each vessel carries in regards to the heart.
4. Explain what blood pressure is.
5. Explain the terms Systolic and Diastolic.
6. Explain which blood types each can receive from and donate to.

Respiratory System

1. *Why do we breathe?*

1. To move _____ into the _____ and to move CO2 out of the _____. (Respiration)

2. ***<u>What is the pathway for O2 and CO2?</u>***

A. O2 enters the body through the_____and the_____.

B. The Air travels through the _____to get to the Larynx (voice box).

C. The flap of skin that prevents food from going into the Trachea is called _____ .

D. Air then enters the_____which carries the air into and out of the lungs. (also known as the windpipe)

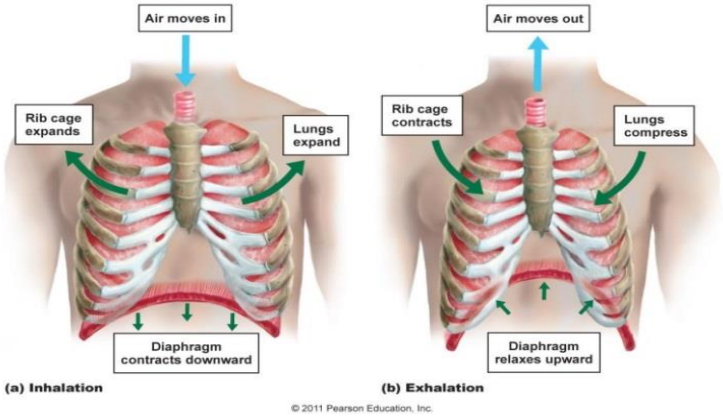
E. The_____take the air into and out of each lung.

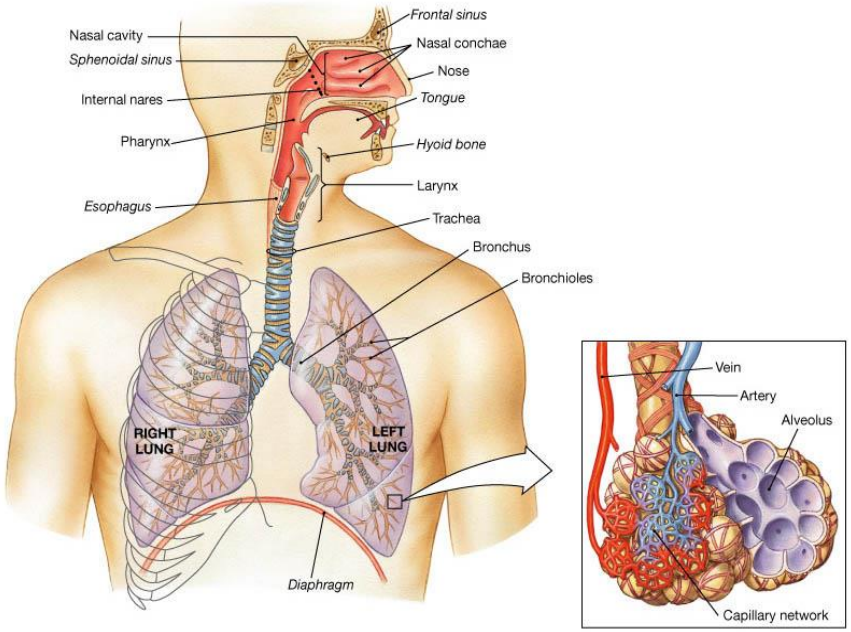
F. Once the air enters the lung it moves into tiny, thin walled sacs called, _____in the lungs where the exchange of oxygen and carbon dioxide takes place. (These look like grapes.)

G. The muscle called the _____, is a dome-shaped muscle that separates the lungs from the abdomen. It sits just below the lungs.

How do we move O2 in and CO2 out?

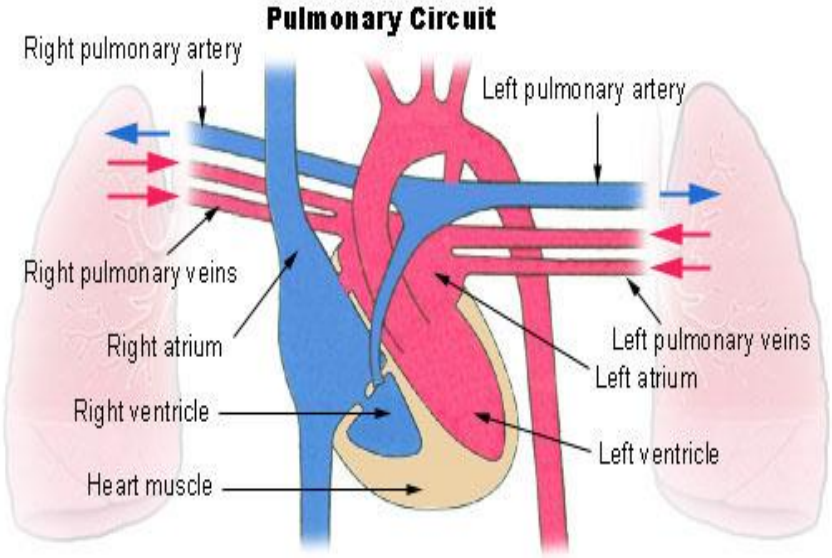
- During inspiration (inhalation), the diaphragm and intercostal muscles(muscles between the ribs) contract.
- During exhalation, these muscles relax. The diaphragm comes upwards.

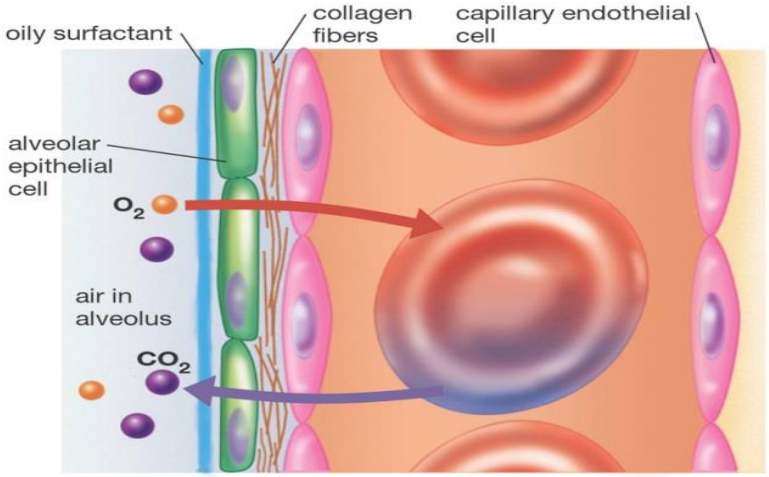




The Exchange System for Living

Circulatory and Respiratory System Partnership





Entrance and Exits of O2 and CO2

- Respiration occurs when deoxygenated blood travels away from the heart to the pulmonary (lungs) and passes by the alveoli sacs where CO2 exchanges with O2.

Cardiovascular Learning Outcomes

- Compare the similarities of an engine and the heart.
- Explain the difference between HDL and LDL cholesterol.
- Illustrate how an artery gradually becomes filled with plaque and how it contributes to a heart attack, aneurysm, and stroke.
- Explain how lifestyle choices can increase an individuals level of risk for cardiovascular disease.

What is the Cardiovascular System

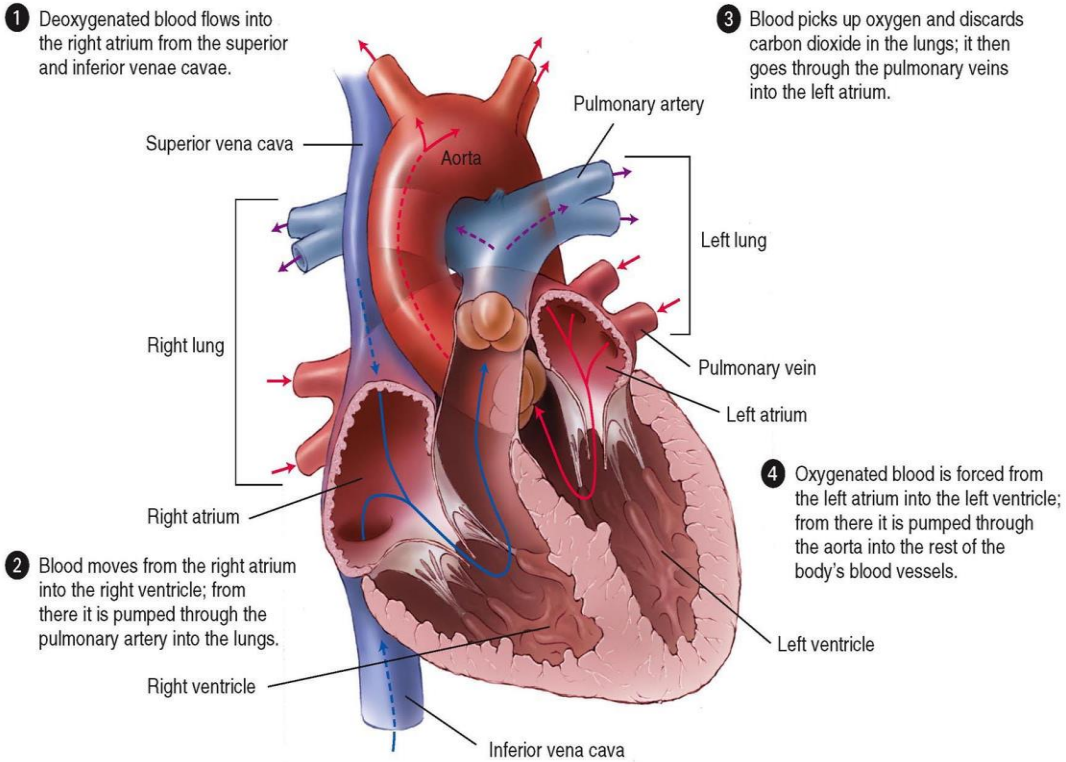
- Cardiovascular system includes: the heart, arteries, arterioles, capillaries, venules, and veins.
- The heart
  - Muscular, four chambered pump
  - Contracts 100,000 times per day
  - Two upper chambers: atria
  - Two lower chambers: ventricles
  - Tricuspid, pulmonary, mitral, and aortic valves

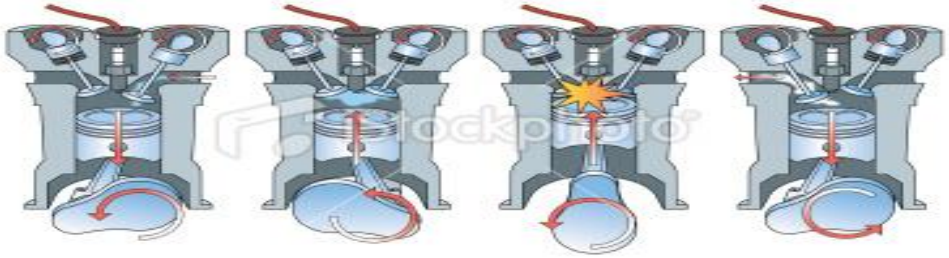
Causes of Death 2010

- **Heart disease:** 597,689
- **Cancer:** 574,743
- **Chronic lower respiratory diseases:** 138,080
- **Stroke:** 129,476
- **Accidents:** 120,859
- **Alzheimer's disease:** 83,494
- **Diabetes:** 69,071
- **Kidney disease:** 50,476
- **Influenza/pneumonia:** 50,097

Blood Flow Through the Heart

- Deoxygenated blood enters the right atrium
- From the right atrium blood moves to the right ventricle, pumped through the pulmonary artery to the lungs
- Oxygen blood enters the left atrium
- Blood from the left atrium is forced into the left ventricle
- The left ventricle pumps blood through the aorta to various parts of the body





Primary Disease of the CV System

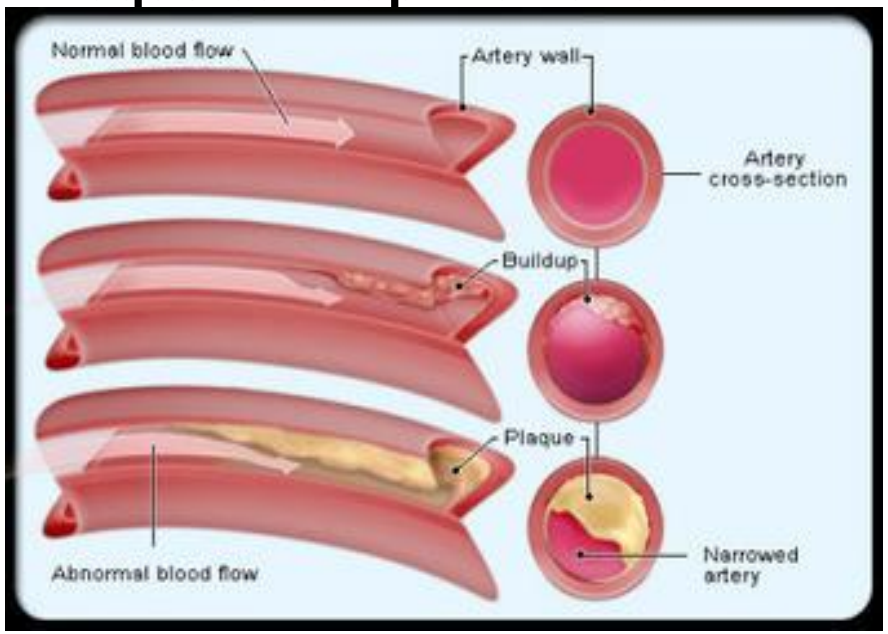
Atherosclerosis

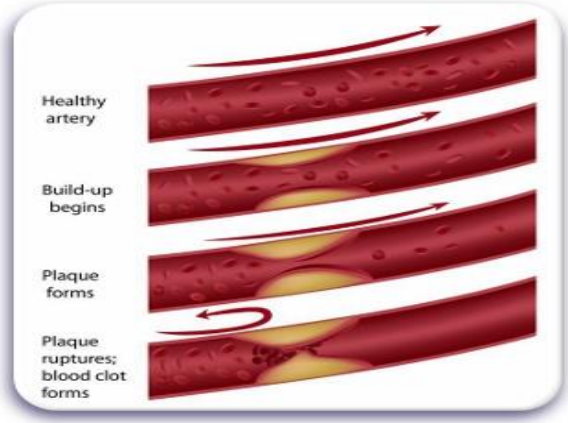
The build up of "plaque" inside the wall of the artery.

Plaque is made of deposits of fatty substances and LDL cholesterol in the inner lining of the artery.

The plaque decreases the diameter in side the wall of the artery and reduces blood flow.

Plaque build up in arteries.





Cholesterol (mg/dl)

TABLE 15.1	Classification of LDL, Total, and HDL Cholesterol (mg/dl) and Recommended Levels for Adults
LDL Cholesterol	
<100	Optimal
100–129	Near optimal/above optimal
130–159	Borderline High
160–189	High
=190	Very high
Total Cholesterol	
<200	Desirable
200–239	Borderline high
=240	High
HDL Cholesterol	
<40	Low
=60	High
Triglycerides	
<150	Normal
150–199	Borderline high
200–499	High
=500	Very high

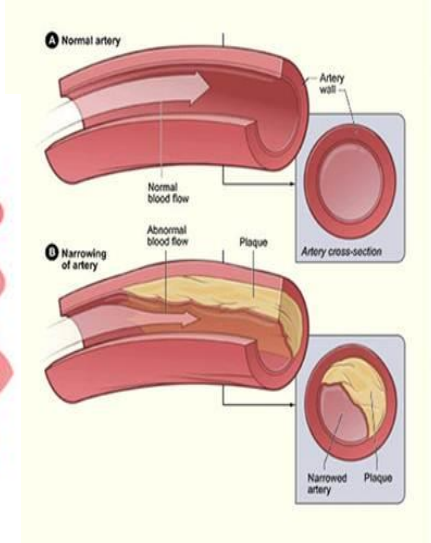
Cholesterol:

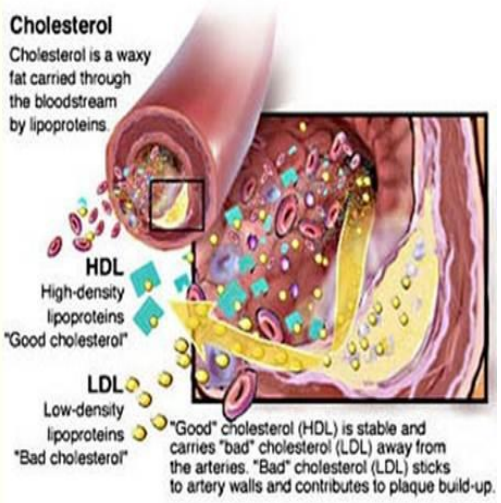
LDL =low density lipoproteins

(lazy losers)

HDL=high density lipoproteins

(happy helpers)





The Facts About Fat

Fat is necessary for good health

- Some fats are essential for good nutrition and health.
- Fats provide essential fatty acids which the body can't manufacture.
- Act as insulators to maintain body temperature.
- Improve the palatability of food and promote digestion.
- It also provide energy, cushions organs

The Skinny on Fat

- Saturated fats- basically means the fat is saturated with hydrogen, they are solid at room temperature. Examples are lard and butter.
- Why are they bad for you? They increase levels of LDL , decrease HDL and increase total cholesterol.

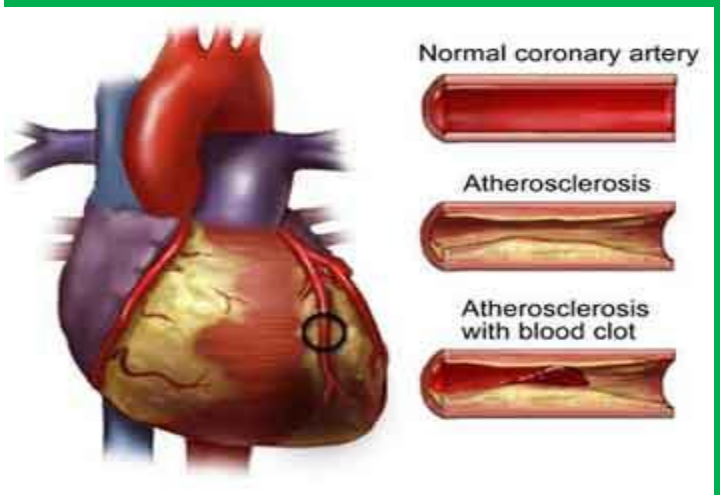
Other Coronary Heart Diseases

Results of Atherosclerosis

1. Coronary thrombosis(Thrombus): stationary blood clot in the artery.

Thrombus= the "BUS" is in the station.

2. Myocardial infarction (MI) or heart attack – blood supplying the heart is disrupted



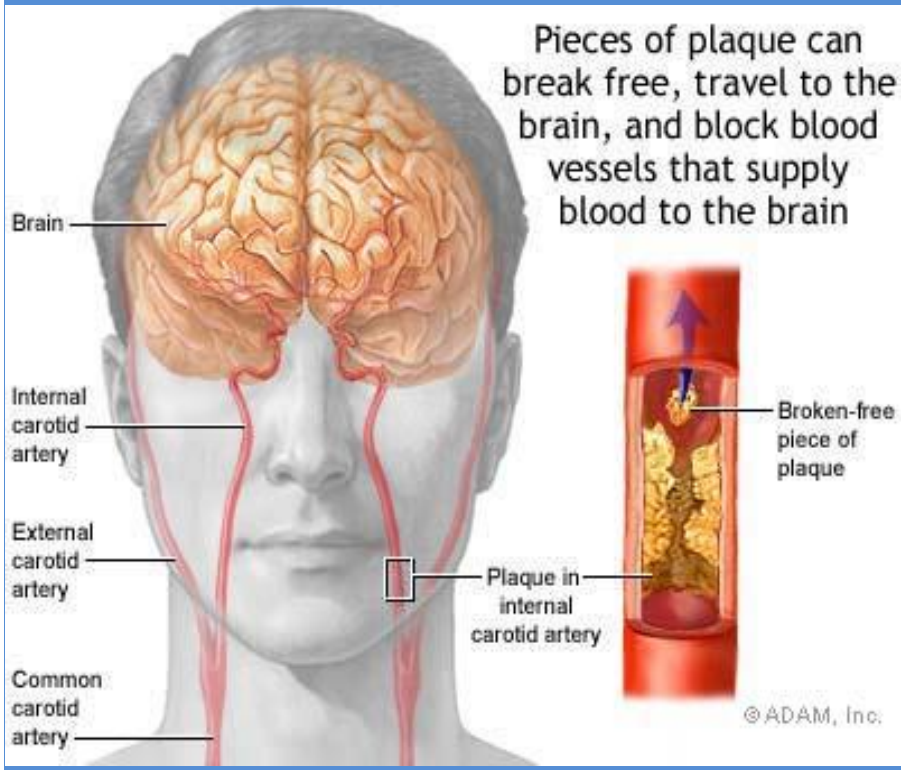
Result of a Thrombus:

- Embolus= moving blood clot

(the bus is Moving)

*Aneurysm=bulging or burst blood vessel

*Stroke: Burst aneurysm



Symptoms of a Heart Attack

Know the Heart Attack Warning Signs

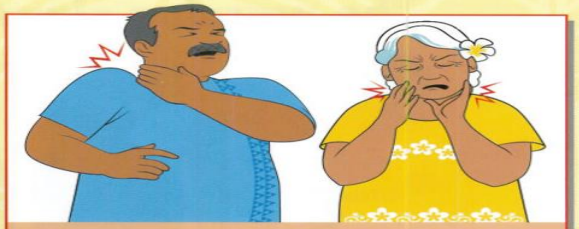
You can save a life, maybe your own.

Learn what a heart attack feels like and what to do if one happens.

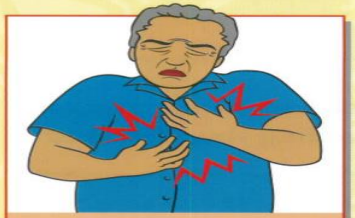
- Treatment can stop a heart attack as it is happening and works best if given within 1 hour from when the symptoms started.
- Call 9-1-1 in 5 minutes or less if you or someone else is having one or more heart attack signs.

Act fast. Call 9-1-1

One or both arms, your stomach, or back may hurt.

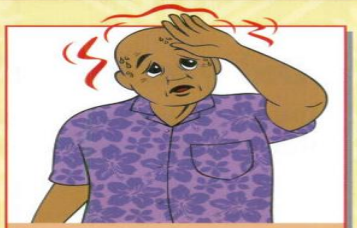


You may feel pain in the neck or jaw.



Your chest may hurt or feel squeezed.

You may feel like you can't breathe.



You may feel light-headed or break out in a cold sweat.

You may feel sick to your stomach.

Act fast. Call 9-1-1

- Some heart attacks happen suddenly and are intense (like in the movies). But most start slowly and may not be painful. It's important to check it out right away.
- Do not drive yourself to the hospital.

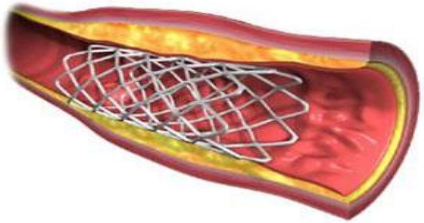
Did you know?

Diabetes raises your chance of having a heart attack or stroke. You can fight back by taking care of your heart and controlling your diabetes.

Angioplasty vs. Bypass Surgery

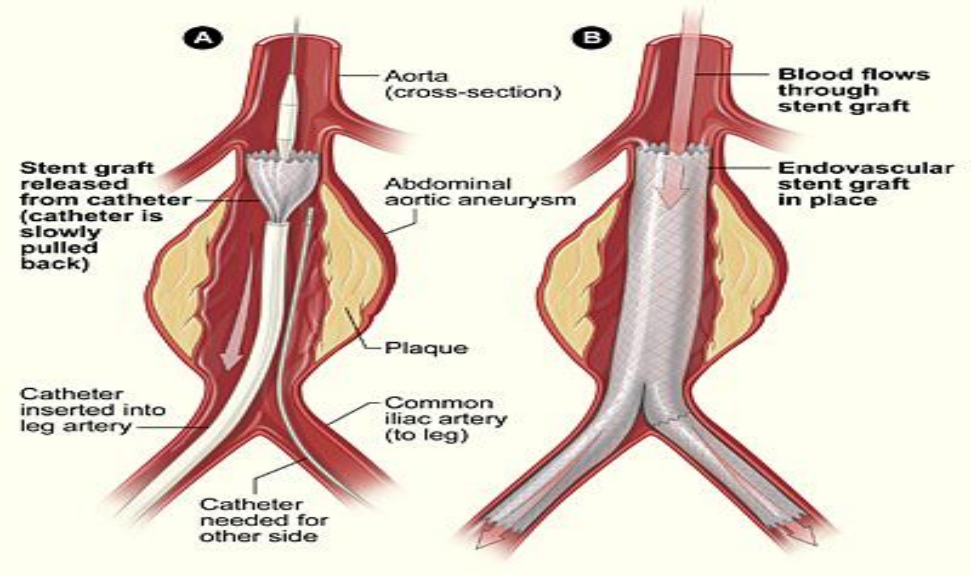
Coronary Bypass Surgery

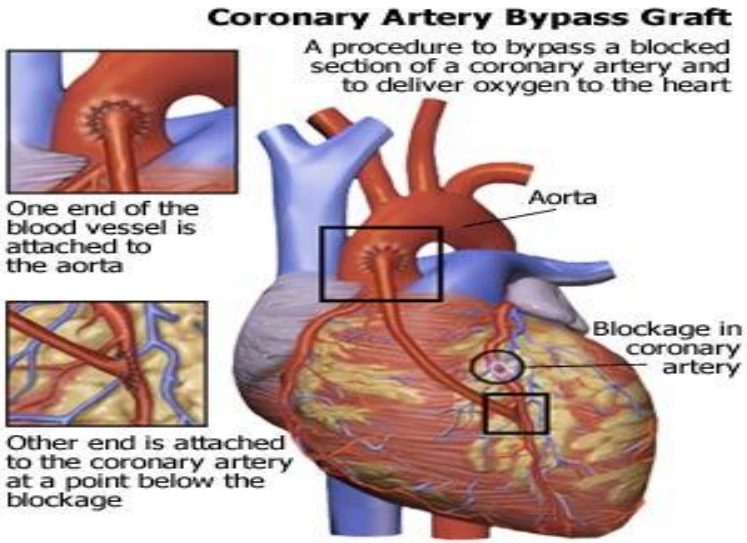
- Angioplasty – a thin catheter is threaded through the blocked arteries. The catheter has a balloon on the tip which is inflated to flatten the fatty deposits against the wall of the artery



- Coronary bypass surgery – a blood vessel is taken from another site and implanted to bypass blocked arteries and transport blood

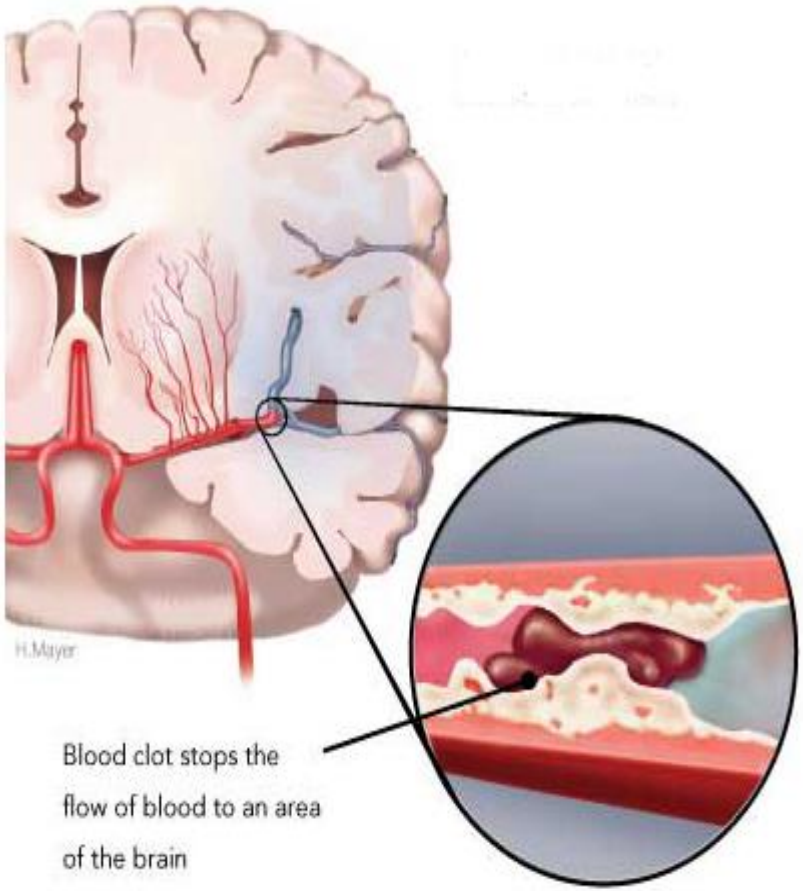
Balloon Angioplasty



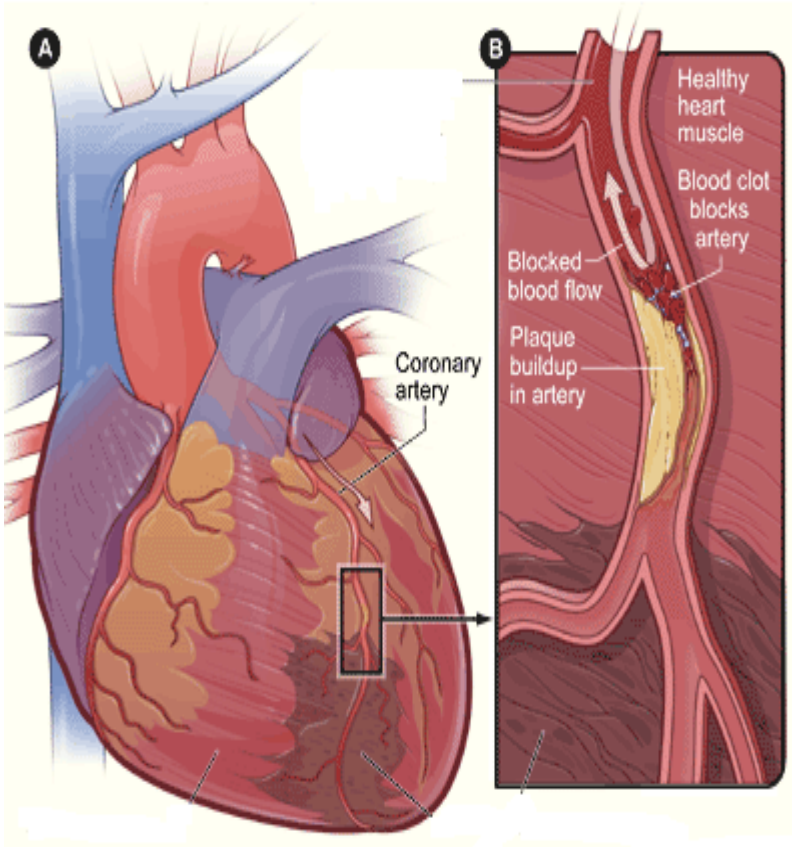


Results of blood clots in the Brain and in the Heart

Aneurysm or Stroke

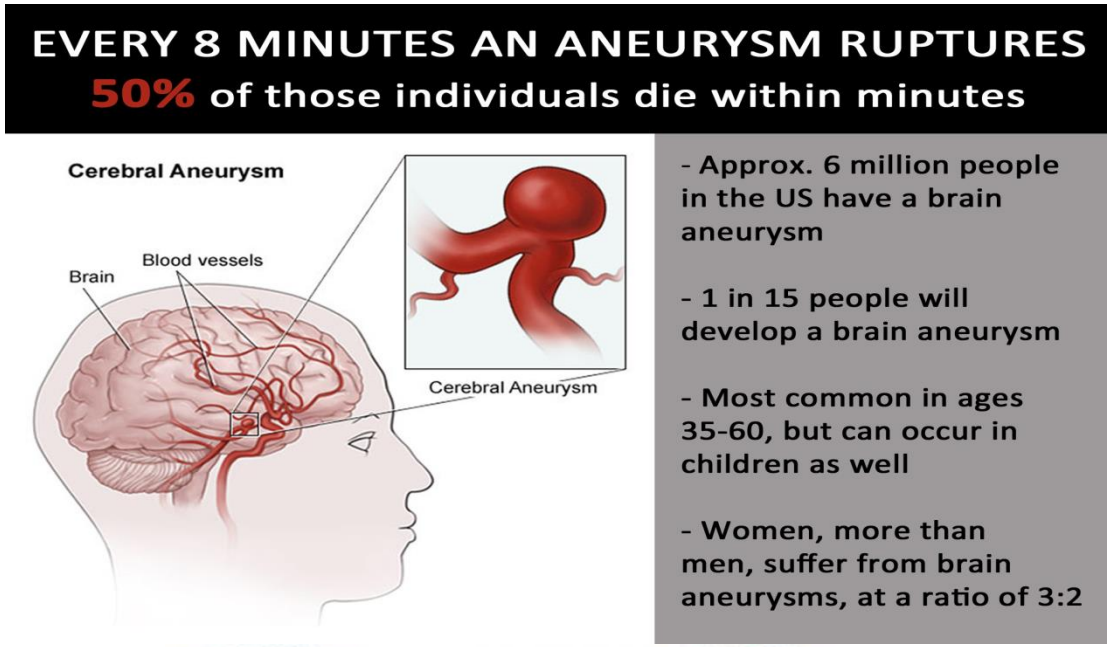


Heart Attack

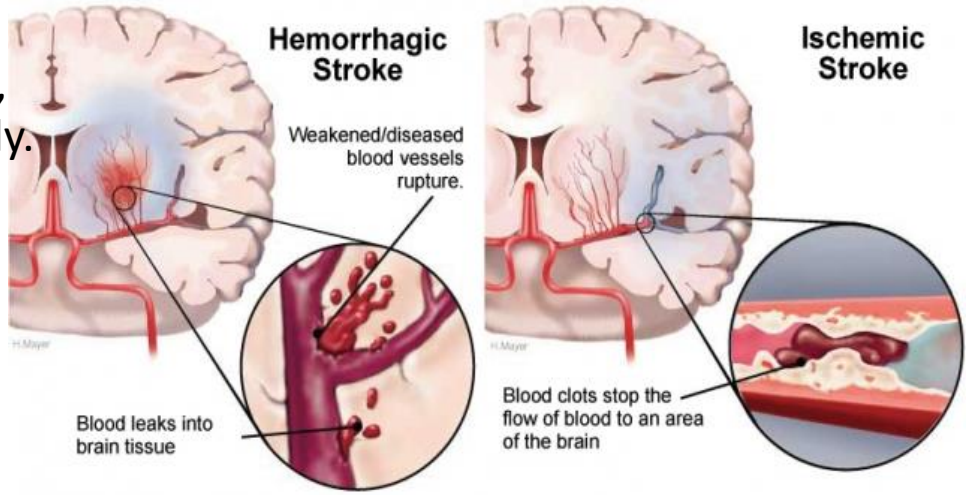


Stroke

- Occurs when the blood supply to the brain is interrupted



*Sudden numbness or weakness of the face, arm or leg, especially on one side of the body.
*Sudden confusion, trouble speaking, or understanding.
*Sudden trouble seeing in one or both eyes.
*Sudden trouble walking, dizziness, loss of balance or coordination.



Risk Factors of Heart Disease

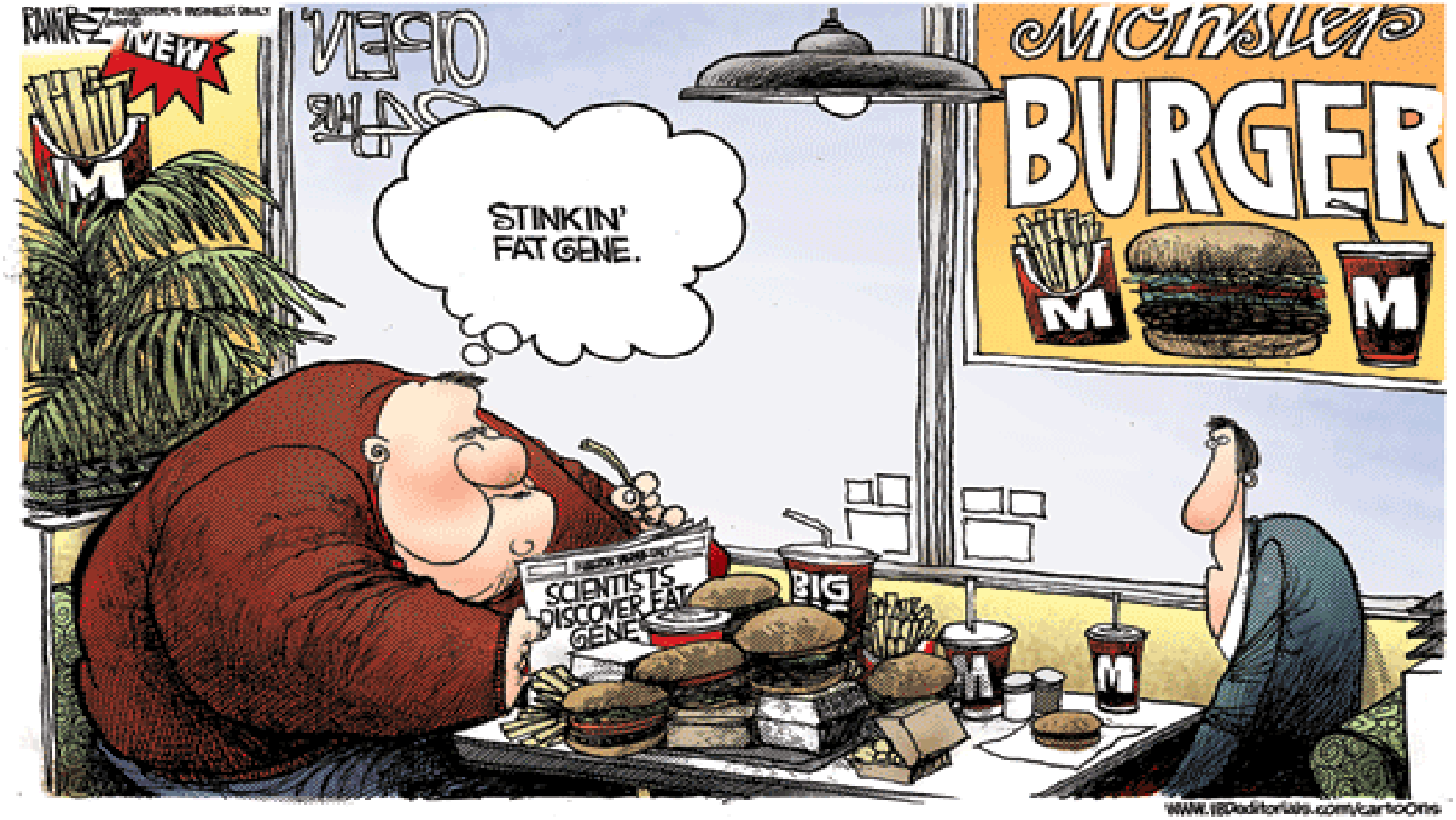
Risks you can control.

- Avoid tobacco
- Cut back on saturated fat and cholesterol
- Maintain a healthy weight
- Exercise regularly
- Control diabetes
- Control blood pressure
  - Systolic – upper number
  - Diastolic – lower number
- Manage stress

Risks you can NOT control.

- **Age:**
  - **Men: >45 years**
  - **Women: >55 years**
- **Gender**
- **Race**
- **Family history**

Reducing Your Risk For Cardiovascular Diseases



Dietary Cholesterol

Choose your low-cholesterol, heart healthy foods.

Eating healthy foods can help lower your cholesterol. Below are some tips from the different food groups. Take this with you to the store when you shop for food. Or, hang it up in your kitchen as a helpful reminder.

Food Groups	Choose	Go Easy On	Avoid
• **Meat** • **Poultry** • **Fish** • **Dry beans** • **Eggs** • **Nuts** (up to 5 ounces of meat, poultry, fish/day)	• Lean cuts of meat • Chicken and turkey without skin • Fish • Egg whites	• Shellfish • Duck • Egg yolks	• Processed meats, such as bacon and bologna • Hot dogs
• **Milk** • **Yogurt** • **Cheese** (2 or more servings/day; 3–4 for pregnant or breast-feeding women)	• Fat-free or low-fat dairy products • Cheeses with no more than 3 grams of fat per ounce • Low-fat yogurt	• 2% fat milk • Sour cream	• Whole milk • Swiss, American, cheddar cheese • Cream cheese
• **Fats** • **Oils** (approximately 5–8 teaspoons/day)	• Corn • Olive • Canola • Sunflower oils	• Nuts • Avocados • Olives • Peanut oil	• Butter • Lard • Bacon fat
• **Breads** • **Cereals** • **Pasta** • **Rice** (6–11 servings/day)	• Whole-grain breads • Pasta • Whole-grain rice • Plain baked potato	• Granola • Biscuits • Muffins • Cornbread	• Croissants • Pastries • Egg noodles
• **Fruits** • **Vegetables** (3–5 servings/day)	• Fresh • Frozen • Dried fruits	• Canned fruit in heavy syrup	• Coconut • Vegetables prepared in butter or cream
• **Snacks** (in very limited amounts)	• Sorbet • Low-fat frozen yogurt • Plain popcorn • Pretzels	• Homemade cakes, cookies and pies prepared with unsaturated oils	• Ice cream • Chocolate • Potato chips • Buttered popcorn

Fats in Diet GOOD vs. BAD

Good Fats

Monounsaturated

Foods high in monounsaturated fat

- Canola oil
- Olive oil
- Olives
- Monounsaturated margarine spreads
- Avocado
- Most nuts (almonds, peanuts, cashews, hazelnuts, macadamias, pistachios)
- Egg yolk

Polyunsaturated

Foods high in polyunsaturated fat

- Most vegetable and seed oils (sunflower, soybean, corn, cottonseed)
- Polyunsaturated margarine spreads
- Linseeds
- Some nuts (walnuts, brazil nuts, pecans, pine nuts)
- Wheatgerm
- Oily fish and fish oils

Bad Fats

Saturated

Foods high in saturated fat

- Fatty meats
- Chicken skin
- Butter
- Cream
- Full cream milk
- Cheese
- Ice cream
- Lard
- Coconut oil (copha)
- Palm oil
- chocolate
- Deep fried foods
- Takeaway and fast foods

Trans

Foods high in trans fat

- Biscuits
- Cakes
- Pastries
- Doughnuts

Good fats		Bad fats	
Monounsaturated (MUFA)	Polyunsaturated (PUFA)	Saturated	Trans
Increase your consumption		Reduce consumption	Avoid altogether
• Olive oil • Canola oil • Sunflower oil • Peanut oil • Sesame oil • Avocados • Olives • Nuts (almonds, peanuts, macadamia nuts, hazelnuts, pecans, cashews) • Peanut butter	• Soybean oil • Corn oil • Safflower oil • Walnuts • Sunflower, sesame, pumpkin seeds • Flaxseed • Fatty fish (salmon, tuna, mackerel, herring, trout, sardines) • Soymilk • Tofu	• Beef • Lamb • Pork • Chicken skin • Whole-fat dairy products (milk, cream) • Butter • Cheese • Ice cream • Palm and coconut oil • Lard	• Commercially-baked pastries, cookies, doughnuts, muffins, cakes, pizza dough • Packaged snack foods (crackers, microwave popcorn, chips) • Stick margarine • Vegetable shortening • Fried foods (French fries, fried chicken, • chicken nuggets, breaded fish) • Candy bars

Stay Physically Active

ACSM and AHA Recommendations:

- **Do moderately intense cardio 30 minutes/day, 5 days/week**

OR

- **Do vigorously intense cardio 20 minutes/day, 3 days/week**

AND

- **Do 8 to 10 strength-training exercises, 8 to 12 repetitions of each exercise, twice/week**

Avoid Creeping Obesity

What is Obesity?

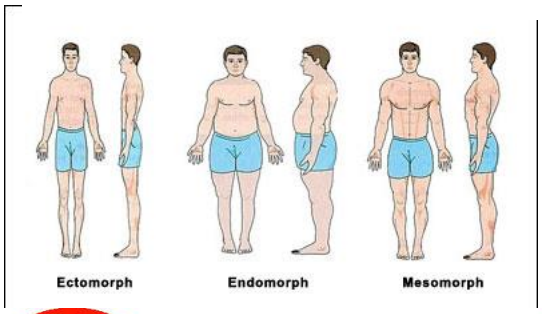
- *Overweight* is defined as having excess body weight for a particular height from fat, muscle, bone, water, or a combination of these factors.[3] *Obesity* is defined as having excess body fat.[4]
- Overweight and obesity are the result of "caloric imbalance"—too few calories expended for the amount of calories consumed—and are affected by various genetic, behavioral, and environmental factors.[5,6]

Creeping Obesity?

*progressive weight gain over time

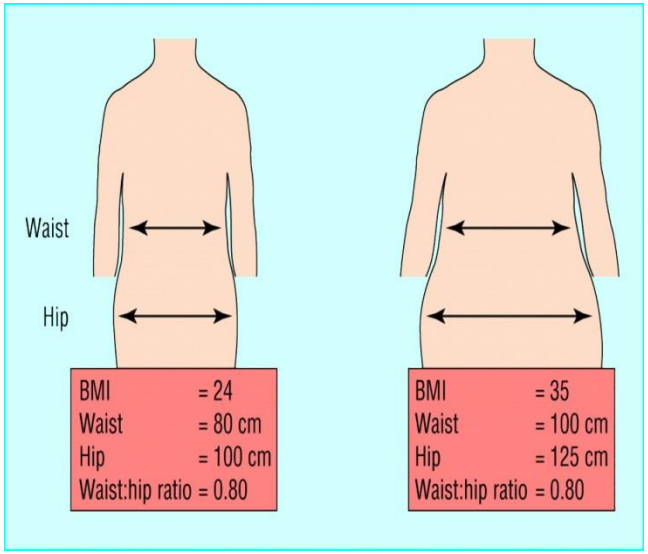
Weight Management

Varies for each person.



Assessment

- Waist to Hip Ratio most accurate



Waist-to-Hip Ratio (WHR) Norms

Gender	Excellent	Good	Average	At Risk
Males	<0.85	0.85–0.89	0.90–0.95	≥0.95
Females	<0.75	0.75–0.79	0.80–0.86	≥0.86

Manage Stress
Manage your Stress or It will Manage You!

- **If left unmanaged, stress can cause emotional, psychological, and physical problems (heart disease, high blood pressure, chest pain, and irregular heart beat)**

- **Stress also may cause you to overeat, exercise less, and possibly smoke more**

Ways to reduce Stress:

Stress Warning Signs

Physical signs	Dizziness, general aches and pains, grinding teeth, clenched jaws, headaches, indigestion, muscle tension, difficulty sleeping, racing heart, ringing in the ears, stooped posture, sweaty palms, tiredness, exhaustion, trembling, weight gain or loss, upset stomach
Mental signs	Constant worry, difficulty making decisions, forgetfulness, inability to concentrate, lack of creativity, loss of sense of humor, poor memory
Emotional signs	Anger, anxiety, crying, depression, feeling powerless, frequent mood swings, irritability, loneliness, negative thinking, nervousness, sadness
Behavioral signs	Bossiness, compulsive eating, critical attitude of others, explosive actions, frequent job changes, impulsive actions, increased use of alcohol or drugs, withdrawal from relationships or social situations

Tips to Reduce Stress

- Identify the stressor first
- Avoid hassles and minor irritation, if possible
- Try to continue doing the things that you enjoyed before the change that caused stress in your life
- Learn how to manage your time efficiently
- Do one thing at a time
- Learn to take a break
- Ask for help when you need it

Do Not Smoke

Results: