

# Cardiovascular Health

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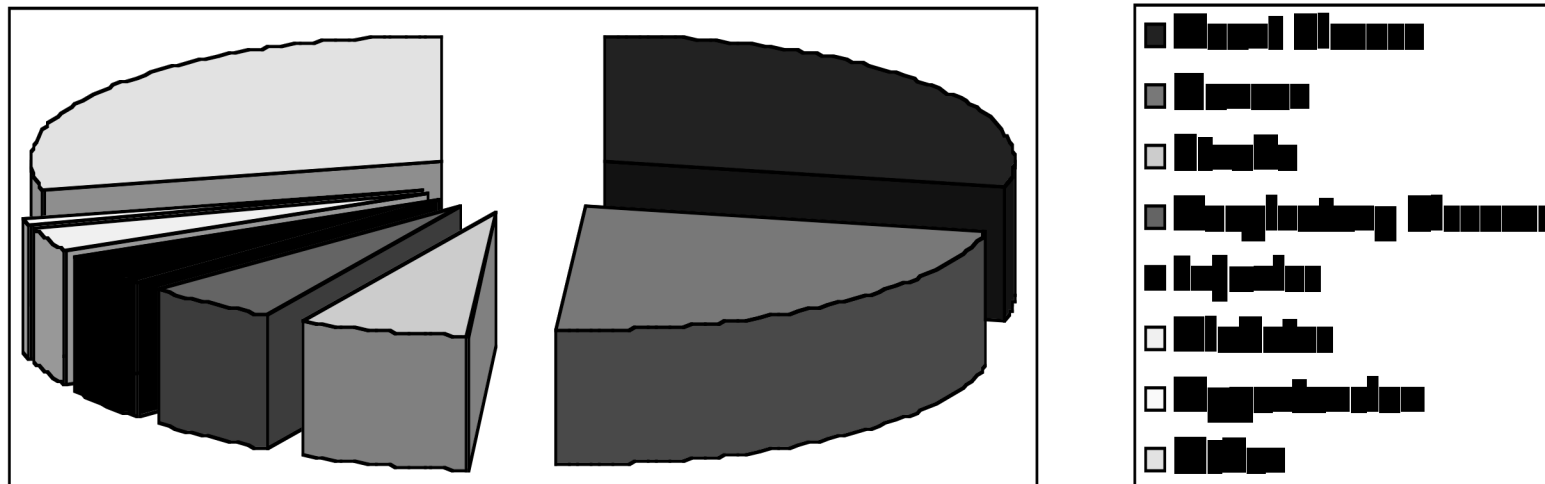
# Cardiovascular Disease (CVD)

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- Cardiovascular disease is the leading cause of death in the United States
  - Too many Americans
    - Are overweight
    - Are sedentary
    - Smoke cigarettes
    - Manage stress ineffectively
    - Have uncontrolled high blood pressure
    - Have high cholesterol
    - Do not know the signs of CVD

# Leading Causes of Death

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# Risk Factors for Cardiovascular Disease

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- Major risk factors that can be changed
  - Tobacco use
  - High blood pressure
  - Unhealthy cholesterol levels
  - Physical inactivity
  - Obesity
  - Diabetes
- Contributing risk factors that can be changed
  - High triglyceride levels
  - Psychological and social factors
- Major risk factors that can't be changed
  - Family history
  - Age
  - Sex
  - Ethnicity

# Risk Factors for Cardiovascular Disease

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- Among Americans adults, approximately
  - 23% smoke
  - 26% have hypertension
  - 18% have high cholesterol
  - 25% are completely sedentary
  - 65% are overweight
  - 8% have diabetes, 19% have pre-diabetes

# Major Controllable CVD Risk Factors: Tobacco

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- Smoking
  - Reduces levels of HDL (“good” cholesterol)
  - Raises levels of LDL (“bad” cholesterol) and triglycerides
  - Raises blood pressure
  - Displaces oxygen in the blood
  - Promotes clotting (by affecting platelet activity)
  - Accelerates the rate of fatty deposits in arteries
- Exposure to environmental tobacco smoke (ETS) also increases CVD risk, causing more than 50,000 deaths per year among nonsmokers

# Major Controllable CVD Risk Factors: High Blood Pressure

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- High blood pressure = too much force or pressure exerted against artery walls
  - Strains, weakens, and enlarges the heart
  - Scars and hardens arteries
  - Increases risk of heart attacks, strokes, kidney failure, and other health problems
- Usually has no warning signs, so regular screening is critical

# Major Controllable CVD Risk Factors: Unhealthy Cholesterol Levels

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- Cholesterol is essential for the body and is an important component of cell membranes, sex hormones, vitamin D, protective nerve sheaths, and other body components
- The body obtains cholesterol from food plus the liver manufactures it
- Cholesterol is carried in the blood—to and from the liver—in lipoproteins

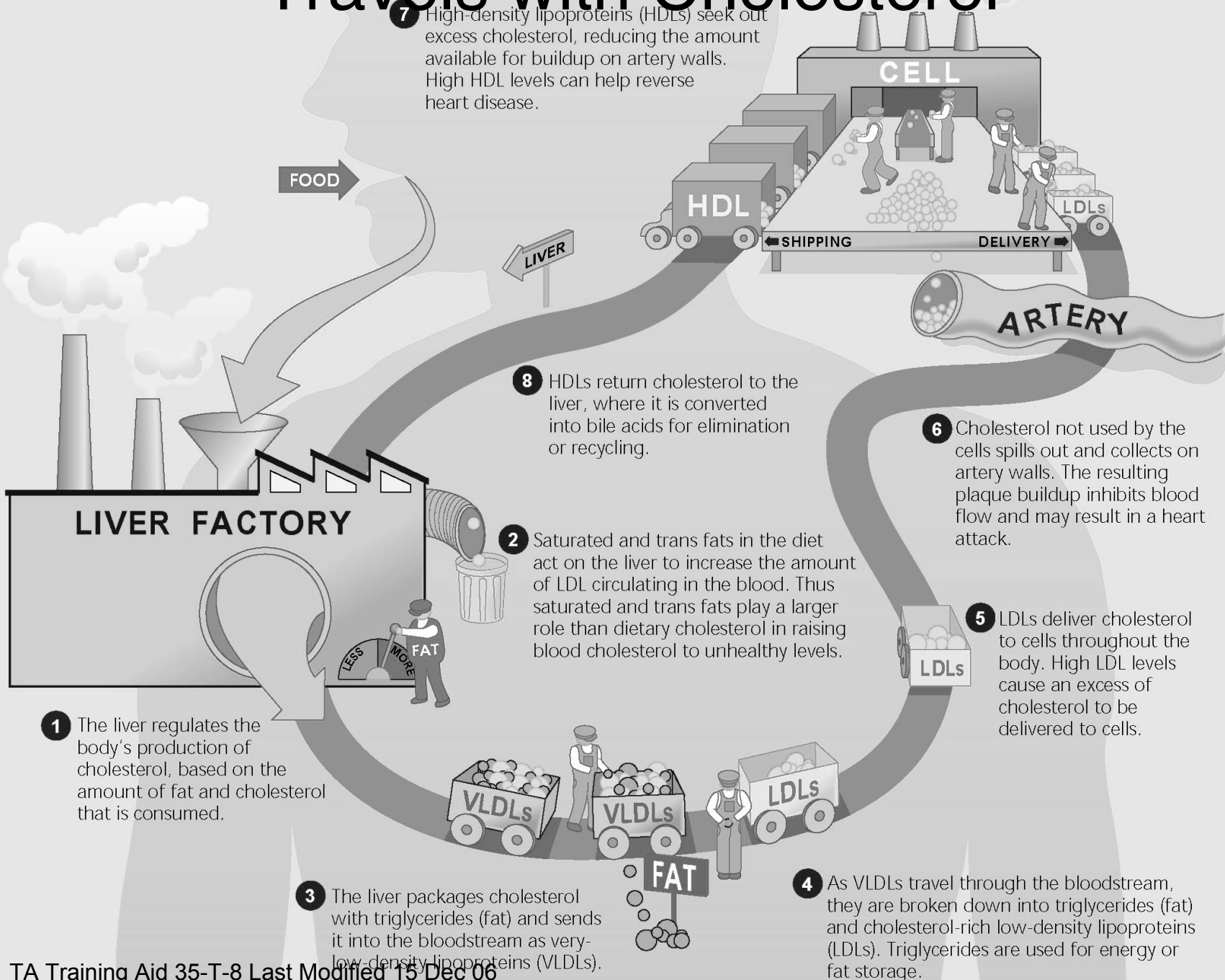


# Major Controllable CVD Risk Factors: Unhealthy Cholesterol Levels

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- Low-density lipoproteins (LDL) = blood fats that transport cholesterol to organs and tissues; excess amounts result in the accumulation of deposits on artery walls
- High-density lipoproteins (HDL) = blood fats that help transport cholesterol out of the arteries, thereby protecting against heart disease

# Travels with Cholesterol



# Cholesterol Guidelines

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## **LDL cholesterol (mg/dl)**

Less than 100	Optimal
100–129	Near optimal/above optimal
130–159	Borderline high
160–189	High
190 or more	Very high

## **Total cholesterol (mg/dl)**

Less than 200	Desirable
200–239	Borderline high
240 or more	High

## **HDL cholesterol (mg/dl)**

Less than 40	Low
60 or more	High (desirable)

# Improving Cholesterol Levels

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- Choose unsaturated fats instead of saturated and trans fats
- Eat more fruits, vegetables, and whole grains
- Exercise regularly
- Maintain a healthy body weight
- Quit smoking

# Major Controllable CVD Risk Factors: Physical Inactivity

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- Exercise
  - Decreases blood pressure
  - Increases HDL levels
  - Helps people maintain a healthy weight
  - Improves the condition of blood vessels
  - Helps prevent or control diabetes

# Major Controllable CVD Risk Factors: Obesity

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- Excess body fat contributes to
  - High blood pressure
  - Elevated cholesterol levels
  - Diabetes
  - Narrowing of coronary arteries
- Fat that collects in the torso (“apple” shape) is more dangerous than fat that collects around the hips (“pear” shape)

# Major Controllable CVD Risk Factors: Diabetes

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- Diabetes = disruption of glucose metabolism, resulting in increased blood levels of glucose; pre-diabetes also increases CVD risk
  - Damages the lining of arteries
- Diabetes is linked to other CVD risk factors
- Diabetes increases CVD risk even if glucose and insulin levels are under control

# Contributing CVD Risk Factors: High Triglyceride Levels

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- Triglycerides = blood fats obtained from food and manufactured by the body
- Contributing factors include many of the same factors that increase cholesterol levels; excess alcohol intake and very high carbohydrate diets also raise triglyceride levels

## **Triglycerides (mg/dl)**

Less than 150	Normal
150–199	Borderline high
200–499	High
500 or above	Very high



# Contributing CVD Risk Factors: Psychological and Social Factors

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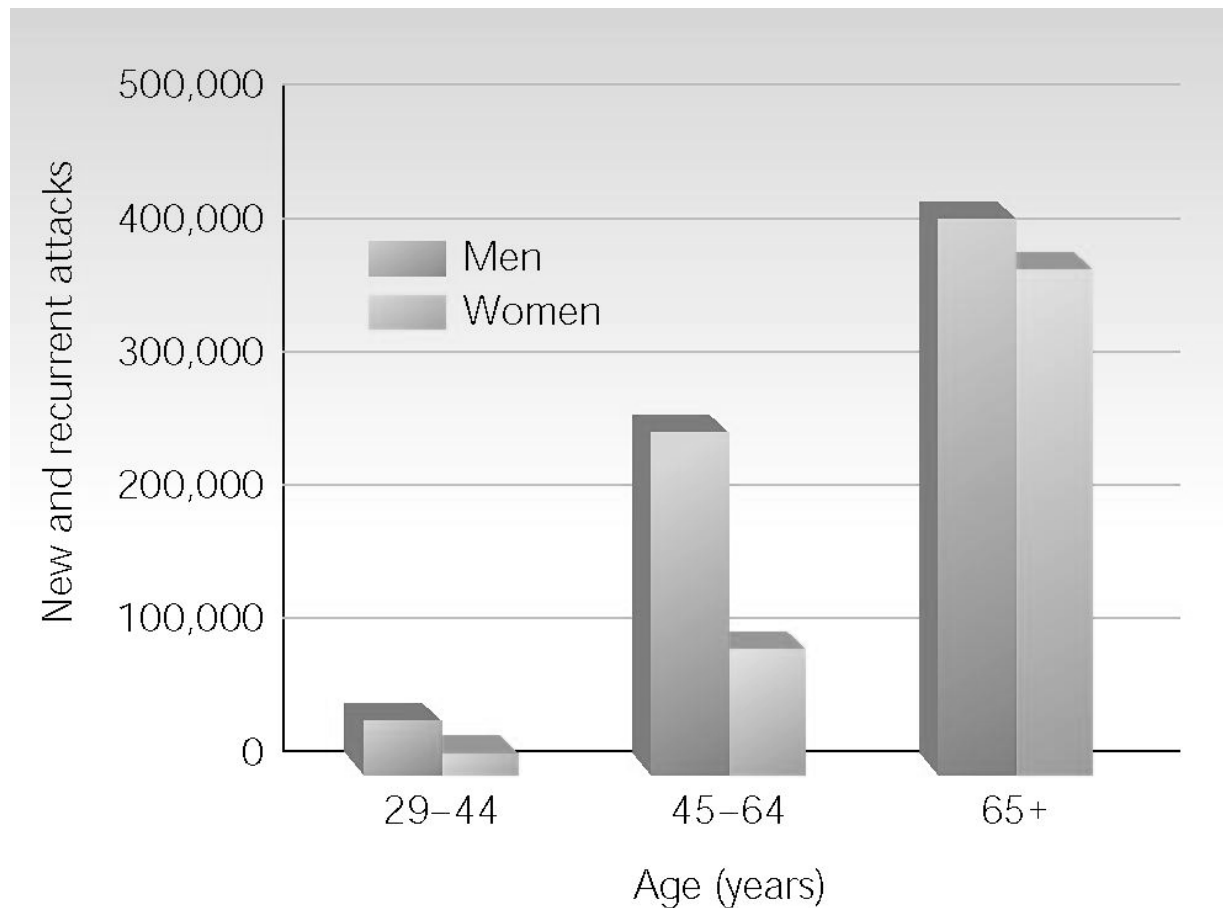
- Stress
- Chronic hostility and anger
- Suppressing psychological distress
- Depression and anxiety
- Social isolation
- Low socioeconomic status

# Major Risk Factors That Can't Be Changed

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- Family history (heredity)
- Aging
- Being male
- Ethnicity

# Annual Incidence of Heart Attack: Age and Gender Differences



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# Gender and Cardiovascular Disease

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- Nearly 1 in 2 women die from CVD
- Estrogen improves blood lipid concentrations and other risk factors in premenopausal women
- HRT is no longer recommended for CVD prevention in menopausal women
- Women are more likely than men to die following a heart attack
- Women are more likely than men to experience a heart attack without chest pain

# Possible Risk Factors Currently Being Studied

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- High levels of C-reactive protein
  - Linked to inflammation
  - Testing recommended for people at intermediate risk for CVD
- Elevated levels of amino acid homocysteine
  - Damage lining of blood vessels
  - Linked to diets low in folic acid and vitamins B-6 and B-12

# Possible Risk Factors Currently Being Studied

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- High levels of lipoprotein(a), or Lp(a)
- Infectious agents: *Chlamydia pneumoniae*, *cytomegalovirus*, *Helicobacter pylori*
- Metabolic syndrome, a cluster of risk factors often found together
  - Found in more than 20% of U.S. adults

# Metabolic Syndrome

(A person is diagnosed with metabolic syndrome if she or he has three or more of the listed risk factors)

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<b>Risk Factor</b>	<b>Defining Level</b>
Abdominal Obesity	
Men	Waist circumference > 102 cm (> 40 in)
Women	Waist circumference > 88 cm (> 35 in)
Triglycerides	≥ 150 mg/dl
HDL cholesterol	
Men	< 40 mg/dl
Women	< 50 mg/dl
Blood pressure	≥ 130 / ≥ 85 mmHg
Fasting glucose	≥ 110 mg/dl

# Major Forms of Cardiovascular Disease

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- Hypertension
- Atherosclerosis
- Heart disease and heart attacks
- Stroke
- Congestive heart failure



# Major Forms of Cardiovascular Disease: Hypertension

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- Systole = contraction of the heart
- Diastole = relaxation of the heart
- High blood pressure
  - Strains both the heart and blood vessels
  - Is very common (about 1 in 4 adults)
  - Often has no symptoms
  - Can usually be controlled with lifestyle and medication

# Major Forms of Cardiovascular Disease: Hypertension

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<b>Category</b>	<b>Systolic (mm Hg)</b>		<b>Diastolic (mm Hg)</b>
Normal	below 120	and	below 80
Prehypertension	120–139	or	80–89
Hypertension			
Stage 1	140–159	or	90–99
Stage 2	160 and above	or	100 and above

# Major Forms of Cardiovascular Disease: Hypertension

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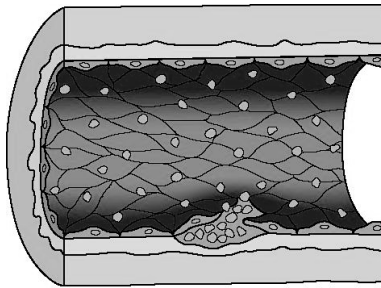
- To control blood pressure
  - Maintain healthy body weight
  - Engage in regular physical activity
  - Drink alcohol only in moderation
  - Eat a healthy diet
    - Increase intake of fruits, vegetables, and whole grains (potassium and fiber are important)
    - Limit salt intake to recommended levels (adequate = 1500 mg/day; limit = 2300 mg/day)

# Major Forms of Cardiovascular Disease: Atherosclerosis

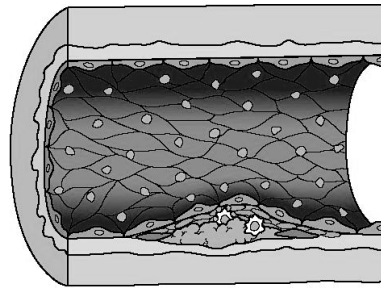
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- Atherosclerosis = disease in which the inner layers of artery walls are made thick and irregular by deposits of a fatty substance (plaque); the internal channels of arteries become narrowed and blood supply is reduced
- Blockage of a coronary artery = heart attack
- Blockage of a cerebral artery = stroke

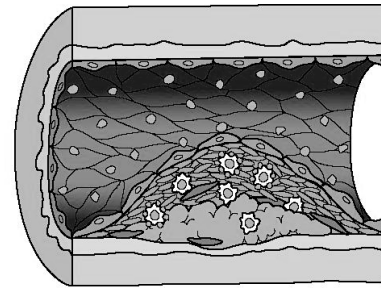
# Atherosclerosis: Stages of Plaque Development



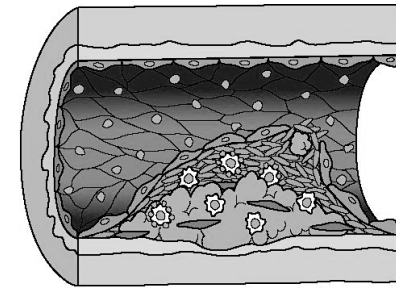
Plaque buildup begins when endothelial cells lining the arteries are damaged by smoking, high blood pressure, oxidized LDL, and other causes; excess cholesterol particles collect beneath these cells.



In response to the damage, platelets and other types of cells collect at the site; a fibrous cap forms, isolating the plaque within the artery wall. An early-stage plaque is called a fatty streak.



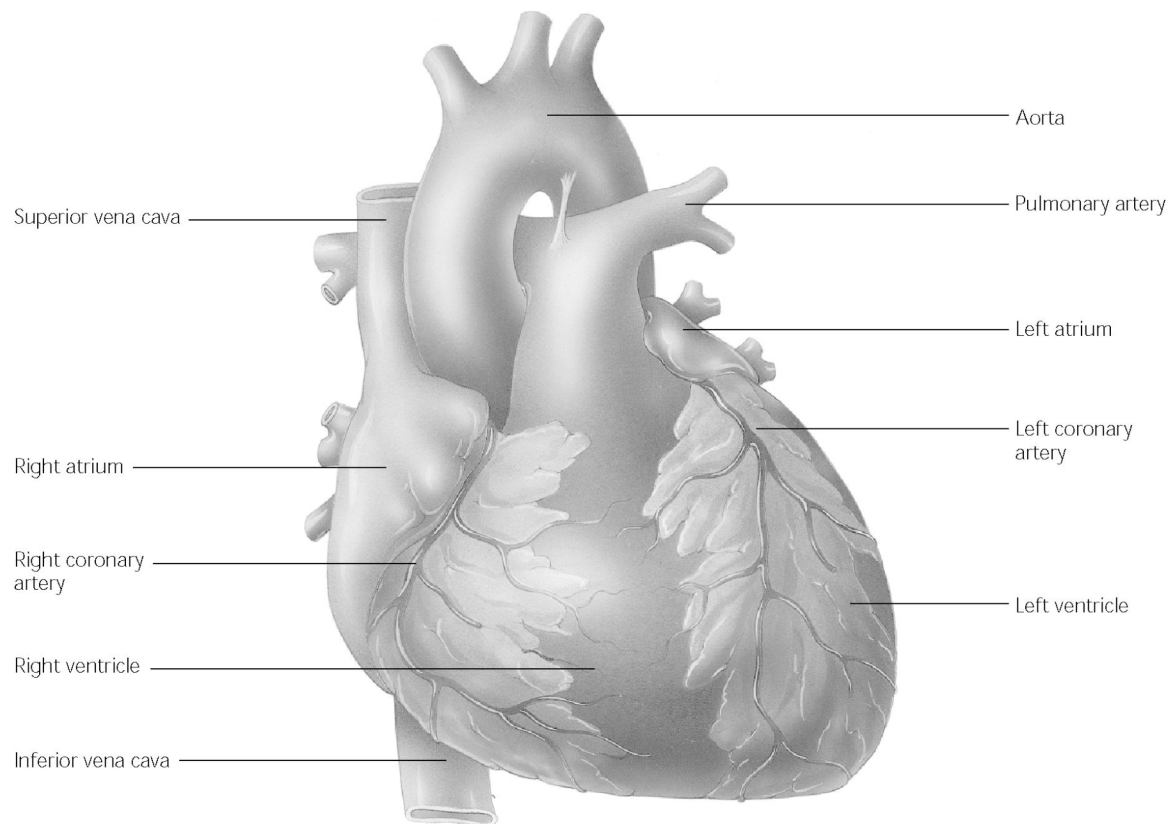
Chemicals released by cells in and around the plaque cause further inflammation and buildup; an advanced plaque contains LDL, white blood cells, connective tissue, smooth muscle cells, platelets, and other compounds.



The narrowed artery is vulnerable to blockage by clots. The risk of blockage and heart attack rises if the fibrous cap cracks (probably due to destructive enzymes released by white blood cells within the plaque).

# Blood Supply to the Heart

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# Major Forms of Cardiovascular Disease: Heart Disease

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- Coronary heart disease (CHD) = heart disease caused by hardening of the arteries that supply oxygen to the heart muscle
- Heart attack = damage to, or death of, heart muscle, sometimes resulting in failure of the heart to deliver enough blood to the body; also known as myocardial infarction (MI)
  - Angina pectoris = chest pain that occurs when the heart muscle doesn't receive enough oxygen
  - Arrhythmia = irregularity in the force or rhythm of the heartbeat

# Major Forms of Cardiovascular Disease: Heart Disease

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- Sudden cardiac death = nontraumatic, unexpected death from sudden cardiac arrest; most often due to arrhythmia
- Diagnostic tools
- Treatments
  - Aspirin
  - Prescription drugs
  - Balloon angioplasty
  - Coronary stents
  - Coronary bypass surgery
- Get help immediately if symptoms occur



# Major Forms of Cardiovascular Disease: Stroke

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- Stroke = an impeded blood supply to some part of the brain results in the destruction of brain cells; a cerebrovascular accident (CVA)
  - Ischemic stroke = caused by blood clot
  - Hemorrhagic stroke = caused by ruptured blood vessel
- Can be fatal or cause permanent disability
- Get help immediately if symptoms occur

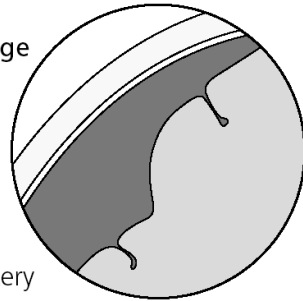
# Types of Stroke

## HEMORRHAGIC STROKE

- 20% of strokes
- Caused by ruptured blood vessels followed by blood leaking into tissue
- Usually more serious than ischemic stroke

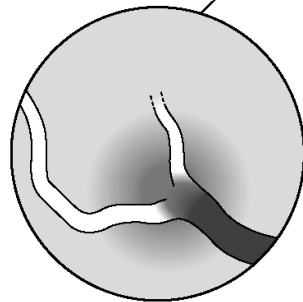
### Subarachnoid hemorrhage

- A bleed into the space between the brain and the skull
- Develops most often from an *aneurysm*, a weakened, ballooned area in the wall of an artery



### Intracerebral hemorrhage

- A bleed from a blood vessel inside the brain
- Often caused by high blood pressure and the damage it does to arteries

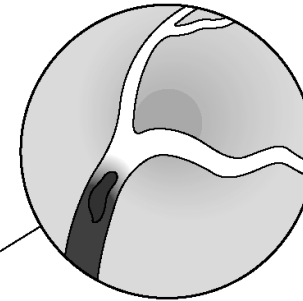


## ISCHEMIC STROKE

- 80% of strokes
- Caused by blockages in brain blood vessels; potentially treatable with clot-busting drugs
- Brain tissue dies when blood flow is blocked

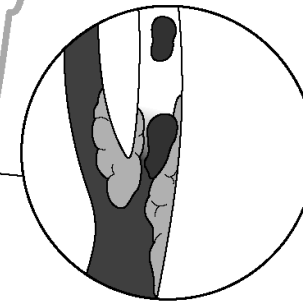
### Embolic stroke

- Caused by *emboli*, blood clots that travel from elsewhere in the body to the brain blood vessels
- 25% of embolic strokes are related to atrial fibrillation



### Thrombotic stroke

- Caused by *thrombi*, blood clots that form where an artery has been narrowed by atherosclerosis
- Most often develops when part of a thrombus breaks away and causes a blockage in a "downstream" artery



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*Fit & Well: Core Concepts and Labs in Physical Fitness and Wellness, Chapter 11*

# Major Forms of Cardiovascular Disease: Congestive Heart Failure

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- Congestive heart failure = condition resulting from the heart's inability to pump out all the blood that returns to it
- Blood backs up in the veins leading to the heart, causing an accumulation of fluid in various parts of the body
- Caused by high blood pressure, heart attack, atherosclerosis, birth defects, rheumatic fever

# Protecting Yourself Against Cardiovascular Disease

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- Eat heart-healthy
  - Decrease fat and cholesterol intake
    - Especially limit saturated and trans fats
  - Increase fiber intake
  - Alcohol intake—moderate, if at all
  - DASH (Dietary Approaches to Stop Hypertension)
- Exercise regularly
- Avoid tobacco

# Protecting Yourself Against Cardiovascular Disease

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- Know and manage your blood pressure
- Know and manage your cholesterol levels
- Develop ways to handle stress and anger
- Know your risk factors

# Reducing Your Risk of Cardiovascular Disease

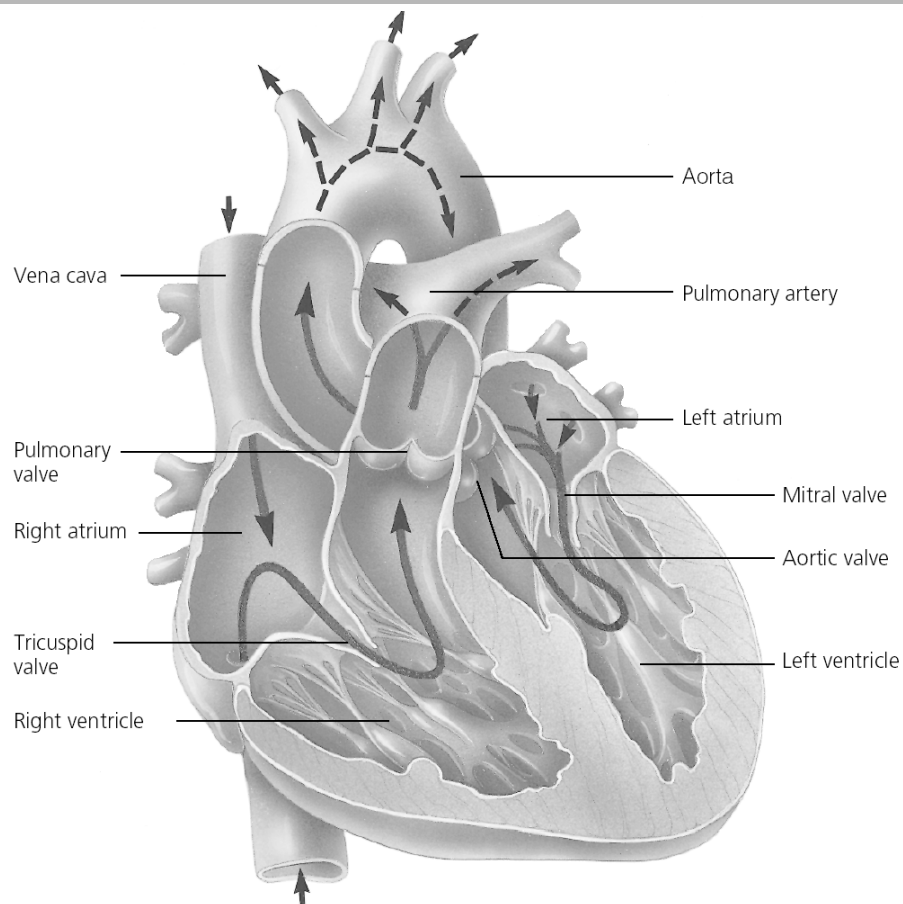
## *Do More*

- Eat a diet rich in fruits, vegetables, whole grains, and low-fat or fat-free dairy products. Eat 5–9 servings of fruits and vegetables each day.
- Eat several servings of high-fiber foods each day.
- Eat 2 or more servings of fish per week; try a few servings of nuts and soy foods each week.
- Choose unsaturated fats rather than saturated and trans fats.
- Be physically active; do both endurance exercise and strength training on a regular basis.
- Achieve and maintain a healthy weight.
- Develop effective strategies for handling stress and anger. Nurture old friendships and family ties, and make new friends; pay attention to your spiritual side.
- Obtain recommended screening tests and follow your physician's recommendations.

## *Do Less*

- Don't use tobacco in any form: cigarettes, spit tobacco, cigars, pipes, bidis, or clove cigarettes.
- Avoid exposure to environmental tobacco smoke.
- Limit consumption of fats, especially trans fats and saturated fats.
- Limit consumption of cholesterol, added sugars, and refined carbohydrates.
- Avoid excessive alcohol consumption—no more than one drink per day for women and two drinks per day for men.
- Limit consumption of salt to no more than 2400 mg of sodium per day.
- Avoid excess stress, anger, and hostility.

# Mitral Valve



A prolapse of the mitral valve is the most common cause of heart “murmur.”