

Hypertension Basics

Blood Pressure (BP)

- **BP**
 - Pressure exerted by blood on the walls of blood vessels.
 - **Normal BP:** 120/80 mmHg
- **Types of blood pressure**
 - **Systolic blood pressure (SBP):** During contraction of Heart; Normal: 100 – 140 mmHg
 - **Diastolic blood pressure (DBP):** During relaxation of Heart; Normal: 60 – 90 mmHg
- **Hypertension (HTN or HT):**
 - Known as high blood pressure
 - Persistent elevation of systolic &/or diastolic blood pressure above the normal values, i.e., 140/90 mmHg



Blood Pressure Categories

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120-129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130-139	or	80-89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

Blood Pressure (BP)

- **Resistant hypertension:** BP remains above the normal range despite concurrent use of three antihypertensive agents of different classes, one of which is diuretics.

Circulatory or Cardiovascular System

- **Structures of circulatory system**

- Heart
- Blood vessels
- Blood

- **Functions**

- Deliver oxygenated blood to the various cells and organ systems
- Responsible for the movement of blood, nutrients, and gases

Cardiovascular System

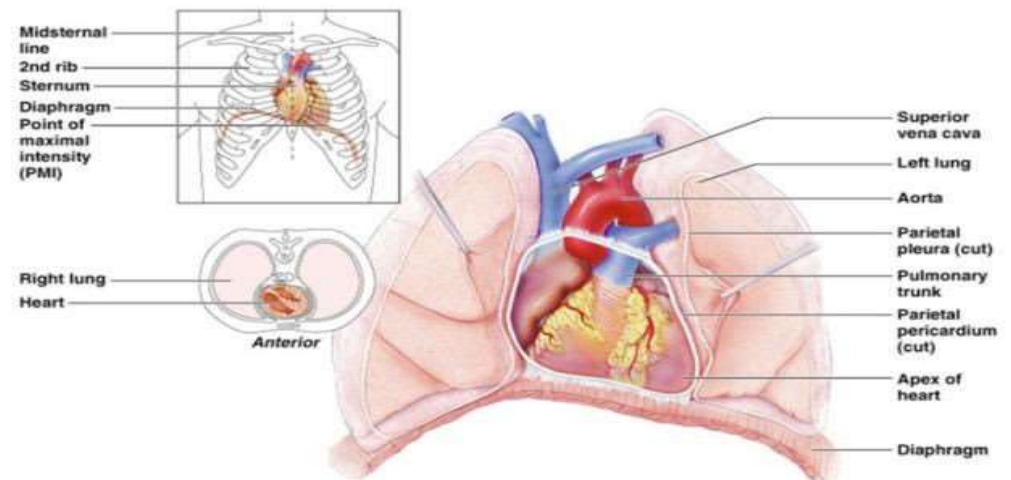
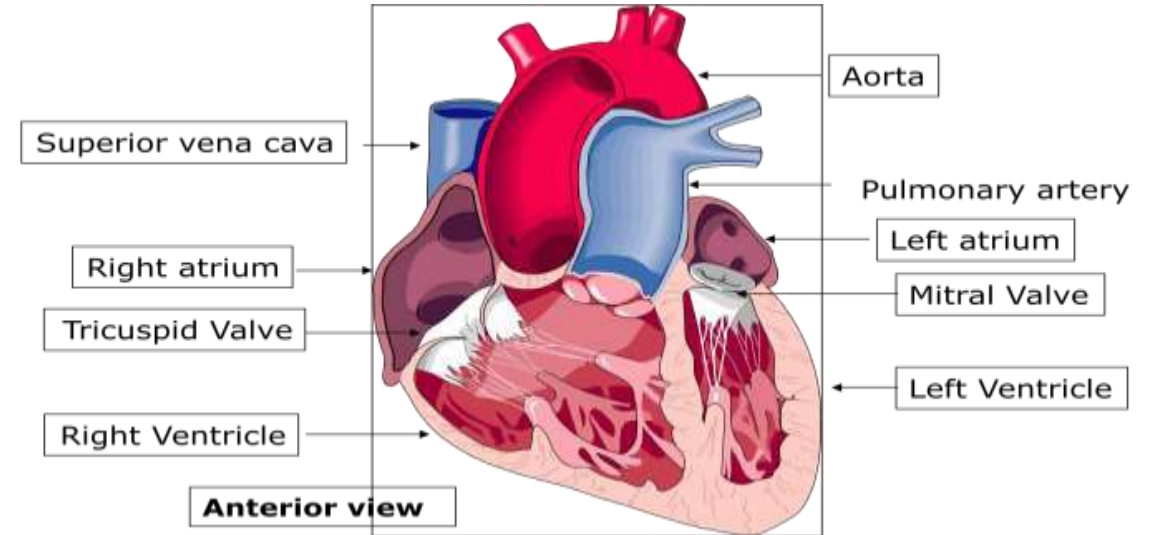
- **Heart:** Four chambers (Right & Left atria/atrium and ventricles)
- **Atrium (right and left):**
 - The right atrium receives oxygen-poor blood from the body and pumps it to the right ventricle.
 - The left atrium receives oxygen-rich blood from the lungs and pumps it to the left ventricle.
- **Ventricles:**
 - The right ventricle pumps the oxygen-poor blood to the lungs.
 - The left ventricle pumps the oxygen-rich blood to the body.

Blood Vessels

- **Arteries:** Carry blood away from the heart to the major organs of the body (Heart to Body)
- **Veins:** Carry blood toward the heart away from the major organs of the body (Body to Heart)
- **Capillaries:** Small blood vessels where gas exchange occurs
- **Valves**
- **Atrioventricular valves**
 - Tricuspid valve,
 - Mitral valve,
- **Semilunar valves**
 - Pulmonic valve,
 - Aortic valve

Heart

- **Vital muscular organ of the circulatory system about the size of a fist**
- **Functions:** Continuous circulation of blood through the body.
- **Heart beats: 70 – 73 times/minute**



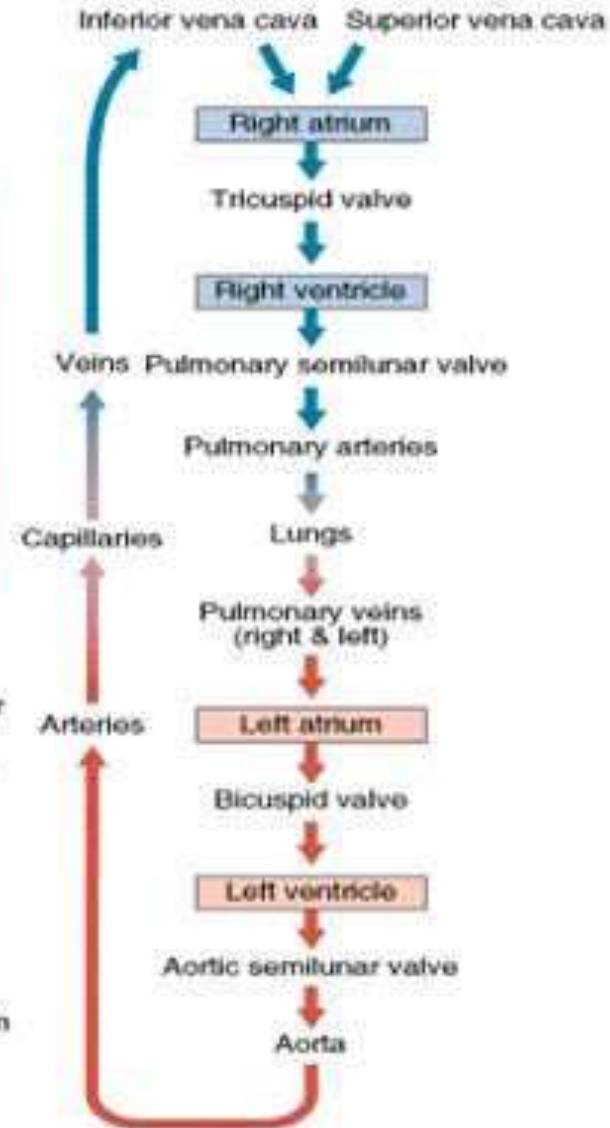
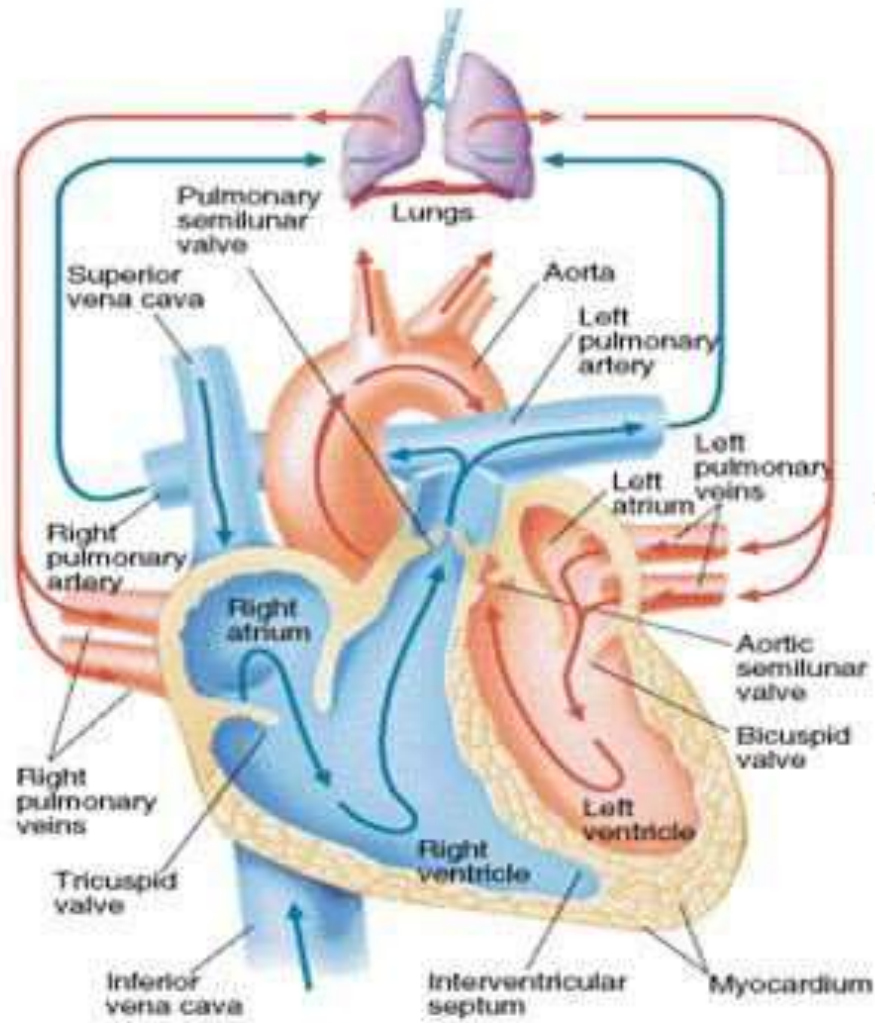
Covering of the Heart

- **Pericardium**
 - A double-walled sac around the heart
 - Protects and anchors the heart
 - Prevents overfilling of the heart with blood
 - Allows the heart to work in a relatively friction-free environment
- **Epicardium:** Visceral pericardium
- **Myocardium:** Cardiac muscle layer forming the bulk of the heart
- **Endocardium:** Endothelial layer of the inner myocardial surface
- Left ventricle has thicker myocardium due to greater work load

Major Vessels of the Heart

- **Superior and inferior vena cava:** Opens into the right atrium and returns deoxygenated blood from body cells.
- **Coronary sinus:** Opens into the right atrium and returns deoxygenated blood from heart muscle (coronary veins).
- **Right and left pulmonary veins:** Opens into the left atrium and returns oxygenated blood from the lungs.

Blood Circulation



Video links:

<https://www.youtube.com/watch?v=UMTDmP81mG4>

<https://www.youtube.com/watch?v=28CYhgjrBLA>

<https://www.youtube.com/watch?v=e37rJqP6-aM>

<https://www.youtube.com/watch?v=ruM4Xhx32U>

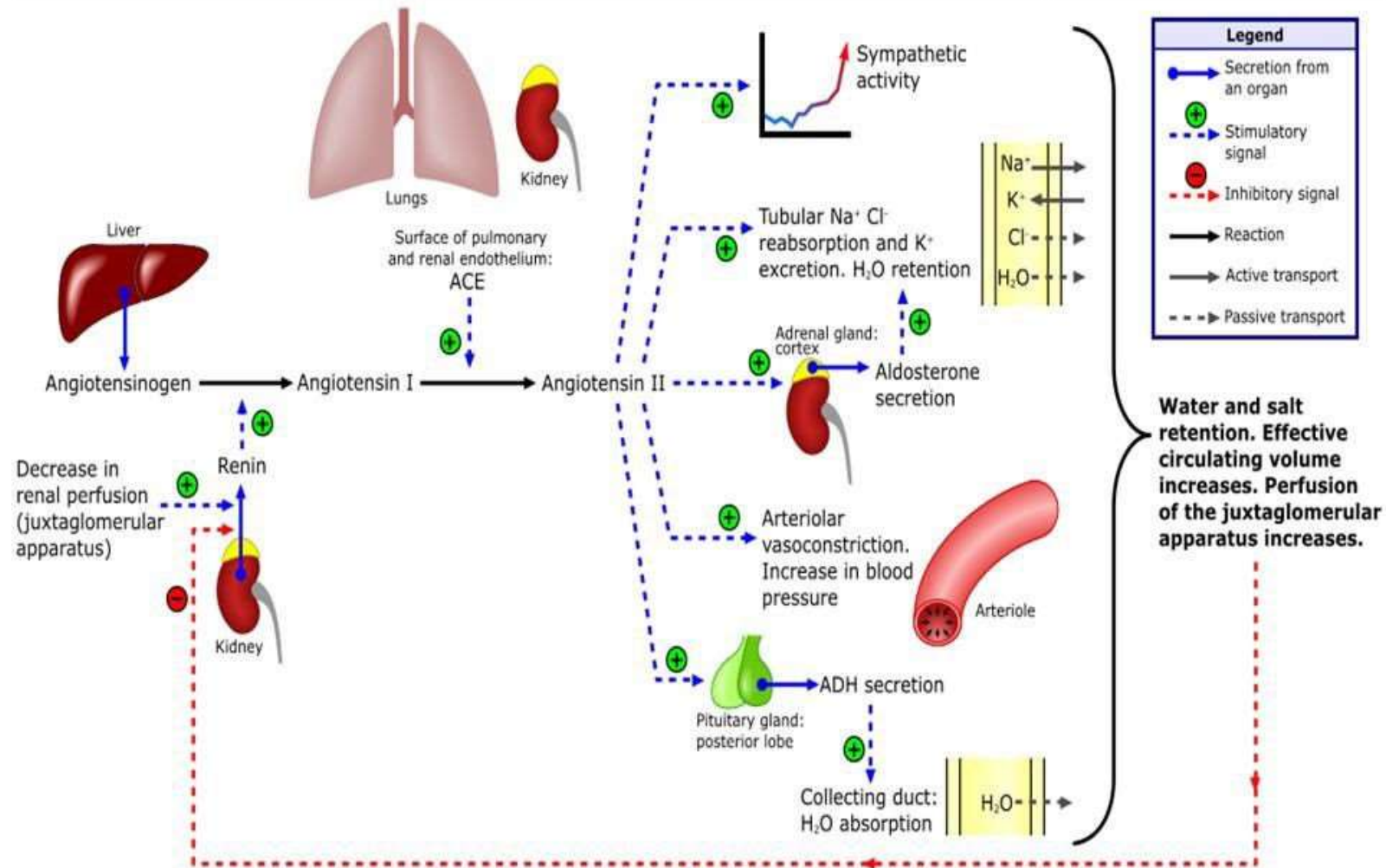
<https://www.youtube.com/watch?v=A8CyN4sVsGg>

Renin-Angiotensin-Aldosterone System (RAAS)

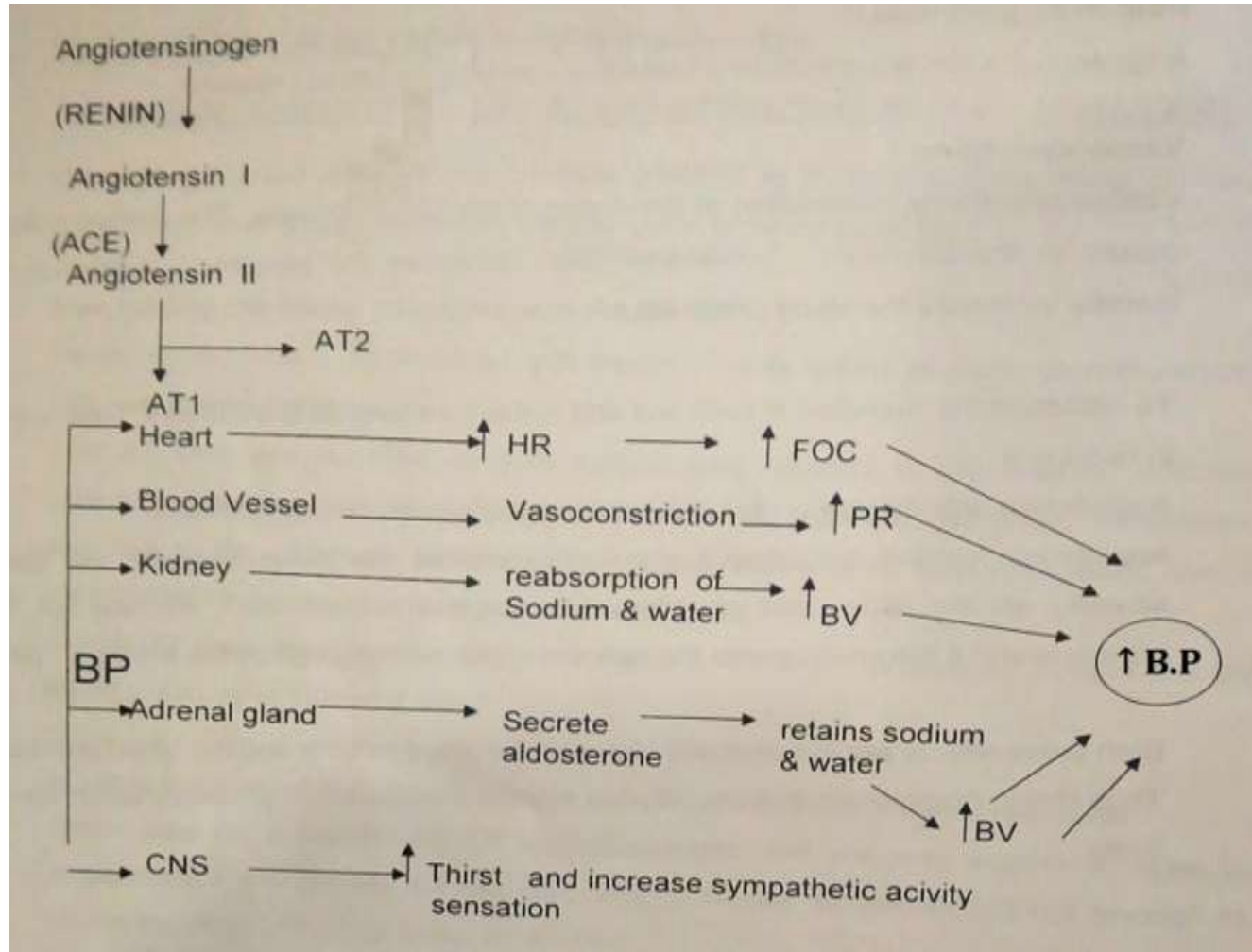
- Renin is a proteolytic enzyme and is also called angiotensinogenase
- **It is secreted in response to:**
 - Decrease in arterial blood pressure
 - Decrease Na^+ in macula densa cells
 - Increased sympathetic nervous activity
- **Angiotensin Receptor Blockers (ARBs):**
 - Also known as Angiotensin II Receptor Antagonists (AT₂ Receptor Antagonists), or Sartans
 - Modulate the RAAS

Renin-Angiotensin-Aldosterone System (RAAS)

Renin-angiotensin-aldosterone system



Renin-Angiotensin-Aldosterone System (RAAS)



Video links:

<https://www.youtube.com/watch?v=6EUSEa6Lw8g>

<https://www.youtube.com/watch?v=bY6IWWvFCrQ>

<https://www.youtube.com/watch?v=PDE2qdS2ZvY>

<https://www.youtube.com/watch?v=fqOfOvwIz-g>

<https://www.youtube.com/watch?v=6zIwZUpglrA>

Cardiovascular Diseases (CVDs)

- **CVDs:** General terms for conditions affecting the heart or blood vessels.
- Usually associated with a build-up of fatty deposits inside the arteries (**atherosclerosis**) and an increased risk of **blood clots**.
- **Types of CVDs:** Basically, there are four types of CVD.
 - Coronary heart disease
 - Stroke or Transient ischemic attack (TIA)
 - Peripheral arterial disease
 - Aortic disease

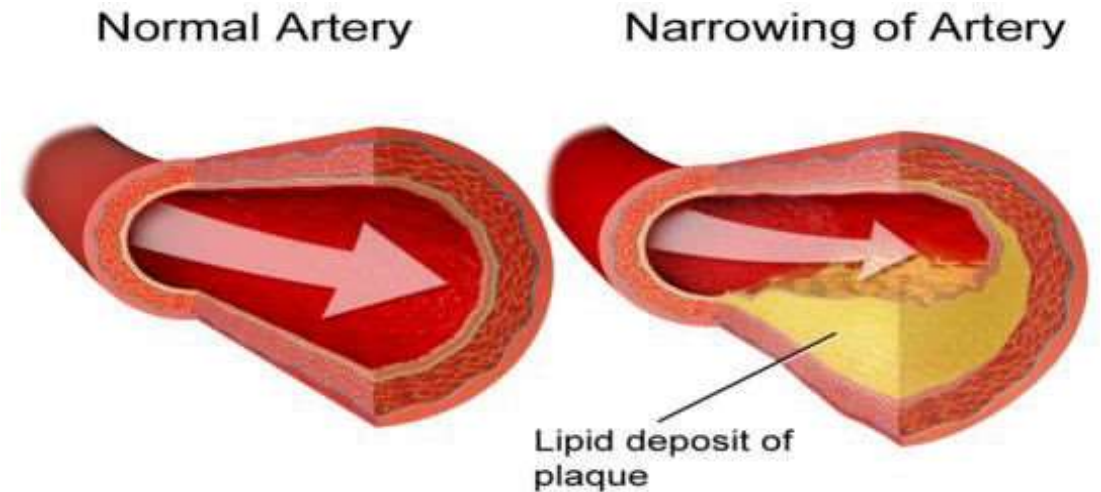
Cardiovascular Diseases (CVDs)

- **Atherosclerosis**

- Major cause of CVDs.
- Thickening, stiffening, and hardening of the arteries due to the accumulation of plaques around the artery wall.

- **Plaque**

- Comprises fat, cholesterol, calcium, and other substances found in the blood.
- Arteries become hardened and narrow over time.
- Leading to disrupt the blood flow around the body, posing the risk of serious complications.



Coronary Artery Diseases (CADs)

- **CADs**
- Most common forms of heart disease and the leading cause of heart attacks. i.e.
 - **Atherosclerosis:** Fatty deposits and hardening of the arteries
 - **Myocardial infarction:** Blocked coronary artery, Heart Attack
 - **Angina pectoris:** Chest pain
 - **Silent ischemia:** No pain or warning
 - **Cardiac arrest:** Sudden stoppage of the heart.
 - **Arrhythmia:** Irregular rate or rhythm of the heartbeat.
 - **Fibrillation:** An irregular heartbeat that may occur in either atria or ventricles

Coronary Artery Diseases (CADs)

- **Angina pectoris**

- Chest pain caused by an inadequate oxygen supply to the heart muscles.
- It is often described as squeezing, pressure, heaviness, tightness, or chest pain.

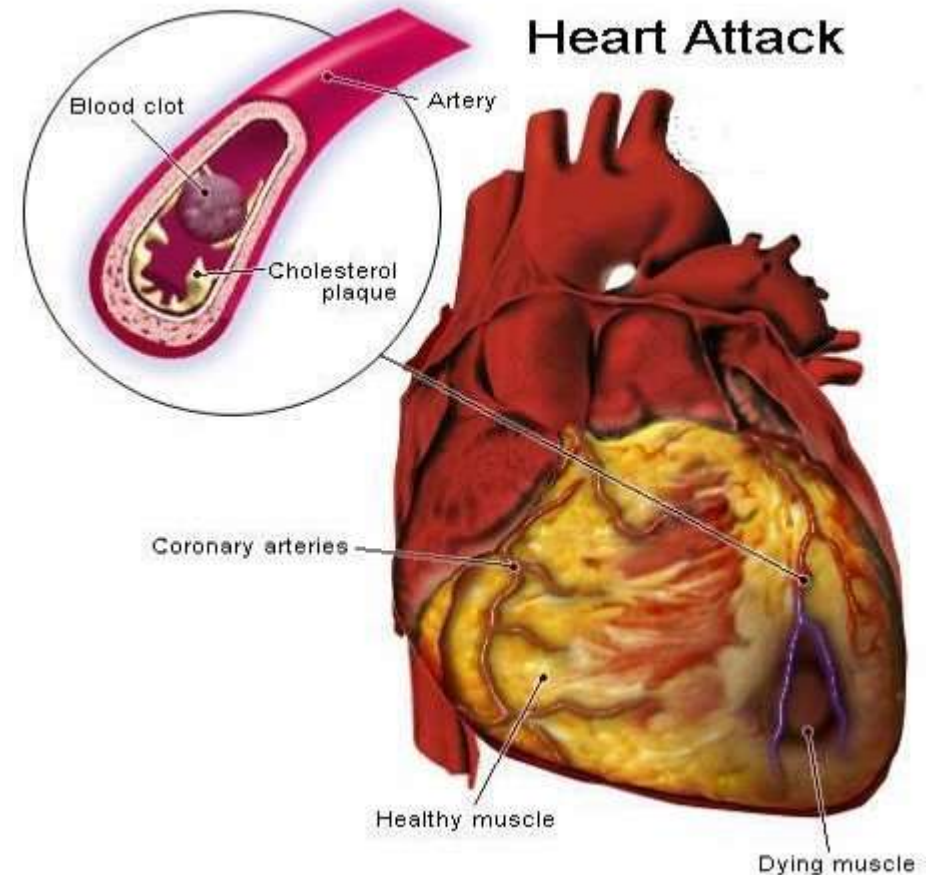
Video link: https://www.youtube.com/watch?v=HarI09KXE_U

Coronary Artery Diseases (CADs)

- **Myocardial infarction (MI), acute myocardial infarction (AMI), or Heart attack**

- Occurs when blood flow decreases or stops in a part of the heart, causing damage to the heart muscle.
- The usual cause of sudden blockage in a coronary artery is the formation of a blood clot (thrombus).
- Symptoms include chest pain or discomfort which may travel into the shoulder, arm, back, neck, or jaw.

(Video link:
<https://www.youtube.com/watch?v=mLmKq5bQOg0>)



Coronary Artery Diseases (CADs)

- **Arrhythmia**

- An abnormal heart rhythm – the heart is beating too fast, too slow, or with an irregular pattern.

Video link: <https://www.youtube.com/watch?v=2U-Zse5a-8>

- **Heart failure**

- Also known as congestive heart failure (CHF)
- The heart can't pump enough blood to the body's organs and tissues

Video link: <https://www.youtube.com/watch?v=b3OHSA7Tz7U>

<https://www.youtube.com/watch?v=GnpLm9fzYxU>

Coronary Artery Diseases (CADs)

- **Cardiac arrest**

- Sudden stoppage of heart.

Video links:

<https://www.youtube.com/watch?v=2fD1OqXBNdo>

<https://www.youtube.com/watch?v=m6fvVLAJbE4>

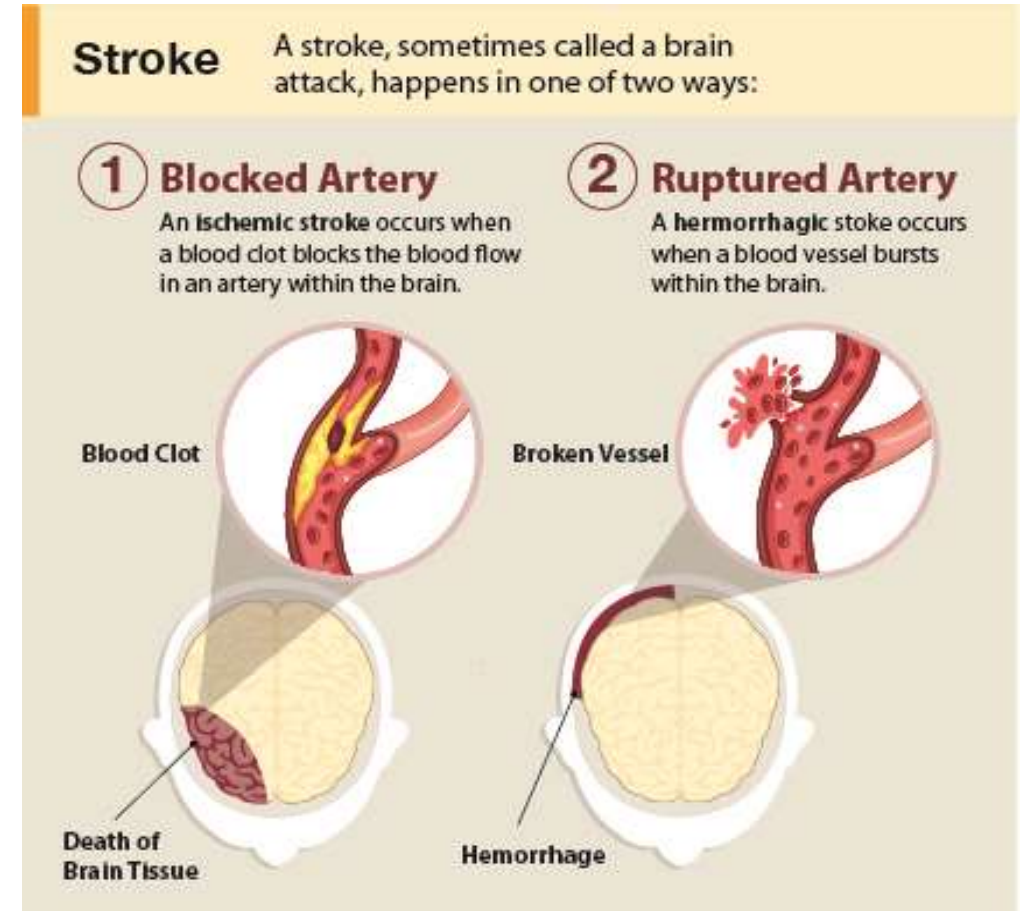
Coronary Artery Diseases (CADs)

- **Stroke**

- Also known as brain attack
- Occurs when blood flow to the brain is interrupted (**ischemic stroke**) or when blood vessels in the brain rupture (**hemorrhagic stroke**).

Video link:

<https://www.youtube.com/watch?v=EY98RlnP-A4>



Lipid-lowering

- **Lipids (Fats)** are easily stored in the body and serve as a source of energy. It is hydrophobic (insoluble in water).
- **Functions of lipids:**
 - Stores energy,
 - Acts as structural components of cell membranes
 - Precursors of vitamins and hormones
 - Precursors of bile acids that help in lipid absorption during digestion

Lipid-lowering

- **Three types of lipids found in foods and in the body:**
 - Triglycerides (fats), phospholipids, and sterols (cholesterol)
 - The basic unit of triglycerides and phospholipids is fatty acid

- **Cholesterol**
 - Waxy substance – technically a sterol (unsaturated fatty acid or sterol alcohol).
 - 75% of cholesterol is made in the liver; the rest is absorbed from food.
 - Cholesterol travels in particles called lipoproteins.

Video links:

<https://www.youtube.com/watch?v=5BBYBRWzsLA>

Lipid-lowering

- **Lipoproteins**

- Cholesterol and its esters, triglycerides, and phospholipids are all transported in plasma as lipoprotein particles. Fatty acids are transported bound to albumin.

- **Function:** Transport of fat-soluble substances

- **Types**

- Chylomicron
- VLDL (Very Low-Density Lipoproteins)
- LDL (Low-Density Lipoproteins)
- HDL (High Density Lipoproteins)

Video links:

<https://www.youtube.com/watch?v=9dgthf7Z7fw>

<https://www.youtube.com/watch?v=0U7YHRW5dyc&t=18s>

Lipid-lowering

Normal Lipid Profile	
Total cholesterol (TC)	≤ 200 mg/dl
HDL	≥ 60 mg/dl
LDL	≤ 100 mg/dl
Triglyceride	≤ 150 mg/dl

Types of Lipoproteins

HDL

- ▶ HDL means High Density Lipoprotein
- ▶ HDL considered the 'good' cholesterol
- ▶ Contains a higher level of protein than cholesterol
- ▶ HDLs transport cholesterol from the tissues of the body to the liver, so the cholesterol can be eliminated in the bile.
- ▶ The higher the HDL cholesterol level, the lower the risk of coronary artery disease.

LDL

- ▶ LDL means Low Density Lipoprotein
- ▶ LDL considered the 'bad' cholesterol
- ▶ Contains a higher level of cholesterol than protein
- ▶ LDLs tend to stick to damaged or inflamed areas of blood vessel walls and form plaque buildup
- ▶ The higher the LDL cholesterol level, the higher the risk of coronary artery disease.

Diseases Related to Cholesterol

- **Hypercholesterolemia:** The concentration of cholesterol is too high in the blood.
- **Dyslipidemia:** Abnormally elevated blood cholesterol or fats (lipids).
- **Hyperlipidemia:** Abnormally elevated levels of any or all lipids and/or lipoproteins in the blood. It is the most common form of dyslipidemia.
- **Mixed dyslipidemia:** Elevated LDL cholesterol and triglyceride (TG) levels are often accompanied by low HDL cholesterol levels.
- **Hypertriglyceridemia:** A high level of a certain type of fat (triglycerides) in the blood.

Cholesterol Synthesis Pathway or Mevalonate Pathway

- **HMG-CoA reductase (3-hydroxy-3-methyl-glutaryl-coenzyme a reductase, HMGCR):** Rate-controlling enzyme of the mevalonate pathway, the metabolic pathway that produces cholesterol and other isoprenoids.



Video link:

<https://www.youtube.com/watch?v=3utYm3ouzaU>

Statins

- **They inhibit an enzyme called HMG-CoA reductase, which controls cholesterol production in the liver.**
- The medicines act to replace the liver's HMG-CoA, thereby slowing the cholesterol production process.
- **Examples include:**
 - Atorvastatin
 - Simvastatin
 - Rosuvastatin
 - Fluvastatin
 - Lovastatin
 - Pravastatin
 - Pitavastatin

Video links:

<https://www.youtube.com/watch?v=2l8eyyZhXUM>

<https://www.youtube.com/watch?v=uEUvmLMSz4w>

https://www.youtube.com/watch?v=GGujNNt_q9Q

Thank you!
Any Questions?