



Atherosclerosis

Cause, Symptoms, Diagnosis, Treatments and Prevention

Solution has collected information from various sources, there reference are cited at appropriate place.

Solution's Objective- our objective and motive is very clear, we are willing to share all information with pharmacy/ medical professionals, specially with students. Support solution by sharing the knowledge

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ATHEROSCLEROSIS

Types, Cause, Symptoms, Diagnosis, Treatments and Prevention

S.N.	TOPIC TO BE DISCUSS	OBJECTIVE OF THE TOPIC
1	Introduction about Atherosclerosis	We will be able to know what Atherosclerosis is
2	Symptoms of Atherosclerosis	How would you know that you are having Atherosclerosis
3	Causes and Risk Factors of Atherosclerosis	Know the cause so that you may get prevented
4	How to Diagnosis Atherosclerosis	Let confirm that really you have Atherosclerosis
5	Prevention and treatment of Atherosclerosis	Which medicine your doctor may prescribe
6	Mechanism of Action of other related drugs	They don't treat atherosclerosis but they reduce the complication associated or generated by atherosclerosis

ATHEROSCLEROSIS

Lets start knowing the basic introduction about Atherosclerosis

Have you ever seen your sink pipe get choked with food materials or any other contamination ? What happen then after and how do you solve that silly problem ? You usually remove that choked plaque or food materials and flow of water restored. The same is applicable in case of Atherosclerosis. **Atherosclerosis is a condition when the arteries become narrowed and hardened due to a buildup of plaque (fatty material) around the artery wall.** Plaque is basically made of made up of fat, cholesterol, calcium, and other cellular waste product and substances found in the blood.

Arteries are blood vessels are same pipe like structure which carry vital nutrients for our body including **water- oxygen, vitamins and many other** . If Plaques causing agents continues to buildup they will accumulate and start forming hardness inside the blood vessels and then blood vessels will be narrow. This limits the flow of oxygen-rich blood to our organs and other parts of body. **Atherosclerosis is not a common problem, it may lead to serious problems, including heart attacks, stroke, and peripheral vascular disease or even death . Atherosclerosis is now become he most common cause of human morbidity and death in the modern world**

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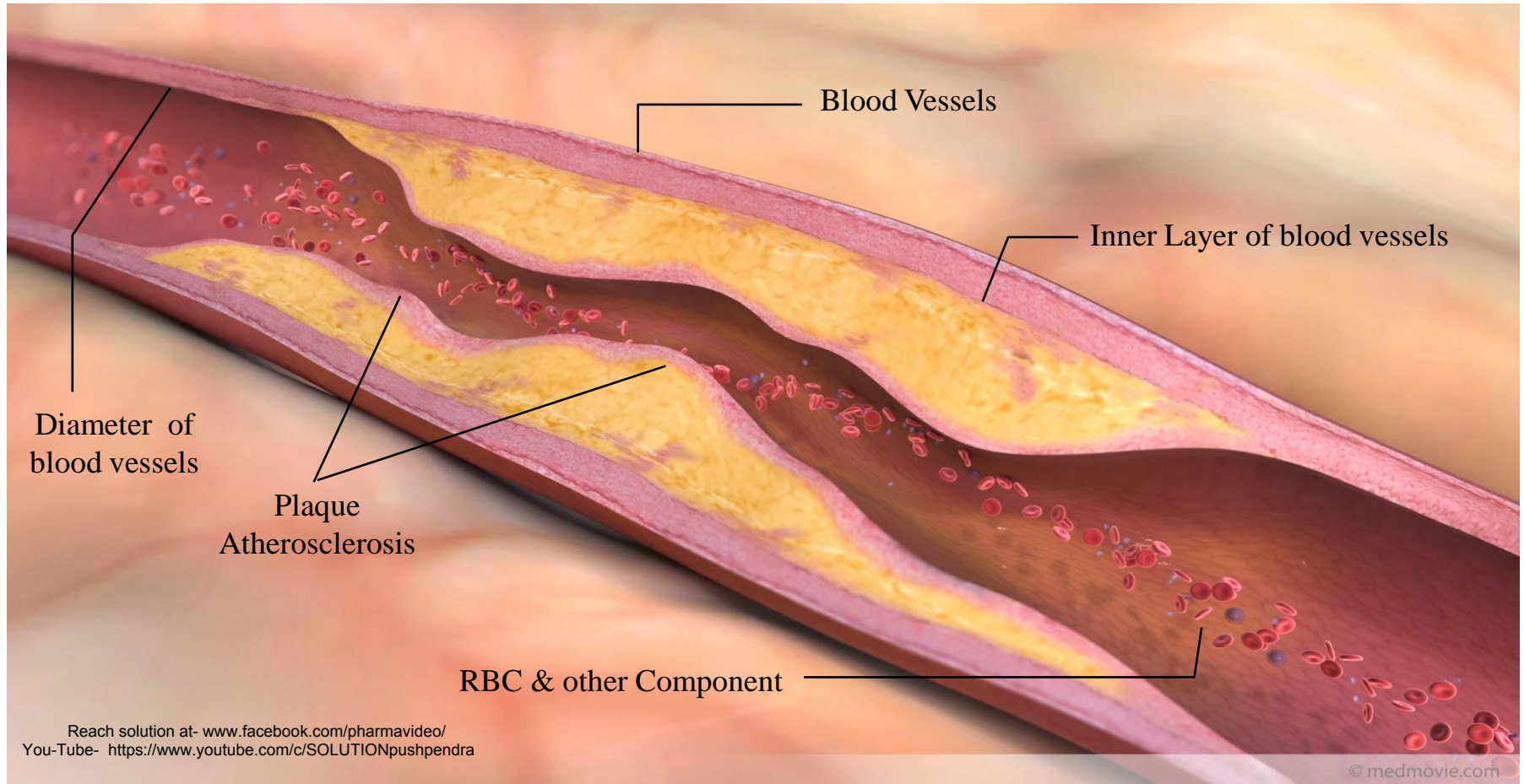


Image Credit- <https://i.ytimg.com/vi/zfAqC1oPbkw/maxresdefault.jpg> Nomenclature in this image is made by Solution

ATHEROSCLEROSIS

Atherosclerosis usually doesn't cause signs and symptoms until it severely blocks an artery.

Arteries Affected	Disease/Disorder Linked to Atherosclerosis	Sign and Symptoms to the Disease/Disorder Linked to Atherosclerosis
Coronary Arteries	Coronary heart disease/ Myocardial Infarction	Angina (chest pain and pressure) and Heart attack. Vomiting, extreme anxiety, chest pain, coughing, feeling faint
Carotid Arteries	Carotid artery disease	Sudden numbness or weakness in arms, leg or face, difficulty breathing speaking or slurred speech, headache, Trouble seeing in one or both eyes, Paralysis. These signal may progress to a stroke.
Peripheral Arteries	Peripheral artery disease	Numbness, pain, and, sometimes, dangerous infections. leg pain when walking
Renal Arteries	Chronic kidney disease	High blood pressure or kidney failure, tiredness, changes in urinate, loss of appetite, nausea swelling of the hands and feet, itchiness or numbness, and trouble concentrating.
Intestinal arteries	Mesenteric Ischemia	Abdominal pain and tenderness, bloating or a sense of fullness, diarrhea nausea, vomiting, fever, blood in the stool

ATHEROSCLEROSIS

Atherosclerosis usually doesn't cause signs and symptoms until it severely blocks an artery.

1. Chest pain or specific pain just like angina (May be stable or unstable)
2. Pain in leg side, arm, or in any other part of the body where there is possibilities of a blocked artery
3. Shortness of breath or restlessness
4. Fatigue and uncomforted
5. Confusion, which occurs if the blockage affects circulation to your brain
6. Muscle weakness in your legs because the supply of oxygenated blood got reduced

It's also important to know the symptoms of heart attack and stroke. Both of these problems can be caused by atherosclerosis and require immediate medical attention.

1. Chest pain or discomfort specially in the left side
2. Pain in the shoulders, back, neck, arms, and jaw, which generally occurs suddenly and disappear
3. Abdominal pain or cramp like feeling
4. Shortness of breath, difficulty in inhaling and exhaling
5. Perspiration which is unusual
6. Lightheadedness which may increase
7. Nausea or vomiting

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Lets know the Causes which may cause Atherosclerosis

Atherosclerosis is a slow, progressive disease that may begin as early as childhood. The major risk factors of arteries are:

Causes/ Risk Factor	Description
High triglycerides and cholesterol	High LDL cholesterol and triglycerides and low HDL in the blood is one of the main cause for the generation of plaque in blood vessels. HDL = Good and LDL = Bad cholesterol
High blood pressure	Higher blood pressures applies a pressure to the blood vessels and this causes which can injure the inner lining of vessels called endothelium, Injured endothelium, may further allows the LDL cholesterol and WBC to enter the lining of the artery, and result into forming the plaque of atherosclerosis.
Smoking and other tobacco intake	Smoking can damage and may make blood vessels hard , it may also increase cholesterol level along with and raise in blood pressure and this elevated BP may do the same as earlier
Diabetes	Person who is suffering from diabetes are more likely to develop Atherosclerosis.
Lack of physical activity	A lack of physical activity is the basic cause of today's Atherosclerosis, this can trigger and initiate the other risk factors like bad cholesterol level, BP, Insulin resistance, obesity etc.

ATHEROSCLEROSIS

Lets know the Causes which may cause Atherosclerosis

Causes/ Risk Factor	Description
Unhealthy diet	Foods that are high in saturated and trans fats, cholesterol, sodium (salt), and sugar can worsen other atherosclerosis risk factors.
Age (Mainly Over age)	Risk for atherosclerosis increases with increase in age . When age increase with respective to time enough plaque has built up to cause signs or symptoms. In men, the risk increases after age 45. In women, the risk increases after age 55.
Pollution (Air mainly)	Although it is not very clear from many literature but the out come we found says- Exposure to air pollution appears to increase the risk of cholesterol build-up in the coronary arteries.
Genetics Related Issue	If anyone in your family is associated with the problem of atherosclerosis and cardiovascular disease than you might have a much higher risk of developing atherosclerosis than others.

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Atherosclerosis



Disease is more prevalent in men than women

Complications



Stroke



Heart attack



Gangrene

Risk



Diabetes



Smoking



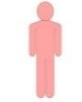
Vitamin B6 deficiency



Age



Obesity



Male sex



Genetic abnormalities



Sedentary lifestyle



Unhealthy food



Hypertension



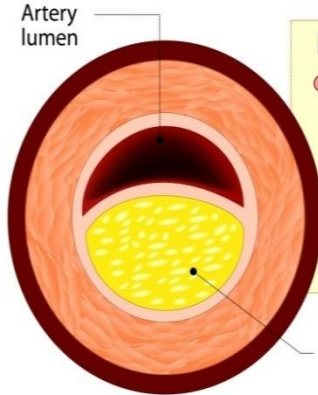
White blood cells



Postmenopausal estrogen deficiency



Chlamydia pneumoniae



Artery lumen

Prevention & Treatment



Exercise



Weight loss



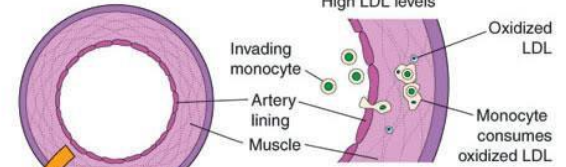
Diet



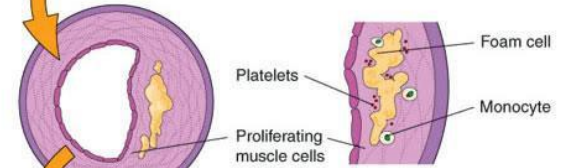
Fat

Cholesterol

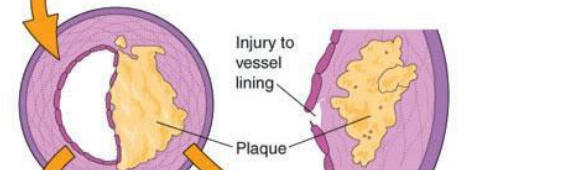
A. Normal artery



B. Fatty streak



C. Partially occluded vessel



D. Totally occluded vessel

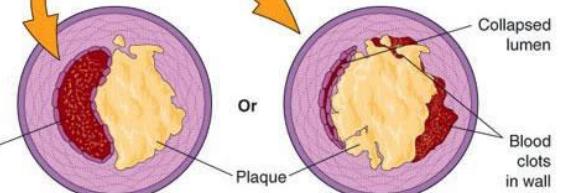
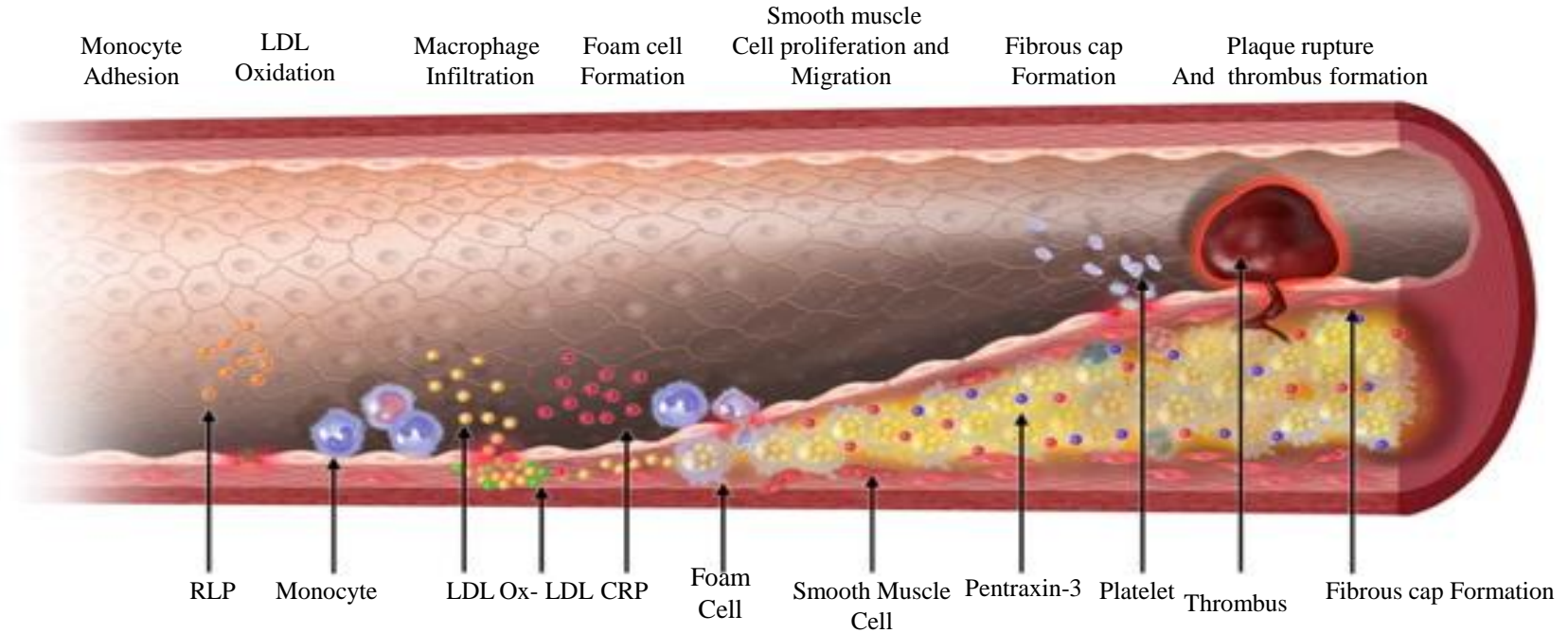


Image Credit- <http://medhealthservices.com/wp-content/uploads/2016/10/Atherosclerosis.jpg> and

<http://www.jacobspublishers.com/index.php/component/content/article/108-journal-of-allergy-and-immunology/1864-articles-in-press-cell-8-full-text>



EPA reported to exert beneficial effect at multiple steps in the atherogenic pathway

Image Credit- <https://www.sciencedirect.com/science/article/pii/S1537189116303147>

(Image quality is improved by solution)

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How will you diagnose Atherosclerosis

Test	Description
Blood tests	If there are high levels of fat and sugar, it could indicate an increased risk of atherosclerosis.
Physical exam	This test is very easy to get an idea about atherosclerosis. The whooshing sound generally occurs when there is uneven blood flow and that may be due to obstruction by atheroma. There may also be a very weak pulse below the area of the artery that has narrowed.
Ultrasound	An ultrasound scanner can check blood pressure at distinct parts of the body. Changes in pressure indicate where arteries may have an obstructed blood flow.
CT scan or magnetic resonance angiography (MRA)	This can be used to find arteries that are hardened and narrowed. Those who are at risk of developing atherosclerosis will likely be told by their doctor to change their lifestyle and maintain a healthy weight. In some cases, treatment may include medication or surgery.

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ATHEROSCLEROSIS

How will you diagnose Atherosclerosis

Test	Description
Ankle-brachial index	The blood pressure in your ankles is compared with your arm. If there is an unusual difference, it can point to peripheral artery disease.
Stress test	Doctors can monitor your heart and breathing while you engage in physical activity, like riding on a stationary bike or briskly walking on a treadmill. Since exercise makes your heart work harder, it can help doctors discover a problem

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Prevention and Treatment of Atherosclerosis

- 1. Diet:** Eating unhealthy and high in unsaturated fats is now become one of the most dangerous cause of atherosclerosis. This habit increase the volume of bad cholesterol and simultaneously decrease the good cholesterol (HDL) **Consuming - olive oil, avocados, walnuts, oily fish, nuts, seeds may decrease the risk of atheroma formation.** Taking foods high in soluble fiber and limiting intake of saturated fats, sodium, and alcohol and also stop smoking may be beneficial for good health.
- 2. Exercise:** Physical activity helps to lose weight, maintain a normal blood pressure, and boosts your “good cholesterol” (HDL) levels.
- 3. Not smoking:** Smoking is one of the major risk factors for atherosclerosis, and it also raises blood pressure. Smokers should quit as soon as possible and arrange a meeting with their doctor about ways to give up and manage withdrawal symptoms.
- 4. Meditation-** Although meditation is not a treatment but it works well in prevention of atherosclerosis as it increase the vibrational and positive energy.
- 5. Healthy mind-** stress free mind help in preventing atherosclerosis, because stress may be one of those reason which trigger the formation of atherosclerosis.

ATHEROSCLEROSIS

Prevention and Treatment of Atherosclerosis

Medications can help prevent atherosclerosis from worsening. Medications include:

1. Cholesterol-lowering medications, including – HMG Co enzyme inhibitor Statins and fabric acid derivatives
 2. Antiplatelet drugs and anticoagulants, such as aspirin, to prevent blood from clotting and clogging your arteries
 3. Beta blockers or calcium channel blockers to lower your blood pressure
 4. Diuretics, or water pills, to help lower your blood pressure
 5. Angiotensin converting enzyme (ACE) inhibitors, which help prevent narrowing of your arteries
-
1. Bypass surgery, which involves using a vessel from somewhere else in your body or a synthetic tube to divert blood around your blocked or narrowed artery
 2. Thrombolytic therapy, which involves dissolving a blood clot by injecting a drug into your affected artery
 3. Angioplasty, which involves using a thin, flexible tube called a catheter and a balloon to expand your artery, sometimes inserting a stent to leave the artery open
 4. Endarterectomy, which involves surgically removing fatty deposits from your artery
 5. Atherectomy, which involves removing plaque from your arteries by using a catheter with a sharp blade at end



Mechanism of Action

of some drugs which indirectly relief atherosclerosis induced complication *

* They don't treat atherosclerosis but they reduce the complication associated or generated by atherosclerosis

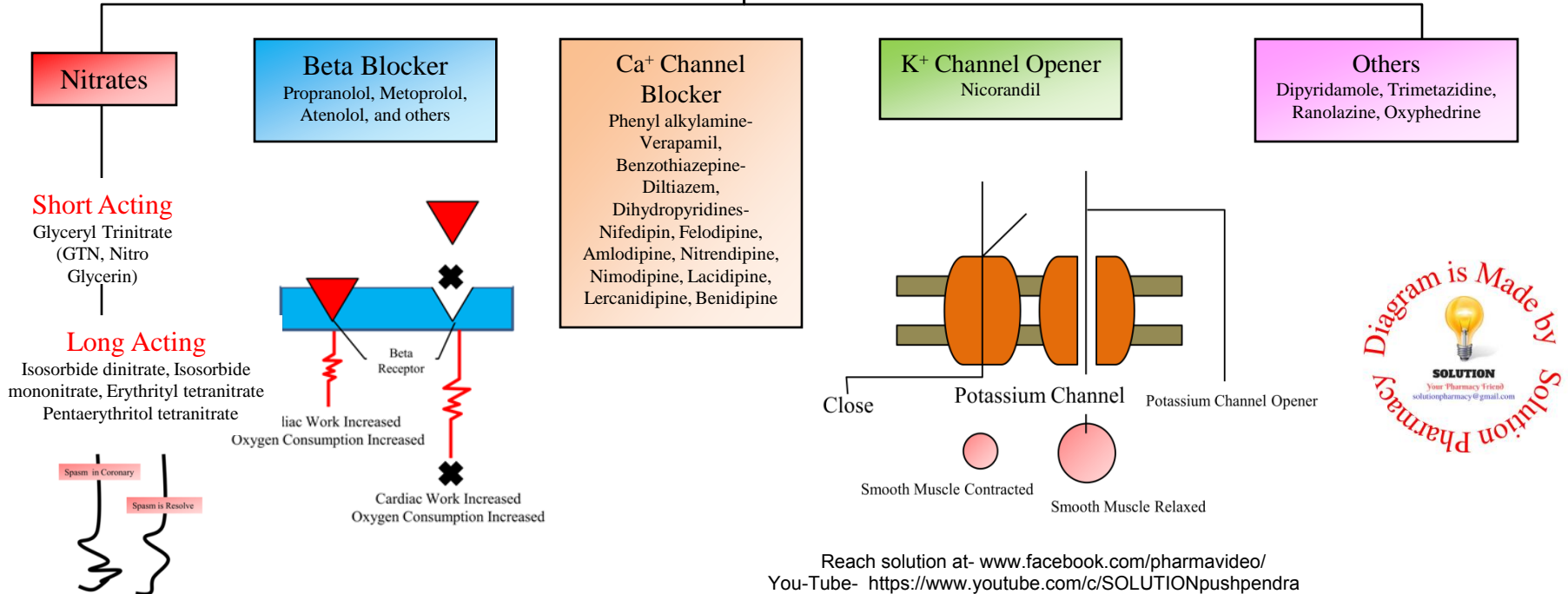
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Antianginal Drugs

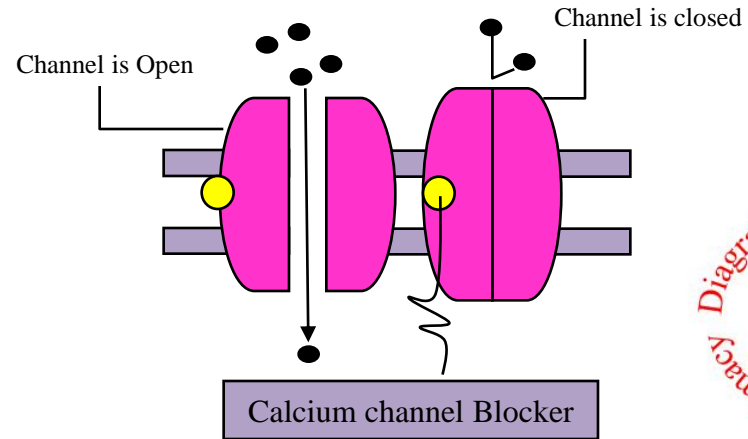
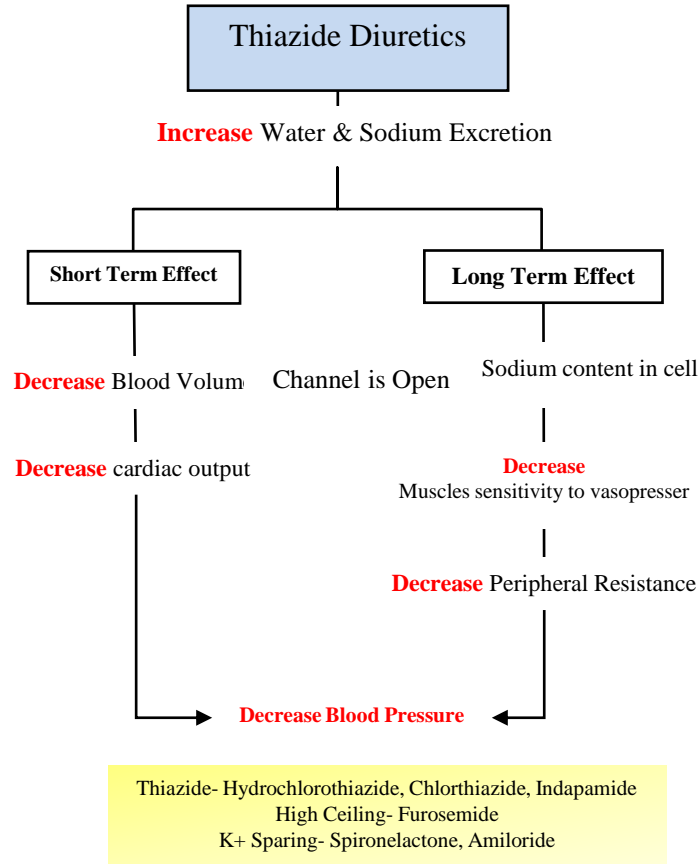
Classification & Mechanism of Action

Based on KD Tripathi

Angina is a chest pain or we can say that it is a signal informing us that there is lack of oxygen supply to myocardium. This is generally occurring at the left side of the chest. It has 02 main types- (1) **Classical Angina (Common form)** - Those type of angina which may arise due to over work like- exercise, emotion etc. (2) **Variant or Prinzmetal's Angina (uncommon form)** - Attack occurs at rest or during sleep and doesn't disappear after rest.



Antihypertensive Drugs Mechanism of Action



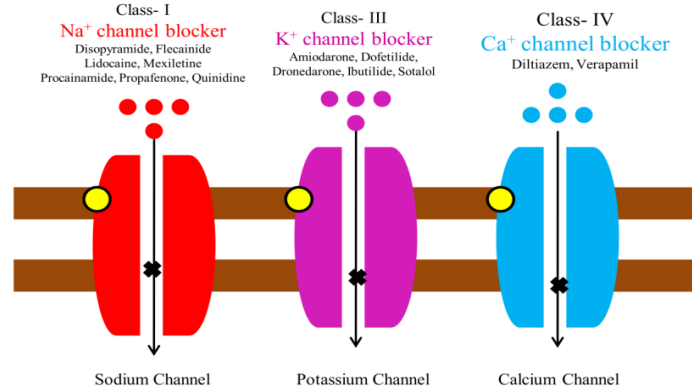
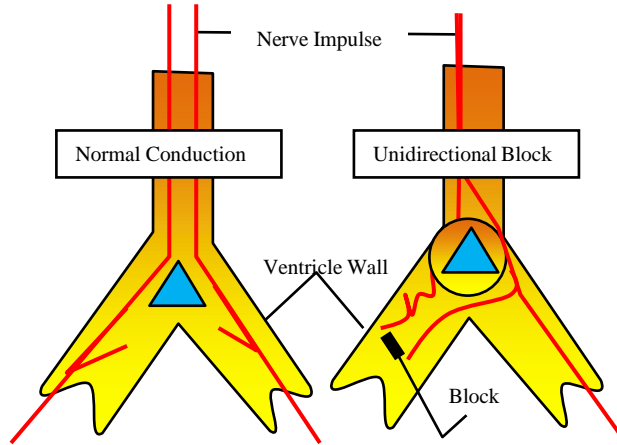
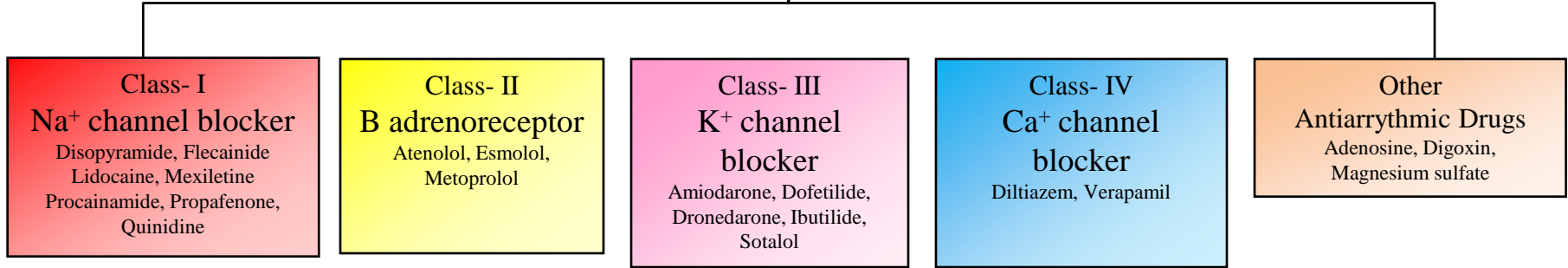
Verapamil, Diltiazem, Nifedipin, Felodipine,
Amlodipine, Lacidipine



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Antiarryhythmics Drugs

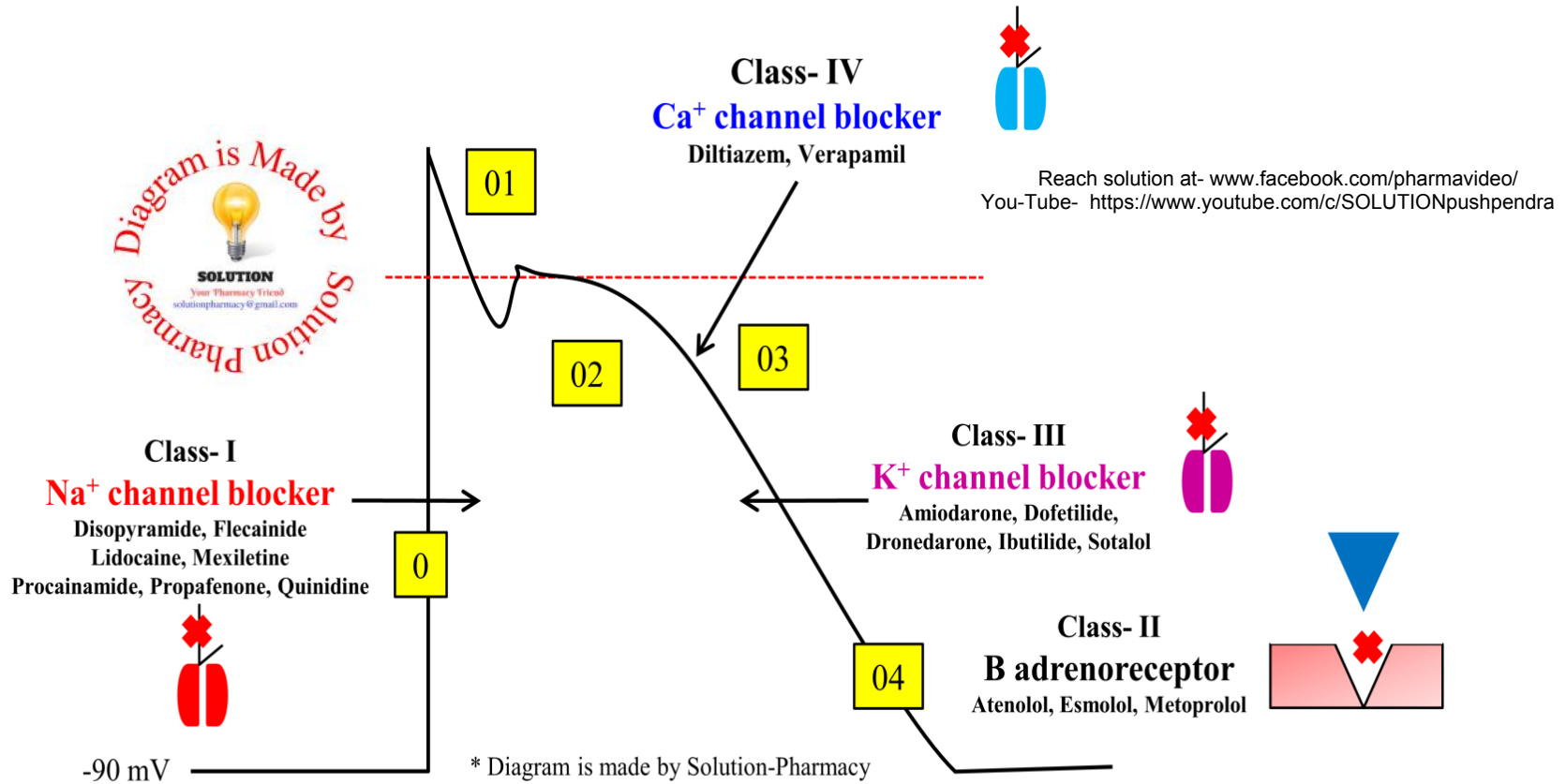
Classification and Mechanism of Action



* Diagram is for representation purpose and not complete mechanism of action

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Graph/Image- Site of action of Antiarrhythmic drugs

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