

Young Scientist Program Anatomy Teaching Team



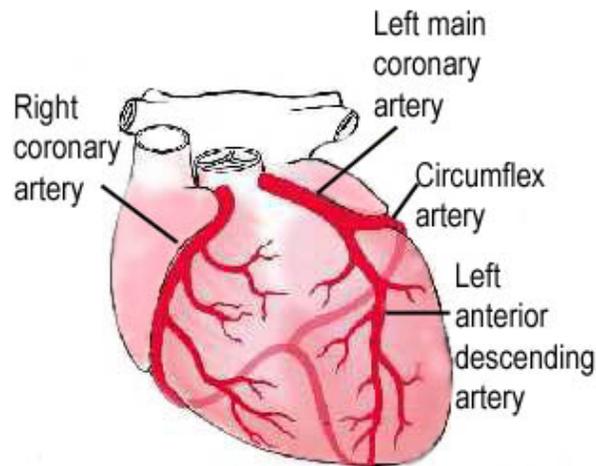
“Feeding the Heart: Coronary Arteries and Heart Attacks”

Lesson Goals:

1. Understand how the heart muscle receives its own supply of oxygen and nutrients of the blood.
2. Be able to name the system of blood vessels and its two major branches that supply the heart with oxygenated blood.
3. Know some risk factors in the formation of atherosclerotic plaques.
4. Understand what causes a heart attack and what can be done to fix it.

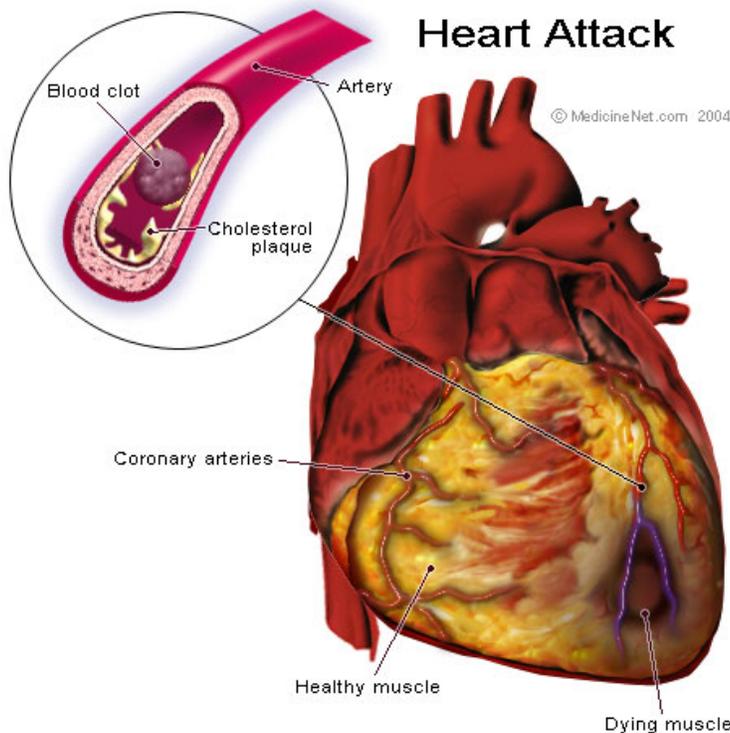
Just like any other tissue in the human body the heart needs both nutrients and oxygen in order to keep its cells alive and well. Being that the heart is mainly a big tough muscle, it needs a lot of nutrients and oxygen in order to continue to work all day and all night. Surprisingly, the heart does not get its nutrients from the blood inside its chambers (aside from a very small layer of muscle on the inside of the heart which can be supplied this way). The heart actually has its own circulation, or system of blood vessels, called the **coronary arteries** that bring important sources of energy to the heart muscle (myocardium). These arteries branch off of the aorta just past the aortic valve at the top of the heart and encircle around all sides of the heart in order to deliver oxygenated blood to the heart muscle. In general, there are a few main coronary arteries that circle the heart. First, the **right coronary artery** runs on the outside surface of the heart in between the right atrium and the right ventricle. It feeds the muscle in both of these chambers. The **left coronary artery** starts at the top of the heart and splits into two branches: the **circumflex artery**, which goes around to the back surface of the heart in between the left atrium and the left ventricle, and the **left anterior descending (LAD) artery**, which runs on the front surface of the heart in between the right and left ventricles. All of these coronary arteries meet in the back/bottom part of the heart where they connect together.

1.) Find the each of the coronary arteries on your sample heart. (They may be a little tough to see, so look close!). Important note: some of the specimens have the coronary arteries dissected out, and these are good example hearts.



The coronary arteries are very important in the function of the heart, and this can be seen very clearly when the coronary arteries cannot deliver blood to the heart muscle normally. When the coronary arteries get completely blocked, the heart muscle fed by the artery begins to suffocate and die due to lack of nutrients. This is what is known as a **“heart attack,”** or a **myocardial infarction** to doctors. There are many risk factors that individuals can be exposed to that can increase their risk of **myocardial infarction** including cholesterol and fatty molecules in the diet, smoking, and lack of exercise. These risk factors promote the formation of **atherosclerotic plaques**, which are collections of cholesterol and inflammatory cells, inside vessels. This is especially important in small blood vessels, like the coronary arteries, in which atherosclerosis can lead to blockage of the arteries preventing the flow of blood to the heart.

2.) *Feel the coronary arteries in your sample heart. Are they hard or “crunchy” feeling? What might this be? Important note: there is a cut aortic specimen that shows lots of atherosclerosis.*



When someone has such a blockage in their coronary artery doctors need to remove it, or get around it, to get blood back to the dying heart muscle. Doctors can perform a **bypass operation** (where a small tube routes blood around the block, like a detour), a **balloon angiography** (where a small balloon is inflated in the blockage to squish the fat to the side of the artery), or a **stent placement** (where they put a small wire cage in the artery to hold it open).

After a heart attack the muscle that is dead does not work like regular heart muscle and does not contract regularly. This makes the heart very weak, and makes it very hard for the heart to pump blood, which can lead to **heart failure**.