**LAB 2**

**ANATOMY OF THE HEART AND BLOOD VESSELS**

CARDIAC FUNCTION TEST

The human heart provides a continuous blood circulation through the cardiac cycle and is one of the most vital organs in the human body.

Heart Wall

The heart is located between lungs in the middle of chest, behind and slightly to the left of sternum. A double-layered membrane called the pericardium surrounds your heart like a sac.

The outer layer of the pericardium (***Epicardium***) surrounds the roots of your heart's major blood vessels and is attached by ligaments to your spinal column, diaphragm, and other parts of your body. The inner layer of the pericardium (***Endocardium***) is attached to the heart muscle.

Heart Chambers

The heart is divided by a septum into two halves, and the halves are in turn divided into four chambers.

The upper chambers are called the left and right atria, and the lower chambers are called the left and right ventricles. The left ventricle is the largest and strongest chamber in heart. The left ventricle's chamber walls are only about a half-inch thick, but they have enough force to push blood through the aortic valve and into your body.

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Heart Valves

Heart valves are flap-like structures that allow blood to flow in one direction. *Four types of valves regulate blood flow through your heart:*

**The tricuspid valve** regulates blood flow between the right atrium and right ventricle.

**The pulmonary valve** controls blood flow from the right ventricle into the pulmonary arteries, which carry blood to your lungs to pick up oxygen.

**The mitral valve** lets oxygen-rich blood from your lungs pass from the left atrium into the left ventricle.

**The aortic valve** opens the way for oxygen-rich blood to pass from the left ventricle into the aorta, your body's largest artery, where it is delivered to the rest of your body.



Heart Anatomy:

Cardiac Conduction

Cardiac muscle cells contract spontaneously. These contractions are coordinated by the sinoatrial (SA) node which is also referred to as the pacemaker of the heart.

The SA node is located in the upper wall of the right atrium. When the SA node contracts it generates nerve impulses that travel throughout the heart wall causing both atria to contract.

When the impulses reach the atrioventricular (AV) node (lies on the right side of the septum that divides the atria) they are delayed for about a tenth of a second. This delay allows the atria to contract and empty their contents first.

The impulses are then sent down the atrioventricular bundle to the left and right ventricles.



At the base of the heart the atrioventricular bundles start to divide further into Purkinje fibers. When the impulses reach these fibers they trigger the muscle fibers in the ventricles to contract.

**Cardiac Cycle (*heartbeat*)**

The cardiac cycle is the sequence of events that occurs when the heart beats. There are two phases of the cardiac cycle.

**In the diastole phase**:

The right and left atria fill with blood.

As blood collects in the upper chambers, the heart's pacemaker sends out an electrical signal that causes the atria to contract. This contraction pushes blood through the tricuspid and mitral valves into the resting lower chambers (the right and left ventricles).

**In the systole phase**,

The second part of the pumping phase begins when the ventricles are full of blood. The electrical signals from the SA node travel along a pathway of cells to the ventricles, causing them to contract. This is called systole. As the tricuspid and mitral valves shut tight to prevent a back flow of blood, the pulmonary and aortic valves are pushed open. While blood is pushed from the right ventricle into the lungs to pick up oxygen, oxygen-rich blood flows from the left ventricle to the heart and other parts of the body.

After blood moves into the pulmonary artery and the aorta, the ventricles relax, and the pulmonary and aortic valves close. The lower pressure in the ventricles causes the tricuspid and mitral valves to open, and the cycle begins again.

**Note:** *The heart normally beats about 60 to 80 times a minute when you are at rest.*

Lactate dehydrogenase

**Overview:**

Lactate dehydrogenase (LDH, or LD) is an enzyme that is found in almost all body tissues but only a small amount of it is usually detectable in the blood. It usually stays contained within the tissues cells. When cells are damaged or destroyed, however, they release LDH into the bloodstream, causing blood levels to rise. For this reason, LDH is used as a general marker of injury to cells.

Elevated levels of LDH and changes in the ratio of the LDH isoenzymes usually indicate some type of tissue damage. Usually LDH levels will rise as the cellular destruction begins, peak after some time period, and then begin to fall.

It can be used as a marker of myocardial infarction. Following a myocardial infarction, levels of LDH will rise within ***24 to 48 hours*** ,peak at ***3-4 days*** and remain elevated for up to ***10 days***.

In this way, elevated levels of LDH can be useful for determining if a patient has had a myocardial infarction if they come to doctors several days after an episode of chest pain.

LDH level is directly proportional to the infraction size

**Note:** *LDH level can be elevated in other cardiac disease such as Myocarditis and*

rheumatic fever.