

Overview of the Heart

Center for Educational Outreach
Baylor College of Medicine

The human heart is a muscular pump that supplies blood to the rest of the body (oblique view).
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Overview of the Heart

Image Reference

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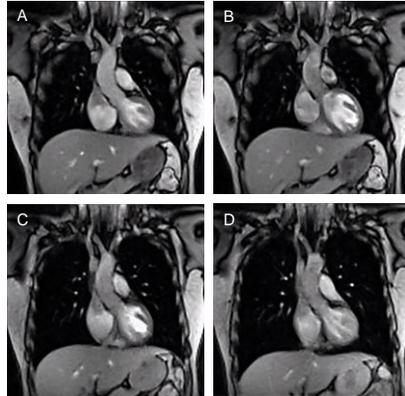
Key Words

heart, cardiology, human, anatomy

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Major Components of the Heart

- The heart is part of the circulatory system, which also includes a network of blood vessels.
- The heart is a muscular organ that pumps blood continuously throughout the body.
- There are four chambers and four valves in the human heart.



The beating of a human heart from a real-time MRI.



MRIs courtesy of S. Zhang, M. Uecker, D. Voit, K. Merbolt, and J. Frahm, Max Planck Institutes CC-BY-SA 3.0.

Major Components of the Heart

The heart is a muscular organ at the center of the circulatory system, which also includes arteries, veins and capillaries to carry blood to and from all areas of the body. When the heart walls contract, blood is pumped into the circulatory system. These contractions are regulated via electrical signals.

Blood carries oxygen and nutrients to organs, and picks up carbon dioxide, a waste product, to be expelled by the lungs. The heart supplies different areas of the body with the right amount of blood needed for proper functioning.

References

1. Explore How the Heart Works: What Is the Heart? Courtesy of the National Heart, Lung, and Blood Institute, NIH.
http://www.nhlbi.nih.gov/health/dci/Diseases/hhw/hhw_what.html
2. Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

Image Reference

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Key Words

heart, cardiology, human, muscle, blood vessel, chamber, artery, vein

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Exterior Anatomy

- Superior and inferior venae cavae: Carry blood from the body to the heart.
- Pulmonary arteries: Carry blood from the heart to the lungs.
- Pulmonary veins: Carry blood from the lungs to the heart.
- Aorta: Carries blood from the heart to the body.
- Coronary arteries supply blood to the heart.

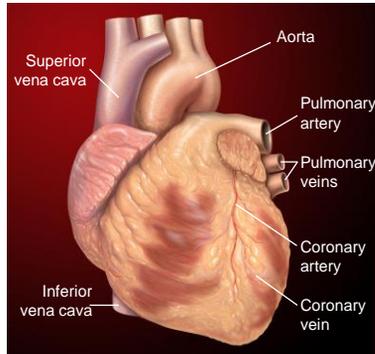


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Exterior Anatomy

The superior and inferior venae cavae are the largest veins in the body. They carry oxygen-poor blood to the right atrium. The superior vena cava brings blood from the upper part of the body, while the inferior vena cava brings blood from the lower parts of the body. From the right atrium, the blood flows into the right ventricle, which pumps the blood through the pulmonary arteries into the lungs.

Oxygen-rich blood from the lungs flows through the pulmonary veins, into the left atrium, and then to the left ventricle, from where it is pumped through the aorta and off to the rest of the body. The coronary arteries supply the heart with oxygen-rich blood.

References

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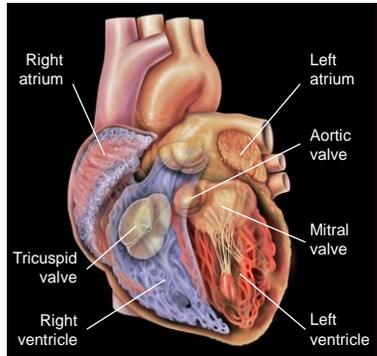
Key Words

circulatory system, heart, vena cava, pulmonary vein, coronary artery, pulmonary artery, aorta, atrium, ventricle

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Interior Anatomy

- The interior of the heart consists of:
 - four chambers (atria and ventricles).
 - four valves (aortic, mitral, tricuspid, pulmonary), and the
 - septum (internal tissue that separates the left and right sides of the heart, not shown).



Interior Anatomy

The heart is made up of four chambers. The two upper chambers, called atria, receive and collect blood. The two lower chambers, called ventricles, pump blood into the circulatory system.

The heart also contains four valves, which prevent backflow of blood. The tricuspid valve separates the right atrium from the right ventricle. The pulmonary semilunar valve, located at the exit of the right ventricle, opens into the pulmonary arteries. The bicuspid or mitral valve separates the left atrium from the left ventricle. The aortic semilunar valve, located at the exit of the left ventricle, opens into the aorta. In combination, the tricuspid and bicuspid valves are called the atrioventricular (AV) valves. The pulmonary and aortic valve together are called the semilunar valves.

The septum is an internal wall of tissue that divides the left and right sides of the heart.

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1. Explore How the Heart Works: What Is the Heart? Courtesy of the National Heart, Lung, and Blood Institute, NIH. <http://www.nhlbi.nih.gov/health/health-topics/topics/hhw/>
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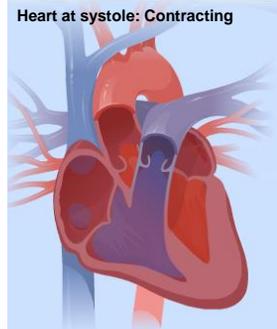
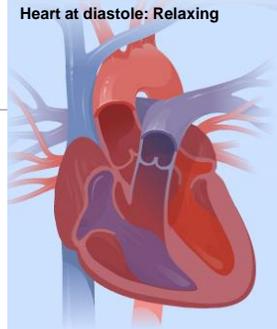
Key Words

circulatory system, heart, chamber, valve, pump, septum

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Cardiac Cycle

- Each heartbeat has two basic parts:
 - Diastole
 - Systole
- The atria and ventricles relax at diastole and contract at systole.



Illustrations courtesy of the National Heart, Lung, and Blood Institute, NIH.

Cardiac Cycle

The valves open and close as the heart goes through its cardiac cycle. The closing of the valves produces the “lub-dub” sounds heard through the stethoscope.

Blood returns to the resting heart through the veins that empty into the atria. As the atria fill, the AV valves open to admit the blood into the ventricles. During this time, the ventricles are relaxing, a period called diastole. After a slight delay, the ventricles contract. This period is called systole.

References

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Image References

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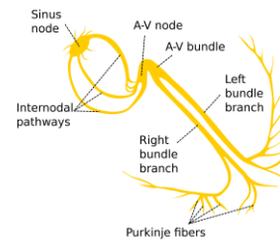
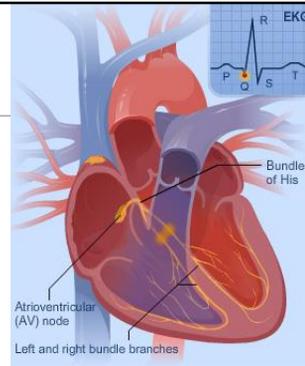
Key Words

circulatory system, heart, cardiac cycle, pump, blood, atria, ventricles, diastole, systole

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Electrical Conduction

- The heart contains an electrical system that can initiate heartbeats without neural activation.
- The heart's electrical system is made up of three main parts:
 - Sinoatrial (SA) node
 - Atrioventricular (AV) node
 - His-Purkinje system



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Electrical Conduction

Specialized cells can initiate heart contraction without neural activation. One of these groups of cells is the SA node, in the wall of the right atrium. It acts as a pacemaker for the rest of the heart. Signals from the SA node travel to the AV node, located on the interatrial septum. After a slight delay, the AV node conducts the stimulus through the bundle of His to the Purkinje fibers, which directly stimulate the cells of the left and right ventricles.

To view an online animation demonstrating the heart's electrical system, visit <http://www.nhlbi.nih.gov/health/health-topics/topics/hhw/contraction.html/>.

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2. Electrical conduction system of the heart © Madhero88 CC-BY-SA-3.0.

http://commons.wikimedia.org/wiki/File:Electrical_conduction_system_of_the_heart.svg

Key Words

circulatory system, heart, electrical conduction, sinoatrial node, SA node, atrioventricular node, AV node, heartbeat

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Functions of the Heart

- Electrical signals contract the walls of the heart and regulate heartbeats.
- Blood pumped by the heart carries oxygen to organs and picks up waste carbon dioxide to be breathed out of the body through the lungs.



Functions of the Heart

Walls of the heart contract to pump blood throughout the body. The blood transports oxygen and nutrients, and also picks up carbon dioxide, a waste product that must be expelled by the lungs.

The cardiac cycle consists of systole (ventricles contract) and diastole (ventricles relax). Heartbeat is regulated by electrical signals.

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Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

Key Words

circulatory system, heart, blood, circulation, oxygen, carbon dioxide, exhale, cardiac cycle

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