

**Adventures in Medicine & Science (AIMS)
Practical Anatomy & Surgical Education
St. Louis University School of Medicine
Distance Learning Program**

**Pig Heart Dissection
High School/ Middle School**

This is a guided pig heart dissection for middle and high school students presented by a physician, medical or graduate student. Students observe and dissect in pairs. In this activity students will become more familiar with the anatomical structures of the human heart by dissecting, studying and identifying the parts of a pig heart. The primary focus is on the anatomy and flow of blood through the heart.

Objectives:

The student will be able to:

1. Identify the chambers, valves and major vessels of the heart;
2. Observe the various structures of the heart;
3. Complete a dissection of a pig heart;
4. Prepare for their graded assessment

Lesson Objectives:

This lesson will:

1. Allow students to observe the parts of the heart;
2. Increase the student's understanding of the structures associated with the heart and the circulatory system;
3. Allow an opportunity for using comparative anatomy;
4. Assist the student in organizing the required material.

Materials:

Textbook or resource materials with labeled pictures or diagrams of the heart

One per pair or group:

- Preserved pig hearts
- Dissecting tray
- Scalpel
- Forceps
- Scissors
- Probe

Procedure:

1. Provide each pair or group of students with a pig heart and a set of equipment for dissecting.
Observe: the pericardium which surrounds the heart.
The fat deposits on the surface of the heart around the coronary vessels.
2. Using pictures or diagrams assist the students in oriented their hearts so that the apex is pointing away from them. Look for the coronary arteries, especially the anterior interventricular artery. The right atrium will be on the left and behind and the left atrium will be on the right and in front.
3. Locate the aorta and the pulmonary trunk.
4. Locate the superior and inferior vena cava to find the right atrium. Using a scalpel, cut the area between the superior vena cava and the inferior vena cava to open the right atrium. Tell the students to cut carefully, but deeply as the heart will be very tough.

Observe: the thickness and texture of the walls of the right atrium;
fossa ovalis;
coronary sinus;
smooth area near the opening of the superior vena cava where the SA node is located.
5. Pass a pair of forceps from the pulmonary trunk into the right ventricle.
6. Spread the forceps and using a scissors, cut the pulmonary trunk between the prongs to open the right ventricle. Continue cutting to the ventricle, curving to the back of the heart toward the right atrium.

Observe: the thickness and texture of the walls of the right ventricle;
tricuspid valve;
chordae tendineae;
papillary muscle;
the cusps of the pulmonary semilunar valve that were cut to expose the right ventricle.
7. Next, open the left ventricle. Orient the heart again with the apex facing away. Starting at the apex, cut along the right side to the left atrium. Lift the auricle and cut through the atrioventricular groove. Cut carefully as much as is necessary to open the left ventricle.
Observe: the thickness and texture of the walls of the left ventricle;
mitral valve;
chordae tendineae;
papillary muscle.

8. Using forceps or a finger, probe inside the aorta and explore the semilunar valve. Turn the heart so that the apex faces a light source and look for the cusps of the semilunar valve.
9. To open the left atrium, insert one blade of the scissors into the lowest pulmonary vein and cut forward to the auricle.
10. Make a longitudinal cut through the mitral valve and up through the aorta. Spread the walls of the aorta and locate the aortic valve.

Observe: aortic valve;
opening of the coronary artery.

11. Investigate the coronary arteries by passing a probe into the opening of the right and left coronary artery. Dissect the coronary arteries as they leave the aorta and travel on the surface of the heart.
12. Hold the heart so that the right ventricle faces you. Cut completely across and through the heart about one-third of the length from the end of the apex to the top. In other words, cut off the bottom of the heart. This will expose the inside of the right and left ventricles.

Observe: the difference in the thickness of the walls of the right and left ventricles.

National Science Education (NSES) Content Standards for grades 9-12

- Content Standard:K-12 ***Unifying Concepts and Processes*** :Systems order and organization; Evidence, models and explanation; Form and function
- Content Standard F, ***Science in Personal and Social Perspectives***: Personal and community health
- Content Standard C, ***Life Science***: Matter, energy and organization of living systems
- Content Standard A ***Science as Inquiry***

National Science Education (NSES) Content Standards for grades 5-8

- Content Standard A ***Science as Inquiry***
- Content Standard C, ***Life Science***: Structure and function in living systems; Diversity and adaptations of organisms
- Content Standard F, ***Science in Personal and Social Perspectives***: Personal Health

Show Me Standards (Science and Health/Physical Education)

- **Science** 3. Characteristics and interactions of living organisms
- **Health/Physical Education** 1. Structures of, functions of and relationships among human body systems

Related Websites:

Pig Heart Dissection

<http://heartlab.robarts.ca/dissect/dissection.html>

Pig Heart Dissection

http://sps.k12.ar.us/massengale/heart_dissection.htm

Pig Heart Dissection

http://www.ymca-coll.edu.hk/biology/Photos/heart_dissection/

Heart Anatomy & Function

<http://www.cbu.edu/~aross/APII/Heart-Lab.htm>

Vocabulary:

anterior interventricular artery - often clinically termed the left anterior descending artery, is a branch of the left coronary artery.

Aortic valve The aortic valve lets blood flow from the heart's left ventricle into the aorta.

atrioventricular groove - The atrioventricular or coronary groove of the heart demarcates the borders of the underlying atria from the ventricles.

chordae tendineae cord-like tendons called the **chordae tendineae** attach valves like the tricuspid valve and the Semilunar valves in the heart.

coronary arteries- are the vessels which bring the blood to the heart muscle. Blockages of these vessels are the number one cause of death in our society.

coronary sinus- The coronary sinus orifice of the right atrium is the aperture through which most of the venous drainage of the heart is returned to the circulation by the coronary sinus

fossa ovalis The fossa ovalis is an oval depression in the inferior part of the interatrial septum

inferior vena cava A large vein formed by the union of the two common iliac veins that receives blood from the lower limbs and the pelvic and abdominal viscera and empties into the right atrium of the heart. Also called *postcava*.

left atrium - The upper right chamber of the heart. The left atrium receives oxygenated blood from the lungs and pumps it down into the left ventricle which delivers it to the body. The main trunk of the systemic arteries, carrying blood from the left side of the heart to the arteries of all limbs and organs except the lungs.

left ventricle- The left lower chamber of the heart that receives blood from the left atrium and pumps it out under high pressure through the aorta to the body.
tricuspid valve - is located between the right atrium and right ventricle and ensures the flow of blood from the right atrium into the right ventricle and prevents the reverse.

mitral valve - which separates the left upper chamber (atrium) from the left lower chamber (ventricle)

papillary muscle *attached to the chordae tendinae in order for the valves to open and close*

Pericardium - The membranous sac filled with serous fluid that encloses the heart and the roots of the aorta and other large blood vessels.

pulmonary semilunar - lies between the right ventricle and the pulmonary trunk.

pulmonary trunk - A vessel that arises from the right ventricle of the heart, extends upward, and divides into the right and left pulmonary arteries that convey unaerated blood to the lungs. When the right ventricle contracts, the blood inside it is put under pressure and the tricuspid valve between the right atrium and ventricle closes. The only exit for blood from the right ventricle is then through the pulmonary trunk. The pulmonary trunk is to the right ventricle what the aorta is to the left ventricle -- the outlet vessel.

pulmonary vein - One of four vessels that carry aerated blood from the lungs to the left atrium of the heart. (The four are the right and left superior and inferior pulmonary veins). The pulmonary veins are the only veins that carry bright red oxygenated blood.

right atrium - The right upper chamber of the heart. The right atrium receives deoxygenated blood from the body through the vena cava and pumps it into the right ventricle which then sends it to the lungs to be oxygenated.

right ventricle -The lower right chamber of the heart that receives deoxygenated blood from the right atrium and pumps it under low pressure into the lungs via the pulmonary artery.

SA node - a specialized bit of heart tissue that controls the heartbeat [syn: pacemaker, cardiac pacemaker, sinoatrial node, SA node]

semilunar valve - prevents blood from re entering the ventricles

superior vena cava - A large vein formed by the union of the two brachiocephalic veins and the azygos vein that receives blood from the head, neck, upper limbs, and chest, and empties into the right atrium of the heart. Also called *precava*.