AP Biology
March 2008

Pig Heart Dissection
Laboratory Handout

Background:

Mammalian hearts are quite similar in that they are all four-chambered. The adult pig heart is approximately the size of an adult human's fist. The structure and size was so similar to than of a human's that they were once used in human heart transplants, but this practice has since been discontinued.

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.

Materials:

- Textbook or resource materials with labeled pictures or diagrams of the mammalian heart
- Gloves
- Face mask

One per pair or triple:

- Preserved pig heart
- Dissecting tray
- Scalpel
- Forceps
- Scissors
- Probe
- Handout in sheet protector

Procedure:

External Anatomy:

1. The heart is surrounded by a tough layer of connective and epithelial tissue called the pericardium. The sac-like structures of the pericardium is often removed earlier, during the heart's removal from the chest cavity. Try to find any remaining parts of the pericardium around the top of the heart.

2. The atria are also removed by accident in most cases. The atria have very little muscle tissue because they do not pump blood very far. If there is any atrial tissues remaining, it is easily recognized as flap-like muscle at the top of the heart. On the inside, it appears to have numerous pockets into which blood may settle.

3. The left ventricle is the more muscular of the two ventricles because it must generate enough force to pump blood throughout the entire body. The right ventricle pumps blood to the lungs which are nearby. Therefore, the right ventricle has less muscle tissue. Locate the left and right ventricles.

4. The coronary arteries branch off the aorta and run along the outer surface of the heart on the dorsal and ventral sides. These vessels generally run along the location of the septum which is found between the ventricles.

5. Many of the large arteries and veins are cut close to the heart itself when it is removed from the animal. However, the origin of the arteries is within the heart itself and along with the semilunar vales can be observed when you inspect the heart internally.

Internal Anatomy:

1. 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.

2. Locate the aorta and the pulmonary trunk.

3. Locate the superior and inferior vena cava to find the right atrium. Using a scalpel (**BE VERY CAREFUL, THE SCALPELS ARE SHARP**), cut the area between the superior vena cava and the inferior vena cava to open the right atrium. 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.

4. Pass a pair of forceps from the pulmonary trunk into the right ventricle.

5. 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;
   pailllary muscle;
   the cusps of the pulmonary semilunar valve that were cut to expose the right ventricle.

6. 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;**
   mitra valve;
   chordae tendineae;
   papillary muscle.

7. Using forceps or your 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.

8. To open the left atrium, insert one bldde of the scissors into the lest pulmonary vein and cut forward to the auricle.

9. 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.

10. 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.

11. 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.**

Clean-Up:

1. Wash dissecting tools thoroughly, dry them with a single paper towel, and return to proper set-up location.

2. Clean up *all* organic material from your workbench, desk, floor, sink and surrounding counter.

3. Wash all surfaces and edges with a sponge dipped in soapy water, picking up all organic matter.

4. Finally, wipe to near dryness with a well-rinsed, wrung-out sponge. There is no need to waste paper towels for this step.

Post-Lab Questions:

1. List (in order) the structures through which blood flows in the heart beginning with the vena cava.

2. Describe what systole and diastole are.

3. Suppose a person's cardiac muscle was not contracting as a unit. What would this indicate?

4. When it is cold out and your face turns red, blood is being directed to the skins in order to warm it. How do blood vessels perform this function?

5. Note that arteries have a thicker layer of tissues than veins. Why is this important and how does it affect the structure of the artery as compared to the vein?