Heart Dissection

**Background:**

The heart is a four-chambered, hollow organ composed primarily of cardiac muscle tissue. It is located in the center of the chest between the lungs. It is the main organ of the circulatory system. It contracts rhythmically, pumping blood into the arteries. After passing through tissues, blood returns to the heart by way of the veins. Cardiac muscle is a type of involuntary striated muscle found within the heart. Its function is to pump blood through the circulatory system through muscular contraction.

In this lab you will be dissecting a preserved pig heart. Preserved pig hearts are the most commonly dissected mammalian heart. The pig heart is very similar to a human heart, in that they both contain four chambers, and are similar in size. Since the pig heart and the human heart are so alike, you will be dissecting the pig heart in this dissection lab.

**Objectives:**

- Learn about the heart as an important organ in our body
- Examine a pig heart through hands-on dissection
- Learn the many different structures associated with the heart including both external and internal structures
- Learn the functions of the different structures inside of the heart

**Materials:**

- One pig heart
- Dissection Tools
- Dissection tray
- Gloves

**Procedure: EXTERNAL**

1. Go to the bucket and get yourself a pig heart. Rinse off the excess preservative with tap water and run water into the larger blood vessels to force any blood clots out of the heart chambers. Pat the heart dry and place it in your dissection tray.

2. It is important to know that the heart is usually covered in adipose tissue. Your specimen may have arrived with the adipose tissue already having been removed.

3. Before cutting into the heart, carefully observe the external heart. Locate the thin membrane or pericardium that still covers the heart. The pericardium or pericardial sac, is a double layered closed sac that surrounds the heart and anchors it. The pericardium consists of two tissues layers which are continuous with each other where the vessels enter or leave the heart. The slender gap between the parietal & visceral surfaces is the pericardial cavity & is filled with fluid to reduce friction between the layers as the heart pumps.

4. After examining the pericardium, carefully remove this tissue. Located below the pericardium is the muscle of your heart called the called the myocardium. Most of the myocardium is located in the lower two chambers of the heart called ventricles.

5. Locate the tip of the heart or the apex. Only the left ventricle extends all the way to the apex.

6. Place the heart in the dissecting pan so that the front or ventral side is towards you (the major blood vessels are on the top and the apex is down). The front of the heart is recognized by a groove that extends from the right side of the broad end of the heart diagonally to a point above & to your left of the apex.
7. The heart is now in the pan in the position it would be in a body as you face the body. Locate the following chambers of the heart from this surface:

- **Left atrium** - upper chamber to your right
- **Left ventricle** - lower chamber to your right
- **Right atrium** - upper chamber to your left
- **Right ventricle** - lower chamber to your left.

8. While the heart is still in this position in the dissecting pan, locate these blood vessels at the broad end of the heart:

- **Coronary artery** - this blood vessel lies in the groove on the front of the heart & it branches over the front & the back side of the heart to supply fresh blood with oxygen & nutrients to the heart muscle itself.
- **Pulmonary artery** - this blood vessel branches & carries blood to the lungs to receive oxygen & can be found curving out of the right ventricle (lower chamber to your left)
- **Aorta** - major vessel located near the right atrium & just behind the pulmonary arteries to the lungs. Locate the curved part of this vessel known as the **aortic arch**. Branching from the aortic arch is a large artery that supplies blood to the upper body.
- **Pulmonary veins** - these vessels return oxygenated blood from the right & left lungs to the left atrium (upper chamber on your right)
- **Inferior & Superior Vena Cava** - these two blood vessels are located on your left of the heart and connect to the right atrium (upper chamber on your left). Deoxygenated blood enters the body through these vessels into the right receiving chamber. Use your probe to feel down into the right atrium. These vessels do not contain valves to control blood flow.

9. Describe the function of all the external structures of the heart. Record you data in **Data Table 1**.

**Procedure: INTERNAL**

1. Use scissors to cut through the side of the pulmonary artery and continue cutting down into the wall of the right ventricle. Be careful to just cut deep enough to go through the wall of the heart chamber. (Your cutting line should be above & parallel to the groove of the coronary artery.)

2. With your fingers, push open the heart at the cut to examine the internal structure. If there is dried blood inside the chambers, rinse out the heart.

3. Locate the **right atrium**. Notice the thinner muscular wall of this receiving chamber.

4. Find where the **inferior & superior vena cava** enter this chamber & notice the lack of valves.

5. Locate the valve between the right atrium and right ventricle. This is called the **tricuspid valve**. The valve consists of three leaflets & has long fibers of connective tissue called **chordae tendinae** that attach it to **papillary muscles** of the heart. This valve allows blood flow from the right atrium into the right ventricle during **diastole** (period when the heart is relaxed). When the heart begins to contract (systole phase), ventricular pressure increases until it is greater than the pressure in the atrium causing the tricuspid to snap closed.

6. Use your fingers to feel the thickness of the **right ventricle** and its smooth lining. Also note the network of irregular muscular cords on the inner wall of this chamber.

7. Find the **septum** on the right side of the right ventricle. This thick muscular wall separates the right & left pumping ventricles from each other.
8. Inside the right ventricle, locate the **pulmonary artery** that carries blood away from this chamber. Find the one-way valve called the **pulmonary valve** that controls blood flow away from the right ventricle at the entrance to this blood vessel.

9. Using your scissors, continue to cut open the heart. Start a cut on the outside of the left atrium downward into the left ventricle cutting toward the apex to the septum at the center groove. Push open the heart at this cut with your fingers & rinse out any dried blood with water.

10. Examine the **left atrium**. Find the openings of the **pulmonary veins** from the lungs. Observe the one-way, **semi-lunar valves** at the entrance to these veins.

11. Inside this chamber, look for the valve that controls blood flow between the left atrium and left ventricle. This valve is called the **bicuspid or mitral valve**. This valve consists of two leaflets & blood flows from the left atrium into the left ventricle during diastole.

12. Examine the **left ventricle**. Notice the thickness of the ventricular wall. This heart chamber is responsible for pumping blood throughout the body.

13. Using your scissors, cut across the left ventricle toward the aorta & continue cutting to expose the valve.

14. Count the three flaps or leaflets on this valve leading from the left ventricle into the aorta and note their half-moon shape. This is called the **aortic valve**.

15. Using scissors, cut through the aorta and examine the inside. Find the hole or coronary sinus in the wall of this major artery. This leads into the **coronary artery** which carries blood to and nourishes the heart muscle itself.

16. You should now be able to identify and describe the functions of the structures in **Data Table 2**. Structures that were in **Data Table 1** are not repeated; but you should still be able to identify them from the cut view of the heart.
Table 1: External Heart

<table>
<thead>
<tr>
<th>Structure</th>
<th>Make a checkmark in this column if you found the structure</th>
<th>Function (2 points each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Atrium</td>
<td></td>
<td></td>
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<tr>
<td>Left Ventricle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Atrium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right Ventricle</td>
<td></td>
<td></td>
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<tr>
<td>Coronary Artery</td>
<td></td>
<td></td>
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<tr>
<td>Pulmonary Artery</td>
<td></td>
<td></td>
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<tr>
<td>Aorta</td>
<td></td>
<td></td>
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<tr>
<td>Pulmonary Vein</td>
<td></td>
<td></td>
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<tr>
<td>Superior &amp; Inferior Vena Cava</td>
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</tr>
<tr>
<td>Structure</td>
<td>Make a checkmark in this column if you found the structure</td>
<td>Function (2 points each)</td>
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<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------</td>
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<tr>
<td>Tricuspid Valve</td>
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<tr>
<td>Mitral Valve (bicuspid valve)</td>
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<tr>
<td>Aortic Semilunar Valve</td>
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<tr>
<td>Septum</td>
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</tbody>
</table>

**Data Analysis and Conclusions**

1. Why are the walls of the left ventricle thicker than the walls of the right ventricle? (8 points)

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2. Pulmonary circulation carries blood between the heart and the lungs. Systemic circulation carries blood to the rest of the body. In what chambers of the heart does pulmonary circulation begin and end? In what chambers does systemic circulation begin and end? (8 points)

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3. **NUMBER** the following structures in the order in which blood passes through them – **Start with the valve** through which blood exits from the right atrium. (0.5 points each)

   a. Aorta  
   b. Aortic semilunar valve  
   c. Left ventricle  
   d. Lungs  
   e. Mitral valve  
   f. Pulmonary semilunar valve  
   g. Pulmonary artery  
   h. Right ventricle  
   i. Superior / inferior vena cava  
   j. Tissues of the body  
   k. Tricuspid valve  
   l. Pulmonary veins  
   m. Left atrium

4. **Fill in the blanks** (4 points each)

   a. The ______________ valve is also known as the mitral valve.
   b. One-way flow of blood from the right ventricle is ensured by the presence of the ____________ valve.
   c. Mitral valve prolapse, which is abnormal, may allow blood to enter the ______________.
   d. The ____________ is a muscular wall between the left and right ventricles.
   e. The ____________ is the name of the sac that surrounds the heart.
   f. The bulk of the heart rests on the ___________ side of the body.
   g. The following chambers of the heart function to receive blood from the veins: ____________ and ____________.
   h. The ______________ is the largest artery of the human body.

5. What function does the adipose tissue surrounding the heart serve? (8 points)

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   __________________________________________________________
   __________________________________________________________

6. Compare the thickness of the wall of the superior and inferior vena cava and the aorta?  
   Which is thicker and why? (8 points)

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   __________________________________________________________
   __________________________________________________________
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