**Heart Dissection**

**Introduction**

The heart dissection is probably one of the most difficult dissections you will do. Part of the reason it is so difficult to learn is that the heart is not perfectly symmetrical, but it is so close that it becomes difficult to discern which side you are looking at (dorsal, ventral, left or right). Finding the vessels is directly related to being able to orient the heart correctly and figuring out which side you are looking at. The heart is also difficult because the adipose (fatty tissue) that surrounds the heart can obscure the openings to the vessels. This means that you really must experience the heart with your hands and feel your way to find the openings. Many people will be squeamish about this, and because the heart is slippery, it is easy to drop. Don't be shy with the heart, use your fingers to feel your way through the dissection.

**Objective**

Using a pig heart, students will observe the major chambers, valves, and vessels of the heart and be able to describe the circulation of blood through the heart to the lungs and back and out to the rest of the body. (The pig heart is used because it is very similar to the human heart in structure, size, and function.)

**1. Step One: Orientation**

**External Anatomy**

There are a few clues to help you figure out the left and the right side, but often the packaging and preserving process can cause the heart to be misshapen. If you are lucky, the heart will be nicely preserved and you will see that the front (ventral/anterior) side of the heart has a couple of key features: 1) a large pulmonary trunk/artery that extends off the top of it 2) the darker flaps of the atria. 3) the curve of the entire front side, whereas the backside is much flatter. 4) the left ventricle contains the entire apex of the heart.

The front of the heart is recognized by a groove that extends from the right side of the base of the heart diagonally to a point above and to your left of the apex. This groove is called the **interventricular sulcus** and shows where the **interventricular septum** is located internally. Therefore, it also shows where the left and right ventricles are separated.

Locate the tip of the heart or the apex.

Find the flaps of dark tissue on the base of the heart. These ear-like flaps are the **atria**.

* The **coronary arteries** which feed the heart muscle can be found in and around the interventricular sulcus.
* The left ventricle contains the entire apex of the heart. The right ventricle is on the other side of the interventricular sulcus. Confirm the **left and right ventricles** by squeezing each half of the heart. The left half will feel much firmer and more muscular than the right side. (Remember: The left side of the heart is more muscular because it has to pump blood to the whole body. The right side only pumps blood to the lungs.)
* **Label the right atrium, left atrium, left ventricle, right ventricle, coronary arteries, interventricular sulcus and apex. Photograph them.**
* While looking at the front of the heart, in the middle of the base, there is an obvious vessel. This is the **pulmonary trunk/artery** which takes blood from the right ventricle to the lungs.

Sticking straight up from the center of the heart (and **situated behind the pulmonary artery**) is the largest blood vessel you will see. This is the **aorta**, which takes oxygenated blood from the left ventricle to the rest of the body (The vessels may be covered by fat, so use your fingers to poke around until you find the opening or cut some of the fat carefully. Call me over if you need help!)

* Push your finger all the way in the aorta and you will feel inside of the left ventricle. The left ventricle has a very thick wall, unlike the right ventricle. Insert your finger through the pulmonary artery to feel the right ventricle and you will notice and feel that it is much thinner than the left side of the heart.

**NOTE:** Sometimes, the aorta still has its branches attached to it. There are three vessels that branch from the aorta: the **brachiocephalic, left common carotid and the left subclavian**. The majority of the time, these vessels are not visible because the aorta was cut too close to the base of the heart when the heart was removed from the animal. Occasionally, you can find the brachiocephalic artery attached. You are not responsible for these, since they may not be present in all specimens.

* **With 2 popsicle sticks, place one in the aorta and the other in the pulmonary trunk. You should notice that they crisscross each other, with the pulmonary trunk in the front. Photograph these.**

Remember that if you are looking at the back of the heart, then the right and left sides are the same as your right and left hand.

* Find the large opening at the top of the heart next to the right atria. This is the **superior vena cava**, which brings blood from the top half of the body to the right atrium (the atria are the top chambers in the heart). Put your finger in this vessel and gently push until you are in the right atrium. Note: In many preserved hearts, the heart was cut at these points, so you won't see the vessels themselves; you will just find the openings.
* Gently stick a blunt probe down this vessel or the opening.
* Keep your eyes on the superior vena cava, but turn your heart so that you are looking at the posterior side. Inferior and to the left of the superior vena cavathere is another blood vessel opening. Insert your probe into this; it should also lead into the right atrium. This is the **inferior vena cava**, which brings blood from the lower tissues.
* Remove the probe from the superior vena cava and place your finger in it. See if you can get your finger or a probe through the superior vena cava and out of the inferior vena cava.
* **Photograph a probe going through the superior vena cava and into the inferior vena cava on the posterior side of the heart.**
* You can also see blood vessels on the posterior side of the heart next to the left atrium. These are the **pulmonary veins** that bring blood from the lungs into the left atrium. There are two, since one comes from each lung. Depending on how the vessels were cut, you **may** see four total (two on each side).
* Place your finger in either pulmonary vein. Your finger should now be in the left atrium.
* ***Place popsicle sticks in each pulmonary vein. Photograph these.***

**2. Step Two: Cutting the Heart**

**Internal anatomy: Atria and AV valves**

* Position the heart in your tray with the anterior side up.
* Cut open the right atrium across the top, so that when you look in it you will be looking down at the tricuspid valve.
* Find the tricuspid valve.
* Cut open the left atrium the same.
* Locate the bicuspid valve between the left atrium and left ventricle.
* **Photograph the Tricuspid and Bicuspid valves from this angle. Make sure the valve is viewable.**

**Internal anatomy: Ventricles and Semilunar Valves**

* Beginning at a point below the middle of the left ventricle, make an incision through the left ventricle wall as shown in Figure 1.
* Remove the lower-front portion of the wall. Spread the left side of the heart open.

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| http://www.carolina.com/images/en_US/local/page_specific/teacherresources/preserved/sheep_heart4.gif |
| **Figure 1** |

* Look through the hole you have produced and locate the chordae tendinae. They will look like strings.
* Locate the papillary muscles. They will look like bumps where the chordae tendinae meet the wall of the heart.
* Trim away the front and side of the left ventricular wall, leaving part of the papillary muscles and all of the bicuspid valve in place.
* Locate the aortic semilunar valve which will lead to the aorta. **It will not look like the bicuspid.**
* **Photograph the Chordae tendinae, papillary muscle, bicuspid valve and aortic semilunar valve from this angle.**
* The right side is dissected similarly; begin by opening the top of the right atrium and locating the tricuspid valve between the right atrium and ventricle.
* Remove the lower-front portion of the ventricular wall just as you removed that of the left ventricle.
* Cut high across the front of the heart (near the pulmonary trunk/arteries) to locate the pulmonary semilunar valves.
* Trace the path of blood through the heart, beginning with the right atrium.
* **Photograph the Chordae tendinae, papillary muscle, tricuspid valve and pulmonary semilunar valve.**

**Your dissection is complete!!**

**Please attach this to your portfolio:**

**Heart Dissection Rubric**

Lab Members:

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| Photograph | Features | Points |
| 1  Exterior | * Left Atrium * Right Atrium * Left Ventricle * Coronary arteries * Interventricular sulcus * Apex | 6 |
| 2  Exterior | * Aorta * Pulmonary Trunk | 2 |
| 3  Exterior | * Superior Vena Cava * Inferior Vena Cava | 2 |
| 4  Exterior | * Right Pulmonary Vein(s) * Left Pulmonary Vein(s) | 2 |
| 5  Internal | * Tricupsid valve * Bicupsid valve | 2 |
| 6  Internal | * Chordae tendinae * Papillary muscle * Bicuspid valve * Aortic semilunar valve | 4 |
| 7  Internal | * Chordae tendinae * Papillary muscle * Tricuspid valve * Pulmonary semilunar valve | 4 |
| TOTAL |  | 22 |