Mammalian Heart Dissection Worksheet

The goal of this laboratory activity is to learn about cardiac anatomy and to understand how the structure relates to the function. We will dissect a bovine heart. Bovine hearts are very similar to, but larger than, human hearts.

*Note for TAs: Defrost* frozen bovine hearts for six hours in cold water. At 45-60 minutes before class, put hearts in hot water until class time. This defrosted the muscle and external fat and left some residual ice in the ventricular cavities, which was mostly melted by the second hour of the lab. Hearts defrosted this way had minimal odor.

Safety first! Cow hearts are obtained from a local butcher. They have not been treated with preservatives or other chemicals. They are not known to be any more or less hazardous than other fresh cuts of beef. We will use scissors and scalpels with care.

Protective equipment: Eye protection, examination gloves, lab apron.


The parietal pericardium has been removed from these bovine heart specimens.

1. Examine the heart before cutting anything. Identify the following major landmarks:
   - Apex
   - Right and left ventricles
   - Right and left atria
   - Right and left atrial appendages = right and left auricular appendages
   - Aorta and, if present, large blood vessels coming off the aortic arch
   - Pulmonary trunk = main pulmonary artery
   - Right and left pulmonary arteries. Pass a finger or an anatomical probe into the right pulmonary artery and out the left pulmonary artery.
   - Pulmonary veins
   - Inferior vena cava, superior vena cava. Pass a finger or an anatomical probe into the IVC and out the SVC.
   - Coronary blood vessels (likely to be hidden under fat)
     - The left main is usually hidden deep between the pulmonary artery and the ascending aorta.
     - Anterior interventricular artery = left anterior descending artery (LAD)
     - Circumflex artery
     - Right coronary artery
     - Right marginal artery
     - Coronary sinus

2. Use dissecting scissors, hemostats, and scalpel to remove fat and connective tissue from the heart. The goal is to expose the large vessels and coronary arteries as clearly as possible. Take time to do this well. Each person does some. Dispose of removed tissue in separate dissecting tray.

3. Review the location of items from 1 which were hidden under fat before – such as great vessels and coronary arteries and veins.

4. Observe the ascending aorta turning into the aortic arch. Observe the main pulmonary artery making a T into the right and left pulmonary arteries. Observe the pulmonary veins merging to form the back wall of the left atrium. Observe the IVC and SVC merging to form the lateral wall of the right atrium. Note the difference in thickness of the large vessels carrying blood into versus out of the heart. If the aortic arch is long enough, you may observe the brachiocephalic trunk. The typical human and bovine arch
anatomies differ. Most humans have three vessels coming off of the aortic arch. \( \text{(What are they?)} \) Most cows have a single vessel coming off of the aortic arch: the brachiocephalic trunk, which splits into the L & R subclavian arteries and the L & R common carotid arteries.

5. Cut off the pulmonary artery and aorta 2-3 cm above the valve, using scissors or scalpel, so that you have a clear view of the semilunar valves.

\[ \text{Q1. How many leaflets does the aortic valve have?} \]
\[ \text{Q2. How many leaflets does the pulmonary valve have?} \]

6. Find the main coronary arteries branching off the aorta just above the aortic valve leaflets. Push a probe into each main coronary artery as far as possible without puncturing the artery.

\[ \text{Q3. How many coronary arteries are coming off of the root of the aorta?} \]

7. Using your finger or a probe, try to push the aortic and pulmonary valve leaflets backward into the ventricle. Can you? If not, what prevents you from doing so?

8. Use scissors or scalpel to make an incision running lengthwise through the lateral edge of the IVC and SVC and through the connecting portion of the right atrial wall. This will allow you to open up the right atrium. See the thick lines on figures below, which have been added to Fig. 18.5b and 18.5d of the textbook (Marieb & Hoehn 10th ed.) The dashed line is on the back of the heart as it appears in the image.

9. Use the opening you have made to observe the inside of the right atrium. Find the fossa ovalis, the ostium of the coronary sinus, and the tricuspid valve. The ostium is also known as the opening and is usually found slightly below the posterior part of the fossa ovalis and above the posterior opening of the tricuspid valve.

\[ \text{Q4. What is the fetal precursor to the fossa ovalis? What is the function of the fetal precursor? Why does it change after birth?} \]

Do either 10A or 10B. Some lab groups in each section do 10A and some do 10B.

10A. Use scalpel and scissors to make a frontal section through the heart, removing the anterior portions of the left and right atria, the left and right ventricles, and the proximal, or lower, portion of the main pulmonary artery (also known as the pulmonary trunk). Attempt to reproduce the image in Figure 18.5e of M&H 10th ed.

10B. Use scalpel and scissors to make a transverse section through the heart, removing the inferior portion of the LV and RV, as shown in Figure 18.9 in M&H 10th ed.

11. Observe all four chambers and all four valves. Note the LV free wall, interventricular septum, RV freewall, and atrial wall. Note the chordae tendinae on the atroventricular valves. Note the papillary muscles in the LV.

\[ \text{Q5. What are the functions of the chordae tendinae and papillary muscles?} \]
\[ \text{Q6. How does the wall thickness differ among the cardiac chambers? Why?} \]

12. Trade hearts with a group that sectioned the heart the other way, and repeat the observations of step 11.

13. Dispose of cardiac tissue in the red biohazard bags and boxes. Remove scalpel blades carefully and safely using the small plastic blade-remover boxes, or use hemostats to carefully and safely remove the blade and put it in a sharps container. Wash all trays and instruments thoroughly with soap, taking care to remove fatty residue. Wash and dry lab benches and tables, if necessary. Dispose of gloves and aprons in the red biohazard bags.
Fig 18.5 a,b (M&H 10th ed.)

Figures above show human. Bovine hearts typically have only one major vessel coming off top of aortic arch.
These figures show a human heart. A bovine heart typically has one vessel coming off the top of the aortic arch. The human usually has three vessels coming off the aortic arch, as shown here.
Fig. 18.9 (M&H 10th ed.)

Bovine aortic arch and thoracic aorta. 2016.