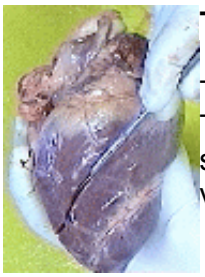
What does a Real Heart Look Like?

Dissecting a Porcine (Pig) Heart

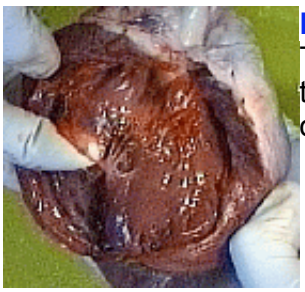
The pig heart is interesting to us because it is very similar to the human heart in anatomy, size and function. Its excellent availability in most areas of the world, along with the similarities to the human heart, make porcine heart tissue ideal for transplant into humans. Of course, untreated porcine tissue would be rejected very quickly by the recipient's body, in the same way that a human's donated organ would be rejected. To prevent this, porcine heart valves are treated with glutaraldehyde to reduce their immunogenicity.

The muscle of your heart is called the myocardium. Most of the myocardium is located in the ventricles which are roughly the size of your fist. The porcine heart, like a human heart, has four chambers and four *valves*. Blood flows through the pig heart in the same manner as through a human's. This picture shows the pig heart from the front, with the portion on the right of the picture being the left side of the heart and vice versa. The *aorta* is clearly visible at the top, with an *atrium* on either side, while the *ventricles* are in the bottom left. A top view shows the aortic and pulmonary arteries as well as the pulmonary veins and superior vena cava. Ok, let's get dirty!



The first incision - Studying the right side of the heart

The first incision is along the right ventricle, allowing us to see inside the right side of the heart. The right ventricle can be identified by squeezing the heart, since the myocardium on the right side is much less rigid than that of the left ventricle. This incision allows us to see the tricuspid valve and the right ventricular outflow tract which includes the pulmonary valve.

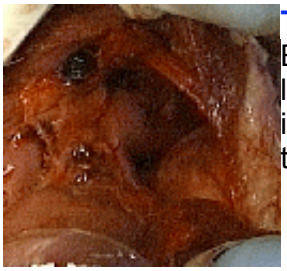


Longitudinal cut through the right ventricle

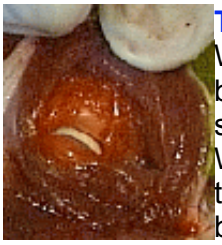
The right ventricle has been cut open from the apex of the heart (at the bottom) towards the top. In this picture, the myocardium is being held back. My finger is stuck underneath one leaflet of the tricuspid valve, which leads to the pulmonary valve.

The tricuspid valve (39k JPEG)

The tricuspid valve allows blood to flow from the right atrium (above) into the right ventricle when the heart is relaxed during *diastole (di-a-stol-ee)*. When the heart begins to contract the heart enters a phase called *systole (sis-toll-ee)*, and the atrium pushes blood into the ventricle. Then, the ventricle begins to contract and blood pressure inside the heart rises. When the ventricular pressure exceeds the pressure in the atrium, the tricuspid valve snaps shut. The valve itself consists of three leaflets that are attached to the myocardium directly at the top. At the bottom, long thin fibers of collagen (a connective tissue protein) called *chordae tendinae* connect the leaflets to specialized heart muscles called *papillary muscles*. The chordae tendinae keep the valve leaflets in the right position so that they can close properly during systole.



The right outflow tract (54k JPEG)
Behind the posterior leaflet of the tricuspid valve is the right ventricular outflow tract. This leads up to the pulmonary valve and pulmonary artery. When the ventricles contract, blood is forced along the outflow tract and through the pulmonary valve. Then the blood flows to the lungs where gas exchange takes place.



The pulmonary valve (41k JPEG)
When the heart is contracting during systole, the pulmonary valve is open because the blood pushes the cusps out of the way. However, at the end of systole, the ventricles begin to relax and the intra-ventricular pressure drops. When the ventricular pressure drops to below the pulmonary artery pressure, the pulmonary valve closes and prevents back-flow (called *regurgitation*) of blood into the ventricle.

In the two top views, the valve has been cut away from the top of the right ventricle by an incision through the myocardium below the valve. The valve consists of three cusps, which are thin flaps of connective tissue. Because of the shape of the cusps, the pulmonary valve is described as being semi-lunar. The cusps look like little sacs that are attached to the wall of the pulmonary artery.

Continue on with the porcine heart dissection.

Heart Valve Lab Home Page

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Contacting the lab
