

Dissection: The Fetal Pig

Objectives

- To learn some of anatomical structures of the fetal pig.
- To be able to make contrasts and comparisons of structures between different animal phyla as additional organisms are observed.
- To deduce the adaptive significance of differences in the structures of animal phyla as additional organisms are studied.

Introduction

In addition to the characteristics shared between all of the vertebrates, such as a vertebral column, dorsal hollow nerve cord etc., members of the class Mammalia are also characterized by body hair, a four chambered heart, a muscular diaphragm, mammary glands and are warm blooded. The representative animal to be studied here is the fetal pig, *Sus scrofa*. To begin this exercise, go to the Diversity section of the BiologyOne DVD. Select Dissections and then, after the introduction screen, select the Fetal Pig from the list of organisms.

In the dissection exercises, you will be asked to examine the organisms and learn something of their individual anatomy. Equally important is a comparison of the anatomical structures of between organisms, noting how they are similar, how they differ, and how their differences may be adaptive to the different life styles of these organisms.

Activity 231.1 **External Features**

From the introductory screen, click on the forward arrow in the lower right to begin your observations of the pig's anatomy.

If you could feel the texture of the skin with your fingers you would note that the skin is relatively smooth but much thicker than the skin of organisms such as the frog. One of the unique characteristics of mammals is the production of hair by the skin. These are produced by specialized cells that make up a hair follicle. What adaptive significance is there for this organism to have hair covering its body?

Carefully observe the shape of the pig's body. Describe its shape and how this shape could be advantageous in the pig's habitat.

The pig has two paired appendages. The front legs are comparable to our own arms having an upper portion, an elbow, a lower portion, wrist, and hand/foot with digits. How many digits does the pig have on its forelegs? Can you find any evidence of digits have become reduced in size and are unused? Likewise, the hind legs are similar to our legs having a thigh, knee, shank, ankle, and a foot with digits. How many digits are on the rear feet of a pig? Any sign of lost digits? How would you explain a reduction in the number of digits?

Note the points of attachment of the forelimb and hind limb of the pig in relation to the body's mass. Do their positions appear to be effective for the pig's mobility? What role do you think each limb plays in supporting the body and when the pig moves? Note the angle at which the limbs exit the body of the pig. Do you think the angle of the limbs could be adaptive? Adaptive to what?

Note the position of the eyes on the body of the pig. If each eye is able to gather images within a 160 degree arc, how much of the pig's surroundings can it see without moving its head/body? Does this have a selective advantage?

To view the pig's ventral surface, click on the forward arrow in the lower right.

After studying the external features of the fetal pig, label the illustration located in the Results Section.

Activity 231.2 **Internal Anatomy**

To examine the internal organs of the pig, place the pig on its back and make a longitudinal incision through the skin, muscles and bones of the chest along the ventral midline from just anterior the umbilical cord to throat. If you're using scissors, keep the point of the scissors pointed up to avoid tearing the internal organs. Then make two longitudinal incisions starting from the first cut, around the umbilical cord and back to the anus. To allow the skin to be pulled back to view the internal organs, make two lateral incisions from the cut just posterior the umbilical cord to just in front of the hind legs.

Make another two lateral cuts from the sternum along the lower margin of the ribs. The final incisions should be lateral cuts from the first incision near throat region, out and back through the muscles and ribs to the previous cut so that the entire lower portion of the rib cage can be removed. You may need to carefully remove membranes and fat tissue to observe the internal organs. To complete this dissection, from the ventral view of the pig, click on the forward arrow in the lower right.

With the internal organs of the pig exposed, take a moment to become generally familiar with the position of its major organs.

Click on the forward arrow to closely view the thoracic cavity.

When the trachea reaches the thoracic cavity it branches right and left to enter the two lungs. Note how the lungs are located in the body. They are surrounded on the front, sides, and back by the rib cage. Above the lungs is the bone and muscle of the pectoral girdle. Below the lungs is a sheet of muscle, the diaphragm, extending across the base of the ribs. These structures create a somewhat flexible chamber for the lungs and heart. What will happen to the volume of this chamber if the diaphragm flattens out toward the abdomen? If the rib cage is lifted and expanded? What role would these motions play in breathing? To help answer this questions examine the tissue of the lungs. Is it muscular?

The pig's heart is composed of four chambers. The two smaller upper chambers are the atria and the two larger, muscular chambers are the ventricles. As you view the heart ventrally, the left atrium (on the pig's left) is more exposed than the right atrium. Likewise, the left ventricle, which is larger to begin with, is more visible than the right ventricle.

Blood from the body enters the right atrium of the heart. From here the blood is pumped through a valve into the right ventricle. When the ventricles contract, the blood in the right ventricle is pumped into the pulmonary arteries and travels to the lungs. After passing through the capillary beds in the lungs, the blood returns to the heart through the pulmonary veins to the left atrium. From the left atrium the blood is moved into the left ventricle. When the left ventricle contracts, the blood flows into the aorta that disperses the blood to the body through various arteries. The blood will pass through capillary beds in the body, collect in veins and return to the right atrium completing the circuit.

Before completing your study of the pig's heart and associated blood vessels, closely examine the arteries and veins attached to the heart. Note the relative thickness of the walls of these blood vessels. Describe the differences you observe. Can you speculate as to the adaptive value of any differences you observe?

Click on the forward arrow to observe the abdominal cavity. From the mouth, food travels through the thoracic cavity to the stomach in the abdominal cavity within a tube named the esophagus. You could follow this tube a short ways by inserting a blunt probe into the esophagus at the back of the mouth. Describe the nature of this tube. How does it compare to the trachea that leads to the lungs? Why would these tubes have a different construction?

To view the stomach you'll need to lift the liver out of the way. Complete this dissection by clicking on the forward arrow in the lower right. Food enters the stomach from the esophagus through a valve called the cardiac sphincter.

If this valve allows gastric juices from the stomach up into the esophagus you feel a burning sensation called heart-burn. At the lower end of the stomach is a second valve called the pyloric sphincter. This valve controls the flow of the stomach's contents into the small intestine. Click on the forward arrow to completely remove the liver.

Cut the connective tissues that hold the intestines in place and then move the intestines to the side to examine the organs lying underneath. Complete this dissection by clicking on the forward arrow. The small intestine is divided into three sections. The section nearest the stomach is the duodenum. This is a relatively short section that is specialized to receive the material from the stomach as well as bile from the liver and enzymes from the pancreas. The other sections of the small intestine are the jejunum and the ileum. These are the highly coiled portions of the small intestine.

The last portion of the digestive system is the large intestine or colon. Water and ions are recovered from the digestive tract at this point. The lower portion of the colon constricts as it passes through the pelvic girdle. The feces are then expelled from the body through the anus. How long is the colon in the pig? Does this tell you anything about the importance of its function to the pig's life?

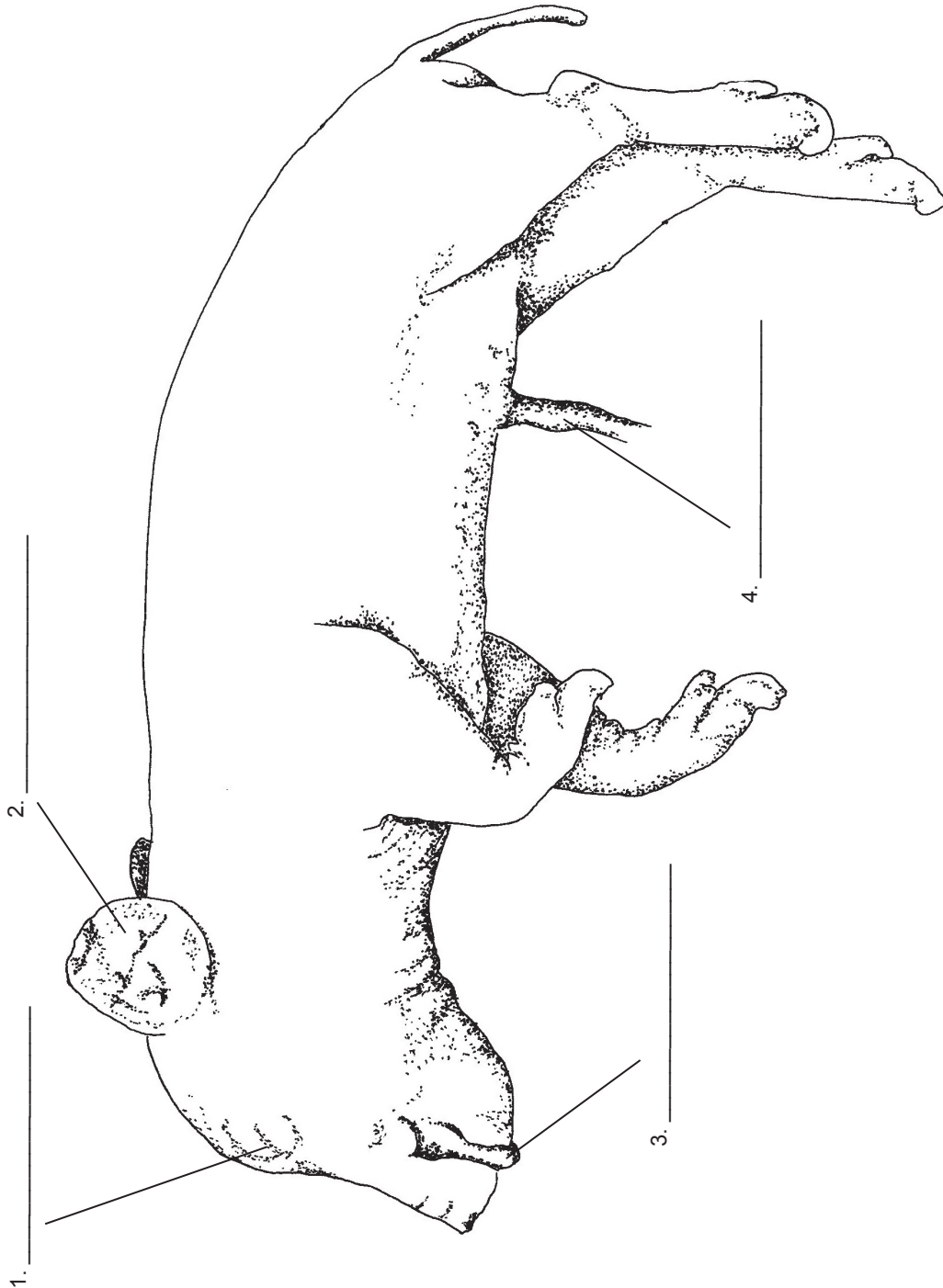
Click on the forward arrow to remove the stomach so you can view the organs underneath. You should now be able to see the pancreas, a loosely organized organ that produces digestive enzymes to the small intestine.

Clicking on the forward arrow a last time exposes the kidneys and the reproductive organs. This particular pig is female.

After studying the internal features of the fetal pig, label the photograph located in the Results Section.

Results Section

Activity 231.1
External Features



Activity 231.2
Internal Anatomy

