

APPENDIX E The Dissection of a Fetal Pig

Inquiry Skills

Questioning	Observing
Hypothesizing	Concluding
Predicting	Inferring
Conducting	Classifying
Recording	Identifying
Analyzing	Measuring
Evaluating	Reporting
Synthesizing	Creating Models
Communicating	

Note: The illustrations used in this investigation are also available electronically. If you do not dissect a fetal pig or other organism in your course, many virtual dissections are available to enhance your learning.

Pigs are members of the class Mammalia. Before birth, the young are nourished by the placenta in the mother's womb. For this reason, pigs (like humans) are known as placental mammals. The structure and organization of the internal organs of the pig are representative of those of all placental mammals. Although the fetal pig is not yet born, its internal systems are complete. In this investigation you will dissect a fetal pig to study its internal organs. This dissection will give you a sense of how internal systems are arranged within your own body.

Dissection involves the careful and systematic examination of the internal structures of an organism. A good dissection will reveal not only the location and structure of individual organs, but also how different organs relate to one another in the various systems of the body. To carry out a successful dissection, you should be familiar with the terms listed in Table E.1. These are the terms used to describe the location of the various structures of the animal and to direct incisions.

This dissection is divided into four parts. In the first part, you will investigate the external anatomy of your specimen and identify its age and sex. In the second part, you will examine the organs of the digestive system. In the third part, you will examine the organs of the circulatory system. Finally, in the fourth part, you will examine the organs of the respiratory system. Between each part of the investigation you will store your specimen. Remember to wrap and store your specimen properly, and to label it so you can identify it again.

Table E.1 The anatomical terms used to locate organs or incisions during this dissection.

Term	Meaning
Dorsal	Upper or back surface
Ventral	Under or belly surface
Lateral	Side
Anterior	Toward the front (head) end
Posterior	Toward the back end
Superficial	Near the surface
Proximal	Close to
Distal	Far from

Safety Precautions



Extreme care must be taken when using dissecting instruments, particularly scalpels. To the extent possible, make cuts away from your body. The pigs are preserved in a chemical solution. Wear plastic gloves, eye protection, and an apron at all times, and work in a well-ventilated area. If some of the chemical comes into contact with your skin, wash it off. At the end of each lesson, wash your hands thoroughly. Dispose of all materials as instructed by your teacher, and clean your work area.

Materials

- preserved fetal pig
- dissecting instruments
- plastic bag and tie (to store your specimen)
- disposable plastic gloves
- large tongs
- newspapers and/or paper towelling
- dissecting tray
- string or strong thread
- waterproof tags (to identify your specimen)
- apron
- T pins

Procedure

Part 1: External Anatomy

1. Rinse your specimen and place it on its side in the dissecting tray.
2. Measure your specimen from the snout to the base of the tail. Use Figure E.1 to estimate the gestational age of your specimen.

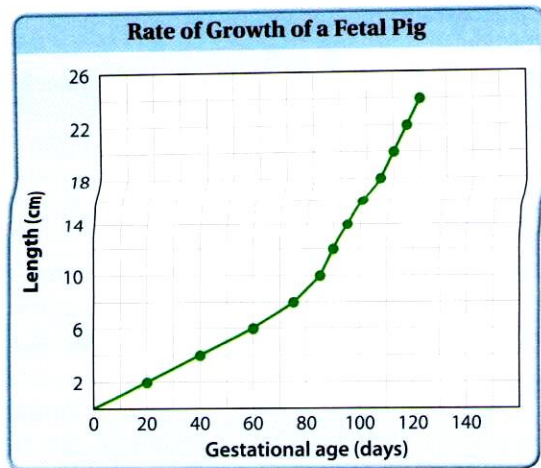


Figure E.1 The gestation period of the pig is about 115 days. About how old is your specimen?

- Identify the external features of your specimen using Figure E.2. Make your own drawing of the lateral view of your specimen, labelling the features. Record the age of your specimen with this drawing.

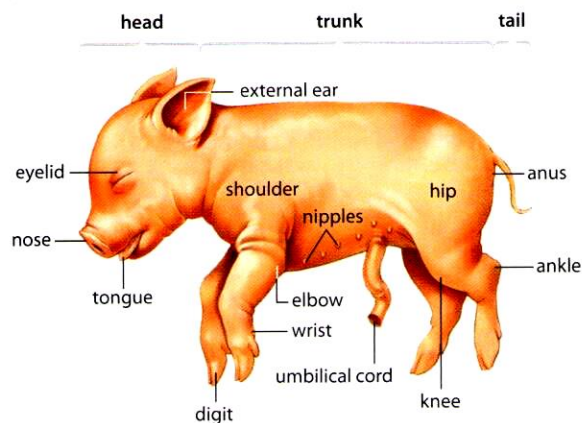


Figure E.2 A lateral view of a fetal pig.

- Turn your specimen onto its back. Using Figures E.3 and E.4, determine the sex of your specimen. Examine a specimen of each sex.
- Make your own drawing of the external reproductive organs of specimens of both sexes. Label the structures.

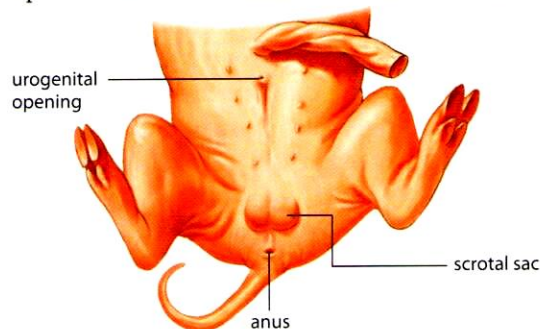


Figure E.3 The external reproductive organs of a male fetal pig.

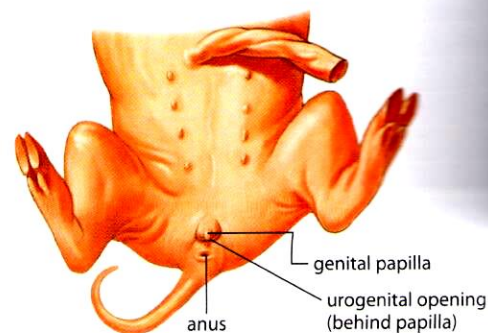


Figure E.4 The external reproductive organs of a female fetal pig.

Part 2: The Digestive System

A. The Mouth

- Using a strong pair of dissecting scissors, make a cut in the corner of the mouth, cutting toward the posterior of the specimen. Repeat on the other side.
- Pry the mouth open. Using Figure E.5, locate and identify the features of the oral cavity.
- Make your own drawing of the mouth of your specimen, labelling the features.

Analysis

- Explain how the appearance of the following structures relates to their function as part of the digestive system. Give as much detail as possible, including size, texture, external structure, and internal structure.
 - the teeth
 - the tongue
 - the epiglottis
- What differences can you see between the pig's mouth structures and your own? Suggest a reason for these differences.

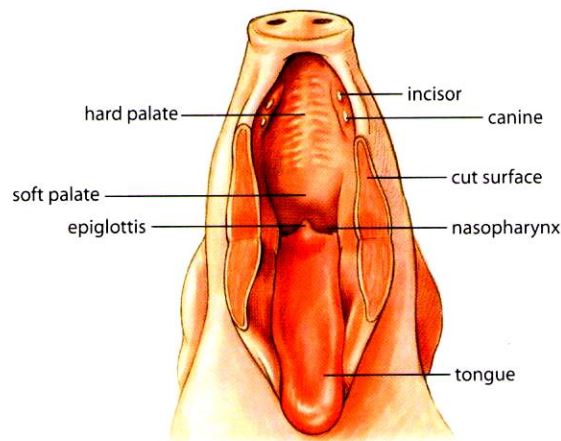


Figure E.5 The oral cavity of the fetal pig.

B. Exposing the Abdominal Organs

1. Place the pig in the dissecting tray with its ventral surface uppermost. Spread out the limbs. Tie a piece of string to one of the forelimbs near the ankle. Pass the string under the tray and securely tie the other forelimb. Repeat the process with the hind limbs.
2. Select a point just anterior to the umbilical cord on the specimen's ventral surface. Using forceps, pinch the skin of the abdomen along the midventral line and pull it slightly away from the animal. With your scissors, make an incision in the skin. The incision should be just large enough to pass the point of your scissors through. Now make a midventral cut ending just posterior to the midline of the animal (shown as #1 in Figure E.6). To avoid damaging the organs as you cut, keep the tips of the scissors pointing up. Be careful not to damage the umbilical cord.
3. From the same starting point, make a second incision around the base of the umbilical cord extending back to just anterior to the anus (shown as #2 on Figure E.6). You may wish to turn your specimen around so you can cut away from you. Repeat on the other side.
4. Locate the base of the sternum (breast bone), situated in the centre of the chest. The ribs are attached to the sternum. Select a point slightly posterior to the sternum and cut across the ventral surface (shown as #3 in Figure E.6). The incision should be posterior to the diaphragm, which you will be able to see as a dome-shaped layer of muscle separating the abdominal and thoracic cavities.
5. Make two final incisions, one on each side of the cuts bordering the umbilical cord and just anterior to the hind limbs (shown as #4 in Figure E.6). Use T pins to pin back the skin to expose the internal organs of the abdominal cavity. The T pins should point away from the specimen so they will not interfere with your work.
6. *The organs of the abdomen are covered and protected by a membrane called the peritoneum. The double-layered sheets of peritoneum are called mesenteries. Using forceps or a dissecting probe, gently move the mesenteries aside to reveal the underlying organs.*

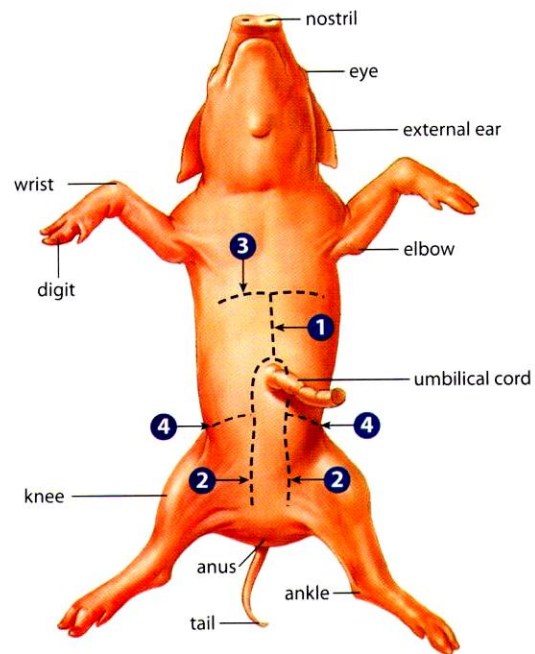


Figure E.6 A ventral view of a fetal pig showing the pattern of incisions that expose the organs of the abdominal cavity.

7. Using Figure E.7 and Figure E.8, locate and identify the organs of the abdominal cavity. Make a drawing of your specimen showing the location of the internal organs and labelling them.

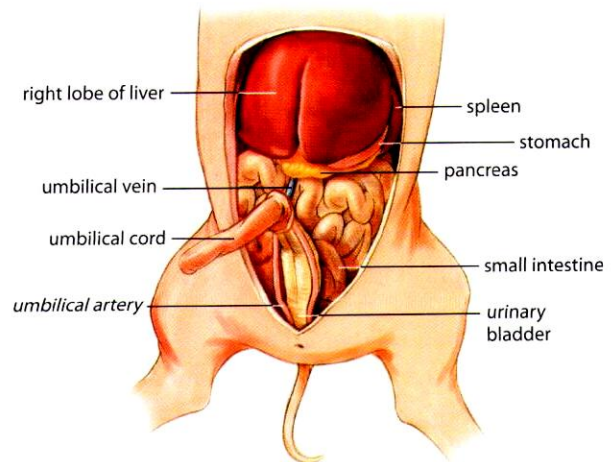


Figure E.7 The major organs found in the abdominal cavity of the fetal pig.

C. Examining the Abdominal Organs

1. Locate the liver, the largest organ of the abdominal cavity. Describe its appearance in your own words. Note its different lobes.
2. Locate and describe the esophagus. Note how it passes through the diaphragm just before it enters the stomach.

3. Locate and describe the stomach. Carefully cut open the stomach and describe the inner surface.
4. Locate and describe the pancreas, situated below the stomach, between the stomach and the small intestine. It is usually lighter in colour than the surrounding organs.
5. Locate and describe the small intestine. See if you can identify the separate portions of the duodenum, ileum, and jejunum.
6. Using forceps or a probe, gently lift the connective tissue that links the liver and the duodenum. Locate the bile duct in this mesentery and trace it back to its source at the gall bladder. The gall bladder is embedded on the surface of the liver.
7. Move to the distal end of the small intestine and locate the point on the left side of the abdominal cavity where the large intestine begins.
8. The main part of the large intestine is called the colon. Identify the path the colon takes in the abdomen.
9. Toward the end of the large intestine is the rectum. Note where the tract terminates at the anus.
10. Cut the esophagus as close to the top of the abdominal cavity as you can. Make a second cut as close as you can to the end of the digestive tract near the anus. Carefully remove the entire digestive tract, in one piece, from the specimen.
11. Carefully cut away the connective tissue around the digestive tract. Unravel the tract and make a drawing of it, identifying the different sections of the digestive tract. Measure each section of the digestive tract.
12. Make a drawing of the unravelled digestive tract and describe the appearance of this tissue in your own words.

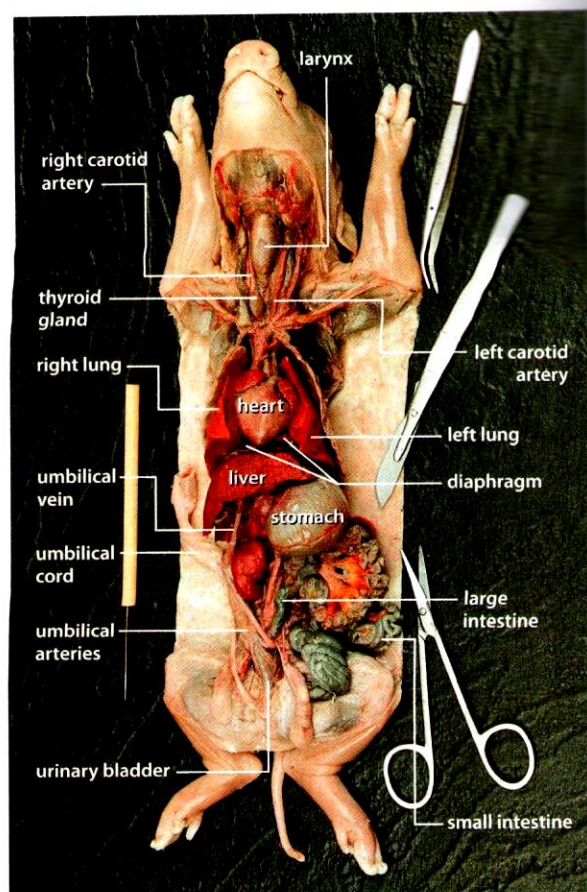


Figure E.8 The internal abdominal and thoracic organs. (Note: the pancreas is not visible in this photograph.)

Analysis

1. Explain how the appearance of the following structures relates to their function as part of the digestive system. Give as much detail as possible, including size, texture, external structure, and internal structure.
 - a. liver
 - b. pancreas
 - c. esophagus
 - d. stomach
 - e. small intestine
 - f. large intestine
 - g. gall bladder
2. Using your own drawings of the abdominal organs, trace the path of food from the mouth to the rectum. Identify the major steps in the digestive process that take place along the way.

Part 3: The Circulatory System

A. Exposing the Organs of the Thoracic Cavity

1. Locate the base of the sternum (breast bone), which is in the centre of the chest. The ribs are attached to the sternum. Use this as the starting point for your incision. With forceps, pinch the skin of the abdomen along the midventral line and draw it slightly away from the animal. With your scissors, make an incision in the skin—the incision should be just large enough to pass the point of your scissors through. Now make a midventral cut (shown as #1 in Figure E.9). This cut should extend as far forward as the hairs near the base of the throat. Be careful not to damage the underlying body wall as you cut. Remember to keep the tips of your scissors pointing up, not down, to avoid damaging the internal organs.
2. Next, make two cuts (shown as cuts #2 and #3 in Figure E.9) from the midventral line in the region of the thoracic cavity. Carefully lift the skin and pin it to the sides of the specimen using T pins. The T pins should point away from the specimen so they will not interfere with your work.

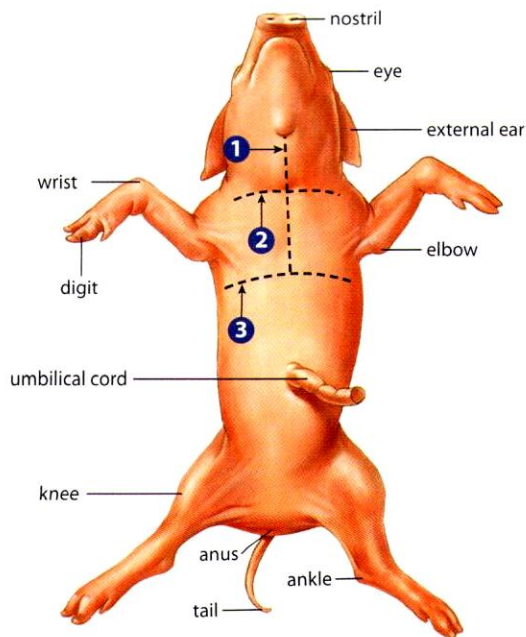


Figure E.9 A ventral view of a fetal pig showing the pattern of incisions that will expose the organs of the thoracic cavity.

3. Using a sturdy pair of dissecting scissors, cut the ribs along the sternum, and pry them apart to reveal the organs of the thoracic cavity.
4. Using forceps or a dissecting probe, remove the connective tissues and membranes that surround the lungs and heart.

5. Using Figure E.8 and Figure E.9, identify the internal organs of the thoracic cavity. Make a drawing of your specimen.

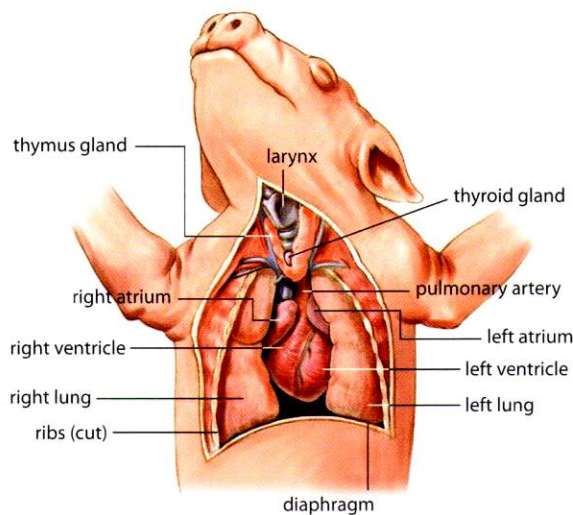


Figure E.10 The organs of the thoracic cavity.

B. Examining the Organs of the Circulatory System

1. Using Figure E.10 and E.12 for reference, identify and compare the sizes of the following major blood vessels.
 - a. aorta, including the aortic arch
 - b. superior vena cava
 - c. pulmonary artery
 - d. pulmonary vein
 - e. inferior vena cava
2. Your specimen may have a small blood vessel connecting the pulmonary artery to the aorta. This vessel is called the *ductus arteriosus*. Try to locate this vessel on your own specimen. If you cannot find it, examine another specimen in which this vessel is visible.
3. Locate and describe the heart.
4. Make a drawing of your specimen showing the location of the circulatory organs.
5. Carefully cut through the blood vessels a short distance from the heart. Remove the heart. Make an incision in the ventral surface of the heart as shown in Figure E.11. Your incision should expose all four chambers of the heart.
6. Using Figure E.12 for reference, identify the internal features of the heart. Try to locate and identify the heart valves at the opening to the blood vessels.
7. Compare the structure of the different chambers of the heart. Make a labelled drawing and describe the structures in your own words.

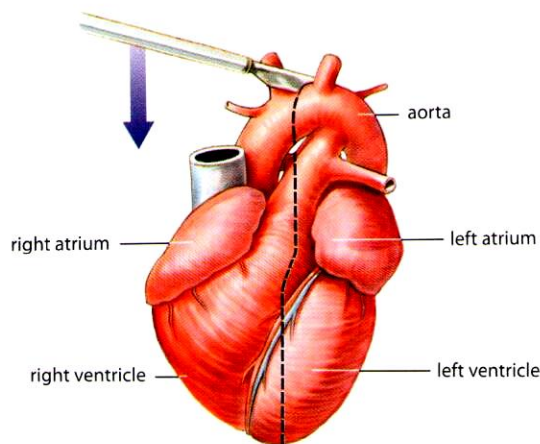


Figure E.11 With the heart on its dorsal surface, make your incision beginning at the aortic arch and continuing straight to the base of the ventricles.

Analysis

1. Explain how the appearance of the following structures relates to their function as part of the circulatory system. Give as much detail as possible, including size, texture, external structure, and internal structure.
 - a. right atrium
 - b. left atrium
 - c. right ventricle
 - d. left ventricle
 - e. arteries
 - f. veins
 - g. ductus arteriosus
 - h. heart valves
2. Using your own drawings, trace the passage of blood from the body through the heart and back to the body.

Part 4: The Respiratory System

Examining the Respiratory Organs

1. Using Figure E.10 for reference, identify the major organs of the respiratory system.
2. Note the difference in structure between the right and left lung. In your own words, describe the structure and texture of the lungs.
3. Locate and describe the pleural membranes encasing each lung.
4. Using a probe, move aside the layers of muscle to work deeper into the neck. If necessary, carefully cut the muscle tissue. Locate the larynx, trachea, and esophagus. Describe the difference in structure between the trachea and esophagus.

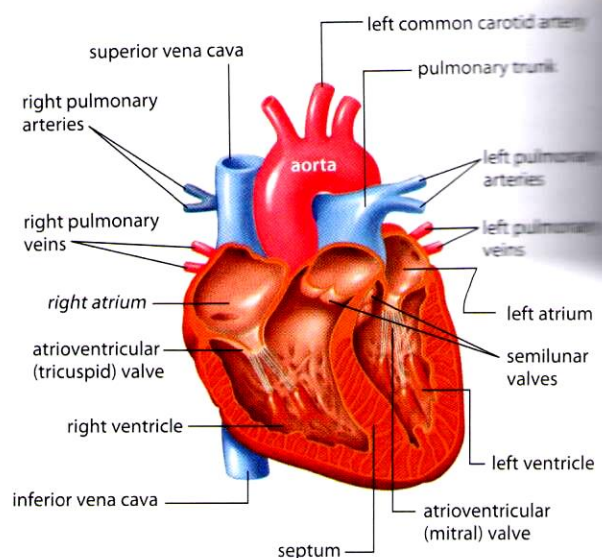


Figure E.12 A ventral cross section of the heart.

5. Examine the rib cage and try to identify the external and internal intercostal muscles.
6. Open the mouth and describe the relationship between the glottis, esophagus, and pharynx.
7. Trace the passage of the trachea through the throat. Try to identify the two branches of the bronchi.
8. Make a drawing of your specimen showing the location of the organs of the respiratory system.
9. Using a small syringe or dropper, push a small amount of air into the trachea. Note the inflation of the lungs.

Analysis

1. Explain how the appearance of the following structures relates to their function as part of the respiratory system. Give as much detail as possible, including size, texture, external structure, and internal structure.
 - a. trachea
 - b. right lung
 - c. left lung
 - d. pleural membrane
 - e. larynx
 - f. glottis
 - g. diaphragm
 - h. rib cage
2. Using your own drawings, trace the path of air from the mouth to the lungs.