

Fetal Pig Dissection Guide

Observe • Identify • Explain

Explore the external features and major internal organs of the fetal pig. Use recognizable landmarks to locate each structure, then connect its shape and position to its function.



Use with the two Mr. E Science fetal pig dissection videos and the assigned pre-lab and lab write-up.

Meet the fetal pig

This guide accompanies the two Mr. E Science fetal pig dissection videos. Part 1 introduces external anatomy and opening the body cavities. Part 2 examines the internal organs.

Explore the external features and major internal organs of a fetal pig. Use recognizable landmarks to locate each structure, then connect its shape and position to its function.

Classification

Kingdom Animalia • Phylum Chordata • Class Mammalia

Genus *Sus* • Species *Sus scrofa*

Domestic form commonly called *Sus scrofa domesticus*

A **fetal pig** is a developing pig that has not yet been born. It has the basic mammalian arrangement of organs, including a four-chambered heart, lungs, kidneys, and a complete digestive tract. Its developing organs allow us to study both body organization and life before birth.

Natural history

Domestic pigs are raised worldwide. Their wild relatives occur naturally across much of Europe and Asia and occupy habitats that provide food, water, and cover. Pigs are omnivores. They use a mobile snout and a strong sense of smell to locate plant material and animal food.

Before birth, the fetus receives oxygen and nutrients through the **placenta** and **umbilical cord**. The placenta is associated with the mother's uterine wall. The cord connects the fetus to the placenta; it does not attach directly to the uterine wall.

The lungs have not begun air breathing, and the digestive tract has not begun processing ordinary meals. Keep these differences in mind when discussing how the organs function after birth.

Size and gestational age

Gestation is the period of development before birth. Full gestation for the domestic pig is 115 days. Hall gives the following approximate ages based on specimen length. Ages are approximate classroom estimates based on commercial/lab length charts; breed, litter size. Growth varies, so use these as estimates rather than exact ages.

Length in inches (from tip of snout to base of tail)	Length in cm	Approximate age
6–7	15.2–17.8	~75–85 days
7–8	17.8–20.3	~80–88 days
8–9	20.3–22.9	~85–92 days
9–10	22.9–25.4	~90–97 days
10–12	25.4–30.5	~95–105 days
12–14	30.5–35.6	~105–112 days
14+	35.6+	near term – full term

Think About It 1: Use the table above to determine the approximate age of your specimen.

Length_____ approximate age_____

Prepare for the dissection

Materials

You will need a preserved fetal pig, some specimen may have blood vessels injected with latex rubber to help identify arterial (red), venous (blue) and hepatic (yellow) blood flows. You will also need a dissecting tray, string, blunt probe, forceps, dissecting scissors with a rounded tip, and a scalpel when authorized by your teacher. Have protective eyewear, gloves, an apron or lab coat, paper towels and if assigned, the drawing materials available.

Before you begin

Read the guide and watch both videos before beginning the dissection. During the lab, Listen and follow your teacher’s directions. Use the lab writeup, complete each task, and identify NTK (need to knows) structures by testing your fellow lab partners before asking for teacher’s initial and moving onto the next tasks.

Work in the area designated for preserved specimens. Review the preservative instructions with your teacher. Keep food and drinks away from the work area. Cover cuts and secure loose hair and clothing. Treat the specimen respectfully.

Work safely

Keep hands away from your face while working. If preservative contacts your eyes or skin, tell your teacher immediately and follow the classroom rinsing procedure.

Handle instruments carefully

Keep all dissecting instruments in the tray when not in use. Use a probe to separate tissue whenever possible. Lift tissue before cutting, keep fingers outside the cutting path, and make short controlled cuts. Never force a blade through resistant tissue. Ask your teacher for help.

When a scalpel is necessary, use the controlled pencil-style grip demonstrated in the video. Do not change or remove a blade yourself. Return sharp tools to the designated location when they are not in use.

Between sessions and at cleanup

The pig dissection is often a multi-day event. In those instances, keep the specimen moist using only the solution your teacher supplies. Store it as directed. Put tissue and fluids in their assigned containers. Clean tools and the work surface, remove gloves, and wash your hands thoroughly with soap and water.

1 • External Examination

Video: Part 1 — external features and orientation.

Orient the animal

Begin with the **umbilical cord** as your **external landmark**. It projects from the ventral abdomen and identifies the region that must be preserved when you open the body wall.

Identify anatomical positions on your specimen. **Dorsal** means toward the back; **ventral** means toward the belly. **Cranial** or **anterior** means toward the head, and **caudal** or **posterior** means toward the tail. **Medial** means toward the midline; **lateral** means away from the midline, toward the side. **Proximal** and **distal** describe positions nearer to or farther from a limb's attachment.

Always use the pig's right and left. With the pig in proper its right side is on your left. Turning the tray does not change the animal's right and left.

The **thorax** is the chest region supported by the rib cage. The **abdomen** lies caudal to the thorax. The neck connects the head to the trunk.

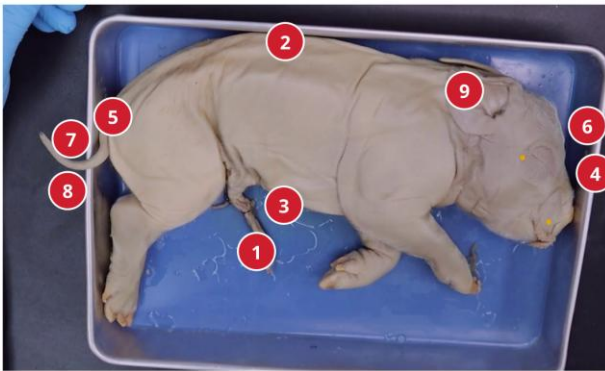
Head region

Locate the **pinna**, the flap of the external ear; the plural is pinnae. The **external nares** are the nostrils on the snout. Find the **eyes**, eyelids, and **mouth**. Observe the limbs and the hoof-covered digits without cutting.

Look for fine hair on the skin and rows of **mammary papillae**, or nipples, along the ventral surface. Both sexes have nipples, so nipples alone do not identify sex.

Think About It 2: Why should labels say the pig's right lung instead of the lung on the left side of the photograph?

External lateral view (figure 1)

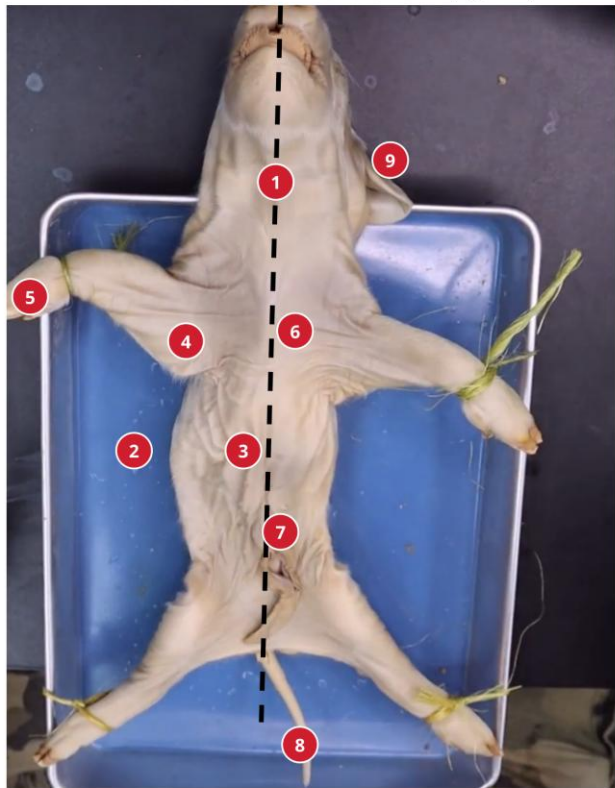


- | | |
|---|-----------|
| 1 Umbilical Cord
(external landmark) | 6 Cranial |
| 2 Dorsal | 7 Caudal |
| 3 Ventral | 8 tail |
| 4 Anterior | 9 pinna |
| 5 Posterior | 10 snout |

The umbilical cord is the external landmark. The head lies to the right in this lateral view. The nostrils and tongue require a closer view.

Anatomical Position (figure 2)

- 1 midline
- 2 Lateral
- 3 medial
- 4 proximal
- 5 distal
- 6 Thoracic Region
- 7 Abdominal Region
- 8 tail
- 9 pinna
- snout



Anatomical position is ventral side up, dorsal side on the tray cranial (anterior) side up, caudal (posterior) side down. The pig's right is on the left side of this photograph. Preserve the umbilical region during opening.

Mouth cavity observations

Gently open the mouth and locate the **tongue**. The tiny projections along the edge of the tongue are **papillae**. The tongue moves food and contributes to swallowing and taste. To open the mouth fully enough to see all of the structures, you need to cut (with a scalpel) from each corner of the mouth back to the jawbone. Make sure you are going straight back from the corner of the mouth. This will ensure the soft tissues in the mouth are not damaged.

Once you are back to the jawbone on both sides, you will have to force the mouth open. (be ready for a "cracking" sound as the jaw dislocates). Place one hand on the pig's snout, with your thumb on the **hard palate** (careful of the

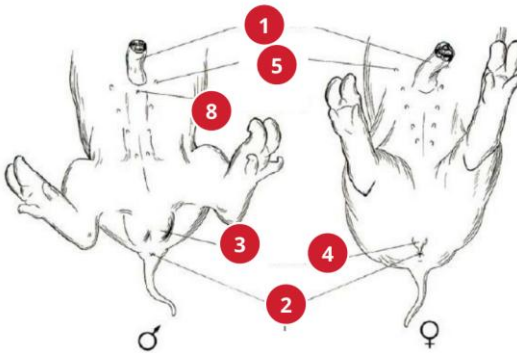
sharp **canines** and **incisors** teeth!). Place your other hand on the lower jaw with your thumb on the tongue. Pull open the mouth until you hear the jawbone dislocate. The **hard palate** forms ridges on the firm anterior roof of the mouth. The **soft palate** lies farther back. They help separate the oral and nasal passages. A deeper view reveals the **pharynx** and **epiglottis**; a flap covering the **glottis** and associated with protection of the airway during swallowing.

External sex identification

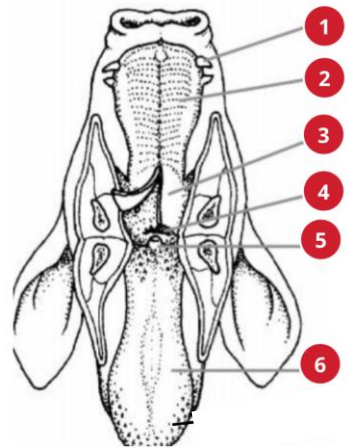
Find the **anus** immediately ventral to the base of the tail. It is the terminal opening of the digestive tract and is separate from the urogenital opening. In a male, the **urogenital opening** is just caudal to the umbilical cord. The **scrotum** is near the posterior end between the hind limbs. Its prominence depends on development. In a female, the urogenital opening is near the **genital papilla**, ventral to the anus. Use the location of the opening to identify sex, and ask your teacher if the specimen is difficult to interpret.

Record the sex only after you locate the appropriate opening. Preserve these features when planning incisions. The basic umbilical flap must protect the bladder and the structures associated with the cord.

Sex Identification (figure 3)



- | | |
|------------------------------|---------------------------|
| 1 Umbilical cord | 5 Mammary papillae |
| 2 anus | 6 Thoracic Region |
| 3 scrotum | 7 Abdominal Region |
| 4 Urogenital opening -female | 8 Urogenital opening male |



Mouth Cavity (figure 4)

- | | |
|----------------|-----------|
| 1 Canine tooth | 4 pharynx |
| 2 Hard palate | 5 Glottis |
| 3 Soft palate | 6 tongue |

2 • Open the body cavities

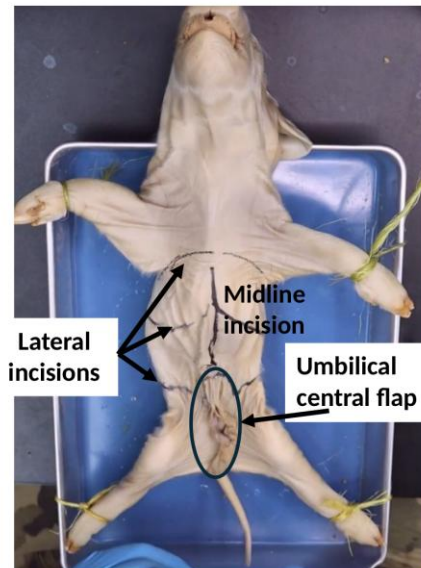
Opening the abdominal cavity

Video: Part 1 — positioning, incision pattern, and opening the abdomen.

Follow Part 1 and your teacher's demonstration. First identify the rib margin, ventral midline, umbilical cord, and external urogenital opening.

1. Place the pig in anatomical position (dorsal surface on the tray, ventral surface upward). Support the head and neck on the tray as demonstrated. Tie string around opposite forelimbs and pass it beneath the tray. Repeat for the hind limbs. Stretch the limbs to expose the ventral surface and the specimen rests securely in the tray.

Abdominal incision pattern (figure 5)



Follow the demonstrated cuts while lifting the body wall away from the organs. The central flap preserves the umbilical region and underlying bladder.

2. Gently lift the umbilical cord. Use scissors and make a small cut along the midline opening the body wall just anterior to the cord.

3. Insert the rounded scissor tip beneath the lifted body wall. Keep the tip directed away from the organs. Extend the opening anteriorly/cranially along the midline to the rib margin.
4. Make the lateral cuts demonstrated near the rib margin to **form abdominal flaps**. Keep lifting the wall with the scissor tip as you cut to prevent damage to the interior organs.
5. Continue the lower cuts around the umbilical region, preserving a **central umbilical flap** containing the cord externally and the **urinary bladder** and **umbilical arteries**. Extend the flaps toward the hind-limb region.
6. Fold the flaps outward and pin in place (pinning optional). Leave the organs in place for the first inspection.

Your internal landmark

The large **liver** just caudal to the diaphragm is the **internal landmark**. Cranial to it are the heart and lungs; much of the digestive tract lies caudal to the liver. Examine the organs in place before moving anything. Preserved color varies, so confirm each identification by position, shape, and connections. A pig's liver is multilobed (structure identification will take place later in the dissection).

Opening the thorax and throat region

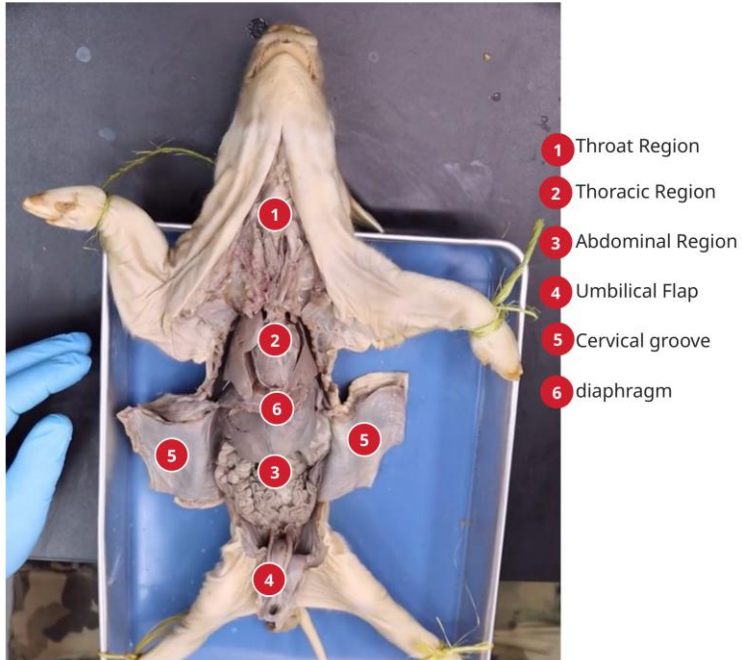
Video: Part 1 — opening the chest and exposing the internal organs.

Before opening the chest, find the **diaphragm**. It is a sheet of skeletal muscle directly cranial to the liver, our internal landmark and separates the thoracic and abdominal cavities.

1. Using the scalpel, extend the superficial midline incision from the chin posteriorly to the posterior edge of the thorax. Use controlled shallow cuts. Separate the overlying tissue of the **throat region** carefully. Preserve the neck structures beneath it.
2. With your teacher's guidance, open the chest wall along the sternum. The **heart** lies close beneath it. Gently lift the chest wall, using a metal probe separate the tissue attached to the inner chest wall. Work in small steps to prevent damage to the heart and lung structures.
3. Release attachments that hold the chest flaps closed. Protect the **pericardium**, the sac around the **heart**, until you have identified it.
4. Inspect the diaphragm before releasing its lateral attachments at the inner rib margin. Leave enough tissue to recognize its position and its separation of the

two cavities. The video **removes rib flaps** for a clearer view; do so only when directed

Ventral side incisions (figure 6)



The two thoracic flaps (rib cage) have been removed and the throat incision is made. The diaphragm is visible and separates the thorax from the abdomen. The two abdominal flaps are pinned and preserves the umbilical flap, underlying bladder and umbilical arteries.

3 • The Throat Region

Video: Part 2 — neck structures, lungs, and thymus.

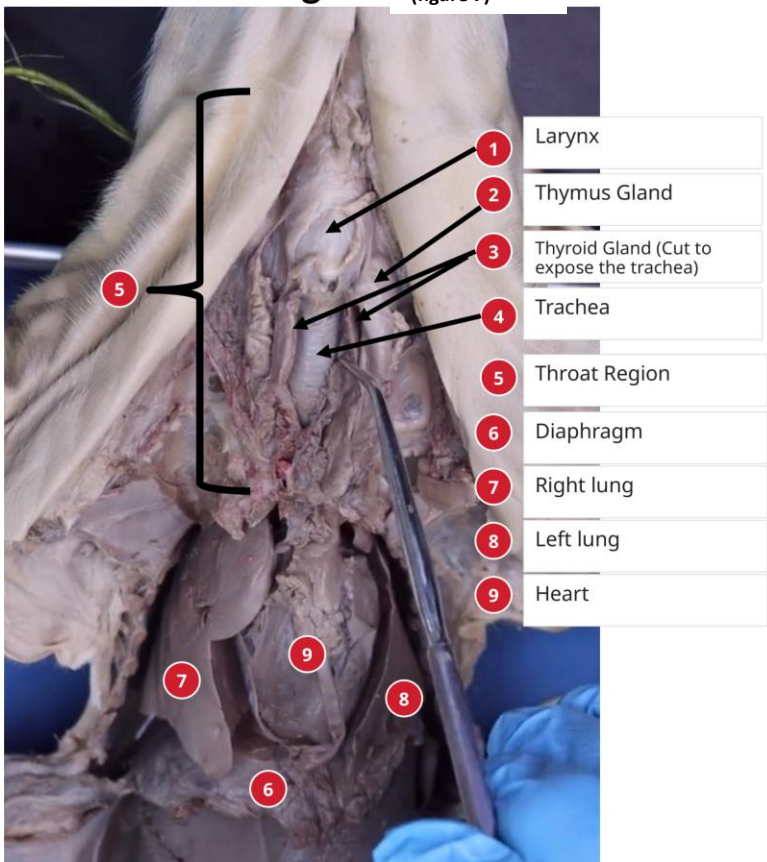
5. Using your scalpel continue the midline cut cranially (anteriorly) to the base of the chin. Continue the scalpel incision and gently slice through the skin and muscle layers to expose the throat region.

Thymus and thyroid

6. Identify the large **Larynx**, the white cartilaginous “voice box” is at the cranial end of the respiratory airway. The large **thymus gland** extending from the larynx

area posteriorly down to the heart area. Its pale lobulated tissue supports the maturation of T lymphocytes, important immune cells. The **thyroid gland** is a smaller, darker gland near the ventral trachea, caudal to the larynx. Its hormones help regulate metabolism and development. Continue slicing through the thyroid to expose the **trachea**, the white cartilaginous tube. Follow the **trachea** caudally; notice the cartilage rings help keep its passage open. It branches into **bronchi** entering the lungs and then into smaller and smaller bronchioli (discussed later).

Throat Region (figure 7)



Trace the airway caudally from the larynx. The thyroid has been displaced during the demonstration. Confirm the thymus boundary during review.

4 • The Thoracic Region

Respiratory System

Video: Part 2 — heart and major vessels.

The **lungs** lie on either side of the heart. Smaller **bronchioles** lead to microscopic gas-exchange regions. You may see larger airway branches in a teacher-approved cut surface, but ordinary video stills cannot resolve individual **alveoli**.

Pig lung lobes differ from the familiar human pattern. The right lung includes an accessory lobe that may be hidden, and the left cranial lobe is subdivided.

The **diaphragm** is skeletal muscle. After birth, its contraction increases thoracic volume and helps draw air into the lungs. Before birth, the placenta supplies oxygen; the fetal lungs are not ventilated with air.

Circulatory system

Video: Part 2 — heart and major vessels.

Heart and major blood vessels

The **heart** lies between the lungs, cranial to the diaphragm. Identify the **pericardium** before carefully opening it with a probe and scissors. Avoid cutting the heart wall.

Find the broad **base** at the cranial end (top of the heart) and the pointed **apex** toward the diaphragm (bottom of the heart). The heart has two receiving chambers, the right and left **atria**, and two larger pumping chambers, the right and left **ventricles**.

The wrinkled external flaps are **auricles**, extensions of the atria. A visible auricle is not the entire atrial chamber. Label right and left from the pig's position.

Follow the blood vessels

The **cranial vena cava** and **caudal vena cava** return systemic blood to the right atrium. These correspond to the superior and inferior venae cavae in human terminology.

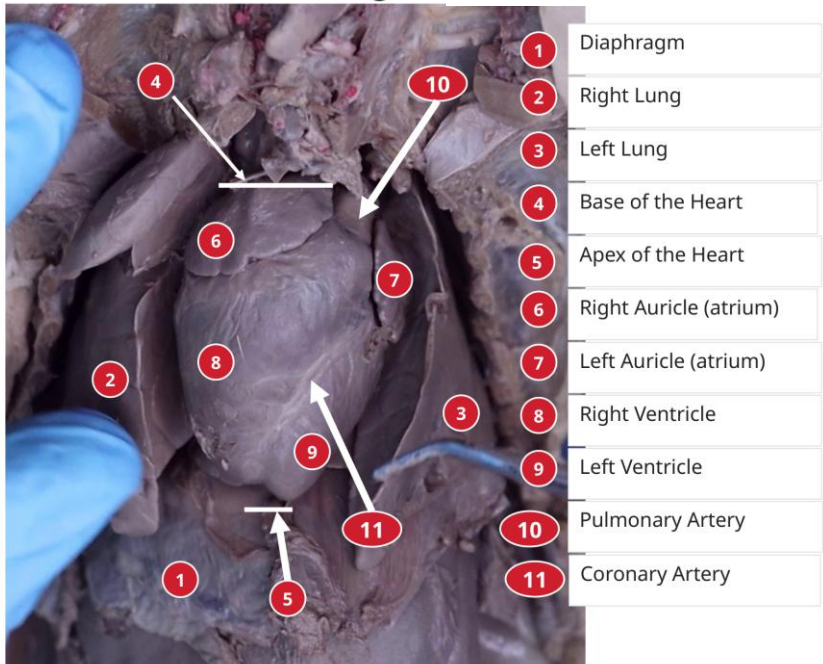
The **pulmonary trunk** leaves the right ventricle and branches into pulmonary arteries leading to the lungs. **Pulmonary veins** return blood from the lungs to the left atrium.

The **aorta** carries blood from the left ventricle into the systemic circulation.

Look for **coronary vessels** on the heart's surface. Coronary arteries supply the heart muscle itself. Do not assume every visible surface vessel is an artery without tracing or other identifying evidence.

Arteries carry blood away from the heart; veins return blood toward it. Red or blue injected latex is an identification aid, not the natural color of the vessel or a universal rule about oxygen content.

Thoracic Region (figure 8)



The auricle is an external extension of an atrium. The apex points toward the diaphragm. The great vessels and individual chamber boundaries need a more specific view.

4a • Circulation before and after birth

Video: Part 2 — umbilical vessels, with additional reading on fetal circulation.

The pathway after birth

After the lungs begin air breathing, blood returning from the body enters the right atrium and right ventricle. The right ventricle pumps it to the lungs. Blood then returns to the left atrium, passes to the left ventricle, and leaves through the aorta to supply the body.

The fetal pathway

A fetus obtains oxygen through the placenta. The single **umbilical vein** carries relatively oxygen-rich blood toward the fetus and its liver region. Two **umbilical**

arteries carry blood away from the fetus toward the placenta. Locate them beside the urinary bladder on the preserved umbilical flap.

Fetal circulation includes shortcuts that reduce flow through the unventilated lungs. The **foramen ovale** permits flow between the atria, and the **ductus arteriosus** connects the pulmonary outflow to the aorta. The **ductus venosus** allows some umbilical blood to bypass liver tissue.

These connections change or close as circulation adjusts after birth. Learn their purpose here; exposing them is optional. The foramen ovale is inside the heart and cannot be labeled on an ordinary external photograph.

The mother's and fetus's blood normally remain in separate vessels. Oxygen, nutrients, and wastes exchange across placental tissues.

Think About It 4: Why is the umbilical vein called a vein even though it carries relatively oxygen-rich blood?

5• The Abdominal Region

Digestive system

Video: Part 2 — abdominal organs.

Use the liver to orient yourself. This section describes the path food follows after birth and the accessory organs that help digestion.

Esophagus and stomach

The **esophagus** is a muscular tube dorsal to the trachea. It carries swallowed food through the diaphragm to the **stomach**. Trace it gently when exposed; do not confuse it with the trachea, the firmer ringed airway.

Lift the left portion of the liver carefully to find the stomach, a curved sac on the pig's left. Its muscular wall mixes food, while gastric secretions begin chemical digestion, particularly of proteins. The **pyloric region** is its outlet to the small intestine.

Liver and gallbladder

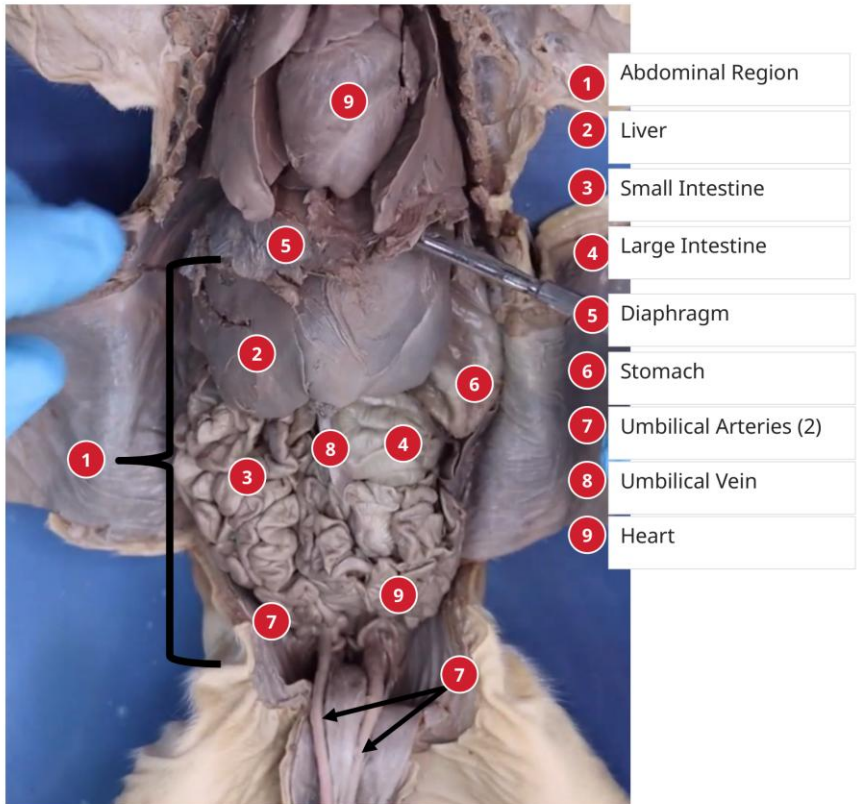
The **liver** produces bile, processes absorbed nutrients, and stores some energy reserves. It also performs many chemical-processing functions. In fetal life, it is an important site of blood-cell formation.

Look beneath the liver for the **gallbladder**, a small sac that may appear greenish or brownish. It stores and concentrates bile. Bile reaches the small intestine through the bile ducts and helps disperse fat into small droplets.

Lift the liver only as much as needed. Keep the **umbilical vein** intact during the first observation. The umbilical vein is often cut to allow the umbilical cord to lay caudally while opening the abdominal region. The video notes that the gallbladder is difficult to see from its camera angle; a label must identify the actual sac rather than a nearby shadow.

Think About It 3: Which organ produces bile, and which organ stores it?

Abdominal Region (figure 9)



The liver obscures much of the stomach in this view. The compact large intestine contrasts with the narrower small-intestine loops. Hidden organs are not labeled.

Intestines and accessory organs

Trace the digestive pathway

The **small intestine** forms numerous slender coils. Its first region, the **duodenum**, receives material from the stomach and digestive secretions. The **jejunum** and **ileum** continue the pathway. Most nutrient absorption occurs in the small intestine after birth.

The **mesentery** is a thin, often translucent fold supporting the intestines and carrying their vessels and nerves. Spread a loop gently to see it. The **peritoneum** lines the abdominal cavity and covers many organs; mesentery is a specialized fold of this membrane.

The pig's **large intestine**, including its compact spiral colon, forms a thicker, more tightly organized mass and is difficult to separate. It absorbs water and electrolytes and helps form feces. The **cecum** is a blind pouch near the small-to-large-intestine junction. The **rectum** continues toward the anus.

Pancreas and spleen

The **pancreas** is a pale, lobulated gland near the stomach and duodenum. It releases digestive enzymes and bicarbonate into the small intestine. Its hormone-producing cells also help regulate blood glucose. Finding it is an extension beyond the structures clearly described in Part 2.

The **spleen** is an elongated, flattened organ along the stomach. Although encountered here, it belongs to the lymphatic and immune systems. It filters blood, removes aging blood cells, and supports immune responses.

Move intestinal loops aside for deeper observations. Do not remove the digestive tract until your teacher has checked the required structures.

6 • Urinary system

Video: Part 2 — bladder, kidneys, and ureters near the end of the demonstration.

Return to the umbilical flap. Locate the elongated **urinary bladder** between the **umbilical arteries**. It stores urine. Preserve its attachments while you trace the urinary pathway.

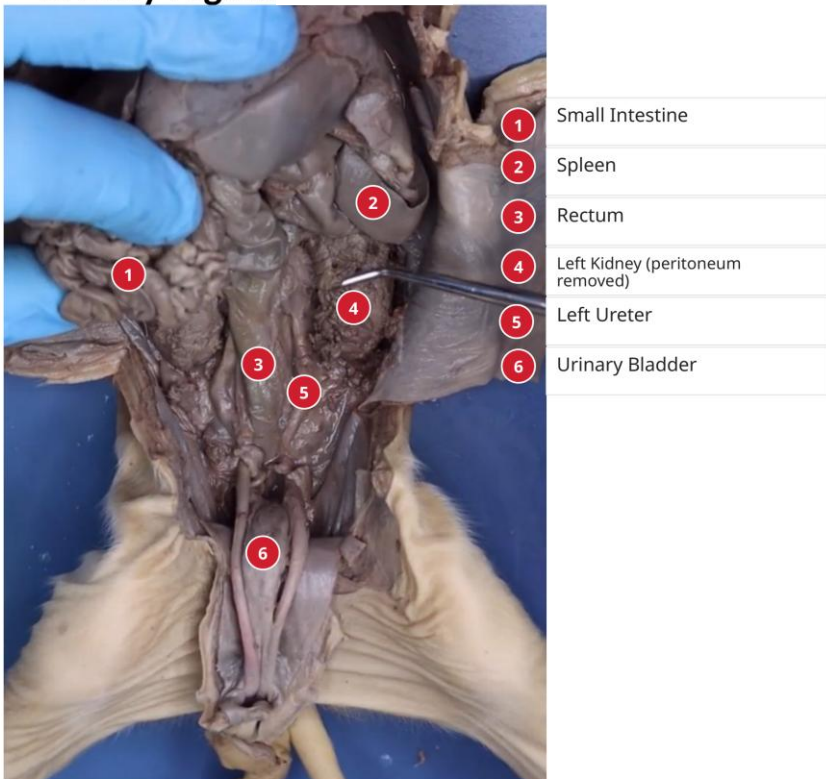
Kidneys and ureters

Gently move the intestines to expose the dorsal body wall. The paired **kidneys** lie on either side of the spine, behind the peritoneal lining. Carefully separate the covering tissue with a probe rather than pulling the kidney free.

The kidneys filter blood and adjust water, salts, and acid-base balance. Their microscopic **nephrons** form urine through filtration, reabsorption, and secretion. A nephron is too small to identify in an ordinary whole-kidney photograph. Trace a **ureter** from each kidney toward the bladder. These slender tubes carry urine. Distinguish a ureter from a nearby blood vessel by following its connection to the bladder.

Urine leaves the bladder through the **urethra**. The ureters enter the bladder; the urethra leaves it. The passage beyond the bladder differs between male and female specimens, so follow your teacher's directions for any deeper dissection.

Urinary region (figure 10)



The intestines are reflected to expose the dorsal wall. The ureter is too indistinct here for a reliable endpoint. The bladder lies on the reflected umbilical flap.

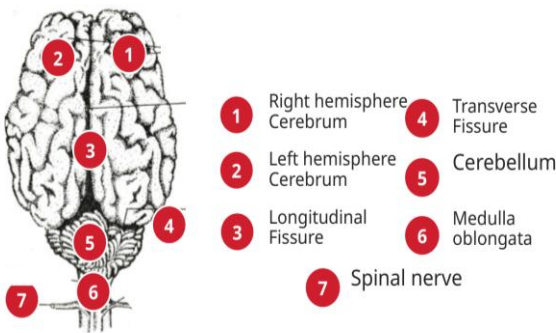
Fetal function

Fetal kidneys produce urine, but the placenta remains a major route for transfer of metabolic wastes to the mother for removal. Do not assume that identifying a functioning fetal kidney means the fetus is physiologically independent.

Think About It 5: How can you distinguish a ureter from the urethra by tracing its endpoints?

7 • Additional body systems

The following observations extend beyond the main video sequence. Your teacher will decide which to include.



The Brain (figure 11)

Nervous system

The nervous system detects changes inside and outside the body, processes information, and coordinates responses. The central nervous system (CNS) consists of the brain and spinal cord. The peripheral nervous system (PNS) includes the nerves connecting the CNS to the rest of the body. Sensory neurons carry information toward the CNS, while motor neurons carry instructions to muscles and glands. During examination of the pig's **brain**, identify these major regions and surface features. The pig's nervous system has the same basic organization as the human nervous system, making it useful for studying mammalian anatomy.

To obtain access to the brain enter from the dorsal side of the pig's skull. Remove the skin and tissue until the skull is exposed. Use strong scissors to snip bone tissue away and slowly expose the brain itself. The brain is covered with a tough 3 layers of tissue: the **Dura Mater**, the **Arachnoid** and the **Pia Mater**.

The **cerebrum** is the largest part of the brain. It processes sensory information and is involved in learning, memory, and voluntary movement. A deep groove called the longitudinal fissure separates the cerebrum into **right and left hemispheres**. Its outer layer, the cerebral cortex, has raised folds called **gyri**

(singular: **gyrus**) and shallow grooves called **sulci** (singular: **sulcus**). These folds increase the surface area, allowing more cortex to fit inside the skull.

The **medulla oblongata** is the part of the brainstem that connects to the spinal cord. It helps regulate automatic functions such as breathing, heart rate, and blood pressure. The **spinal cord** carries signals between the brain and body and coordinates many reflexes—rapid, automatic responses to stimuli.

The cerebellum lies behind and beneath the rear portion of the cerebrum. It helps maintain balance and posture and coordinates smooth, precise movements. The transverse fissure is the deep groove separating the cerebrum from the cerebellum.

Endocrine system

Review the thyroid and pancreas. The **adrenal glands** lie near the kidneys and produce hormones involved in stress responses and internal balance. Small pale structures should not be labeled as adrenal glands unless their identity is confirmed.

Reproductive system

In a female, the **ovaries** lie near the kidneys. **Oviducts** carry released eggs toward the reproductive tract. The paired **uterine horns** join the body of the **uterus**; the long horns accommodate multiple developing offspring in an adult sow.

In a male, the **testes** develop sperm-producing and hormone-producing tissue. Their position varies with fetal development. The **epididymis** connects to the **ductus deferens**, which carries sperm toward the urethra after sexual maturity. The urethra continues through the **penis**.

Finish and self-check

Before you finish

Use your specimen to locate the external and internal landmarks. Explain how the diaphragm separates the cavities. Trace the digestive route, the urinary route, and the basic circulation after birth. Then explain why fetal circulation differs.

If drawings are assigned, use colored pencils and straight leader lines that end on the actual structure. Keep labels outside the specimen outline when possible. Show the pig's right and left and use cranial and caudal directions consistently. Do not draw an unseen organ as though you observed it.

Complete the assigned observations before cleanup. Your teacher will tell you whether the specimen will be stored for another session or disposed of.

Sources and booklet notes

Primary classroom resources

Ted Ehrheart. Mr. E Science Fetal Pig Dissection Parts 1 and 2. Primary sources for the demonstrated sequence.

David H. Hall. An Illustrated Dissection Guide to the Fetal Pig, including An Illustrated Miniguide to the Dissection of the Fetal Pig. User-supplied guide_pig.pdf. Reference for scope and anatomical organization.

Ward's Science. Fetal Pig Visual Dissection Guide. Illustrated by Leah Hofgesang. © 2015. WARD470156-776. User-supplied pig_guide_03.pdf. Reference for structure locations and system coverage.

Biology II Laboratory Manual. Reading Fetal Pig Dissection. Lumen Learning / SUNY course resource. Consulted for lung divisions, neck relationships, and fetal circulation. <https://courses.lumenlearning.com/suny-bio2labs/chapter/reading-fetal-pig-dissection/>

Think About It answers

Check these answers after attempting the questions in the guide.

1. the length and age of each specimen will vary.
2. Anatomical right and left belong to the pig. A photograph can be rotated or viewed from another direction, changing where an organ appears on the page.
3. The liver produces bile. The gallbladder stores and concentrates it.
4. A vein carries blood toward the heart. The name describes direction of flow, not oxygen content.
5. A ureter connects a kidney to the bladder. The urethra carries urine away from the bladder.