

Fetal Pig Dissection Labs

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<http://www.youtube.com/watch?v=IWikhoXMxkI>

<http://www.youtube.com/watch?v=Fl1CweKjJyM>

Objective: In this exercise you will examine the organization of the many body systems studied this semester in the context of a single specimen, the fetal pig. Be sure to identify the major organs as you explore the extent of each system.

As you encounter each structure, discuss its function and interactions with surrounding structures with your lab partners

Recommendations:

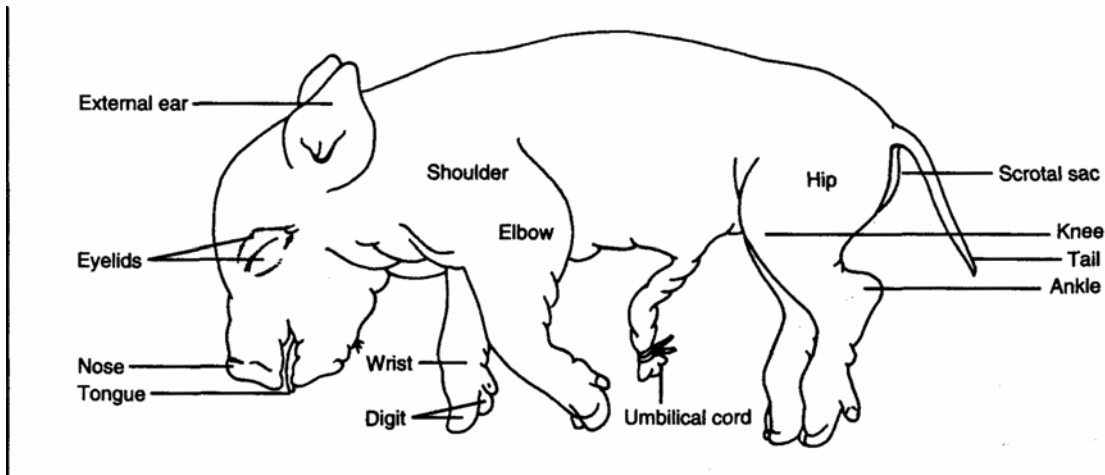
- **Carefully follow the directions**
- Read the description of each incision and understand it prior to beginning
- Each group should have a directions **reader** and a dissector
- The **rest of the group** should follow along referring to the textbook or lecture notes with details on the structures being studied
- Be prepared to answer questions that will be posed **during** lab
- Use the **scissors** for most incisions
- All students handling the specimen must wear gloves

Use the scalpel only when absolutely necessary

Clean-up at the end of each dissection:

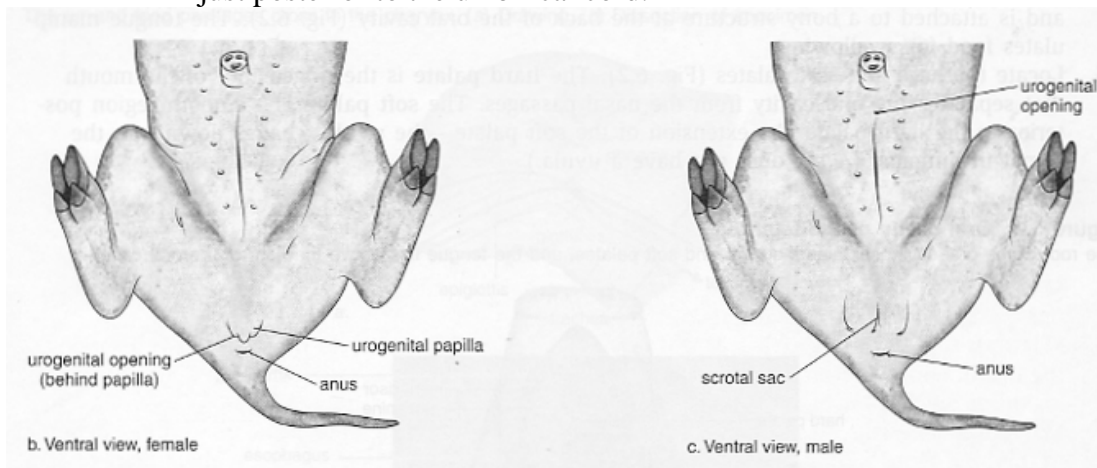
- Dispose of lab discards in the provided receptacles
- Place your pig into the plastic bag provided
 - Expel excess air from the bag and tie it shut
 - Write your group name and class time on the tag provided and attach it to the bag
 - Place the bags in the storage bin for your class
- **WASH and DRY** the dissection instruments and the plastic case that houses them
- Wash and air dry the dissection trays
- **Clean table tops** with Simple Green spray
- **Wash hands** before leaving class

FETAL PIG LAB ONE: Respiratory 1, Mouth, Pharynx & Thorax



External Anatomy

- Examine the fetal pig and locate the external features shown above.
- Two rows of nipples of mammary glands are present on the ventral abdominal surface of both males and females. Mammary glands later develop only in maturing females.
- Umbilical cord: Make a transverse cut through the umbilical cord and examine the cut end. Locate the two umbilical arteries that carry blood from the fetal pig to the placenta, and the single umbilical vein that delivers nutrient-rich blood back to the fetal pig.
- Determine the sex of your specimen
 - Female: The urogenital opening in the female is immediately ventral to the anus and has a small genital papilla marking its location.
 - Male: The scrotal sac is ventral to the anus and a urogenital opening is just posterior to the umbilical cord.

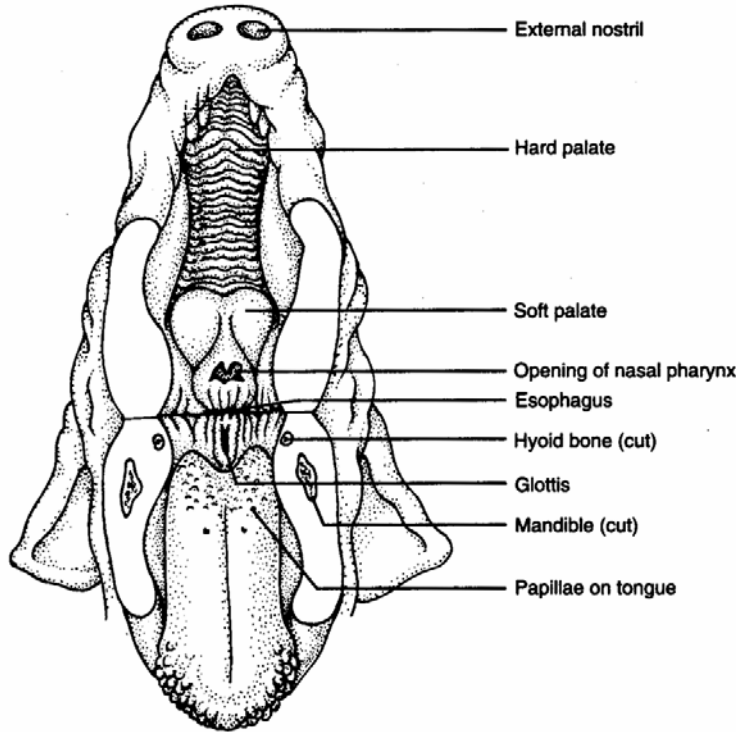


Positioning the pig for dissection

Place the fetal pig on a dissecting tray ventral (belly) side up. Use two or three rubber bands to tie the right hind leg around the ankle. Run the rubber bands around the underside of the tray and tie the left hind leg. Repeat for the forelegs.

Dissection Procedure
HEAD AND NECK

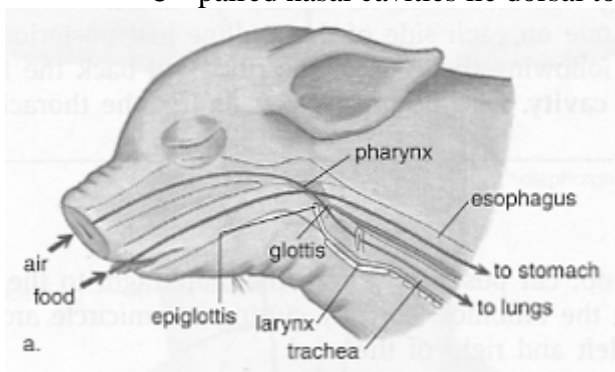
To expose the structures of the mouth and pharynx, start by inserting a pair of scissors in the angle of the lips on one side of the head and cut posteriorly through the cheek. Open the mouth as you make your cut and follow the curvature of the tongue to avoid cutting the roof of the mouth. Hold down the **epiglottis** and surrounding tissue and continue your incision dorsal to it and on into the opening of the esophagus. Now, repeat the procedure on the other side so that the lower jaw can be pulled down to expose the structures of the mouth and pharynx as shown.



- **Teeth:** Only a few deciduous **canine** and/or **incisor** teeth will have erupted. Other teeth are still being formed and may present as bulges of the gums. Make an incision in one of these bulges to observe the developing tooth.
- **Tongue:** The tongue is attached posteriorly and free anteriorly. Locate the **papillae** on its surface, especially near the base of the tongue and along its anterior margins.

You will recall that papillae are the home of many microscopic **taste buds**.

- **Hard & Soft palate:** roof of the mouth
 - formed anteriorly by the hard palate supported by bone and cartilage
 - formed posteriorly by soft palate
 - paired nasal cavities lie dorsal to the roof of the mouth



- **Nasopharynx:** space posterior to the nasal cavities and soft palate
 - contiguous with the oropharynx or throat
- **Oropharynx (throat):** space posterior to the mouth
 - Posterior extension of nasopharynx

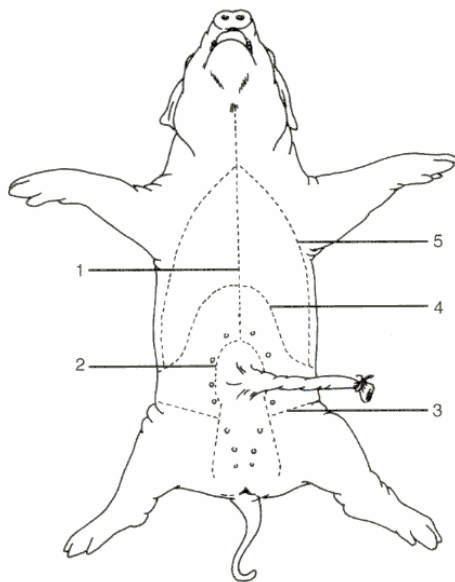
- may be difficult to visualize because incision cuts through it on each side.

When you have completed your observations, close the lower jaw by wrapping a single rubber band around the snout.

GENERAL INTERNAL ANATOMY

Using a sharp scalpel, make a small incision through the abdominal skin and muscle about ½-inch above the umbilical cord. **IMPORTANT:** Do not use the scalpel for further dissection work today. Use *scissors* to continue cutting along the midsagittal line on the ventral surface (INCISION 1), first cutting upward toward the neck (it will be necessary to cut through the ribs as well).

Be careful not to cut any underlying organs
Always cut away from yourself when using scissors for better control
Rotate the dissecting pan as necessary for better access



Turn the tray around and cut down to the caudal (tail) end of the pelvic region, leaving ½-inch border around the umbilical cord. This step is important to prevent cutting of the umbilical vein and arteries in the abdominal cavity.

Continue the midsagittal cut down into the pelvic region. Cut around the other side of the **umbilical cord** (INCISION 2), again leaving about a ½-inch border. Stop your cut about one inch short of the **anus**.

Make the two lateral incisions just in front of the hind legs (INCISION 3). If you have a male pig, cutting off-center ensures that you do not cut the penis, which is incompletely formed in the fetal pig and appears as a thickened tube within the skin of

the lower abdominopelvic area.

You may omit INCISION 4.

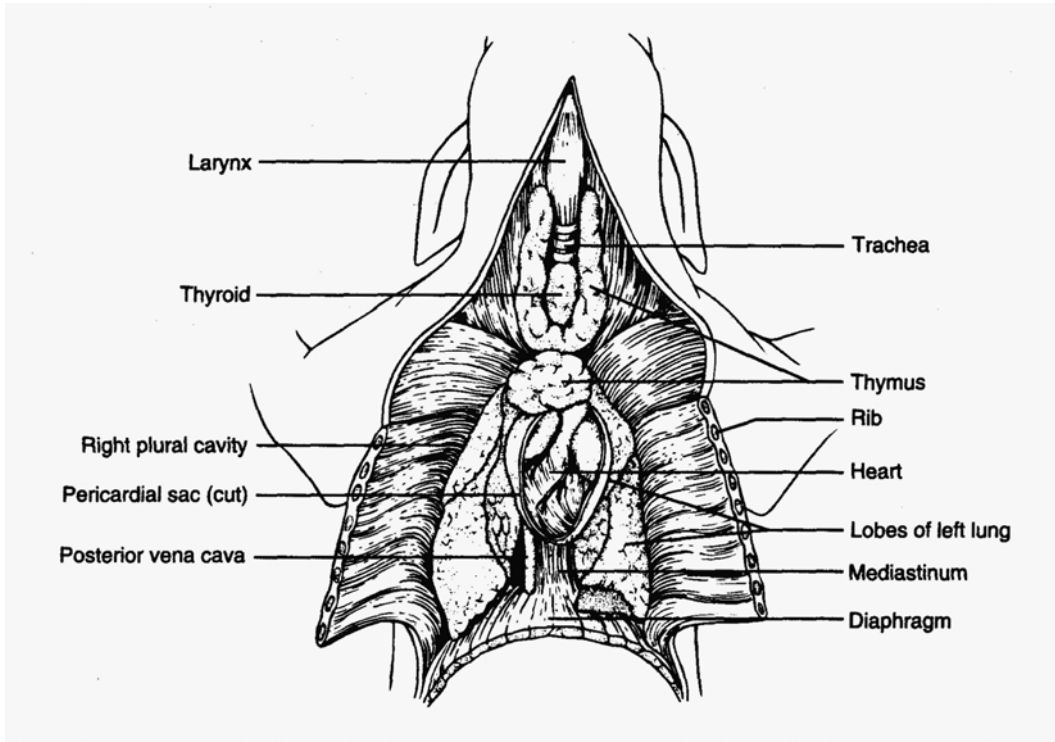
Make two lateral incisions (INCISION 5) through muscle and ribs out from the midline incision.

Lifting the lateral flaps of ribs, skin and muscle on each side, cut the **diaphragm**, which is attached to the inside body wall. You should now be able to peel open the left and right flaps of the ventral body wall like a book.

Wash out the cavities of the pig in a sink if needed to remove any brownish material (mainly bile and clotted blood) while being careful to keep the organs in place.

You may loop the rubber bands around the legs as necessary to get a better view into your specimen. When you are finished with your pig, *do not* cut the rubber bands! Simply slide the rubber band from under the pan so that next time you need not retie the pig.

THORACIC ORGANS



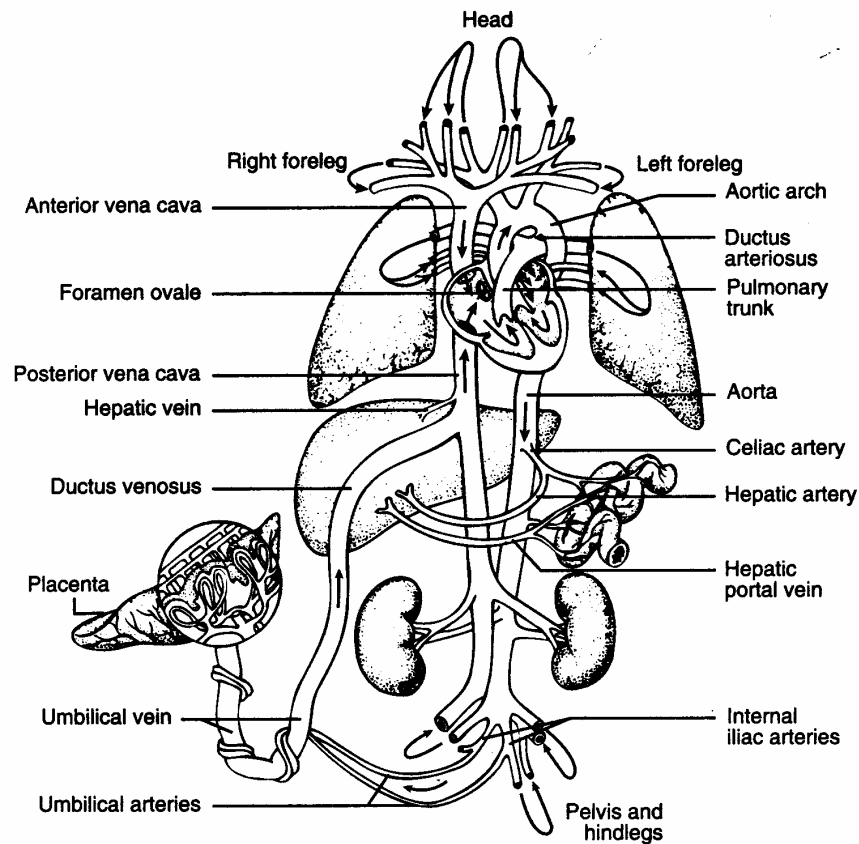
- **Lungs:** The thoracic cavity is divided into left and right pleural cavities containing the lungs. At the midline, the inner thoracic wall forms a partition between the pleural cavities called the **mediastinum**.
- **Heart:** The heart can be found enclosed in the pericardial sac located within the mediastinum and attached to the diaphragm. Remove this sac to expose the heart.

FETAL PIG LAB TWO: Respiratory 2, Neck & Cardiovascular **NECK**

In the neck region, locate the **larynx** (voice box) which is composed of cartilage and contains the vocal cords. The **trachea** (windpipe) extends posteriorly from the larynx and splits dorsal to the heart to form the **bronchi** that enter the lungs. These structures are more clearly visible after the heart has been removed.

- **Thymus gland:** whitish gland that lies near the anterior margin of the heart and extends into the neck on each side of the trachea
 - **Thyroid gland:** on anterior surface of the trachea at the base of the neck
- Remove the thymus and thyroid glands as necessary to get a better view of the trachea and larynx, but do not cut major blood vessels
- **Esophagus:** carefully remove the connective tissue supporting the trachea so that you can move the trachea to one side to expose the esophagus located dorsal to it
 - you will get a better view of the esophagus later on

CARDIOVASCULAR SYSTEM



Study the heart, major veins, and major arteries by carefully removing tissue as necessary to expose the vessels. This is best done by separating tissues with a blunt probe and by picking away connective tissue (CT) from the blood vessels with a forceps.

In a fetus, the placenta is the source of oxygen and nutrients, and also removes metabolic wastes from the blood. The lungs, digestive tract, and kidneys are nonfunctional. Circulatory adaptations to this condition make the circulation of blood in the fetus quite different from your study of the adult cardiovascular system.

Identify the following structures using the illustration as reference:

- **Heart:** carefully cut away the pericardial sac from heart and great vessels
 - locate atria, ventricles, coronary vessels
- **Anterior vena cava:** returns blood from head, neck, and forelegs to right atrium
- **Posterior vena cava:** returns blood from regions posterior to heart to right atrium
- **Pulmonary artery (trunk):** carries blood from right ventricle
- **Aorta:** carries blood from left ventricle
- **Umbilical vein:** carries blood rich in oxygen and nutrients from placenta to fetus
- **Ductus venosus:** segment of umbilical vein going to liver and on to posterior vena cava carrying blood rich in placental oxygen and nutrients

- **Ductus arteriosus:** carries blood from pulmonary trunk to aorta (bypassing the non-functional lungs)
 - white and underneath apex of heart
- **Umbilical arteries:** carries waste-laden blood from pelvic region to placenta for disposal

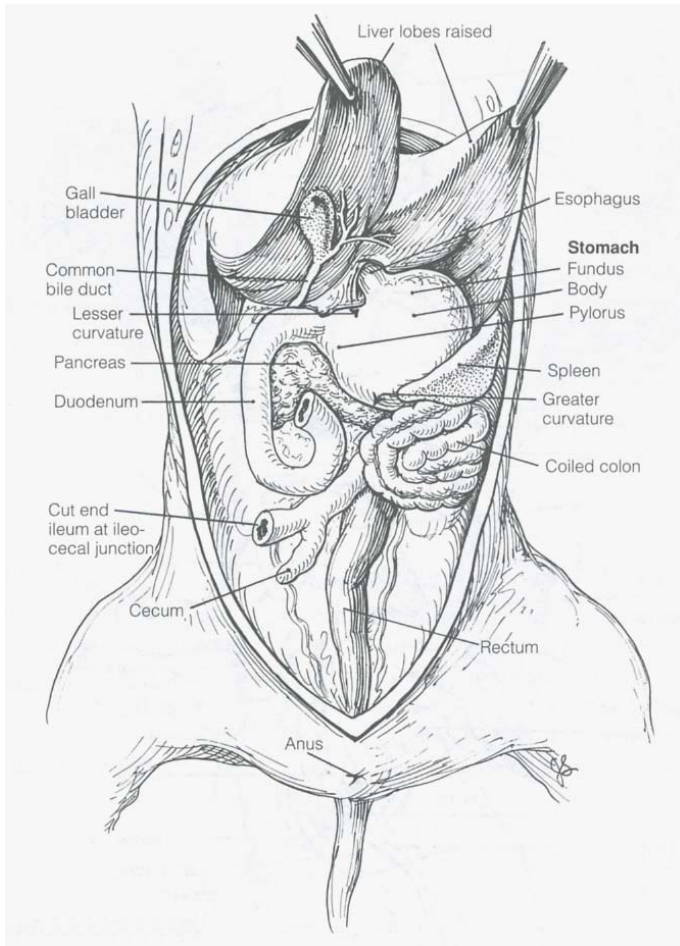
After locating the major arteries and veins, carefully cut through the major vessels and remove the heart. Leave stubs of the vessels on the heart and identify them.

RESPIRATORY SYSTEM

Return now to the neck and thoracic cavity to observe the respiratory organs. Locate the following structures:

- **Larynx:** composed of cartilage and contains the vocal cords
- **Trachea:** note C-shaped cartilaginous rings
- **Bronchi:** trachea branches to form the two primary bronchi
 - Note: these structures should be readily visible since the heart has been removed
 - dissect away connective tissue as needed
- **Vocal cords:** view on each side after making a mid-central incision in larynx
- **Bronchioles:** dissect along bronchus to view branching as it enters lung

FETAL PIG LAB THREE: Digestive System



DIGESTIVE SYSTEM

Digestive organs in the abdomen

Identify the following structures using the illustration for reference.

- **Liver:** large, multilobed structure under the lungs and diaphragm
- **Gallbladder:** lift up the lobes of the liver on the right side to find the small, green, saclike organ
- **Esophagus:** lies directly behind the trachea; follow its path from its beginning in the neck to its entry into the stomach
- **Stomach:** saclike organ under the liver on the left side
- **Duodenum:** first part of the small intestine attached to the right side of the stomach

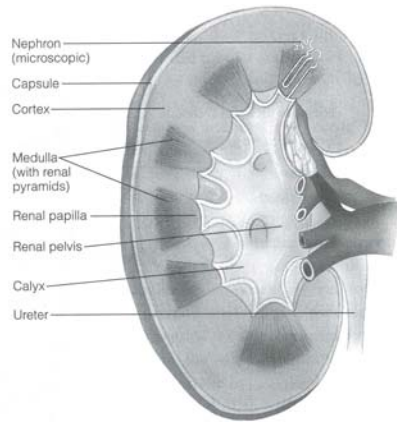
- **Pancreas:** begins in the loop between the stomach and duodenum and ends near the spleen on the left side; looks like a clump of about one hundred pinhead-sized grapes
- **Jejunum & Ileum:** the coiled remainder of the small intestine
- **Cecum:** the thumb like blind pouch at the junction of the ileum and colon
- **Colon (large intestine):** usually darker, thicker, coiled (large) intestine
- **Rectum:** the last one to two inches of large intestine leading to the anus

FETAL PIG LAB FOUR: Urinary System

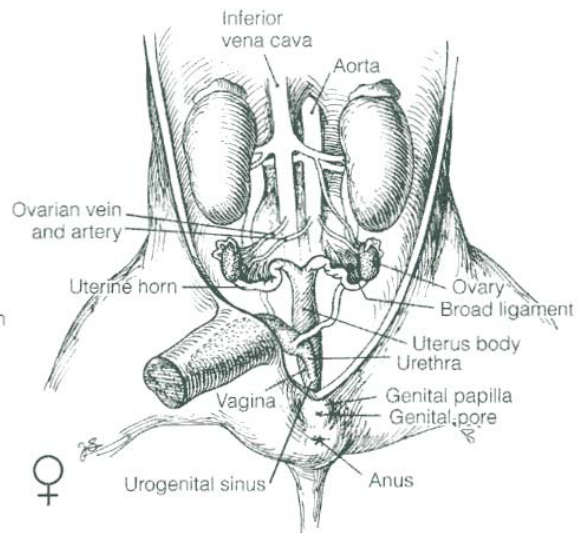
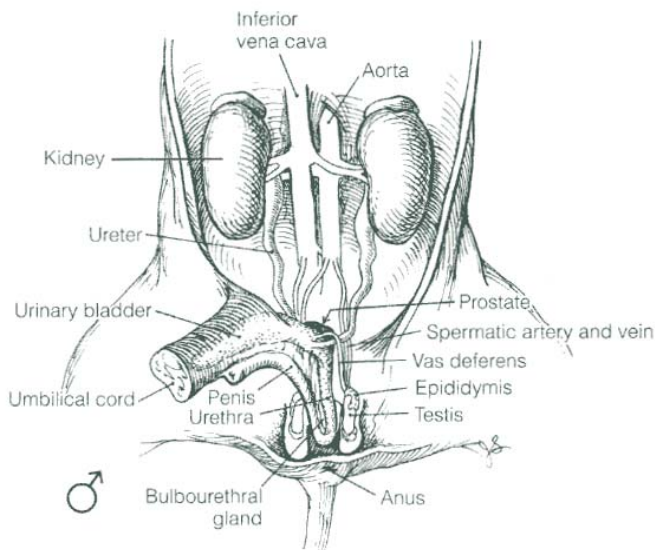
Remove the intestines to expose the urinary organs. Leave a stub of the large intestine to allow for location of the rectum later.

Dissect away surrounding tissue to expose the:

- **Adrenal glands:** on anterior surface of each kidney
- **Kidneys:** against dorsal body wall
 - Find the ureter, renal vein (thinner), and renal artery
 - Make a frontal (longitudinal) section and observe the following



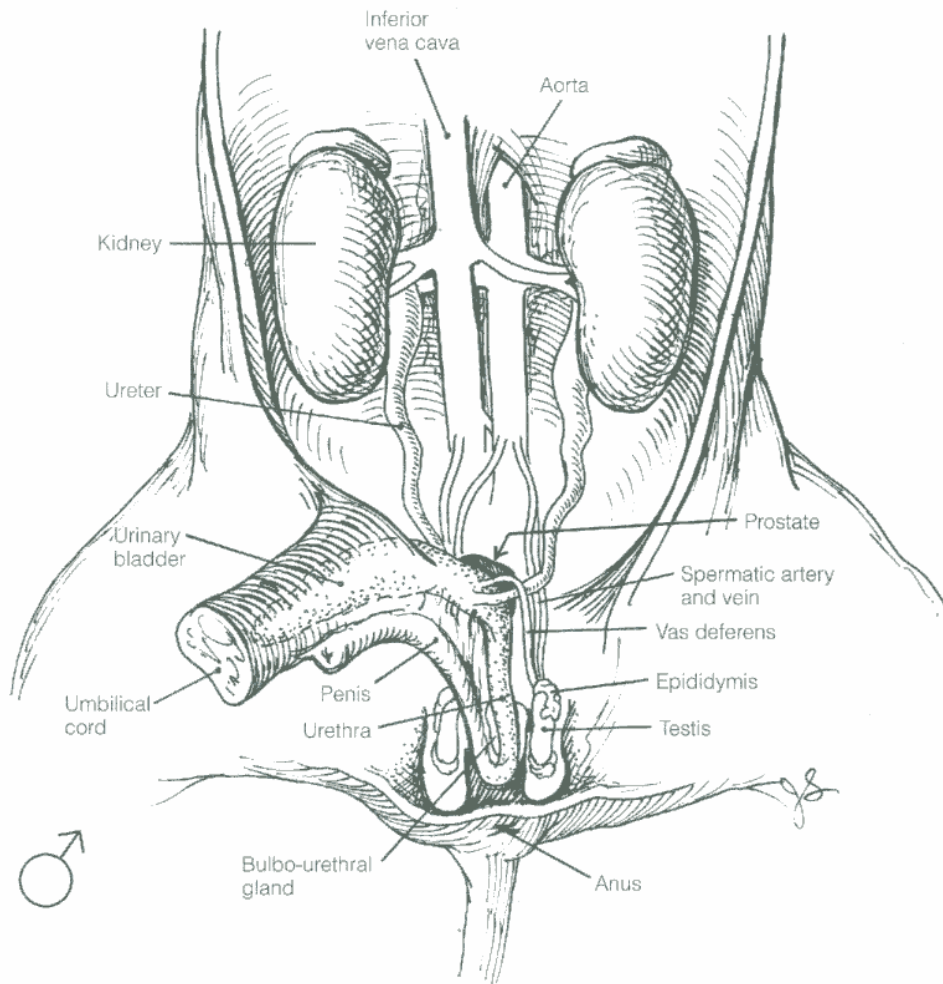
- kidney cortex
- kidney medulla
- renal pyramids
- renal columns
- calyces
- renal pelvis
- **Ureters:** originate on medial surface of kidney, near renal vessels
- **Urinary bladder:** follow both ureters posteriorly into the urinary bladder
- **Urethra:** urinary bladder narrows posteriorly to form urethra entering pelvic cavity



FETAL PIG LAB FIVE: Reproductive System

Examine the reproductive system of your specimen. Exchange it for a specimen of the opposite sex from a classmate when you are finished.

Male Reproductive System

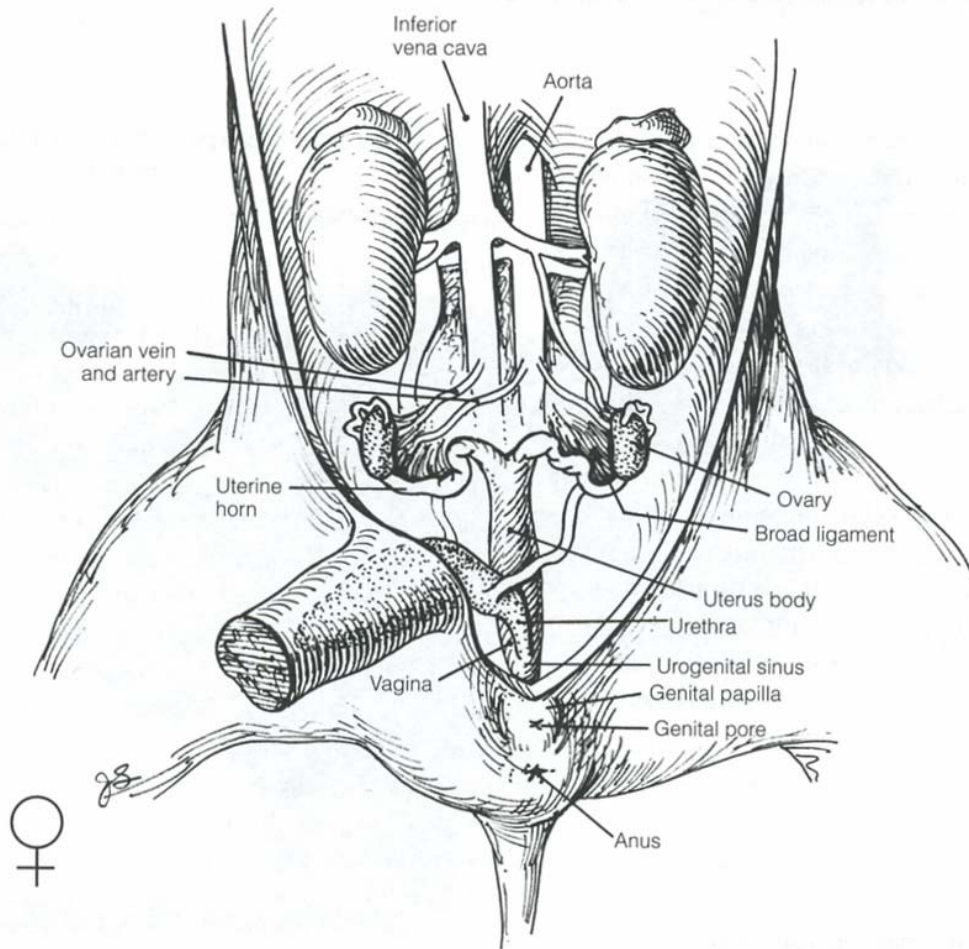


- **Testes:** locate the testes within the scrotum (external pouch)
Carefully cut open the scrotum to expose a testis.
- **Epididymis:** begins at anterior margin of testis extends to form vas deferens
- **Vas deferens:** extends anteriorly from scrotum and loops over ureter to enter urethra
- **Urogenital opening:** just posterior to umbilical cord in reflected flap of body wall containing the urinary bladder
- **Penis:** extends posteriorly from urogenital opening

Make an incision alongside the penis and free it from the body wall. Push it to one side and use a scalpel to make a midline incision through the pelvic muscle and bones. Spread the legs and open the pelvic cavity so that you can dissect out the pelvic organs.

- **Urethra:** at the end of the urinary bladder
- **Rectum:** located dorsal to the urethra
 - carefully remove the connective tissue around urethra to separate it from the rectum
 - continues posteriorly into pelvic cavity
- **Seminal vesicles:** small paired glands on each side of the urethra
- **Prostate gland:** very small gland between seminal vesicles on dorsal surface of urethra
- **Bulbourethral glands:** paired glands on each side of urethra where it enters the penis

Female Reproductive System



- **Uterus & uterine tubes (horns):** located dorsal to urinary bladder and ventral to the descending colon (LI)
- **Ovaries:** follow uterine tubes anterolaterally to the ovaries
 - located just posterior to kidneys

Remove or reflect the skin from the ventral surface of the pelvis. Use your scalpel to cut carefully at the ventral midline through the muscles and bones of the pelvic girdle. Spread the legs and open the pelvic cavity to expose the continuation of the urethra and:

- **Vagina:** just dorsal to urethra
 - extends posteriorly from body of uterus
- **Rectum:** terminal portion of LI

FETAL PIG LAB SIX: Nervous System (optional)

- With the pig dorsal side down, open both **thoracic** and **abdominal** flaps and locate the spinal column.
- Select a site along the spine and remove any organs blocking your view of the spine. Using a scalpel, expose the spine and locate any emerging nerves. Trace one as far as you can into the body.
- Reposition the pig dorsal side up in your dissecting tray. In the thoracic region, remove the skin and muscle to expose 10mm of the vertebral column.
- Using forceps to grip the spine and scissors to cut, open the **vertebral canal** by cutting off the **vertebral arch**. Note the **dura mater** or outermost covering of the brain & spinal cord.
- Make a second cut on the other side of this vertebrae, and fold the spine section upward so you can view the cross-section. Locate the **white and gray matter, dorsal and ventral root, central canal**, and a **dorsal root ganglion**.
- Maintaining the dorsal side up, remove the skin and muscles from the skull.
- Cut through the skull near the center at the anterior fontanel. Be careful not to break the meninges or membranes covering and protecting the brain.
- After the skull is open, cut away the pieces **but do not use the scalpel blade for cutting**.
- When the brain is completely exposed, locate the 2 large hemispheres called the **cerebrum**. **Fissures** indenting the surface of the cerebrum are called **sulci** (sulcus, singular). **Gyri** (gyrus, singular) are ridges projecting outward from the surface.
- Locate the **longitudinal fissure** or indentation that runs laterally between the right and left cerebral hemispheres. The **olfactory lobes** that control smell are at the front of the cerebrum. The cerebrum controls thinking, senses, etc.
- Posterior to the cerebrum is the **cerebellum**. Locate the cerebellum and the **transverse fissure** that separates it from the cerebrum. The cerebellum consists of 2 lateral hemispheres and is involved with the control of muscles and coordination.
- Carefully remove the brain from the skull in order to locate the hind section of the brain known as the medulla oblongata. The medulla connects the brain to the spinal cord and controls all vital functions of the body such as heart beat and breathing.

FINISHING UP

Time permitting, feel free to revisit any part of this exercise.

Actually seeing the structures you have been studying in the context of an entire organism plus a free-flowing discussion of their anatomy and physiology should prove valuable in your preparation for upcoming examinations.

Dispose of your specimen using the plastic bucket receptacle for organic matter and related materials. Lastly, be sure to use the provided disinfectant to sanitize your tabletops and to wash your hands with soap and water before leaving class.

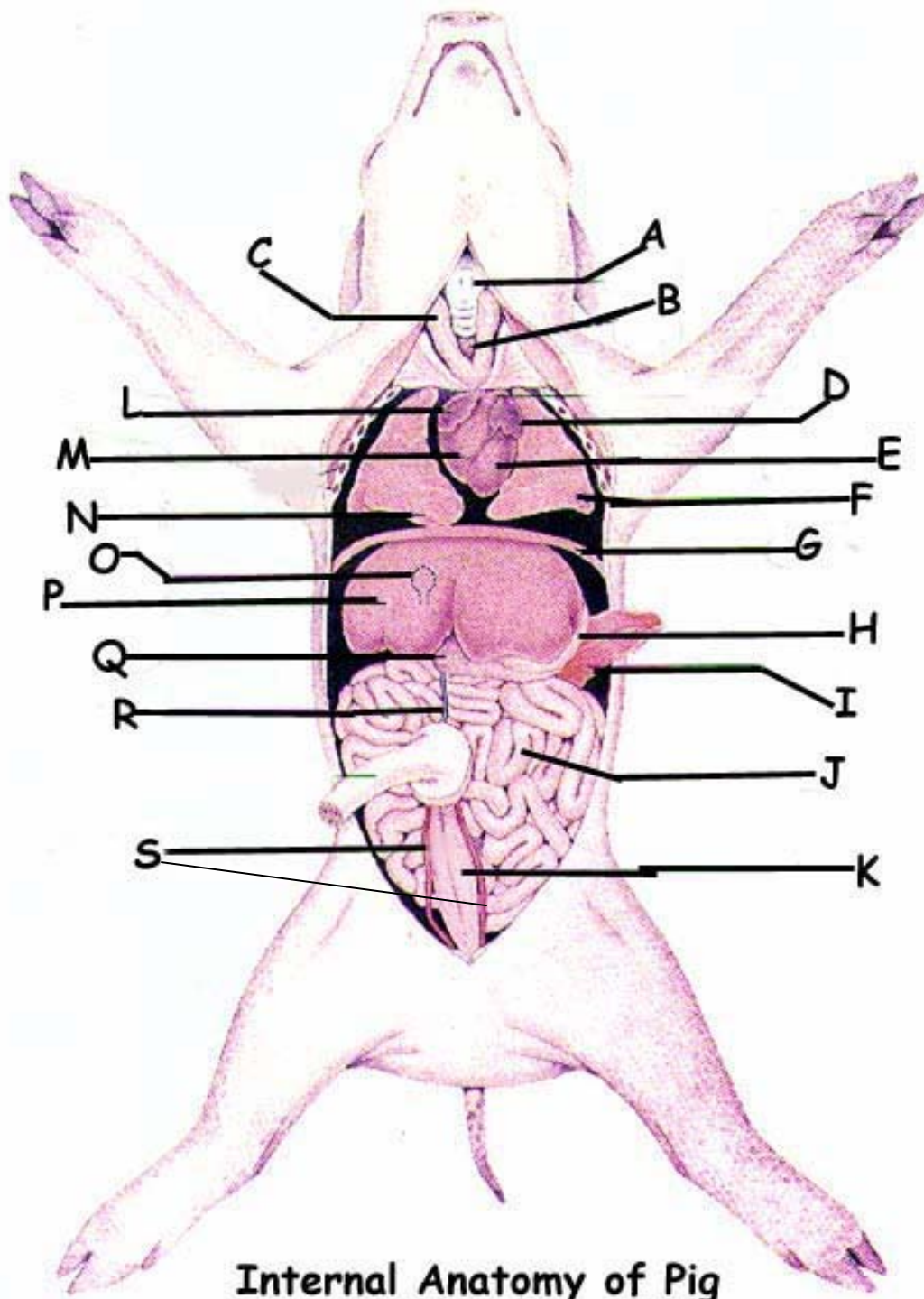
Wrap-up Exercise

Check what you have learned by identifying all the structures in the figure on the next page. You should also be able to discuss their function(s) and relation to overall health.

A		K	
B		L	
C		M	
D		N	
E		O	
F		P	
G		Q	
H		R	
I		S	
J			

Please note:

- N refers to the triangular shaped structure
- S refers to the paired thin, threadlike structures
- K refers to the larger central structure



Internal Anatomy of Pig