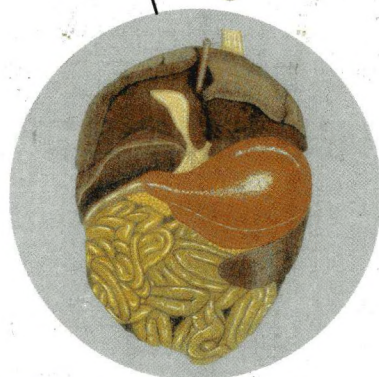
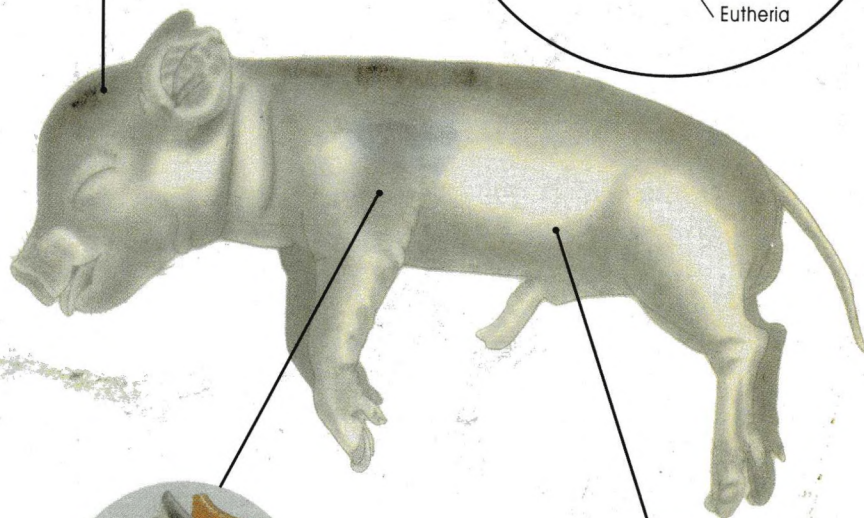
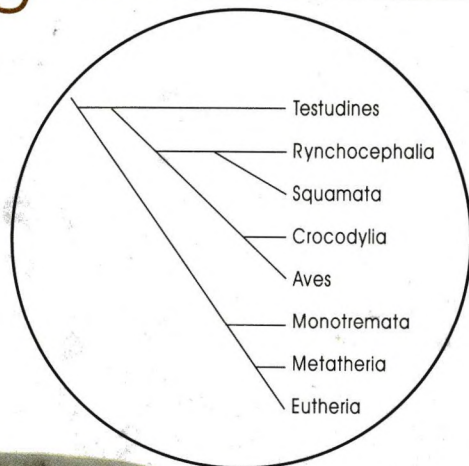
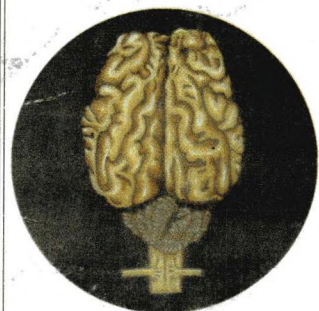


An Illustrated
Dissection Guide
To The...

Mine

Fetal Pig



by David H. Hall

An Illustrated Miniguide to the Dissection of the Fetal Pig

Introduction

The fetal pig belongs to the phylum chordata, class mammalia, order Artiodactyla, genus *Sus*, species *scrofa*. The fetal pig is an excellent specimen for mammalian dissection because of its convenient size. The approximate age of your pig can be determined by the length of your specimen.

11 - 12 inches +	= 115 days
8 - 10 inches	= 100 days
6 - 8 inches	= 75 days

Before you begin, make sure you have the proper dissecting tools, including: dissecting scissors with one tip rounded, dull probe, dissecting needle, forceps. In order to keep your specimen from molding, drying out, and tissues becoming brittle, we recommend rinsing the specimen in Delta-Sol (particularly once the body cavity is opened) to rid the specimen of obnoxious embalming fluid fumes. Delto-Sol is a non-toxic, odorless, preservative which can be ordered in easy-to-mix concentrate form from our catalog.

Anatomical Terms

In order to understand much of this text, the student should become familiar with the following Anatomical terms and the diagram in *Figure 1*.

- Cranial** — Toward the head
- Caudal** — Toward the rear
- Dorsal** — Toward the back
- Ventral** — Toward the belly
- Proximal** — Near to
- Distal** — Away from

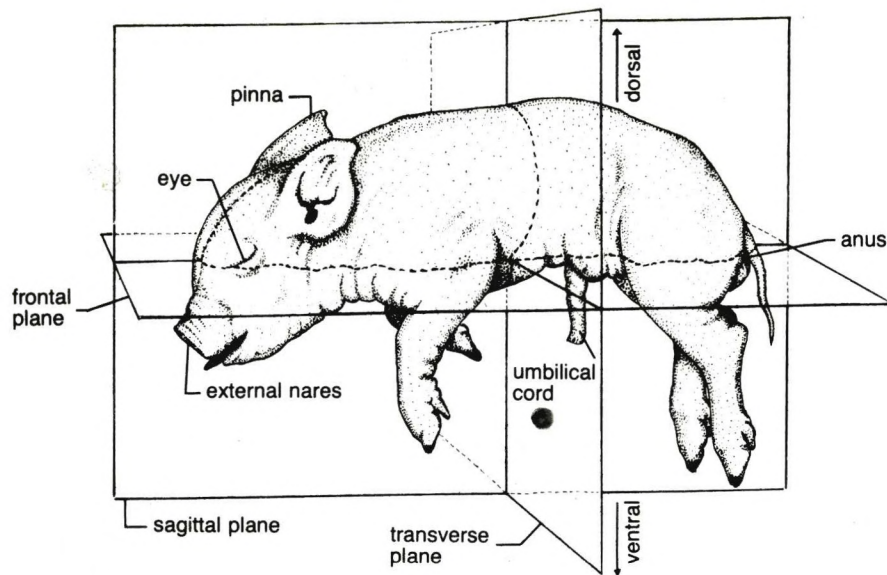


Figure 1. External features and anatomical planes.

External Features (see Figure 1)

- **Pinna**—The flap-like external ear
- **Nares**—The two nostrils
- **Eye**—Note the upper and lower eyelids. Look closely in the corner of an eye and find the small nictitating membrane.
- **Anus**—The terminal opening of the digestive track where feces are expelled, located just ventral to the tail.
- **Urogenital Opening**—In the male fetus, this is located just caudal from the umbilical cord. You should also find the scrotal sac which is a swelling proximal to the umbilical cord. In females the urogenital opening is just ventral to the anus.
- **Mammary Papillae**—These are found on the ventral surface on either side of the umbilical cord in both sexes. These develop into teats on mature females.

Oral Cavity (not pictured)

Find the following structures after you have cut the joints on both sides that hold the upper and lower jaws. Use your scissors and a firm amount of pressure in order to cut these joints.

- **Tongue**—The most obvious feature in the mouth, it functions as a taste organ and as a muscular appendage to manipulate food in the mouth.

- **Hard Palate**—Located on the roof of the mouth, this is a bony structure. It separates the oral from the nasal cavity.
- **Soft Palate**—Is the mouth roof just caudal from the hard palate. The soft palate is composed of tissue with no underlying bone or cartilage.

Skeleton (Figure 2)

Use this diagram as a reference in finding the various muscle insertions and origins.

Superficial Muscles

Skin your pig specimen in the following manner: Shallowly cut around the distal end of each limb, around the umbilical cord and the head. Cut from the area just ventral from the anus (below the urogenital opening on females), cranially to the tip of the jaw. Cut four incisions along the ventral side of each limb from distal cuts made earlier to the mid-ventral cut also made earlier. Now carefully peel off the skin from the connecting tissue (fascia) which secured the skin to the underlying muscles. A dull probe or scissors handle may be used. In this manner you will expose the superficial muscles.

Lay your specimen on its side and identify the following muscles with the help of Figure 3.

Rhomboideus Cervicis—Origin, last cervical and first six thoracic vertebrae; insertion, scapula; draws scapula forward.

Rhomboideus Capitis—Origin, occipital bone; insertion, on vertebral border of scapula; draws scapula forward.

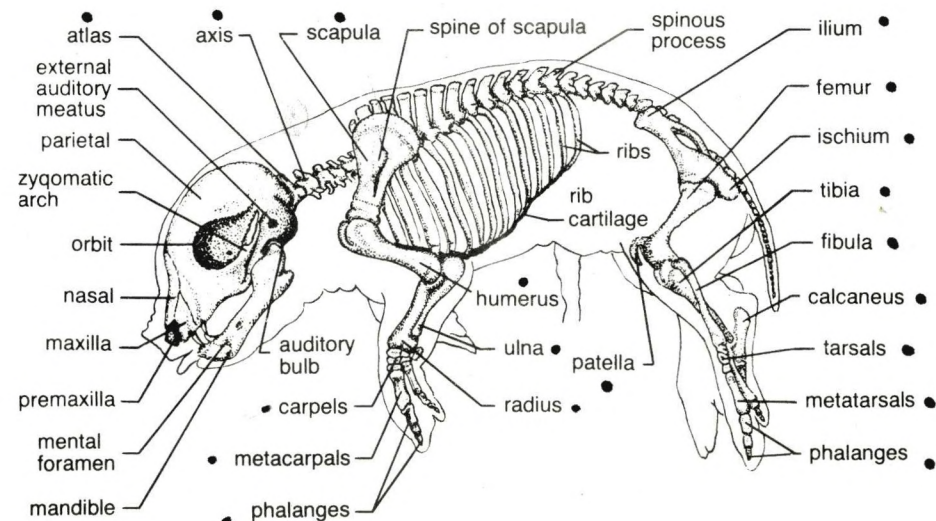


Figure 2. Skeleton of the fetal pig.

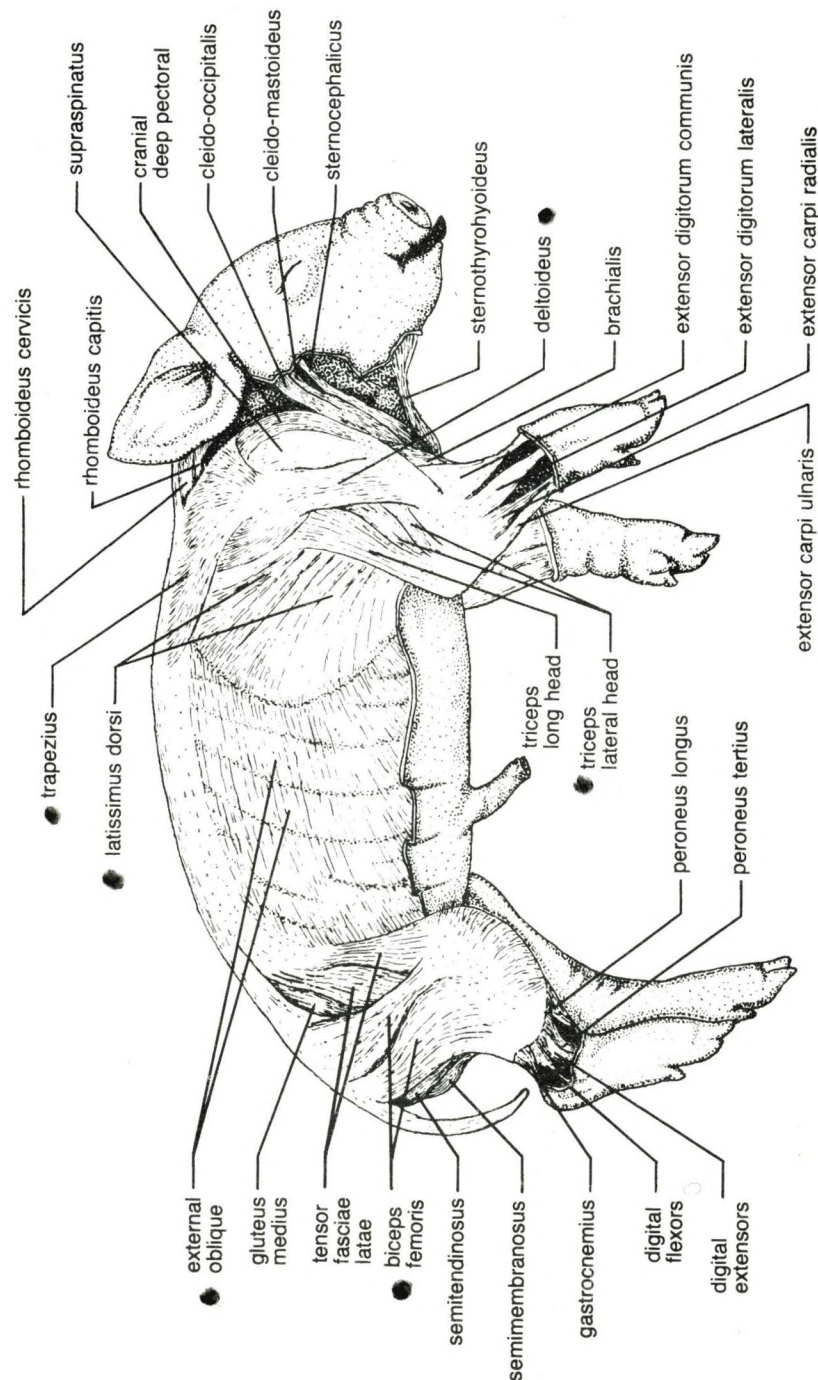


Figure 3. Lateral view of the superficial muscles.

Cranial Deep Pectoral—Origin, sternum on cranial end; insertion, aponeurosis at dorsal end of supraspinatus; adducts forelimb.

Supraspinatus—Origin, scapula; insertion, humerus; extends scapula.

Cleido-occipitalis—Origin, lambdoidal ridge of the occipital bone and mastoid process; insertion, distal humerus; flexes forelimb.

Sternocephalicus—Origin, cranial end of sternum; insertion, mastoid process via long tendon; flexes head.

Sternothyrohyoideus—Origin, first costal rib cartilage; insertion, body of hyoid bone; moves hyoid caudally.

Brachialis—Origin, proximal part of humerus; insertion, proximal ulna; flexes lower limb.

Deltoideus—Origin, spine of scapula; insertion, deltoid ridge of humerus; flexes humerus.

Extensor Carpi Radialis—Origin, humerus; insertion, radius; extends forefoot.

Extensor Digitorum Communis—Origin, humerus; insertion, through a divided tendon to digits; extends digits.

Extensor Digitorum Lateralis—Origin, humerus; insertion, through divided tendon to the digits; extends digits.

Extensor Carpi Ulnaris—Origin, humerus; insertion, through long tendon to fifth metacarpel; extends wrist.

Triceps, Long Head—Origin, humerus; insertion, on the olecranon process of the ulna; extends forelimb.

Triceps, Lateral Head—Same as above.

Trapezius—Origin, spinous processes of first ten vertebrae and occipital bone of skull; insertion, spine of scapula; draws scapula medially.

Latissimus Dorsi—Origin, lumbar and last thoracic vertebrae and also on the lumbodorsal fascia; insertion, proximal end of humerus through a tendon; moves forelimb dorsally and caudally.

External Oblique—Origin, lumbodorsal fascia and ribs; insertion, linea alba (the mid-ventral ligament); constricts abdomen.

Gluteus Medius—Origin, lumbodorsal fascia; insertion, femur; abducts thigh.

Tensor, Fasciae Latae—Origin, ilium; insertion, connective tissue called the fascia latae which connects to patella; extends leg and tenses fascia latae.

Biceps Femoris—Origin, ischium; insertion, fibia and tibia; flexes shank, abducts thigh.

Semimenbranosus — Origin, ischium; origin insertion, fibia and tibia; extends thigh.

Gastrocnemius — Origin, femur; insertion, calcaneus by way of the achilles tendon, extends foot.

Digital Flexors — Origin, fibula and tibula; insertion, digits of foot; flexes digits.

Digital Extensors — Origin, tibia and fibula; insertion, metatarsals; extends digits.

Peroneus Longus — Origin, tibia and fibula; insertion, metatarsals; flexes ankle.

Peroneus Tertius — Origin, femur; insertion, third metatarsal; flexes foot.

Internal Anatomy

Place the specimen on its dorsal surface on a dissecting tray. Secure your pig by tying a length of string to one limb and pass it under the tray to be tied to the opposite limb tautly. Repeat this with the other limbs.

Make incisions through the body wall as outlined in *Figure 4*. Be careful to cut around the umbilical cord and make your cuts deep enough (use scissors) to cut just through the muscles. Pin the flaps of muscles away to expose the body cavities.

Compare your specimen with *Figure 5* and identify the following:

- **Thymus** — This is a greyish mass that covers the upper trachea. The thymus is a gland that produces hormones important in the production of plasma cells. As the pig matures, the thymus decreases in size and function.
- **Trachea** — Remove the thymus and find this tough cartilage tube which conducts air to and from the lungs. At the point just caudal from the oral cavity is a swelling which is the voice box or larynx.
- **Lungs** — Follow the trachea downward where it splits into the bronchi which go to each lung. The lungs themselves are reddish and spongy in texture. The right lung has four lobes while the left lung has three.
- **Heart** — This organ is located between the lungs and is covered by the pericardial sac. Superficial structures include: right and left ventricles, right and left atria.

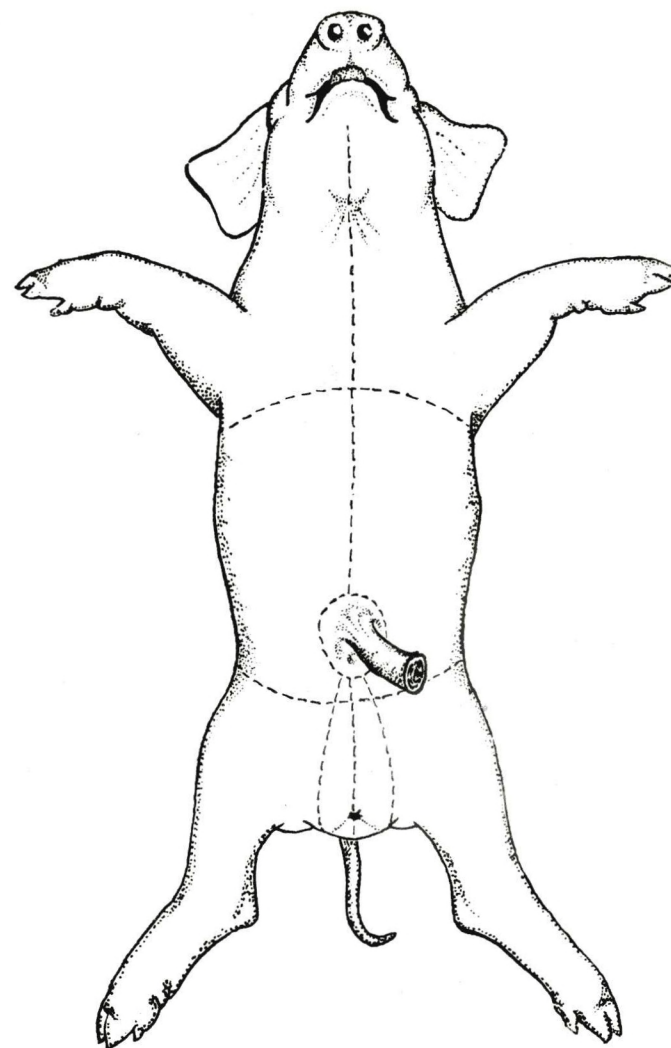


Figure 4. Body wall incisions.

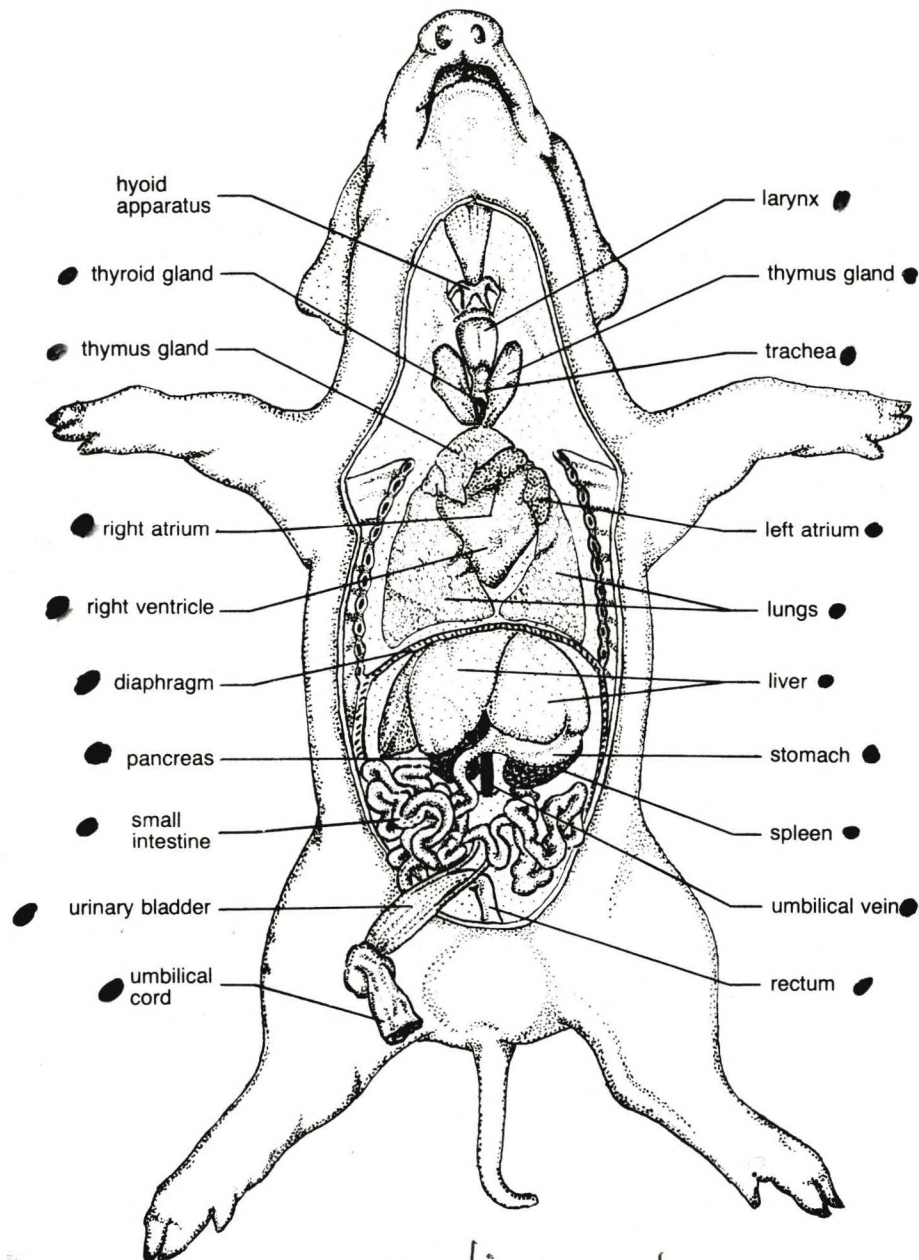


Figure 5. Internal anatomy.

The above organs are within the thoracic cavity. This cavity is divided from the abdominal cavity by different membranes and the diaphragm. The esophagus (a muscular tube dorsal to the trachea which conducts food from the mouth to the stomach). Aorta and the Caudal Vena Cava pass through the diaphragm and membranes. The following are the digestive organs of the abdominal cavity:

- **Liver** — Located just caudal from the diaphragm is this brown, lobed organ which purifies blood, stores sugars, and produces the fat emulsifying fluid called bile.
- **Gall Bladder** — Located on the surface of the right liver lobe. This organ stores bile until it is needed. Connected to the liver by the bile duct, it drains into the small intestine by the cystic duct.
- **Stomach** — Under the left lobe of the liver the stomach breaks down food, and a limited amount of absorption occurs. The emptying of the stomach into the small intestine is done by the pyloric valve.
- **Small Intestine** — This highly coiled tube receives food from the stomach and mixes it with digestive enzymes for further breakdown and the absorption of the breakdown products.
- **Pancreas** — A greyish organ located in the membranes (mesentery) which holds the small intestine. The pancreas produces many digestive enzymes which enter the small intestine by the pancreatic duct.
- **Large Intestine** — Follow along the length of the small intestine. At the terminal end, it connects to a much larger tube-like organ. This is the large intestine or Colon. The colon has two functions: the absorption of water and elimination of wastes.
- **Cecum** — At the junction of the large and small intestines is this small finger-like projection.
- **Rectum** — At the terminal end of the large intestine is the rectum. This is a storage area for feces. The feces are eliminated through the opening known as the anus.
- **Spleen** — Although not a part of the digestive system, it is advantageous to study it now. The spleen stores and produces red blood cells and certain lymphocytes.

The Urogenital Systems

After the digestive system has been viewed, it may be dissected out so that the urogenital systems can be easily studied. Cut through the junction of the esophagus and the stomach; cut away the membranes that hold the stomach, liver, pancreas, large and small intestines; but leave an inch or so of the rectum. Dispose of the digestive tract according to your teacher's instructions. Depending on the sex of your specimen, use Figure 6 (female) or Figure 7 (male) to identify the following:

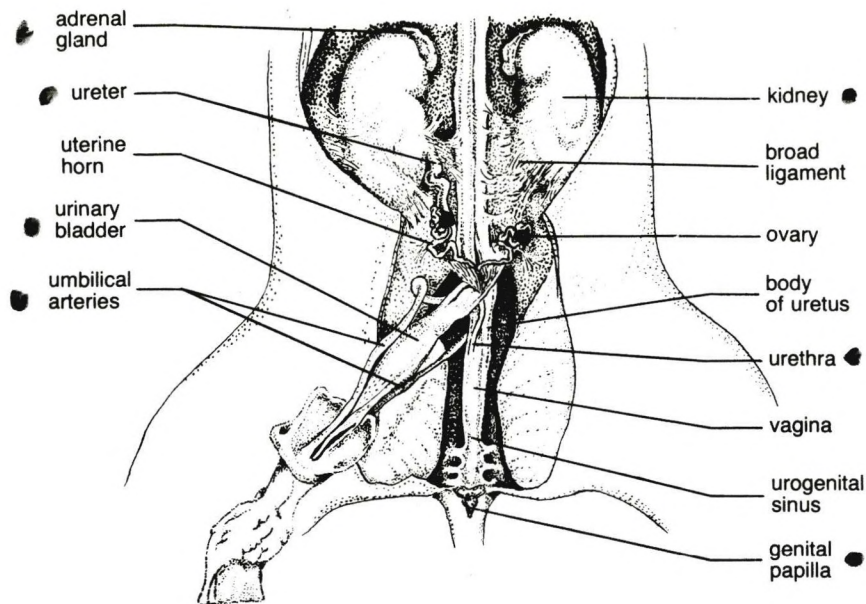


Figure 6. Female urogenital system.

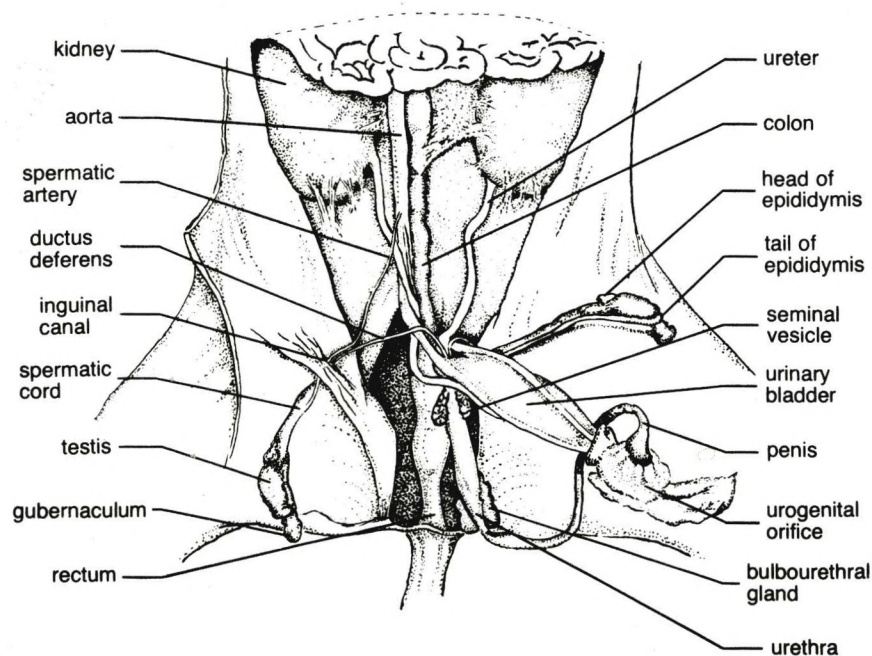


Figure 7. Male urogenital system.

● **Kidneys** — These are located on the dorsal body wall, on either side of the midline, just below the liver. The general functions are: The elimination of wastes from the blood stream, elimination of excess water, ion balance regulation.

● **Ureters** — These are the tubes which carry urine from the kidney to the Urinary Bladder. This is where the urine is stored prior to elimination. It is a long tube-like organ located in the posterior region of the abdominal cavity.

● **Urethra** — This is the tube connecting the urinary bladder to the urogenital opening where urine is expelled.

Female Reproductive Systems (Figure 6)

Ovaries — These are located on either side of the mid-line just below the kidneys. This is the organ which produced the eggs.

Oviducts — Leading from each ovary are the oviducts (fallopian tubes). The egg, after release from the ovary, travels into the oviduct through its ciliated, funnel-shaped opening called the ostium. The cilia set up a current in the body cavity fluid which sweeps the egg into the oviduct. The oviducts enter the uterus at the junction of the two organs which is called the Uterine Horn.

Uterus — The pig uterus is a y-shaped affair which is called a bicornate type. The embryos develop in the arms of the y and not in the junction or uterine body.

Vagina — A muscular tube dorsal to the Urethra, this is the passage-way for sperm to fertilize eggs and the exit of embryos during birth.

Male Reproductive System (Figure 7)

Scrotum — At one point in the development of the pig (as in all mammals) the testes are found directly within the abdominal cavity. Later, the testes descend into a sac-like structure of the **scrotum**. As the testes descend into the scrotum, they carry along with them nerves, blood vessels, and ducts. The openings that remain between the abdominal cavity and the scrotal cavity are called the inguinal canals.

Testes — Open one side of the scrotum. Inside you will notice a rather round, whitish structure. This is the testis. The testes are the sites of sperm and male sex hormone production. On either side of the testis is a small highly coiled tubule: The **epididymis** which functions to store sperm cells.

Ductus Deferens — The epididymis continues as the ductus deferens which connects to the urethra. At this junction there are two small glands; the seminal vesicles and, in between these, the prostate gland. If the urethra is followed caudally, another pair of glands will be found: The Bulbourethral Glands. All of these glands secrete fluids that along with sperm form semen.

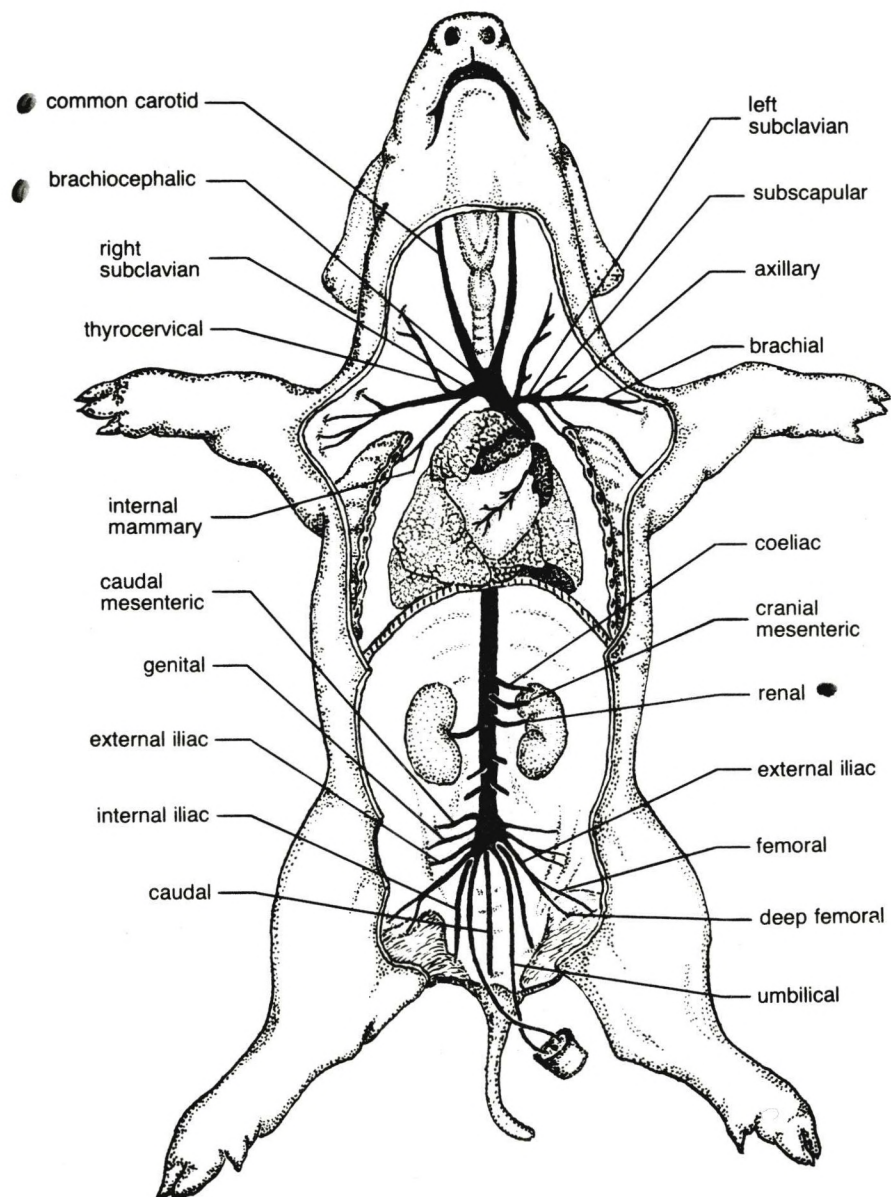


Figure 8. Major arteries.

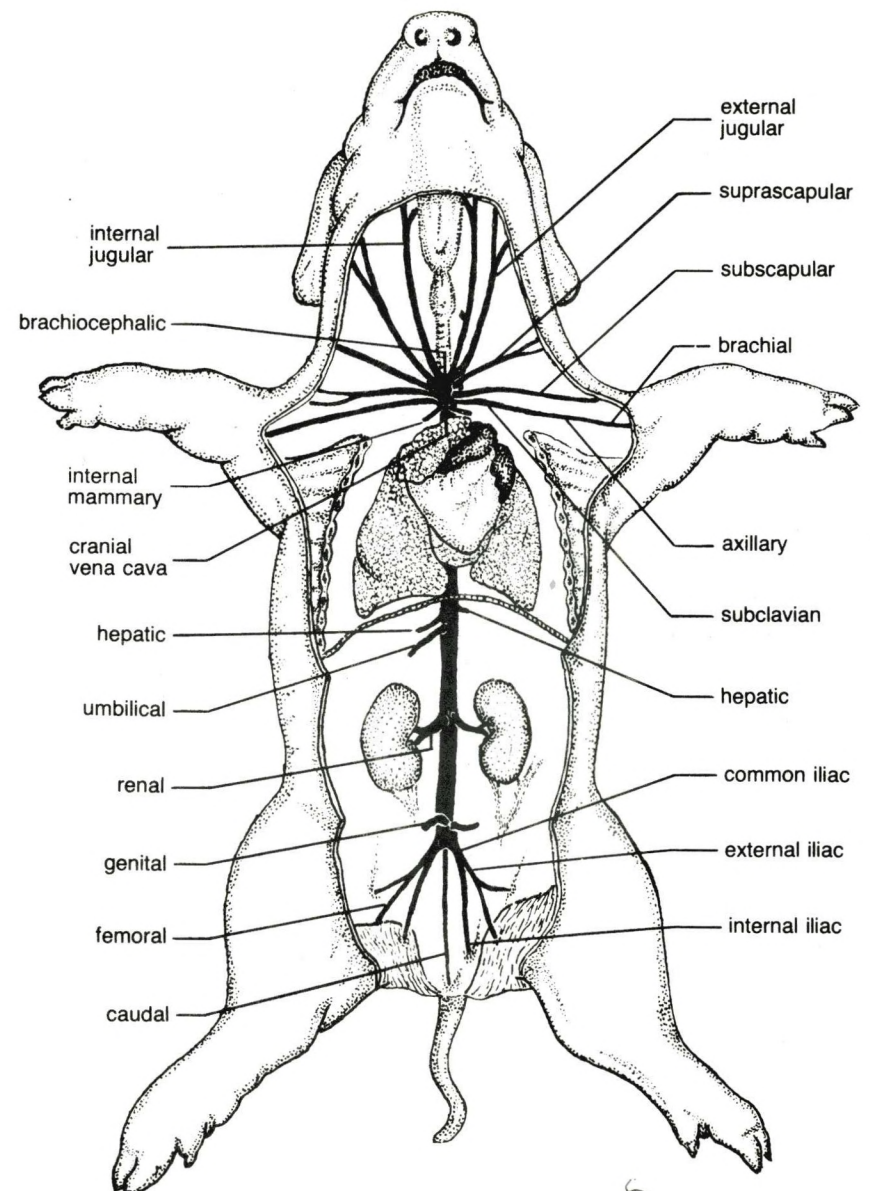


Figure 9. Major veins.

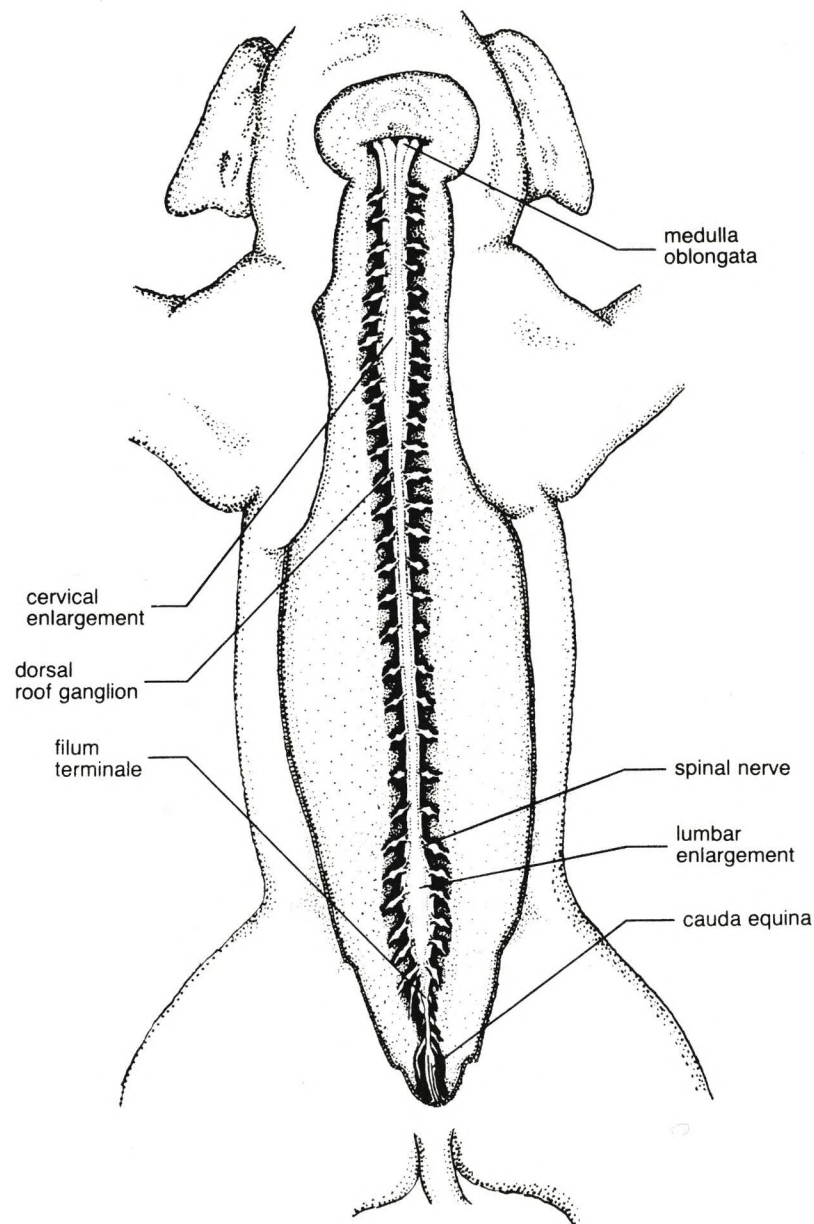


Figure 10. Dorsal view of spinal cord.

Penis—If the urethra is followed further along, it will be seen to enter the penis. In order to expose this part of the reproductive system, the pelvic bone and muscles must be cut through mid-ventrally. Follow the penis to its distal end and note the slight swelling called the glans penis.

Arterial and Venous Systems

In specimens that have been double injected, the arteries will appear red and the veins blue. If your specimen is triple injected, then the hepatic portal system will appear yellow. Dissecting out blood vessels is a challenging task which requires patience. Start at the heart and work cranially, using *Figures 8 and 9* as guides. Once this has been done, start at the heart and work caudally again using *Figures 8 and 9* as guides.

Nervous System

Dissecting the Spinal Cord. (Figure 10)

Remove the tissue that surrounds the vertebrae from the base of the skull caudally to the pelvic girdle. Avoid cutting any nerves which come out of the column. When the spine has been exposed, carefully shave off the neural arches of the vertebrae with a sharp scalpel. This will gradually expose the spinal cord. Look for the paired spinal nerves emerging from the cord at regular intervals. Follow one of these nerves distally to a swelling. This is the dorsal root ganglion which conveys nerve impulses into the spinal cord. The nerve coming out of the cord ventral to dorsal nerve is the ventral root which carries motor impulses from the cord.

The Brain. (Figure 11)

Remove the skin and tissue from the dorsal half of the head until the skull is exposed. Using bone clippers, cut the occipital bone away gradually working your way to the cranial tip of the skull. What you will be doing is carefully chipping the skull away and removing the bits of bone. Work until the entire brain has been exposed. The brain is covered by three membranes, or meninges. The outermost layer, the Dura Mater, is a hard-fibrous connective tissue layer. The Arachnoid (the middle membrane) is a delicate net-like membrane which is hard to see. The innermost membrane, the Pia Mater is a very delicate, highly vascularized tissue which closely follows the contours of the cerebral cortex.

Because the fetal brain is so soft, it hard to dissect the entire brain out. What can be seen, however, is outlined in *Figure 11*.

Cerebral Hemispheres—The two highly convoluted lobes which occupy most of the Dorsal brain.

Cerebellum—The smaller single mass which is caudally located. This mass is also highly convoluted.

Medulla Oblongata—The enlarged base of the spinal cord before it enters the brain.

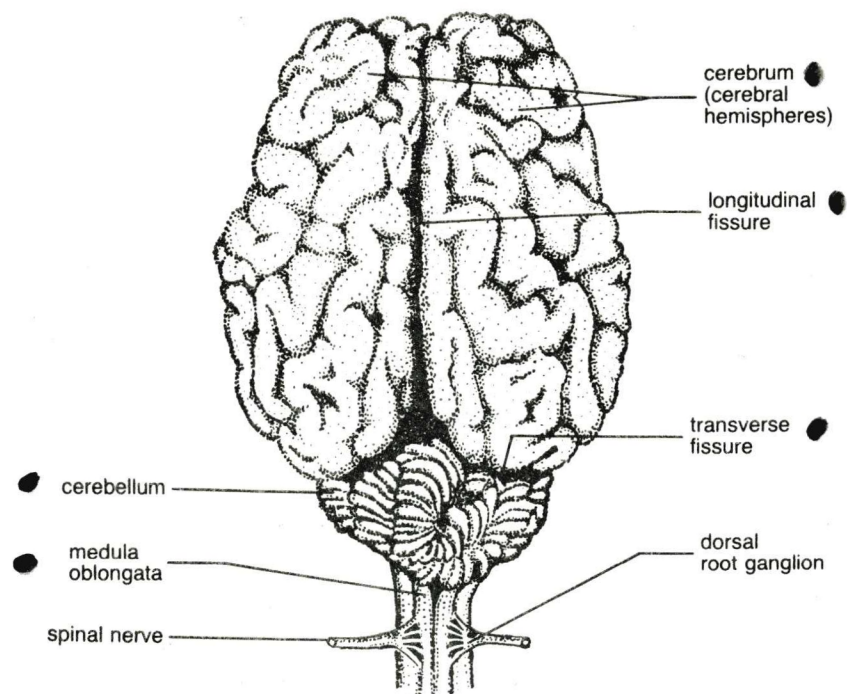


Figure 11. Dorsal view of brain.