

Fetal Pig Dissection notes.

### Anatomy terms

**Anterior**- toward the head

**Posterior**- toward the tail

**Dorsal**- toward the back

**Ventral**- toward the lower surface or belly

**Lateral**- toward the side

**Medial**- toward the midline

**Proximal**- toward some point of reference

**Distal**- away from a point of reference

## 1. External Anatomy

The length of the specimen, from nose to the base of the tail, helps determine the approximate age from time of fertilization. Over 30 inches is about 115 days which is full term.

The most overlooked organ is the most obvious one, the skin, which performs important jobs: it is a barrier to UV rays, it keeps out harmful substances and disease-producing organisms, helps prevent water loss, aids in regulating body temperature, serves as a receptor for external stimuli through nerve endings, stores reserve nutrients and is the site of Vitamin D production.

There are two layers to the skin: the outer layer called the *epidermis* and a deeper layer called the *dermis*. Also found in skin are hair follicles, various sense organs, blood vessels and nerves. *Hooves* are like the nails of your hand, modifications of the epidermis.

There are four sections to the pig: **head, neck, trunk and tail.**

**a. Head:** The *snout* is a flat, plate-like tip containing cartilage. The pair of nostrils are called *nares* and serve as the passageway for air into the nasal cavity, where it is warmed, filtered, and moistened. The upper *lip* is thick-rimmed while the lower lip is smaller and more pointed. Look into the *mouth* and find the *tongue* and possibly teeth. The roof of the mouth, the *hard palate*, consists of a thin layer of tissue covering bone and cartilage that separates the mouth cavity from the nasal cavity. This allows food to be chewed while breathing continues.

Examine the eyes and the upper and lower eyelids. There is a third eyelid, the *nictitating membrane*, which covers the anterior portion of the eye and helps to clean it. To see it you will need to make a small incision and open the other two lids. The incision should be forward from the inner corner of the eye.

The *external ears*, or *pinnae*, serve to channel sound waves into a small opening through a short passage, the *auditory canal*.

## **b. Neck**

The neck of the pig is short and thick. No external features are noticeable.

## **c. Trunk**

The trunk of mammals is divided into the *thorax* and the *abdomen*. The thorax is the region that includes the *ribs*. Below the neck, the *forelegs* are connected at the shoulders. Note that the pig has four toes, and that it walks on the middle two. On the abdomen are two rows of *mammary papillae* or *teats*.

On the belly is the *umbilical cord* which connected the fetal pig to its mother's placenta. Cut the umbilical cord about 2 cm (3/4 inch) from the abdomen, Close examination reveals three blood vessels: one vein and two arteries, embedded in gelatinous connective tissue. The *umbilical vein* carries blood rich in food and oxygen from the placenta to the developing fetus. The two *umbilical arteries* carry waste-laden blood to the placenta, where the waste passes into the mother's blood. The blood does not mix.

Look closely at the umbilical cord to determine if your specimen is male or female. The male will have a small opening behind the umbilical cord, the opening for the *penis*. Also in males, you should find the *scrotum*, a sac of skin beneath the anus and between the hind legs. The female will have an opening just behind the anus under the pig's tail. The female *urogenital opening* serves both the reproductive and urinary organs. Be sure to examine pigs of both sexes.

## 2. Skeleton

The skeleton of a fetal pig is mostly *cartilage* that is later replaced by bone. *Bone* is living tissue that consists of *blood vessels, nerves, fat, and bone cells*. Bone has a number of functions. it serves as a means of support and provides for the storage of calcium and other minerals. The marrow of the long bones is a site of red blood cell formation. There is a system of levers that provides for movement. Muscles are attached to ligaments that are attached to bones.

There are several types of joints. *Immovable joints* are found in the skull. Fibrous connective tissue unites the interlocking margins of these bones. *Slightly movable* joints for example are the vertebrae. *Movable joints* are what we commonly think of when we speak of joints. The ends of the bones are held together by a capsule of connective tissue. Because the skeleton of the fetal pig is not mature and is composed mainly of cartilage, it is necessary to study some other skeleton such as a human or a cat. Read and write through Chapter 15.2 The Skeletal System in your IR tonight to learn more about the skeletal system.

### 3. The Muscles

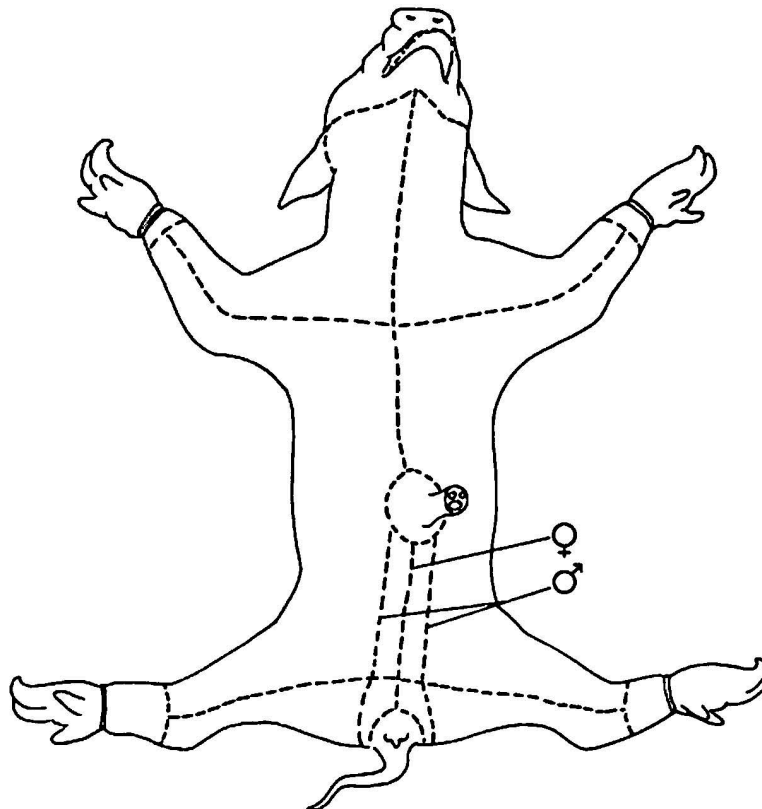
Muscle is a *contractive* tissue. There are three types of muscle: skeletal, cardiac, smooth. Here we are referring to only skeletal muscle. Muscles are composed of *muscle fibers*, the basic units of the muscular system. Each fiber is a separate cell.

The most important thing to remember is that muscles never push! Muscles contract, or shorten, and can only pull. They work in conjunction with the skeletal system to move parts of the body.

To see more of the muscular system of the pig, you must skin it. If you carefully follow the directions for skinning the pig, you will see much more and save a lot of time.

Place your pig on its back. Tie a string to the ankle of each forelimb, loop each string under the tray, pull until the arms are spread and tie the strings together. Now do the same for the hind limbs.

Use a scalpel to make a *shallow* incision just through the skin along the midventral line from the umbilical cord to the throat. Make an incision from the end of the initial cut, moving along the jaw and all the way to the back of the head. At the level of the shoulders, cut laterally across the chest and along each forelimb. Cut completely around each wrist.



**Figure 14.** Diagram showing where to make incisions in order to skin the pig. Note the difference between the incisions for male and female.

If the specimen is female, cut a circle all the way around the umbilical cord. Cut caudally along the midventral line until you reach the genital papilla. Now make an incision all the way around the genitals, the anus, and the tail. Beginning near the pelvis, directly between the legs, cut along each hind limb and completely around each ankle.

If the specimen is male, cut a "U" with the apex at the anterior side of the umbilical cord. Inside the "U" will be both the penis and the umbilical cord. Extend the parallel arms of the "U" caudally and around the anus and tail, enclosing the scrotum. Beginning near the pelvis cut along each hind limb and then around each ankle. Refer to the illustration if you have any problems.

An incision along the mid-dorsal line (along the backbone) is needed to serve as a stopping point for skinning the pig.

A final incision from the mid-ventral cut around the throat at its junction with the head will allow you to skin one side of your pig. Lay the pig on its side. Carefully remove the skin, using a blunt probe to separate skin from the underlying muscles. The muscles have a pinkish color and are surrounded by gel-like connective tissue. Clear away any extra connective tissue. Carefully blot the muscles dry.

As you skin the pig, notice that the skin does not just fall off; you have to pull it away from the muscles. This is because of the connective tissue beneath the skin, which attaches it to the muscles. The skin muscles cause the skin to quiver when a pig or horse tries to get rid of a fly on its

back. These muscles are collectively known as the *cutaneous maximus* and the *panniculus carnosus*. In humans, some of the muscles of facial expression are skin muscles.

When you begin to dissect, you might find that simply memorizing the names gets boring. For a dissection to be meaningful, it is important not to separate structure and function. A more interesting way to remember the muscles is to learn how they function. As you dissect the muscles and identify them, try to determine how they act. Following are some terms that describe muscle action.

*Adductors* – draw a body part toward the midline of the body.

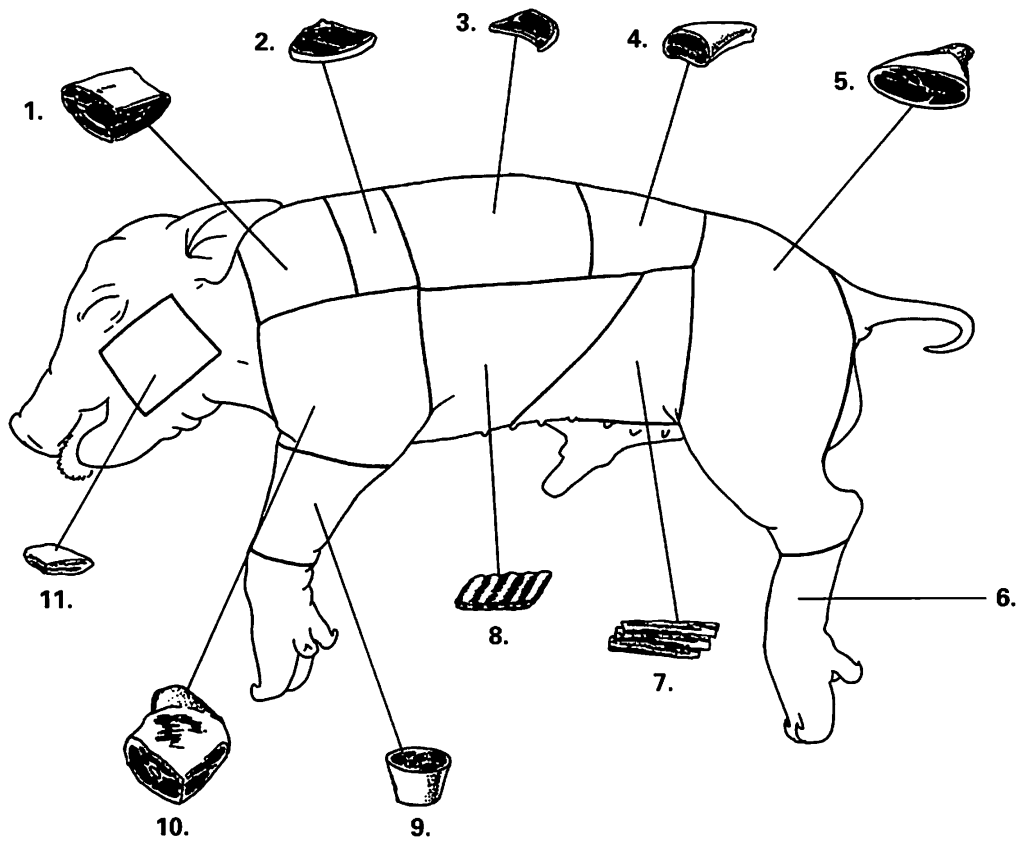
*Abductors* – draw a body part away from the midline of the body. (Remember that to be abducted is to be taken away.)

*Flexors* – bend a limb or body part against another part.

*Extensors* – straighten a limb or body part.

*Constrictors* – contract or shorten a body part.

Now that we have covered a few of the many muscles and their functions in the pig, you may wonder which are the pork chops, bacon, ham, etc. (Fig. 18). Hams come from the thigh. We get bacon from the sides; the muscles that are in bacon are the external and internal obliques and the transverse abdominis. Spare ribs are the *intercostal* muscles, along with the ribs to which they are attached. Pork chops, loin chops, and tenderloin are taken from along the backbone. The tenderloin is the *psoas major*, which is also found in pork chops. However, the main muscle making up the chops is the *longissimus dorsi*.



1. Shoulder blade
2. Top loin roast
3. Baby back chops
4. Canadian-style bacon, tenderloin
5. Ham
6. Pig feet
7. Bacon
8. Spare Ribs
9. Hock
10. Arm roast, sausage
11. Hog jowls

#### 4. Internal Anatomy

To view the internal anatomy, it is necessary to open the pig. Lay your pig on its back and tie the legs with string as you did for the skinning. Using your forceps, grasp the umbilical cord and pull up slightly. Use a scalpel or scissors to make an incision about 1 cm above the umbilical cord along the mid-ventral line of the body, working toward the neck. Free the diaphragm, a bell-shaped muscle that separates the thoracic and the abdominal cavities, by cutting around its edge near the body wall. This will keep it intact for further study.

As you lengthen the incision toward the thoracic cavity, you will encounter resistance. The structures causing this resistance are the ribs and sternum. As this is a *fetal* pig, its ribs and sternum are still composed of cartilage. Cartilage can be cut by a sharp scalpel or a good pair of dissecting scissors. Use either of these to cut through the rib cage and expose the organs in the chest cavity. You will see the *heart*, enclosed by a whitish, sac-like membrane, the *pericardium*. You will also see the *lungs*.

As you cut through the muscles of the neck, use light pressure. Be careful not to plunge the scalpel into the pig or you could cut structures you need to see later. In fact, whenever possible you should use upward pressure when cutting, by turning the blade over. Carefully cut through the muscles of the neck until you see a whitish tube the size of a pencil. This is the *trachea* or windpipe. The *thymus*, an endocrine gland involved in the immune response during infancy, lies on either side of the trachea and extends

over the heart. You will probably also see a brown, oval structure lying on top of the trachea. This is the thyroid. Remove the thymus and the thyroid at this time.

Once you have cut from the umbilical cord to the neck, return to the umbilical cord area. Make a shallow incision around the cord (making a U-shaped cut for males, a circle for females) to the pubic region and the anus (Fig. 20). Cut about 3 mm ( $1/8''$ ) deep until you reach the pubis. Use light pressure and avoid cutting into the internal organs; the layer of muscle over the abdomen is very thin. You have cut deeply enough when you see the white, shiny, semitransparent *peritoneum*. When you reach the pubic region, make your incision slightly off-center and deeper. The muscles overlying the pubic region are roughly the same thickness as those of the neck region, so you must cut much deeper than in the abdominal cavity. You also need to cut through the pubis to expose structures that lie beneath it.