Fetal Pig Dissection

I. Introduction - will be provided by instructor during lab.

II. Objectives
   1) Describe the form and function of various organs found in pigs
   2) Identify and name the organs that make up various systems of the pig
   3) Compare and contrast pig (mammalian) and frog (amphibian) anatomy

III. Dissection

PART A - EXTERNAL ANATOMY:

1) Put on safety goggles, gloves, and a lab apron.

2) Obtain a fetal pig and rinse off the excess preservative by holding it under running water. Lay the pig on its side in the dissecting pan and locate dorsal, ventral, & lateral surfaces. Also locate the anterior and posterior ends.

3) Examine the pig's head. Locate the eyes, eyelids and the external ears or pinnae. Find the external nostrils. For each structure, list the comparable structure found in frogs (when possible). Compare and contrast the structure and function of these external structures with those found in frogs.

   Eyes -

   Eyelids -

   Ears -

   Nostrils -

4) Locate the umbilical cord. With scissors, cut across the cord about 1 cm from the body. Examine the 3 openings in the umbilical cord. The largest is the umbilical vein, which carries blood from the placenta to the fetus. The two smaller openings are the umbilical arteries which carry blood from the fetus to the placenta. See Figure 1 for a diagram of the fetal pig external anatomy.
Did you observe any structures similar to an umbilical cord in the frog you dissected last week? Explain.

5) Lift the pig's tail to find the **anus**. Examine the ventral surface of the pig and note the tiny bumps called **mammary papillary**. These are present in both sexes. In the female these structures connect to the mammary glands. See **Figure 1** for a diagram of the fetal pig external anatomy.

Did you observe any structures similar to mammary papillary in the frog you dissected last week? Explain.

6) Determine the sex of your pig by locating the **urogenital opening** through which liquid wastes and gametes pass. In the male, the opening is on the ventral surface of the pig just posterior to the umbilical cord. In the female, the opening is ventral to the anus. Record the sex of your pig. Make sure to observe the external anatomy of both a male and female pig before you leave today.

7) With scissors, make a 1 inch incision in each corner of the pig's mouth. Your incision should extend posteriorly through the jaw. Spread the jaws open and examine the **tongue**.

Observe the palate on the roof of the mouth. The anterior part of the palate is the **hard palate**, while the posterior part is the **soft palate**.

Locate the **epiglottis**, a cone-shaped structure at the back of the mouth. Above the epiglottis, find the round opening of the **nasopharynx**. This cavity carries air from the nostrils to the **trachea**, a large tube in the thoracic which supplies air to the lungs.

In the space below, compare and contrast the "entrance" of the respiratory system of mammals and amphibians.
Dorsal to the glottis, find the opening to the esophagus. Where does the esophagus lead?

8) Examine the teeth of the pig and record your observations below. Are they all the same? Canine teeth are longer for tearing food, while incisors are shorter and used for biting. How does the pig's teeth relate to it's diet?

Figure 1. Diagram of the fetal pig external anatomy.

Key to Structures:
1 - umbilical arteries
2 - allantoic duct
3 - umbilical vein
4 - umbilical cord
5 - scrotum
6 - genital papilla (female)
7 - anus
8 - urogenital opening (female)
9 - urogenital opening (male)
10 - mammary papilla
PART B - INTERNAL ANATOMY:

1) Place the fetal pig ventral side up in the dissecting tray.

2) Tie a string securely around a front limb. Run the string under the tray, pull it tight, and tie it to the other front limb. Repeat this procedure with the hind limbs to hold the legs apart so you can examine internal structures.

3) Use Figure 2 to make your incisions. The lines numbered 1-4 show the first set of incisions that you will make. To find the exact location for the incision marked 3, press along the thorax with your fingers to find the lower edge of the ribs. This is where you will make incision 3.

With scissors, make the incisions in order, beginning with 1. Be sure to keep the tips of your scissors pointed upward because a deep cut will destroy the organs below. Also, remember to cut away from yourself.

Figure 2. Sequence of incisions for investigation of fetal pig internal anatomy.
4) After you have made your incisions through the body wall, you will see the **peritoneum**, a thin layer of tissue that lines the body cavity. Cut through the peritoneum along the incision lines.

5) Spread the flaps of the body wall apart. Cut the umbilical vein which extends through the liver. Once the vein is cut, carefully pull the flap of skin, including the end of the umbilical cord between the hind legs. You now should be able to see the organs of the abdominal cavity.

Now we can move onto our observations of mammalian organs systems.

**Digestive System**

1) Locate the **diaphragm**, a sheet of muscle that separates the abdominal cavity from the thoracic cavity. Find the most obvious structure in the abdominal cavity, the brownish-colored **liver**. Count the number of lobes.

2) Find the tube-like **esophagus** which joins the mouth and the stomach. Follow the esophagus and locate the soft, sac-like **stomach** beneath the liver.

   How does food move through the esophagus?

3) With scissors, cut along the outer curve of the stomach. Open the stomach and note the texture of its inner walls. These ridges inside the stomach are called **rugae**.

   Is there anything in the stomach of your specimen? Why?

   Why is the lining of the stomach ridged?

4) Locate the entrance to the stomach or **esophageal area**, the **cardiac region** which is largest, and the **pyloric region** where the stomach narrows to join to the small intestine.

5) At both ends of the stomach, there is a **sphincter** muscles. Locate the **cardiac sphincter** at the junction of the stomach and esophagus, and the **pyloric sphincter** at the junction of the stomach and small intestine.

   What is the role of the sphincter muscles?
6) Identify the first part of the small intestine, the U-shaped **duodenum**, which connects to the lower end of the stomach. Pancreatic juice, made by the pancreas, and bile, made by the liver and stored in the gall bladder, are secreted into the duodenum.

What activity primarily occurs in the duodenum?

What is the role of bile in the duodenum?

7) Examine the rest of the small intestine. Notice that it is a coiled, narrow tube, held together by tissue called mesentery. Carefully cut through the mesentery and uncoil the small intestine. Note and record its length in centimeters. The mid-section is called the **jejunum**, while the last section is called the **ileum**.

What activity primarily occurs in the jejunum?

What activity primarily occurs in the ileum?

8) With scissors, remove a 3-cm piece of the lower small intestine. Cut it open and rinse it out. Observe the inner surface of the small intestine. Run your finger along it and note its texture. Using a magnifying glass or dissecting microscope, examine the **villi**, the tiny projections that line the small intestine.

What role do the villi play in the gut?

9) Follow the small intestine until it reaches the wider, looped large intestine. Cut the mesentery and unwind the large intestine or colon. Measure and record its length.

Which is longer, the small or large intestines? Why?
10) At the junction of the large and small intestine, locate a blind pouch called the **caecum**. The caecum has no known function in the pig.

11) Notice that the large intestine leads into the **rectum**, a tube that runs posteriorly along the dorsal body wall. The rectum carries wastes to the **anus** where they are eliminated.

12) Locate the thin, white **pancreas** beneath the stomach and duodenum.

What is the function of the pancreas in digestion?

13) Between the lobes of the liver, find the small, greenish-brown **gall bladder**.

What is stored in the gall bladder?

Where does the stored product of the gall bladder go?

How does it get there?

14) Find the **spleen**, a long, reddish-brown organ wrapped around the stomach. The spleen filters out old red blood cells and produces new ones for the developing fetus.

**Respiratory System**

1) Examine the diaphragm, a sheet of muscle that stretches across the **abdominal cavity** and separates it from the **thoracic cavity** where the lungs are located.

What is the function of the diaphragm in mammals?

Has your pig had to use it's diaphragm yet? Explain.

How does the anatomy of the thoracic cavity of the pig and the frog you dissected last week differ? Can you think of reasons to explain this (these) difference(s)?
2) In order to see the upper part of the respiratory system, you will need to extend cut #1 up under the pig's throat and make to more lateral incisions in order to fold back the flaps of shin covering the throat.

3) In the thoracic cavity, carefully separate the **pericardium** or sac surrounding the heart and the diaphragm from the body wall.

   What is the function of the pericardium?

4) Locate the two, spongy **lungs** that surround the heart. The tissue that covers and protects the lungs is called **pleura**.

   Has your pig had to use it's lungs yet? Explain.

5) Find the **trachea**, a large air tube that lies anterior to the lungs. The trachea is easy to identify because of the cartilaginous rings.

   Why is the trachea equipped with cartilaginous rings?

Recall that the trachea branches into each lung. These two tubes are called **bronchial tubes**. Inside the lungs these branch into smaller **bronchioles** that end with a grape-like cluster of air sacs or **alveoli** where oxygen and carbon dioxide are exchanged with capillaries. If you have time, try to observe the inner surface of the lungs under a dissecting scope.

   Smoking has been shown to damage and destroy alveoli. If you damage alveoli, how does that affect your respiratory system?

6) At the top, anterior end of the trachea, find the hard, light-colored **larynx** or voice box. This organ contains the vocal cords that enable the animal to produce sound.
Circulatory System

1) Locate the **heart**. It is covered by a thin tissue called the **pericardium**. Remove this membrane to study the heart.

What is the function of the pericardium?

2) Pigs, like all mammals, have four-chambered hearts. The right side of the heart pumps blood to the lungs, while the left side of the heart pumps blood to all other parts of the body. Locate the right and left sides of the heart.

How is the structure of the mammalian heart and amphibian heart (which you observed last week) similar?

How is the structure of the mammalian heart and amphibian heart different?

3) Each side of the heart has an upper and a lower chamber. Upper chambers are called **atria** and receive blood, while lower chambers are called **ventricles** and pump blood out of the heart. Locate the **right** and **left atria** and **ventricle**.

The right atrium receives blood from which structure?

The left atrium receives blood from which structure?

The right ventricle pumps blood into which structure?

The left ventricle pumps blood into which structure?

4) Anterior to the heart, locate the large vein that enters the right atrium. This vein is the **anterior vena cava**.

Blood entering the heart from the anterior vena cava comes from which part of the body?

5) Now lift the heart to view its dorsal surface. Observe the **posterior vena cava** that empties it into the right atrium.

Blood entering the heart from the posterior vena cava comes from which part of the body?
6) Find the **pulmonary artery** which leaves the right ventricle. After birth, this vessel carries blood to the lungs. However, in a fetus, a shunt called the **ductus arteriosus** allows fetal blood to bypass the lungs and go directly to the **aorta**, the largest artery of the body.

7) Locate the **pulmonary veins** that enter the left atrium. After birth, these vessels carry oxygenated blood from the lungs to the heart.

8) Identify the **aorta**, a large artery that transports blood from the left ventricle. Many arteries that carry blood throughout the body branch off of the aorta.

**Urogenital System**

1) Remove the organs of the digestive system to observe the excretory and reproductive organs that make up the urogenital system.

2) Locate the large, bean-shaped **kidneys** lying against the dorsal body wall. Notice that they are covered by the **peritoneum**. Kidneys filter metabolic wastes from blood.

What waste product is formed in the kidneys?

What happens to this metabolic waste once it is filtered in the kidneys?

3) Find the **ureters**, tubes which extend from the kidneys to the bag-like **urinary bladder**.

4) Lift the urinary bladder to find the **urethra**, the tube which carries urine out of the body. Follow the urethra to the **urogenital opening** on the outside of the pig's body.

*Follow the directions below for locating the excretory and reproductive organs in either a male or female pig. When you finish observing the organs in a pig of one sex, exchange specimens with another classmate to view the organs in a pig of the opposite sex.*

**Male Reproductive System**

1) In the male pig, locate the two **scrotal sacs** at the posterior end of the pig. If the pig is in the later stages of development, you will find a **testis** in each sac. If the pig is in an early stage of development, the oval-shaped testes will be in the abdominal cavity. These testes have not yet descended into the scrotal sacs.
2) On each testis, find the coiled **epididymis**. Sperm cells produced in the testis pass through the epididymis and into a tube called the **vas deferens**. This tube crosses over a ureter and enters the urethra.

3) Follow the urethra to the **penis**, a muscular tube lying just below the skin posterior to the umbilical cord. In mammals, the penis is the organ that transfers sperm.

**Female Reproductive System**

1) In the female pig, find the two bean-shaped **ovaries** at the posterior end of the abdominal cavity. Observe the coiled **Fallopian tube** attached to each ovary, which carries eggs from the ovary.

2) Follow the Fallopian tube to the **uterus**. The uterus is dorsal to the urinary bladder and the urethra.

3) Trace the uterus to a muscular tube called the **vagina**. The vagina will appear as a continuation of the uterus. Sperm from the male are deposited into this organ during mating. The vagina and the urethra open into a common area called the urogenital sinus. This cavity opens to the outside at the **urogenital opening**.

*When you have completed your observations of the urogenital system of both sexes, clean up your materials and work area. Discard your pig as directed by your instructor. Make sure to wash your hands thoroughly with soap before leaving.*

**Notes:**