Fetal Pig Dissection

**Introduction:** In this lab you will be examining many characteristics of an unborn mammal--the fetal pig.

Dissection will help you to get a 3-dimensional picture of how all the systems fit together. You've seen separate diagrams of many of the major systems. Now you'll get to see how they are arranged spatially. You'll also get a better idea of the texture of many organs that make up the pig's system. For additional help at home point your web browser to <http://www.esu7.org/~lweb/Lakeview/science/fetal.html>.

**This lab will be broken up into the following labs:**

#1- External Anatomy

#2- Oral Cavity

#3- Digestive System

#4- Circulatory System

#5- Respiratory System

**Materials:** preserved fetal pig, dissecting pan, scissors, scalpel, forceps, probe, and twine

General Directions: All underlined words must be located on your pig and all numbered questions must be answered on each of your packets. Your teacher will check the questions as you work through the laboratories. Most cuts can be done with the scissors. Dissection is an art and you must be as careful as you can during this laboratory.

**Pig Lab #1 - External Anatomy**

You will be examining several characteristics of an unborn mammal. The period of gestation for the pig is 112-115 days. The age of the fetus can be estimated by measuring the body length from the tip of the snout to the attachment of the tail. Compare this length to the data given on relative sizes of a fetal pig at different times during gestation or the time of development inside the uterus. (mm = millimeters)

21 days - 11 mm 56 days - 40 mm

35 days - 17 mm 100 days - 220 mm

49 days - 28 mm 115 days - 300 mm

Generally speaking, orders of mammals are recognized rather easily by their external appearance. These external features which separate mammals into orders are such traits as the number of digits (toes or fingers) on the feet, method of walking or other locomotion and characteristics of the teeth.

Mammals have two unique external characteristics which distinguish them from all other vertebrates: (1) all mammals have hair at some time during their development, and (2) all female mammals possess mammary glands with external openings for nourishing the young. Your fetal pig probably does not have a lot of hair due to the fact that it is not fully developed yet. However, at maturity most pigs do have some strands of hair on their body. The lips around the mouth are well developed and the upper lip is usually cleft in the center by a groove called the philtrum. Humans also have a philtrum. This is the indent underneath your nose. The external nares (nostrils) are found on the nose. Examine the ears. They have a flexible outer flap called the pinna. The pinna helps the pig hear by focusing the sound.

Many mammals have sensory facial hairs called vibrissae; however, our pigs do not possess these yet. They are evident once a pig reaches maturity. They help organisms feel their way around in the dark.

Examine the eyes. They have an upper and lower lid and a small mass of tissue in the upper corner known as the nictitating membrane. This helps keep the eye clean. Birds can moisten their eyes in flight using this membrane and not blinking; blinking could cause a collision with a branch or tree.

Examine the feet. The pig is called unguligrade because it walks on its hooves. Humans are plantigrade because we walk on the entire soles of the foot. Dogs and cats are digitigrade because they walk on their digits. In pigs, the first digit of both the fore and hind limb is absent and the second and fifth are reduced in size but remain functional. The pig's trunk is divided into two regions: thorax (chest) and abdomen (stomach). Examine the umbilical cord. Observe that it contains three blood vessels: a large vein and two smaller arteries. Observe the paired row of nipples on the ventral surface of the abdomen in both sexes. The actual number of nipples varies from mammal to mammal. Animals that have litters tend to have more nipples.

**Internal Anatomy - General Directions:**

In the dissection and observations of the internal organs, you will proceed by systems and remove organs only when directed to do so. Study and use the accompanying diagrams to aid in your observations of the internal organs. As you dissect, keep in mind the interrelationships of systems. While concentrating on a single system, use care not to damage other systems. Again, most cuts can be done with the scissors. Occasionally, the scalpel must be used. Dissection is an art and you must be as careful as you can during this laboratory. Do not carry any of the sharp dissection tools around the room.

**Pig Lab #2 - Oral Cavity**

You will now study the oral cavity (mouth) of the pig. With a pair of scissors cut deeply into both corners of the mouth. This may be difficult as you must cut through both tissue and bone. Open the mouth. Be sure to follow the curvature of the throat and do not cut straight back into the neck tissue.

Examine the oral cavity containing the tongue and teeth. Notice the ridged roof of the mouth called the hard palate. The soft palate is the fleshy portion of the roof of the mouth and lies caudal to the hard palate. Locate the tongue with all its taste buds. Mammals have two types of teeth - incisors, located in the very front of the oral cavity and cheek teeth located toward the back of the oral cavity.

To find the next few structures, you will have to cut through the bone of the jaw, and then apply gentle pressure to force the mouth open. Far back in the oral cavity is the pharynx, a common passage for food going to the esophagus and air going to the lungs. Locate the tear-shaped epiglottis, a flap like structure at the top of the trachea. The esophageal opening, which is the entrance to the esophagus (food tube) can also be found in the back of the throat. The esophagus is located behind the trachea.

**Pig Lab #3 - Digestive System**

Use two pieces of strong twine and tie one around a wrist and one around an ankle of the pig. Pull each under the dissecting pan and tightly tie the twine to the opposite wrist or ankle. To open the abdominal cavity, make incisions as indicated in figure #1a (see also figure 1b on page 7). Cut carefully with scissors to avoid damaging the underlying organs. Note--when you cut through the thoracic cavity, you will encounter bone. You must cut through this bone to expose the underlying organs. Cut the skin flaps back close to the back bone so they will remain open. Be careful not to injure the kidneys. Pull back the two flaps of skin (you will need to cut the diaphragm along the sides) and muscle to view the internal organs. Locate the umbilical vein inside the abdomen. Once determined, cut it and lay back the cord and its strip of skin. The large, reddish-brown organ that occupies much of the abdominal space is the liver. Gently lift it up and probe it to locate the gall bladder which is on the pig’s right side. The diaphragm (a thin brown muscular tissue) is the tough muscle which separates the thoracic and abdominal cavities. The esophagus goes through it to the stomach. The esophagus carries the food from the pharynx to the stomach. Locate the stomach on the upper left side of the abdominal cavity. It is underneath the liver. The stomach resembles a pouch in appearance and is connected to the esophagus at its anterior end. Slit open the stomach longitudinally. The longitudinal ridges that line the stomach are called rugae. The constricted caudal portion of the stomach leads to the small intestine. The first 3-4 cms of the small intestine is the duodenum. The remaining length is divided into the ileum and jejunum. Observe that the small intestine is not loose in the abdominal cavity but is held in place the the mesentery. Check and look for veins and arteries in the clear mesentery that carry absorbed nutrients to the liver through the hepatic-portal vein. Inside the small intestine are finger-like projections called villi. The villi increase the surface area of the small intestine for absorption. These villi are microscopic. The large intestine appears as a compact coil and is larger in diameter than the small intestine. Locate the junction of the large and small intestine. Below this junction may be found a small pouch-like structure called the caecum. This is the same item that is the appendix in humans. It helps in the slow digestion of plant materials in other animals. Follow the large intestine (colon) to the rectum. This lies in the dorsal wall of the abdominal cavity and is the straight end portion of the large intestine. Water is absorbed by the body in the large intestine. Waste material stored in the rectum leaves the body through the anus. Locate the pancreas which is a large white granular organ located below the stomach. The pancreas makes a variety of digestive enzymes that travel to the small intestine through the pancreatic duct. This duct is difficult to find in the pig. The red elongated organ extending around the outer curvature of the stomach is the spleen. It resembles a tongue. The spleen helps destroy old red blood cells.

**Pig Lab #4 - Circulatory System**

The circulatory system of the pig consists of the heart, arteries, veins, and capillaries. There are two major parts to this system. Pulmonary circulation supplies the lungs with blood. The systemic circulatory system supplies all parts of the body except the lungs. You will need to cut through the sternum to open the thoracic cavity. Covering the heart is a thin, tough membrane called the pericardium. Partially covering the heart is the thymus gland (globular structure). The thymus is largest in young individuals. It is part of the immune system. The heart is composed of 4 chambers. Locate the 2 atria and 2 ventricles. With your finger, touch the atria and ventricles. The pig may have been injected with colored latex which makes it easy to locate the veins (blue) and the arteries (red). Locate the anterior and posterior vena cava. These carry blood from the cranial and caudal portions of the body, respectively. Find the pulmonary veins which carry blood from the lungs to the left atrium. This carries oxygenated blood from the lungs back to the heart. The most noticeable artery is the aorta. The aorta curves to the left and passes cranially along the dorsal side of the thoracic and abdominal wall. The next largest artery is the pulmonary artery. It arises from the anterior portion of the right ventricle and soon divides into the right and left pulmonary arteries. Other arteries are named for the body part they serve. The gastric artery leads to the stomach, the hepatic artery leads to the liver, the renal artery leads to the kidney and the carotid artery leads to the head. Locate the carotid artery, jugular vein and the descending aorta. Remove the heart by carefully cutting the arteries and veins leading to and from the heart as far away from the heart as possible. DO NOT damage any lung tissue. Cut the heart in half through the frontal plane using a sharp blade. ASK FOR TEACHER ASSISTANCE if at any time you are unsure of the procedure. Identify the right atrium, right ventricle, left atrium, and left ventricle. The valves that prevent the back flow of blood are the A/V valves and the semilunar valves. A/V valves are found between the atria and the ventricles. The semilunar valves are found between the ventricles and the pulmonary artery and vein. The structure between the two ventricles is the septum. On the surface of the heart are the coronary arteries and veins. A characteristic feature of the fetal mammalian heart is the ductus arteriosus. This short vessel allows blood to bypass pulmonary circulation until birth, at which time there is a complete closure of the vessel.

**Pig Lab #5 - Respiratory System**

The respiratory system is responsible for the exchange of gasses. The pig must take in oxygen to burn food and must rid itself of carbon dioxide waste once it's born. Air enters through the external nares. Air is drawn into the nasopharynx or nose chambers where sensory nerve cells detect smell. Here, also, is where the glottis (the opening of the trachea) may be found. The trachea is a tube that extends from the neck to the chest. It is white and lined with cartilage. The enlargement at the anterior end of the trachea is the larynx (voice box) which contains the vocal cords. The trachea splits in the chest cavity into two bronchi. Each of these air tubes extends into the lungs and splits into smaller tubes called bronchioles. The lungs are located on either side of the heart. The lungs are made of tiny air sacs called alveoli (microscopic) where gas exchange occurs. Locate the thin muscular diaphragm just above the liver. This muscle is responsible for drawing air into the chest cavity. Spasms of this muscle result in hiccups!