**Rat Dissection**

**Pre-Lab Discussion: (summarize this in your lab notebook)**

Be sure to read through the **entire lab procedures** before starting. Make sure you know what is expected of you before you start.

Rats belong to the class Mammalia. Rats are among the most commonly studied organisms in biology. Although many differences exist between humans and rats, the basic body plans are similar. Humans and rats both belong to the class Mammalia. By studying the anatomy of the rat, you will be better able to understand your own body.

In this investigation, you will examine the external features of a rat and identify parts of its external anatomy. In addition, you will dissect a preserved rat to observe its internal anatomy.

**Materials: (write in your lab notebook)**

Preserved rat
Dissecting Tray
Dissecting Kit
Dissecting Pins
Dissecting Scope
Resealable plastic bag
Paper Towels

**Procedures: (summarize these in your lab notebook)**

*In your lab notebook, you need to summarize the procedural steps listed below. You don't need to write down every step, just a general idea of what you are going to be doing.*

**Part 1: EXTERNAL ANATOMY**

Draw your rat and label all parts in **bold**

Need help finding something? [Look Here.](http://renz.fosterscience.com/honorsbiology/images/ratext.jpg)

**Pinna** - The flap like, external ear that directs sound waves into the ear opening (external auditory meantus).

**Eyelids** - There are four well-formed upper and lower eyelids. Spread these apart and look for the nictitating membrane in the inside corner of the eye.

**Vibrissae** - Long, stiff hairs located on the face that have a sensory (tactile) function; the "whiskers."

**Nares** - Paired openings leading into the nose; the nostrils.

**Anus** - The opening to the digestive tract, located under the base of the tail.

**Female urogenital structures**

In the female rats, there are two openings, close together, in front of the anus, whereas males have only one. The most anterior opening of the female is the **urethral orifice**, and it leads into the urinary system. The **vaginal orifice** is the external opening of the reproductive system, and it lies posterior to the urethral orifice. **Mammary papillae (nipples)** - Present in females only. There generally are six on each side, three in the chest area and three in the abdominal area.

**Male Urogenital structures**

In males; reproductive products and urine exit the body at the tip of the penis. The penis is usually hidden inside a fold of skin and will be described in more detail later. In males in breeding condition, each testis is large and housed in a pouch **(scrotum)** located between the penis and anus.

**SKINNING THE RAT (The Cutting Part 1)**

***Midventral Incision***-Lay the rat on its back, and if desired, pin it to the tray through each paw. Most laboratory specimens have a small opening in the neck area, where colored latex was injected into the arteries. Using forceps, lift the posterior edge of this opening, and using a blunt probe, gently separate the underside of the skin from the muscle below. While continuing to lift, use scissors to cut the freed skin along the ventral midline. Continuing to lift, separate, and cut in posterior direction, stopping just in front of the urogenital area. Extend your cut forward to the point of the jaw as well. Be careful to cut only the loosened skin and not underlying muscle.

***Lateral Incisions*** - On each side make four lateral incisions. The first is along the edge of the lower jaw to the cheek and then to the top of the skull, just behind the eye. The second and the third cuts are down the inside of each leg to the paws; also make a circular incision around each leg at the wrists and ankles. The last lateral cut is from the front of the urogenital area, around the rear margin of the hind legs, to the top of the base of the tail.

***Removing the Skin*** - Loosen all skin on the ventral and lateral surfaces using a blunt probe. Now turn the rat over and remove the entire skin from the limbs and dorsal body. It is easier to start at the rear and work your way forward. After removing the skin, note the brownish tissue that adheres to its underside. This represent the platysma muscle in the head and neck area and the cutaneous maximus muscle in the trunk area; these are dermal muscles that allow the animal to move its skin. The cutaneous maximus is most strongly attached to other muscles in the armpit region, and you may have to cut the muscle free in this area. On female specimens, the mammary glands appear as a band of tissue running under the nipples; this tissue may be greatly expanded in pregnant and lactating individual. Save the skin and use it to wrap your specimen between laboratory periods.

**THE ABDOMINAL CAVITY AND DIGESTIVE TRACT**

**(The Cutting Part 2)**

Using scissors, carefully open the abdominal cavity by cutting through the abdominal muscles, along the ventral midline, from the urogenital area to the sternum. Be sure to lift the muscles as you cut to avoid damage to the internal organs. If necessary, cut laterally from the sternum, along the posterior boundary of the rib cage, and again laterally from the urogenital area, toward the backbone, in front of the legs. This will leave you with a flap of tissue on each side that may be pinned to the tray, allowing an unobstructed view of the organs. Need help finding something? [Look Here.](http://renz.fosterscience.com/honorsbiology/images/ratdigest.jpg)

**Draw the internal anatomy of your rat and label the parts in bold.**

*Mesenteries* - Translucent membranes attaching to and holding the internal organs in place. Fat bodies often appear within the mesenteries, and blood vessels travel along them to various organs.

**The Digestive System**

**Liver** - Large brown organ dominating the anterior of the cavity. It consists of four sections or lobes. The median lobe is most superficial, and it is divided by a long notch near the ventral midline. Under the median lobe is a large left lobe and a right lobe that is mostly separated into two distinct parts (NOTE: "left" and "right" always refer to the animal's left and right sides - not yours.) A small caudate lobe is hidden under the left lobe. Among other things, the liver manufactures bile to aid fate digestion. Each lobe is drained by tubes that eventually combine to form a bile duct that carries bile to the small intestine. Unlike humans, a rat lacks a storage organ (gall bladder) for bile.

**Esophagus** - Penetrates the muscular wall (diaphragm) at the front of the abdominal cavity and connects to the central part of the stomach.

**Small intestine** - Long coiled tube that leaves the stomach. The junction between the stomach and small intestine is marked by a distinct constriction, a smooth muscle called the **pyloric sphincter**. Based on microscopic detail, anatomists divide the small intestine into three sections: an anterior duodenum, middle jejunum, and posterior ileum. The mesentery connected to the small intestine is called the mesentery proper.

**Colon** - It is shorter, but often wider, than the small intestine. The **cecum** is a saclike buldge near the junction with the small intestine and is visible on the left side of the rat when the abdominal cavity is first opened. The straight terminal portion of the colon, leading to the anus, is the **rectum**.

**Pancreas** - A diffuse gland with a lobular appearance. It is best seen in the mesentery proper next to the duodenum.

**Spleen** - A dark-colored, somewhat elongate structure located left of the stomach. The spleen is not part of the digestive system, but its location often leads beginners to confuse it with digestive structures. It is a storage organ for red blood cells and a site for the manufacture of white blood cells.

**(The Cutting Part 3)**

If not done already, separate the muscles along the ventral midline of the throat area using a probe and forceps. Next cut through the ribs on one side of the sternum, from the diaphragm to the throat. Now cut laterally, separating the diaphragm from the posterior ribs. Finally cut laterally from the anterior end of the sternum, through the ribs to the armpit area. You should now be able to reflect the rib cage and view the chest (thoracic) cavity. Light brown tissue covering the organs is the thymus gland, an organ of the immune system; gently remove the thymus with forceps. Need help finding something? [Look Here.](http://renz.fosterscience.com/honorsbiology/images/ratthoracic.jpg)

Draw the respiratory and circulatory systems of your rat and label the parts in **bold**

**RESPIRATORY SYSTEM**

**Trachea** - Long tube supported by semicircular rings of cartilage; it extends along the throat into the thoracic cavity.

**Larynx** - a cartilaginous box at the anterior end of the trachea; it contains the vocal cord. The glottis, seen earlier is the opening to the larynx. Dark tissue against the caudal part of the larynx and cranial part of the trachea is the thyroid gland, part of the endocrine system.

**Bronchus** - Dorsal to the heart, the trachea splits into a right and left bronchus that travel to the lungs.

**Lung** - spongy structures located in the thoracic cavity. The right lung consists of four lobes, whereas the left has only one; what may appear to be a second left lobe, in reality, is a lobe that extends from the right side.

**Diaphragm** - A thin muscular sheet, seen earlier, that separates the abdominal and thoracic cavities. It draws air into the lungs.

**CIRCULATORY SYSTEM**

*Pericardium* - The tough membrane forming a sac around the heart. Cut through it to expose the structures inside.

**Atria** - Portions of the outer walls of the right and left atria are visible as dark flaps on top of the heart.

**Ventricles** - The major pumping chambers of the heart. Right and left ventricles are not readily distinguished without opening the heart.

**Coronary vessels** - Arteries and veins supplying the heart are visible on its surface.

**URINARY STRUCTURES**

Draw the urinary structures of your rat and label the parts in **bold**

Need help finding something? [Look Here for females.](http://renz.fosterscience.com/honorsbiology/images/ratfemuro.jpg) [Look Here for males.](http://renz.fosterscience.com/honorsbiology/images/ratmaleuro.jpg)

**Kidney** - Located against the dorsal body wall and surrounded by fat. Note the beanlike shape.

**Ureter** - A whitish tube that leaves each kidney and passes caudally to the urinary bladder. Ureters can be surrounded by fat. Carefully remove the fat without tearing the ureter.

**Urinary Bladder** - A small sack for temporary storage of urine. It is about the size of a pea when empty.

**Urethra** - An unpaired tube that leaves the bladder and passes caudally, leaving the body through the urethral orifice. To follow the urethra, you must cut through the pubic bone at the ventral midline.

**Female Genital Structures**

**Ovary** - A small nodule, usually buried in fat, posterior and lateral to each kidney. A tiny coiled tube (oviduct) leads from ovary to the uterus, but it is not readily seen without magnification.

**Uterus** - Unlike its human counterpart, the uterus of a rat consists of a pair of enlongated structures called the uterine horns.

**Vagina** - The horns open into a single vagina that lies dorsal to the urethra. The vagina exits the body at the vaginal orifice seen earlier.

**Male Genital Structures**

**Testis** - Open the scrotum and associated tissues on one side, and remove a testis for closer examination.

**Epididymis** - a highly coiled tube attached to the surface of the testis.

**Penis** - Gently open what appears to be the urogenital opening by making small snips with scissors. You are actually cutting through the foreskin, and the penis lies beneath.