

UROGENITAL SYSTEM

The urogenital system includes both the reproductive organs and the excretory organs. They are considered together because they share some common ducts. We will begin by exploring the excretory system, which is comprised of the **kidneys, ureters, urinary bladder, and urethra**. The kidneys function to eliminate nitrogenous wastes produced during the breakdown of proteins, regulate water balance, pH and the ionic composition of the body fluids. These bean-shaped organs are located in the abdominal region adjacent to the dorsal body wall.

- *As you remove the mesentery and fat that surround the left kidney watch for the **adrenal gland**, which lies in the fat anterior to the kidney. Avoid damaging to the artery, vein, and ureter that enter the concave surface or **hilus** of the kidney (Fig. 5.2, arrow).*
- *Make a longitudinal section of the kidney with a scalpel or razor blade and separate the two halves (Fig. 5.1) Note the following structures:*



Figure 5.1. Section through a cat kidney.

Cortex (1). The cortex is the light outer layer of the kidney. This is where blood coming from the renal artery is filtered and enters the nephron or functional unit of the kidney. The cortex contains the glomerulus and the convoluted tubules.

Medulla (2). The **medulla** is the dark tissue below the cortex. It contains the loop of Henle. As the filtrate passes through the renal tubules water, ions, nutrients and other substances are reabsorbed by capillaries and leave the kidneys via the renal veins. The collecting ducts, where urine is concentrated also pass through the medulla.

Renal papilla (3). The renal papilla forms the inner edge of the medulla and is the point where the collecting ducts converge. Urine drips from the renal papilla into the expanded end of the ureter.

Renal pelvis (4). This funnel shaped expansion of the ureter within the hilus collects urine and drains it into the ureter.

Ureter (5). The ureter carries urine posteriorly toward the urinary bladder. *Trace the ureter caudally and locate the point where it enters the bladder.*

Bladder (6). A small muscular bladder collects and stores the urine. Smooth muscles in the bladder wall control the movement of material. The bladder is suspended in the body cavity by a midventral mesentery and paired lateral mesenteries.

Urethra. From the bladder the urine moves into the **urethra**. You will be able to trace this later as we examine the reproductive structures.

Adrenal Gland (7). This endocrine gland is located cranial to the kidney. It prepares the body for stress, regulates metabolism, and affects sexual development.



Figure 5.2. Urogenital system.

Reproductive Systems

The primary functions of the reproductive organs are associated with producing the gametes, providing for fertilization, and nourishing the developing fetus. Before beginning make sure you know which sex you have (Fig. 3.2).

In your study of the reproductive system make sure examine rats of both sexes, as you will be responsible for them on the lab practical. Do careful dissections so you can exchange rats with students dissecting the opposite sex.

Dissection of the Male System

Sperm are produced in the paired **testes** of the male. In rats the testes descend into the **scrotal sacs** during the breeding season and the rest of the year they are located in the abdominal cavity. The scrotal sacs are lined with peritoneum that is continuous with that of the abdominal cavity and the organs of the males system are covered with a layer of visceral peritoneum, the **tunic vaginalis**. In rats there is a broad connection between the scrotum and the abdominal cavity, but in humans it has closed and the testes cannot be retracted.

*Locate one of the testes. If they are in the scrotal sac carefully pinch the base of the sac to move them toward the abdomen. It will be necessary to break the connective tissue that attaches them at the base of the scrotal sac. Remove the testes from the tunic vaginalis being careful not to damage the **spermatic cord**, that contains the nerves and blood vessels. Beginning at the testes, identify the structures through which the sperm move (Fig. 5.3 , Table 5.1).*

*As you continue following the pathway sperm take it will be necessary to remove the foreskin (**prepuce**) and open the pelvic canal. Insert scissors into the preputial orifice and cut through the ventral foreskin that covers the tip of the penis. Then pull the penis caudally and remove the midventral abdominal muscle to expose the pubic symphysis. With scissors carefully cut through the pubic symphysis. Run a probe along the edge of the ischium and pull the hindlegs apart to open the pelvic canal. To make it easier to trace the structures, remove a bit of the pubis on each side of the symphysis.*

Dissection of the Female System

The female gametes are produced in paired **ovaries** located medial and posterior to the kidneys. The ovaries produce gametes as well as hormones that regulate the reproductive cycle. Mature eggs are shed into the **ovarian bursa** that completely surrounds each ovary. From there they move into the uterine tube, are fertilized and implant in the **uterine horns**. The division of the uterus into two horns is an adaptation that facilitates multiple births. Gestation will last 21-22 days and 6-8 young will pass from the uterus through the vagina.

*Locate the **clitoris**, a protrusion just ventral to the opening of the urinary system (Fig 3.2). It is large and can be confused with a penis. From a point about an inch above the clitoris loosen the skin and cut into the groin area on both sides. Use the blunt end of the probe to further loosen the skin toward the tip of the clitoris. Two large **glands of the clitoris** should become evident. Cut the skin slightly off the midventral line to reveal the pointed tip of the clitoris (Fig. 5.6). Remove the midventral abdominal muscle exposing the pubic symphysis. Using scissors carefully cut through the pubic symphysis. Pull the legs laterally and dorsally to open the pelvic canal. To make it easier to trace the structures, remove a bit of the pubis on each side of the symphysis. Beginning at the ovarian bursa locate the structures of the female system (Fig 5.5-5.6, Table5.2).*

Male System

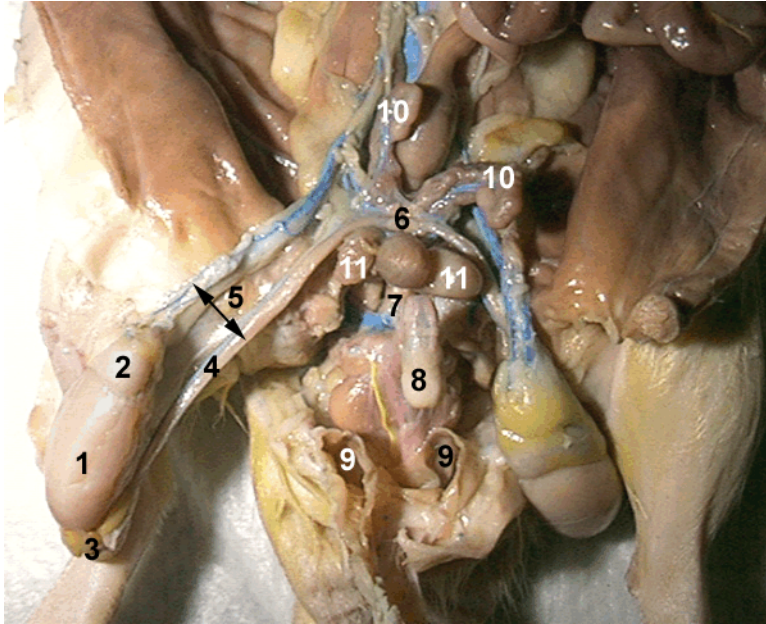


Figure 5.3. Male reproductive system. Use Table 5.1 to identify the labeled structures.

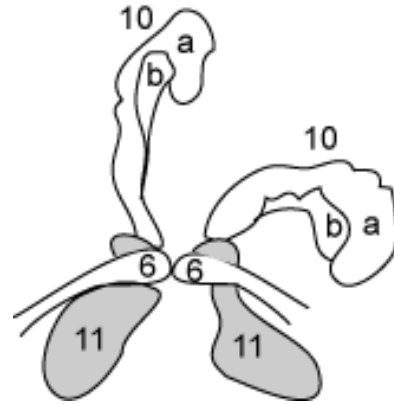


Figure 5.4. Glands associated with the anterior portion of the male reproductive system. Compare the diagram with the photo on the left and use table 5.1 to identify the structures. Also note that the prostrate gland has lobes that lie dorsal to the ductus deferens

Table 5.1. Male reproductive structures. Numbers correspond to those in figure 5.3 - 5.4.

Structure	Function
Testis (1)	Production of sperm and testosterone, a sex hormone.
Epididymis (2 head, 3 tail)	Site of sperm storage
Ductus deferens (4)	Transport sperm to the urethra
Spermatic cord (5)	Surrounded by the tunic vaginalis the sperm cord contains the nerves, blood vessels and ductus deferens
Ampullary gland (6)	Small gland at the end of ductus deferens that contributes to seminal fluid
Urethra (7)	Carry sperm and urine to the outside of the body
Penis (8)	Male copulatory organ
Cremasteric pouch (9)	Extension of the body wall and muscles to form a space housing the testes
(a) Vesicular and (b) Coagulating glands (10)	Secretions from these glands coagulate in the vagina creating a vaginal plug that blocks the pathway for sperm from subsequent copulations
Prostate (11)	Produces seminal fluid to carry the sperm and neutralize the acidic vagina

Female System

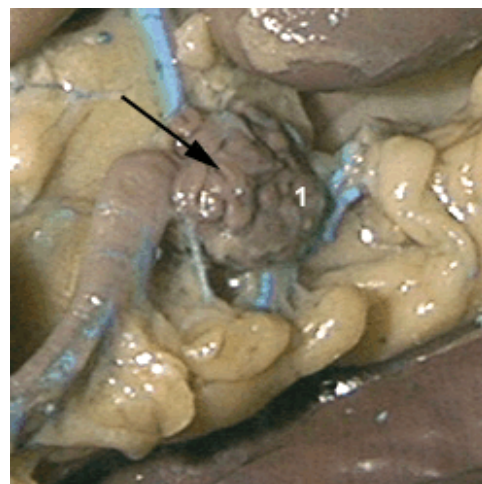


Figure 5.5. Ovarian bursa. The arrow points to the convoluted uterine tube. This expands to form the membranous **ovarian bursa**, which encloses the ovary.

Figure 5.6. Female urogenital system. Structures 1-7 are associated with the reproductive system, 8-11 the urinary system, and 12 is the rectum, a structure associated with the digestive system. Note the pointed tip of the clitoris ventral to the external urethral orifice (11).

Table 5.2. Female urogenital system. Numbers correspond to those in fig. 5.6.

Structure	Function
Ovary within ovarian bursa (1)	Produces eggs and hormones to regulate estrus and pregnancy
Ovarian bursa (1)	Surrounds the ovary and receives the egg after ovulation
Uterine tube (fig 5.5)	Connects the ovarian bursa to the uterine horn. Site of fertilization
Uterine horn (2)	Site of implantation
Body of uterus (3)	A muscular layer enclosing the posterior ends of the uterine horns.
Vagina (4)	Receives sperm during mating and provides pathway to the outside
Broad ligament (5)	Along the length of the uterine horn to provide support
Round ligament (6)	Perpendicular to the broad ligament, supports the uterine horns
Glands of the clitoris (7)	Produce an odoriferous secretion
Ureter (8)	Transport urine to the bladder
Bladder (9)	Store urine
Urethra (10)	Transport urine to the outside
External urethral orifice with ventral clitoris (11)	Terminal opening of the urinary system, mass of erectile tissue ventral to the urethral opening