22.3: Structures of the Male Reproductive System

Rocky Mountain Oysters

First, they are peeled and pounded flat. Then, they are coated in flour, seasoned with salt and pepper, and deep-fried. What are they? They are often called Rocky Mountain oysters, but they don't come from the sea. They may also be known as Montana tendergroin, cowboy caviar, or swinging beef — all names that hint at their origins. Here's another hint: they are harvested only from male animals, such as bulls or sheep. What are they? In a word: testes.

![Lamb fries](https://bio.libretexts.org/Bookshelves/Human_Biology/Book%3A_Human_Biology_(Wakim_and_Grewal)/22%3A_Reproductive%…)

Figure `(PageIndex(1))`: Lamb fries are fried lamb testicles

Testes and Scrotum

The two **testes** (singular, testis) are sperm- and testosterone-producing gonads in male mammals, including male humans. These and other organs of the human male reproductive system are shown in Figure `(PageIndex(2))`. The testes are contained within the **scrotum**, a pouch made of skin and smooth muscle that hangs down behind the penis.
Testes Structure

Figure \((\text{PageIndex}[2])\): This drawing includes a testis, epididymis, and vas (or ductus) deference. The three structures are connected to create a tract through which sperm can travel. Testes are composed of microscopic tubes called Seminiferous tubules where sperm are produced. Sperm is stored in epididymis after maturation until it is ejaculated via vas deferens.

The testes are filled with hundreds of tiny tubes, called seminiferous tubules, which are the functional units of the testes. The seminiferous tubules are coiled and tightly packed within divisions of the testis called lobules. Lobules are separated from one another by internal walls (or septa).

One or more seminiferous tubules are tightly coiled within each of the hundreds of lobules in the testis. A single testis normally contains a total of about 30 m (90 ft) of these tightly packed tubules! As shown in the cross-sectional drawing of a seminiferous tubule in Figure \((\text{PageIndex}[2])\), the tubule contains sperm in several different stages of development.

Other Scrotal Structures

Besides the two testes, the scrotum also contains a pair of organs called epididymes (singular, epididymis) and part of each of the paired vas deferens (or ducti deferens). Both structures play important functions in the production or transport of sperm.

Epididymis

The seminiferous tubules within each testis join together to form ducts (called efferent ducts) that transport immature sperm to the epididymis associated with that testis. Each epididymis (plural, epididymes) consists of a tightly coiled tubule with a total length of about 6 m (20 ft). As shown in Figure \((\text{PageIndex}[2])\) the epididymis is generally divided into three parts: the head (which rests on top of the testis), the body (which drapes down the side of the testis), and the tail (which joins with the vas deferens near the bottom of the testis). The functions of the two epididymes are to mature sperm, and then to store that mature sperm until they leave the body during an ejaculation when they pass the sperm on to the vas deferens.
Vas Deferens

The vas deferens, also known as sperm ducts, are a pair of thin tubes, each about 30 cm (1 ft) long, which begin at the epididymis in the scrotum and continue up into the pelvic cavity. They are composed of ciliated epithelium and smooth muscle. These structures help the vas deferens fulfill their function of transporting sperm from the epididymes to the ejaculatory ducts, which are accessory structures of the male reproductive system.

Accessory Structures

In addition to the structures within the scrotum, the male reproductive system includes several internal accessory structures. They include the ejaculatory ducts, seminal vesicles, and the prostate and bulbourethral (Cowper's) glands. See Figure \(\PageIndex{3}\)). The major reproductive structures represented in this figure are explained below.

Figure \(\PageIndex{3}\)): The figure shows the ejaculatory duct, seminal vesicles, and the bulbourethral gland that produce semen. The figure also shows the other major structures of the male reproductive system.

Seminal Vesicles

The seminal vesicles are a pair of glands that each consist of a single tube, which is folded and coiled upon itself. Each vesicle is about 5 cm (2 in.) long and has an excretory duct that merges with the vas deferens to form one of the two ejaculatory ducts. Fluid secreted by the seminal vesicles into the ducts makes up about 70 percent of the total volume of semen, which is the sperm-containing fluid that leaves the penis during an ejaculation. The fluid from the seminal vesicles is alkaline, so it gives semen a basic pH that helps prolong the lifespan of sperm after it enters the acidic secretions inside the female vagina. Fluid from the seminal vesicles also contains proteins, fructose (a simple sugar), and other substances that help nourish sperm.

Ejaculatory Ducts

The ejaculatory ducts form where the vas deferens join with the ducts of the seminal vesicles in the prostate gland. They connect the vas deferens with the urethra. The ejaculatory ducts carry sperm from the vas deferens, as well as secretions from the seminal vesicles and the prostate gland that together form semen. The substances secreted into semen by the glands as it passes through the ejaculatory ducts control its pH and provide nutrients to sperm, among other functions. The fluid itself provides sperm with a medium in which to "swim."
Prostate Gland

The **prostate gland** is located just below the seminal vesicles. It is a walnut-sized organ that surrounds the urethra and its junction with the two ejaculatory ducts. The function of the prostate gland is to secrete a slightly alkaline fluid that constitutes close to 30 percent of the total volume of semen. The prostate fluid contains small quantities of proteins, such as enzymes. In addition, it has a very high concentration of zinc, which is an important nutrient for maintaining sperm quality and motility.

Bulbourethral Glands

Also called Cowper's glands, the two **bulbourethral glands** are each about the size of a pea and located just below the prostate gland. The bulbourethral glands secrete a clear, alkaline fluid that is rich in proteins. Each of the glands has a short duct that carries the secretions into the urethra, where they make up a tiny percentage of the total volume of semen. The function of the bulbourethral secretions is to help lubricate the urethra and neutralize any urine (which is acidic) that may remain in the urethra.

Penis

The **penis** is the external male organ that has the reproductive function of delivering sperm to the female reproductive tract. This function is called intromission. The penis also serves as the organ that excretes urine.

Structure of the Penis

The structure of the penis and its location relative to other reproductive organs are shown in Figure 22.1.4. The part of the penis that is located inside the body and out of sight is called the root of the penis. The shaft of the penis is the part of the penis that is outside the body. The enlarged, bulbous end of the shaft is called the glans penis.

![Diagram of the human penis](https://bio.libretexts.org/Bookshelves/Human_Biology/Book%3A_Human_Biology_(Wakim_and_Grewal)/22%3A_Reproductiv…)

Figure 22.1.4: This section shows the internal anatomy of the penis and related structures. The penis is composed of glans penis, shaft, root of penis. The corpus spongiosum is the column of erectile tissue that contains the urethra. The corpora cavernosa are the other two columns that erect the penis.
Urethra

The urethra passes through the penis to carry urine from the bladder — or semen from the ejaculatory ducts — through the penis and out of the body. After leaving the urinary bladder, the urethra passes through the prostate gland, where the urethra is joined by the ejaculatory ducts. From there, the urethra passes through the penis to its external opening at the tip of the glans penis. Called the external urethral orifice, this opening provides a way for urine or semen to leave the body.

Tissues of the Penis

![Cross-section of the penis]

Figure 5: Cross-section of the penis: The penis consists mostly of spongy tissues that can fill with blood, stiffening the organ. The corpus cavernosum urethrae are now called corpus spongiosum. You can see the urethra in the center of the corpus spongiosum.

The penis is covered with skin (epithelium) that is unattached and free to move over the body of the penis. In an uncircumcised male, the glans penis is also mainly covered by epithelium, which (in this location) is called the foreskin, and below which is a layer of the mucous membrane. The foreskin is attached to the penis at an area on the underside of the penis called the frenulum.

As shown in Figure 5, the interior of the penis consists of three columns of spongy tissue that can fill with blood and swell in size, allowing the penis to become erect. This spongy tissue is called corpus cavernosum (plural, corpora cavernosa). Two columns of this tissue run side by side along the top of the shaft, and one column runs along the bottom of the shaft. The urethra runs through this bottom column of spongy tissue, which is sometimes called corpus spongiosum. The glans penis also consists mostly of spongy erectile tissue. Veins and arteries run along the top of the penis, allowing blood circulation through the spongy tissues.

Feature: Human Biology in the News

Lung, heart, kidney, and other organ transplants have become relatively commonplace, so when they occur, they are unlikely to make the news. However, when the nation’s first penis transplant took place, it was considered very newsworthy.

In 2016, Massachusetts General Hospital in Boston announced that a team of its surgeons had performed the first penis transplant in the United States. The patient who received the donated penis was a 64-year-old cancer patient. During
the 15-hour procedure, the intricate network of nerves and blood vessels of the donor penis were connected with those of the penis recipient. The surgery went well, but doctors reported it would be a few weeks until they would know if normal urination would be possible, and even longer before they would know if sexual functioning would be possible. At the time that news of the surgery was reported in the media, the patient had not shown any signs of rejecting the donated organ. The surgeons also reported they were hopeful that such transplants would become relatively common, and that patient populations would expand to include wounded warriors and transgender males seeking to transition.

The 2016 Massachusetts operation was not the first penis transplant ever undertaken. The world’s first successful penis transplant was actually performed in 2014 in Cape Town, South Africa. A young man who had lost his penis from complications of a botched circumcision at age 18 was given a donor penis three years later. That surgery lasted nine hours and was highly successful. The young man made a full recovery and regained both urinary and sexual functions in the transplanted organ.

In 2005, a man in China also received a donated penis in a technically successful operation. However, the patient asked doctors to reverse the procedure just two weeks later, because of psychological problems associated with the transplanted organ for both himself and his wife.

**Review**

1. What are the testes? Where are they located?

2. Describe the structure of a testis.

3. Identify the epididymis and its functions.

4. What are the vas deferens? What do they do?

5. Where are the seminal vesicles located? What is their reproductive role?

6. Which parts of the male reproductive system are connected by the ejaculatory ducts? What fluids enter and leave the ejaculatory ducts?

7. Identify the location of the prostate gland relative to other male reproductive organs. What is the prostate’s function?

8. Where are the bulbourethral glands? What is their function?

9. Relate the structure of the penis to its two basic functions.

10. For each of the descriptions below, match the part of the male reproductive system from the list that best fits it. Each part is used only once.

Parts of the male reproductive system: **urethra, seminal vesicle, epididymis, testes**

   A. Sperm are produced here.

   B. Sperm mature here.
C. Sperm are transported through the penis in this structure.

D. This is a gland that produces fluid that is a major component of semen.

11. A vasectomy is a form of birth control for men that is performed by surgically cutting or blocking the vas deferens so that sperm cannot be ejaculated out of the body. Do you think men who have a vasectomy emit semen when they ejaculate? Why or why not?

12. Which of the following structures are located internally within the body? Choose all that apply.

   A. testes
   B. seminal vesicles
   C. epididymis
   D. prostate
   E. glans penis

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