

Male Reproductive System

Objectives

- Identify and give functions of all components of male systems
- Describe the composition of semen and its functions
- Identify the three regions of the male urethra
- Identify the structures and tissues of the penis
- Describe the process/pathway of sperm and development of semen

Male Reproductive Anatomy

The male reproductive system consists of a pair of **testes**, **conducting ducts**, **accessory glands** and the **penis**

Testes

[\[Section 27.1: Anatomy and Physiology of the Male Reproductive System\]](#)

[\[Section 27.1.1: Scrotum\]](#)

[\[Section 27.1.2: Testes\]](#)

[\[Figure 27.2: Male Reproductive System; Figure 27.3: The Scrotum and Testes\]](#)

- paired, separated by the Dartos muscle
- Produces spermatozoa and testosterone (interstitial cells)
- Lies in the scrotum outside the abdominopelvic cavity where the temperature is slightly lower than inside the body. The lower temperature optimizes the rate of sperm production
- Each is covered by a dense connective tissue capsule called the **tunica albuginea** (“white tunic”)
 - Inward extensions of the tunica albuginea divide the testes into lobes containing **seminiferous tubules**
 - These tubules produce millions of spermatozoa a day

Conducting System

[\[Section 27.1.4: Sperm Transport\]](#)

[\[Figure 27.2: Male Reproductive System; Figure 27.4: Anatomy of the Testes\]](#)

Epididymis, vas deferens, ejaculatory duct and urethra form a system of tubules for the transport of spermatozoa from testes to the pelvic cavity. There they will be combined with the secretions of the accessory glands to form semen.

Epididymis

[\[Section 27.1.4.1: Role of the Epididymis\]](#)

[\[Figure 27.2: Male Reproductive System; Figure 27.4: Anatomy of the Testes\]](#)

- An elongated structure on posterolateral surface of testis that caps on the superior side.

- First portion of duct system
- Provides site for maturation of sperm

Ductus Deferens (Vas Deferens)

[\[Section 27.1.4.2: Duct System\]](#)

[\[Figure 27.2: Male Reproductive System; Figure 27.4: Anatomy of the Testes\]](#)

- upon ejaculation, sperm is received here from the epididymis by peristalsis
- passes through the inguinal canal into the pelvic cavity and superiorly over the bladder
- enclosed with **spermatic cord** (a connective tissue sheath consisting of blood vessels, nerves and the **cremaster muscle**. This muscle encases the testes & elevates or lowers them to maintain the temperature needed to create sperm.
- end is enlarged (called **ampulla**)
- empties into the ejaculatory duct

Ejaculatory Duct

- During ejaculation, its contraction pushes sperm through the prostate and to the **prostatic urethra** where it joins the **seminal vesicle**

Urethra

- from the **prostatic urethra**, sperm travels through the **membranous urethra** and then into the **spongy urethra** that runs the length of the penis.

Accessory Glands

Three accessory glands produce seminal fluids that nourish, protect and support the spermatozoa. Combined with spermatozoa from the testes, these fluids form the ejaculate or **semen**. Each gland contributes a certain percentage to the total volume of semen.

Seminal Vesicles

[\[Section 27.1.4.3: Seminal Vesicles\]](#)

[\[Figure 27.2: Male Reproductive System\]](#)

- produces 60% of seminal fluid
- lie close to end of ductus deferens
- produce an alkaline secretion made of fructose and other fluids that provide ATP for the motion of the sperm tail and promotes fertility.
- duct merges with duct of ductus deferens to form ejaculatory duct (this allows sperm and seminal fluid to enter urethra together)

Prostate

[\[Section 27.1.4.4: Prostate Gland\]](#)

[\[Figure 27.2: Male Reproductive System\]](#)

- 20-30% of fluid

- circles around urethra and secretes a milky fluid that coagulates semen.
- This works to help activate the sperm
- Because it encircles the urethra, if the prostate becomes enlarged due to cancer or other facts, men will have a difficult time urinating

Bulbourethral Glands

[*\[Section 27.1.4.5: Bulbourethral Glands\]*](#)

[*\[Figure 27.2: Male Reproductive System\]*](#)

- produces approx. 5% of fluid
- pea shaped and very small
- produce thick, clear alkaline secretion mucus that drains into the membranous urethra
- this secretion is intended to wash any urine out of the urethra when ejaculation of semen occurs as well as act as a buffer to the female reproductive tract (which is an acidic environment.)
- alkalinity neutralizes acidity of the male urethra and female vagina

Penis

[*\[Section 27.1.5: The Penis\]*](#)

[*\[Figure 27.2: Male Reproductive System; Figure 27.7: Cross-Sectional Anatomy of the Penis\]*](#)

- The penis is the male copulatory organ.
- External (along with scrotum)
- Designed to deliver sperm to the female reproductive tract. (The **spongy urethra** transports both urine and semen through the penis)
- Consists of three main parts:
 - **shaft/body**
 - **glans** (large tip of the shaft)
 - **prepuce/foreskin** (loose skin of the penis which covers the glans and is often removed by a process called circumcision)
- The **body** of the penis consists of 3 cylinders of erectile tissue
 - A pair of **corpora cavernosa** on the dorsal side
 - A single **corpus spongiosum** on the ventral side
- During sexual arousal, the three cylinders become engorged with blood, causing an erection

Lab Exercise Male Reproductive System Activities

Testes, Sperm, Epididymis, Spermatic Cord, External Genitalia

Learning Objectives

- Identify the general function of the reproductive system
- To identify the structures of the male reproductive systems on a model, diagram or in a specimen, and to describe the function of each
- To follow the pathway taken by sperm from its site of formation to the body exterior
- To discuss the microanatomy of the structures of the male reproductive tracts, and explain the importance of the microanatomy in reproduction

- To compare and contrast the events of mitosis and meiosis; to identify the phases of mitosis and meiosis and describe the events that are happening during each
- To identify the microanatomical structures of the testis, and sperm
- To compare and contrast spermiogenesis and spermatogenesis, and describe the roles of nurse / Sertoli / sustentacular cells and interstitial / Leydig cells in these processes
- To list and describe the hormones regulating the production of sperm, and identify their origin

Female Reproductive System

Objectives

- Identify the internal and external organs of the female reproduction system and their features
- Describe lactation and identify the structures of the mammary glands
- Describe the phases of the menstrual cycle
- Describe the movement of an egg from the ovary to the external environment

Female Reproductive Anatomy

[\[Section 27.2: Anatomy and Physiology of the Female Reproductive System\]](#)

The female reproductive system includes both **internal and external organs**. Collectively, they function to:

- Produce the female gamete
- Receive male gametes
- Transports oocytes
- Protect and nourish developing embryo
- Deliver child

External Organs

Vulva

[\[Section 27.2.1: External Female Genitals\]](#)

[\[Figure 27.9: Female Reproductive System; Figure 27.10: The Vulva\]](#)

“Vulva” is the collective term for the external female genitalia.

They consist of:

- **Mons pubis**: fatty pad that cushions and protects pubic symphysis during sexual intercourse
- **Labia majora**: two fatty folds that extend posteriorly from the mons pubis; homologous to the male scrotum; contain pubic hair, sudoriferous and sebaceous glands
- **Labia minora**- two smaller parallel folds, contain sebaceous glands but no hair, covers clitoris
- **Clitoris**- made of highly sensitive erectile tissue (same embryonic tissue that forms male penis), exposed region is called the glans
- **Vestibule**- between labia minora, contains vaginal orifice, hymen, the external urethra orifice (which has no reproductive function) and greater vestibular glands (secrete lubricant)

Internal Organs

Vagina

[\[Section 27.2.2: Vagina\]](#)

[\[Figure 27.9: Female Reproductive System; Figure 27.10: The Vulva\]](#)

- Female copulatory organ
- Birth canal
- Lined with stratified squamous epithelium in order to handle “abrasion” during childbirth or intercourse
- Passageway for menstruation
- Approximately 10 cm (4 in) long
- The **vaginal orifice** is the external opening of the vagina (occluded by the hymen)

Ovaries

[\[Section 27.2.3: Ovaries\]](#)

- The primary reproductive organ of females
- Produce endocrine (estrogen and progesterone) and exocrine (eggs, or ova) products
- Supported by the *ovarian ligament*, the *suspensory ligaments* and the *mesovarium*.
- Houses the female gametes (eggs) in *follicles*
- *Ovulation* is the ejection of the gametes from the ovary
- NOT directly connected to uterus; instead *fimbriae* create fluid currents that “wave” the egg down the *fallopian tubes* (*uterine tubes*) and into the uterus

Fallopian (Uterine) Tubes

[\[Section 27.2.5: The Uterine Tubes\]](#)

[\[Figure 27.14: Ovaries, Uterine Tubes, and Uterus\]](#)

- Not directly connected to the ovaries.
- This space between the gonads (ovaries) and the tubes is the reason that STDs like gonorrhea in females can spread outside of the reproductive system and cause inflammation of the pelvic region (*pelvic inflammatory disease*)
- Has 4 parts:
 1. Fimbriae- fingerlike projections that move egg into tube
 2. Infundibulum- expansion at beginning of tube, ciliated epithelium moves egg down tube, where most fertilization occurs
 3. Ampulla- widened area of tube (majority of fertilizations occur here)
 4. Isthmus- last point of tube, narrow, connects to uterus
- Most fertilization occurs in the upper 1/3 of the tube and then implants in the uterus. If the egg implants in the tubes, it is called an **ectopic pregnancy**. Because the tubes cannot support the growing fetus, this is very dangerous as rupturing can occur which endangers the mother's life

Uterus

[\[Section 27.2.6: The Uterus and Cervix\]](#)

[\[Figure 27.14: Ovaries, Uterine Tubes, and Uterus\]](#)

- Between bladder and rectum

- Site of implanted fertilized ovum as well as fetal development
- 3 parts
 1. Fundus- dome shaped
 2. Cervix- inferior, narrow portion
 3. Body – everything between the fundus and cervix

Uterine Wall

[\[Section 27.2.6: The Uterus and Cervix\]](#)

[\[Figure 27.14: Ovaries, Uterine Tubes, and Uterus\]](#)

Consists of 3 layers:

1. **Perimetrium**- outer layer, continuous with the visceral peritoneum, also called the serosa
2. **Myometrium**- muscular middle layer (3 layers of smooth muscle), responsible for labor contractions
3. **Endometrium**- two layers
 - **stratum basalis** - covers myometrium and produces new functional zone each month
 - **stratum functionalis** - very glandular and vascularized, supports embryo, sheds monthly during menstruation due to changes in ovarian hormone levels

Menstrual Cycle

[\[Section 27.2.7: The Menstrual Cycle\]](#)

[\[Figure 27.15: Hormone Levels in Ovarian and Menstrual Cycles\]](#)

hormonally regulated by FSH and LH from the anterior pituitary and by estrogen and progesterone from the ovaries

3 phases:

1. Menstrual phase (menses): approx. day 1-5, “sloughing off” of lining, accompanied with bleeding
2. Proliferative phase: approx. day 6-14, due to estrogen: endometrium is repaired, glands and vessels proliferate, and endometrium thickens. Ovulation occurs during this phase (ovulation is caused by LH from the pituitary)
3. Secretory phase: approx. day 15-28, due to progesterone: vascular supply further increases, size of glands increases and secrete nutrients for sustaining an embryo if present. If there is not an embryo present- the corpus luteum deteriorates, endometrium becomes spastic and menses will occur.

Lactation

[\[Section 27.2.8: The Breasts\]](#)

[\[Figure 27.17: Anatomy of the Breast\]](#)

The *mammary glands* are modified sweat glands that produce milk in a process called *Lactation*
Each breast consists of:

- **Lobes** (15-20) Separated by fat and CT
- **Lobules** –contain alveoli

- *Alveoli* –milk secreting cells
- *Lactiferous Duct-* drain milk from lobules
- *Lactiferous Sinus* -empty milk into nipples
- *Nipple* –surrounded by pigmented *areola*

Reproductive System

Structure	Location	Description/Function
Testes		
Tunica albuginea		
Scrotal sac (scrotum)		
Dartos muscle		
Cremaster muscle		
Seminiferous tubules		
Interstitial cells		
Spermatogonia		
Primary and secondary spermatocytes		
Spermatid		
Spermatozoa		
Sustentacular cell		
Sperm head		
Sperm midpiece		
Sperm tail		
Epididymis, Spermatic cord, Seminal Vesicle and Prostate		
Rete testis		
Epididymis (head, body, tail)		
Ductus deferens		
Spermatic cord		
Testicular vein		
Testicular artery		
Testicular nerves		
Ampulla of ductus deferens		

Reproductive System

Seminal vesicle		
Ejaculatory duct		
Prostate gland		
Prostatic urethra		
Membranous urethra		
Bulbourethral glands		
Seminal fluid		
Semen		
Male External Genitalia and Perineum		
Penis		
Shaft		
Glans penis		
Prepuce		
Frenulum		
Erectile tissue		
Corpus spongiosum		
Corpora cavernosa		
Crus		
Bulb		
Root		
Dorsal arteries		
Deep arteries		
Dorsal vein		
Deep dorsal vein		
Perineum		
Anal triangle		

Reproductive System

Urogenital triangle		
Ovary		
Ovary		
Oocyte		
Uterine tube		
Stroma		
Ovarian follicle		
Primary follicle		
Secondary follicle		
Secondary oocyte		
Mature ovarian follicle		
Corpus luteum		
Corpus albicans		
Uterine Tubes and Uterus		
Fimbriae		
Infundibulum		
Ampulla		
Uterus		
Fundus		
Body		
Cervix		
Perimetrium		
Myometrium		
Endometrium		
Spiral arterioles		
Uterine glands		

Reproductive System

Basal layer		
Straight arterioles		
Broad ligament		
Round ligament		
Ovarian ligament		
Suspensory ligament		
Vagina, External Genitalia and Perineum		
Vaginal canal		
Vaginal orifice		
Fornix		
Rugae		
Anal triangle		
Urogenital triangle		
Vulva		
Mons pubis		
Clitoris		
Glans clitoris		
Prepuce		
Labia minora		
Labia majora		
Urethral orifice		
Vaginal orifice		
Hymen		
Vestibule		
Greater vestibule glands		

Reproductive System

Breast		
Areola		
Nipple		
Body		
Axillary tail		
Suspensory ligaments		
Adipose tissue		
Mammary glands		
Lobes		
Lactiferous ducts		
Lactiferous sinuses		

This lab also includes terms and concepts you need to know in reference to reproductive physiology and embryology.