

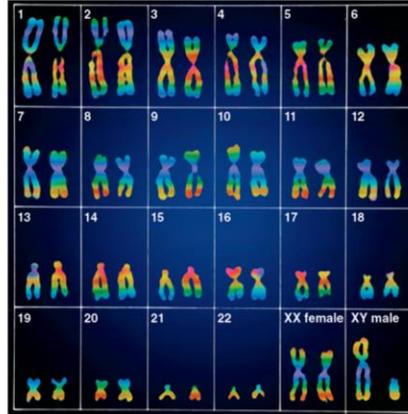


ST. CATHERINE
UNIVERSITY

Reproductive System

Primary Sex Organs

- Gonads
- Gametes
 - 46 Chromosomes, 23 Pairs
 - Diploid (2N)
 - Haploid (1N)
 - Meiosis



Gonads are the primary **sex** organs of the reproductive system. For males, these would be the testes and for females, these would be the ovaries. They function in producing hormones and gametes.

Gametes are sex cells that will become sperm in males and egg or ova in females. Gametes are produced through meiosis, a process of cell division unique for gametes. Gametes begin with 46 chromosomes which can also be known as 23 pairs or diploid (2N). The gamete undergoes meiosis and this process divides the cell and decreases the amount of genetic material from diploid to haploid. Haploid (N) cells contain 23 chromosomes total – half of what it started out with. Meiosis will be discussed in more details later on.



ST. CATHERINE
UNIVERSITY

Male Reproductive

Male Reproductive Functions

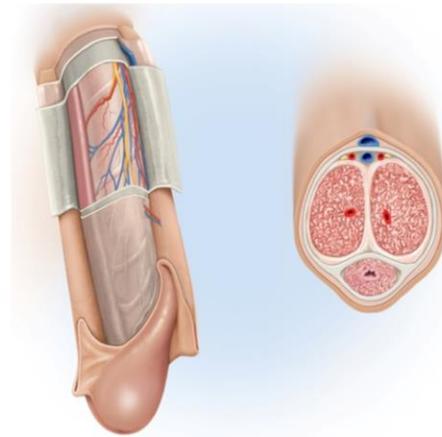
- Sperm Production
- Delivery of sperm
- Produce sex hormones 

The male reproductive system functions primarily in the production and maturation of sperm. It also functions to deliver sperm into the female reproductive system in order to fertilize an egg.

The male reproductive system also produces and releases sex hormones.

Genitalia

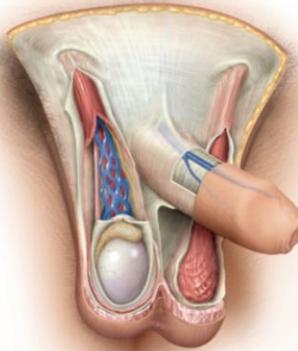
- Penis
 - Deposits semen
 - Erectile Tissues
 - Corpus Spongiosum
 - Corpus Cavernosum (2)
 - Glans



The penis serves to deposit semen into the vagina. It consists of 3 cylindrical bodies, consisting of erectile tissue, which fills with blood during excitement and erection. The corpus spongiosum is erectile tissue found on the ventral side and encloses urethra. The corpus cavernosum is divided into 2 separate bodies by a septum and is located on the dorsal side of penis. The glans is tip of the penis.

Genitalia Cont'd

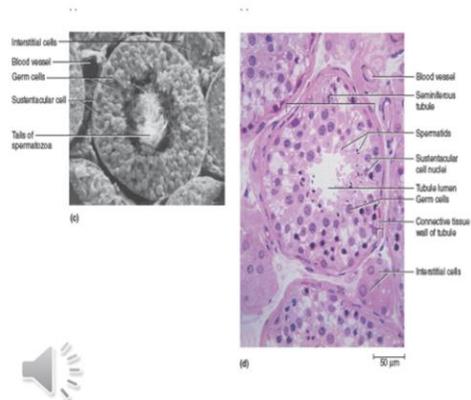
- Scrotum
 - Spermatic Cord
 - Dartos Muscle
 - Cremaster Muscle



The scrotum is a pouch that contains the testes. It also houses the spermatic cord which contains the ductus deferens as well as blood, nerve and lymph vessels. The cord moves internally by passing through the abdominal wall into the groin area. The dartos muscle is on the bottom portion of the testes. It is made of smooth muscle and contracts when cold to pull the testes closer to the body, reducing the surface area of the scrotum and heat loss. The cremaster muscle surrounds the spermatic cord and also pulls up the testes to keep them close to body.

Genitalia Cont'd

- Testes
 - Seminiferous Tubules
 - Germinal epithelium
 - Interstitial Cells
 - Testosterone
 - Sustentacular Cells
 - Blood-testis Barrier
 - Descent of Testis
 - Rete Testis



The testes contain compartments called lobules which houses the seminiferous tubules. The seminiferous tubules consist of a germinal epithelium along the outside surface and sustentacular cells on the inside. The space inside of the seminiferous tubule is referred to as the lumen.

The lumen is lined with a germinal epithelium layer that is considerably thick. This layer is composed of germ cells and sustentacular cells. Germ cells are cells that are in the process of becoming cells. Sustentacular cells protect the developing germ cells and promote their growth by providing nutrients and growth factors and removing wastes. They line the tubules and help form the blood-testis barrier. The blood-testis barrier prevents proteins and other cells from contacting germ cells and lymph cells from attacking the genetically different germ cells. Since the germ cells are undergoing meiosis, they are decreasing the number of chromosomes in the cell and becoming genetically different from other cells in the body. The immune system would not recognize it as belong to our body because of this genetic difference and would attack the cells, hence the need of a protective barrier.

The interstitial cells are clusters of cells between the tubules and produce testosterone.

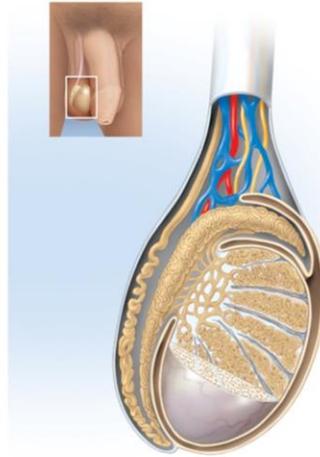
Descent of the testes begins around week 6 of development. Originally they start near the kidneys and pass through the abdominal wall in the 7th month. Descent of the testes is caused by the release of the testosterone. In order to produce sperm, the testes need to descend outside of the body to a cooler environment. The internal body temperature is too hot of an environment to produce viable sperm.

The rete testis is a network of tubes where sperm partially mature in the testes. They lead sperm from the seminiferous tubules to the body of the epididymis.

In the microscopic picture of the seminiferous tubules take note of the different cell types. Also, the wispy hair like things in the middle of the tube are the tails of sperm.

Spermatic Ducts

- Epididymis
- Ductus Deferens
- Ejaculatory Duct



The spermatic ducts have three continuous parts within the male reproductive system.

The first part is the epididymis, this is the site of sperm maturation and storage. It is found on the posterior side of the testes and is a single coiled duct.

It takes about 20 days for sperm to travel through the epididymis to the end where they are stored.

Stored sperm will remain viable for 40-60 days. After which they begin to disintegrate.

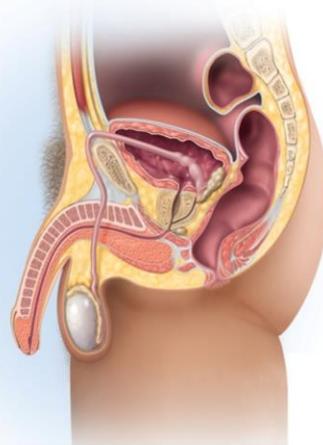
The ductus deferens [originally called vas deferens hence the term vasectomy] continues from the epididymis and moves up and around the urinary bladder. It is a muscular tube that enters the pelvic cavity. It ends by uniting with the duct from the seminal vesicles. The ductus deferens moves mature sperm internally from the testes.

The ejaculatory duct is where the ductus deferens and the duct from the seminal vesicles meet. It passes through the prostate gland and empties into the urethra.

***I would use this picture in slide 9 as well**

Additional Structures

- Urethra
- Accessory Glands
 - Seminal Vesicles
 - Prostate
 - Bulbourethral Gland



In males, the urethra is a shared reproductive and urinary structure. It cannot pass urine and semen at the same time. The urethra comes from the bladder and goes to the external orifice.

There are a number of accessory glands for the male reproductive system.

The seminal vesicles are a pair of glands posterior to the bladder. They secrete a fluid that makes up 60% of semen.

The prostate gland surrounds the urethra and ejaculatory duct and is inferior to the bladder. It secretes a thin, milky substance that makes up 30% of semen.

The bulbourethral gland is underneath/inferior to the prostate and produces a clear, slippery fluid that lubricates the penis for intercourse. The fluid also neutralizes the acidic residue of urine which can be harmful to semen.

Semen

- Fluid expelled during orgasm
- Composed of:
 - 10% Sperm
 - 30% Prostate Fluid
 - 60% Seminal Vesicle Fluid
- Prostate Fluid
- Seminal Vesicle Fluid



Semen is the fluid expelled during orgasm. It is composed of 10% sperm, 30% prostatic fluid, 60% seminal vesicle fluid, and traces of bulbourethral fluid

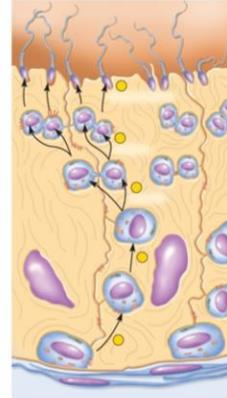
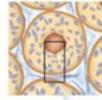
As mentioned, prostate fluid is a thin, milky white substance. It contains calcium, citrate, phosphate ions and a clotting enzyme and helps give semen that sticky texture (clotting enzyme). It is a great evolutionary adaptation, prostate fluid helps semen stick to the side of the vagina and cervix, and keeps it from draining out. Additionally, it helps to elevate pH, sperm are not motile in acidic conditions (the spermatic ducts and vagina are slightly acidic environments).

The seminal vesicle fluid is a yellowish, brown fluid. It is the last component of semen to emerge and flushes any remaining sperm from the urethra. It contains fructose and other carbohydrates that provide lots of ATP to power the sperm's movements .

NOTE: sperm that enter the cervix trigger a peristaltic wave in the uterus which causes the sperm to be pushed up towards the uterine tubes.

Spermatogenesis

Germ cells undergo meiosis
End with 4 genetically distinct cells.
These cells develop and mature to become sperm
74 days to go from germ cell to mature sperm.
A young man produces 300,000 sperm per minute.



Spermatogenesis is the production of sperm. Germ cells undergo meiosis to reduce genetic info, these cells develop and mature into sperm.

It takes 74 days to go from stem cell to sperm. Recall, at the end of meiosis there are 4 genetically distinct cells derived from one germ cell.

A young man produces 300,000 sperm per minute or 400 million per day.