**Male reproductive system**

The male genital system comprises the organs that are involved in the development, maturation, transport and deposition of the male gametes. It consits of:

**a) paired testes,**

**b) epididymides (single,epididymis),**

**c) vas deferentia (single, vas deferens),**

**d) ampullae (absent in some species),**

**e) paired seminal vesicles(vesicular glands),**

**f) prostate gland,**

**g) paired bulbo-urethral (Cowper's) glands, and**

**h) penis.**

The seminal vesicles, prostate, and bulbo-urethral glands discharge secretions, which mix with spermatozoa and fluids secreted by the testes, epididymides, and vas deferens, and for this reason they are often termed the **accessory sex glands**.

**Testes**

The testes are primary organs of reproduction in male, because they produce male gametes (spermatozoa) and male sex hormones (androgens).

Testes differ from ovaries in that all potential gametes are not present at birth. Germ cells which are located in the seminiferous tubules, undergo continual divisions, forming new spermatozoa throughout the normal reproductive life of the male.

Testes also differ from ovaries in that they don’t remain in the body cavity. They descend from their site of origin, near the kidneys, down through inguinal canal into scrotum. Both the gonadotropines and androgens regulate the descent of testes, this descent is completed in the fetus by midpregnancy in bull and just before birth in horse.

In all species testes are covered with tunica vaginalis, which is a serous coat and it is an extension of peritoneum, this serous coat is obtained as testes descend into scrotum

The outer layer of the testes is tunica albuginea testis, is a thin white membrane of elastic connective tissue. Beneath the tunica albuginea testis is parenchyma the functional layer of testes. Parenchyma has yellowish color and is divided into segments by incomplete septa of connective tissue.

Located within these segments of parenchyma tissue seminiferous tubules. Seminiferous tubules are formed from primary sex cords and contain germ cells(spermatogonia) and nurse cells (sertoli cells). Sertoli cells are larger and less numerous than spermatogonia.

Seminifirous tubules are the site of spermatozoa production. They are small and convoluted tubules approximately 200 micrometers in diameter.

Seminiferous tubules join a network of tubules, **rete testis**, which connect to 12 to 15 small ducts, the **vasa efferentia** which converge into head of epididymis.

**Leydigs(interstitial) cells** are found in the parenchyma of testes between the seminiferous tubules. LH stimulates Leydigs cells to produce testosterone.

The scrotum is two-lobed sac which include the testes, it is located in the inguinal region between the rear legs in more species. It has the same embryonic origin of labia majora in the female, it is composed of an outer layer of skin with numerous large sweat and sebaceous glands. The outer layer is lined with a layer of smooth muscle fibers, **the tunica dartos**, which interspersed with connective tissue.

The tunica dartos divides the scrotum into two pouches, and is attached to tunica vaginalis at the bottom of each pouch.

The spermatic cord Is composed of convoluted testicular artery, surrounding venous plexus, nerve trunks, smooth muscle fibers, connective tissue and portion of vas deferense.

Both the scrotum and spermatic cord contribute to the support of the testes, also they have a joint function in regulating the temperature of the testes.

the tunica dartos, the smooth muscle in the spermatic cord, and the cremaster, a smooth muscle around the spermatic cord are sensitive to temperature.

**During cold weather**, contraction of these muscles causes the scrotum to pucker(gather) and the spermatic cord to shorten, drawing the testes closer to the body.

**During hot weather,** these muscles relax, permitting the scrotum to stretch and the spermatic cord to lengthen. thus, the testes swing down away from the body.

These muscles don’t respond to the change in temperature until the age of puberty. They must be sensitized by testosterone to respond to changing ambient temperature.

Actual cooling of the testes occurs by two mechanisms

1. The skin of scrotum has the sweat and sebaceous glands which are more active during hot weather.

Evaporation of the secretion of these glands cools the secrotum and thus the testes. The external scrotum has been observed 2C to 5C cooler than the temperature inside the testes.

As the scrotum stretches during hot weather more surface area is provided for cooling by evaporation.

1. Pampiniform plexus

A single **spermatic artery** is tortuously coiled dorsal to the testis. The two **spermatic veins** form a plexus of veins around the spermatic artery. Collectively, the veins and the artery form the **pampiniform plexus** which is located in the spermatic cord. **Counter current heat exchange** between the warmer arterial blood and cooler venous blood cools the arterial blood before it enters the testis to keep the temperature in the testes at 34C.

**Epididymis**

crescent in shape The epididymis is firmly attached along the epididymal border of the testis. It can be divided into three part: the head, body and tail. The head of the epididymis is firmly attached to the testis and receives the efferent ducts of the testis. After entering the epididymis the efferent ducts join to form the duct of the epididymis. The epididymal duct form the body of the epididymis, and continues as the tail of the epididymis, which attaches to the caudal end of the testis by the proper ligament of the testis.

Functions of epididymis

1. transportation of sperm
2. concentration of the sperm
3. maturation of the sperm, final stage in the development of sperm in which the normal number of chromosomes is reduced by one-half.
4. Storage of sperm

**Vas deferens**

Are a pair of ducts each one extends from the end of the tail of each epididymis. Initially is supported by folds of peritoneum.

It passes along the spermatic cord, through the inguinal canal to the pelvic region, where it merges with the urethra at its origin near the urinary bladder. The enlarged end of vas deferense near the urethra is the **ampulla** . the vas deferense has a thick layer of smooth muscles in its wall and has a single function of **transport the spermatozoa** **from tail of epididymis to the pelvic urethra.**

The ampulla serves as short-term storage depot for semen. However, spermatozoa age quickly in the ampulla, it seems that spermatozoa may pool in the ampulla during ejaculation before being expelled into the urethra.

**The urethra**

In the male, It is a long tube extending from the bladder to the end of penis (glans penis). It serves as excretory duct for both semen and urine.

**Accessory sex glands**

The accessory sex glands are located along the pelvic portion of urethra, with ducts which empty their secretions into the urethra.

They include

* **Seminal vesicles (Vesicular glands)**
* **Prostate gland**
* **Bulbourethral glands(cowpers glands)**

They contribute greatly to the fluid volume of semen. in addition, their secretions are solution of buffers, nutrients, and other substances needed for optimum motility and fertility of spermatozoa.

**Functions of accessory sex glands**

* **Seminal vesicles** secrete a substance high in the simple sugar (fructose) which serves as a nutrient for spermatozoa transport.
* **Prostate gland** secretes a high mineral composition that becomes a part of the semen.
* **Bulbourethral glands** secrete an alkaline and lubricating material which serve to clean the urethra prior to ejaculation.

**Penis**

Is the organ of copulation in male. It forms dorsally around the urethra from the point where the urethra leaves the pelvic.

Bulls, rams and boars have a sigmoid flexure, an S- shapedbend in the penis which permits the penis to be retracted completely into the body.

These three species and stallion have retractor penis muscles, a pair of smooth muscles which will relax to permit extension of the penis and contract to draw the penis back into the body. These muscles arise from the vertebrae in the coccygeal region and fused ventrally to the penis just anterior to the sigmoid flexure.

The glans penis, is the free end of the penis, is well supplied with sensory nerves and is homologous to the clitoris in the female.

In most species the penis is fibroelastic, containing small amounts of erectile tissue. The penis in stallion contains more erectile tissue found in bull, ram, buck and boar.

**Prepuce(sheath)**

Is an invagination of skin which completely enclosed the free end of penis. It has the same embryonic origin of the labia minora in the female.

It can be divided into a prepenile portion which is the outer fold, penile portion, or inner folds. The orifice of the prepuce is surrounded by long and tough preputial hair.