

## **The Male Reproductive System**

The male gonads, the testes (testicles), manufacture sperm and secrete male sex hormones, collectively known as androgens. They are situated in the scrotum, a sac of skin lying at the base of the penis. Each testis (4cm X 2.5cm) is in its own compartment divided by the scrotal septum. Sperm is manufactured at temperatures 3°C less than body temperature and there are two muscles that help control this temperature. The dartos muscle is a layer of smooth muscle that lies just under the skin of the scrotum. When contracted the dartos causes the skin of the scrotum to wrinkle conserving heat. The cremaster muscles that surround each testis are skeletal muscles derived from the internal obliques. When they contract, they elevate the testes bringing them closer to the warmth of the body wall. When they relax, the testes descend allowing them to be exposed to cooler temperatures.

Each testis is covered by two tunics, the outer tunica vaginalis and the inner tunica albuginea. The latter is made of fibrous connective tissue. Septa from the tunica albuginea extend into the testis dividing it into about 300 lobules each containing one to a few seminiferous tubules. It is within the seminiferous tubules that sperm production actually takes place. These tubules come together and form a network of tubules called the rete testis. From the rete testis the sperm then enter the epididymis which lies atop and half way around each testis.

The endocrine functions of the testes are carried out by the Cells of Leydig (interstitial cells) which are interspersed among the seminiferous tubules. They secrete the hormone testosterone and other androgens into the surrounding interstitial fluid.

It takes about three weeks for sperm to move through the coiled epididymis to the ductus deferens (vas deferens). The ductus deferens along with nerves, veins, arteries and lymph vessels leaves the scrotum through a connective tissue sheath called the spermatic cord. The ductus deferens enters the pelvic cavity through the inguinal canal and travels anterior and superior to the pubic bone. It runs along the superior surface of the bladder, crosses the ureter, then posterior to the bladder where it enlarges to form the ampulla. It then is joined by the duct of the seminal vesicle forming the ejaculatory duct as it enters the surrounding prostate gland. In the prostate the ejaculatory duct enters the urethra. During ejaculation sperm is moved the length of the epididymis and ejaculatory duct into the urethra by peristalsis. The urethra leaves the prostate and for a short distance is known as the membranous urethra before entering the penis as the penile urethra. Sperm exits the body through the external urethral meatus.

The penis and scrotum make up the external male genitalia. The penis consists of an attached root, the shaft, and the enlarged distal end called the glans penis which is surrounded by the detached skin of the prepuce (foreskin). The penis contains erectile tissue – a network of connective tissue and smooth muscle interspersed with vascular spaces. During sexual arousal, the smooth muscle relaxes allowing the vascular spaces to become engorged with blood resulting in an erection. The erectile tissue is made up of three long cylinders: the paired corpora cavernosa (dorsal) which make up the bulk of the penis, and the corpus spongiosum (ventral) containing the urethra. The corpus spongiosum expands distally to form the glans.

### **Accessory Glands**

The paired seminal vesicles are found on the posterior wall of the bladder and they produce most of the seminal fluid. This fluid is slightly alkaline and contains nutrients. The single prostate gland encloses the urethra just inferior to the bladder. It also secretes fluid with nutrients and enzymes and a protein called prostate-specific antigen (PSA) that plays a role in sperm activation. An increase in PSA may indicate prostate cancer. The Bulbourethral (or Cowper's) glands lie inferior to the prostate and produce a thick, clear mucus before ejaculation. This fluid neutralizes acidic urine in the urethra.

### **Sperm Structure**

A sperm cell has three major regions:

- the head consists of the nucleus containing the genetic material DNA. Anterior to the nucleus is the acrosome that contains enzymes necessary for the penetration of the egg.
- the midpiece is packed with mitochondria that produce large amounts of ATP.
- the tail which is a flagellum containing microtubules that produce the whip-like motion that propels the sperm.