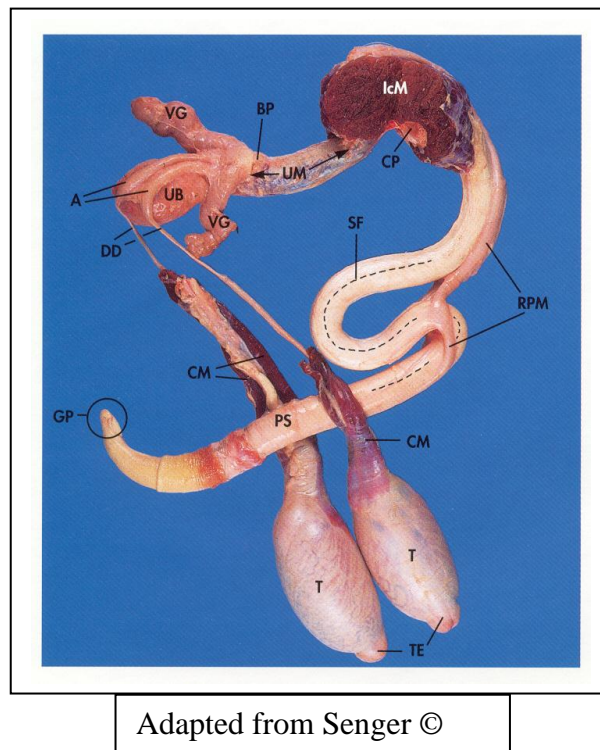


Animal and Veterinary Science Department
University of Idaho
AVS 222 (Instructor: Dr. Amin Ahmadzadeh)
MALE REPRODUCTIVE ANATOMY
Chapter 3

Basic components of the male reproductive system are the: spermatic cord, scrotum, testis, excurrent duct system (epididymis, ductus deference, urethra), accessory sex glands, and penis and associated muscles (Figures 3-1, 3-2 to 3-4)



Also See the Figure on the last page

I. SCROTUM

A. Function

Thermoregulation/radiation, protection, and support of testis

B. Thermoregulation Mechanism (Figure 3-9)

Sweat glands and **thermosensitive** nerves are involved

C. Scrotum layers (Figure 3-2, 3-11, 3-15)

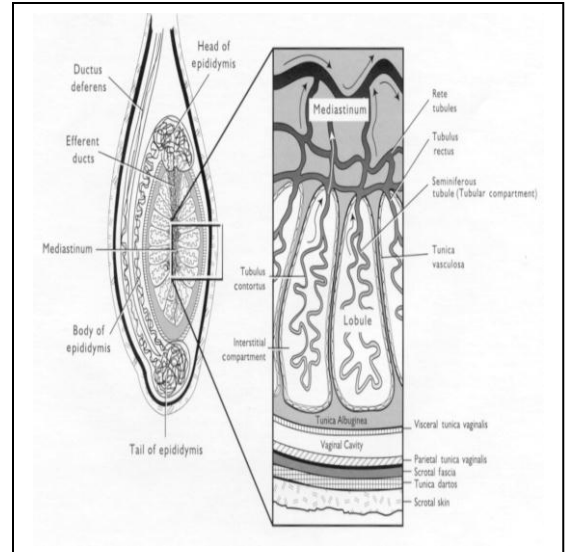
1. Skin
2. Tunica dartos (dartos muscle)
 - Smooth muscle

- Elevate the testes for a sustained period of time in response to temperature or stress

3. Scrotal fascia
4. Parietal and visceral tunica vaginalis (**Figure 3-2, 3-14, 3-15**)
5. Tunica Albuginea (**Figure 3-14, 3-15**)
 - Closely related with secretory tissues of testicle

D. Descent of Testes into Scrotum

1. Inguinal canal
2. Gubernaculum
3. Inguinal hernia
4. Tunica vaginalis formed
5. Timing:
 - a. Sheep/cattle = midgestation
 - b. Swine = last 1/3 of gestation
 - c. Humans/horses = just before or after birth



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II. Spermatic Cord

(Figure 3-4, Bull)

A. Function =

1. Suspends the testis in the scrotum
2. Provides pathway to and from the body for the testicular vasculature, lymphatics, and nerves
3. Thermoregulation Mechanism (**Figures 3-9, 3-10**)
 - Provides a heat exchanger mechanism (**pampiniform plexus**; counter current heat exchanger, and pulse pressure eliminator)
4. Houses the **cremaster muscle (see Figure 3-2)**
 - Primary muscle supporting the testis
 - Coursing the length of spermatic cords
 - Involves with testicular temperature regulation

III. THE TESTES

A. Functions

1. Produce male germ cells (spermatozoa)
2. Produce male hormone (testosterone)
3. Produce inhibin and estrogen, and other proteins

B. Structure (Figures 3-14)

1. Tunica vaginalis
 - a. Thin membrane
 - b. Provides support
 - c. From peritoneum
2. Tunica albuginea
 - a. Connective tissue
 - b. Provides structure
3. Mediastinum
 - a. Connective tissue
 - b. Provides internal support

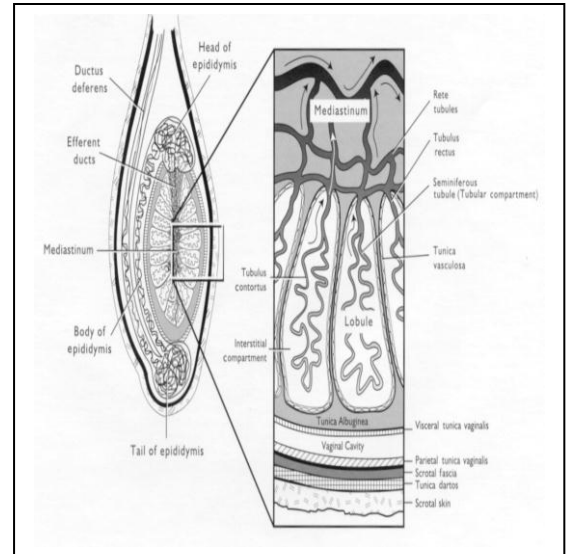
4. **Seminiferous tubules (Figure 3-15)**

part of the testicular parenchyma (see chapter 10)

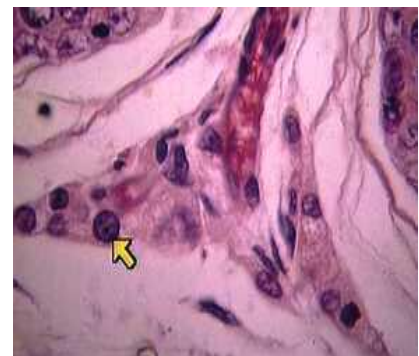
- a. Site of sperm production
- b. Consists of 2 cell types **(Figure 3-16):**
 - **Germ cells** (eventual sperm cells)
 - **Sertoli or nurse** cells which produces variety of substances including **androgen binding hormone, sulfated glycoprotein, transferin, and inhibin**
 - Surround developing germ cells
 - Providing structural and metabolic support to the developing spermatogenic cells
- c.. Blood-testis Barriers **(Figure 3-16)**
 - Cells surrounding the seminiferous tubules
 - Prevent autoimmune reaction from destroying the developing germ cells

5. **Interstitial or Leydig cells**

- a. Located between seminiferous tubules
- b. Produce **androgens (testosterone)**
6. Rete testis
 - a. Collect sperm from seminiferous tubules
7. Vasa efferentia (efferent ductules)
 - a. Collect sperm from rete testis
 - b. Carry sperm out of testis proper



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IV. EPIDIDYMIS (Figure 3-18)

A. Morphology

1. Three parts:

- a. Head (caput)
- b. Body (corpus)
- c. Tail (cauda)

B. Functions

In the epididymis spermatozoa gains the ability of fertilization

1. Sperm transport:

- a. Transport time varies with species

- (1) boars: 9-14 days
- (2) rams: 12 days
- (3) bulls: 14 days

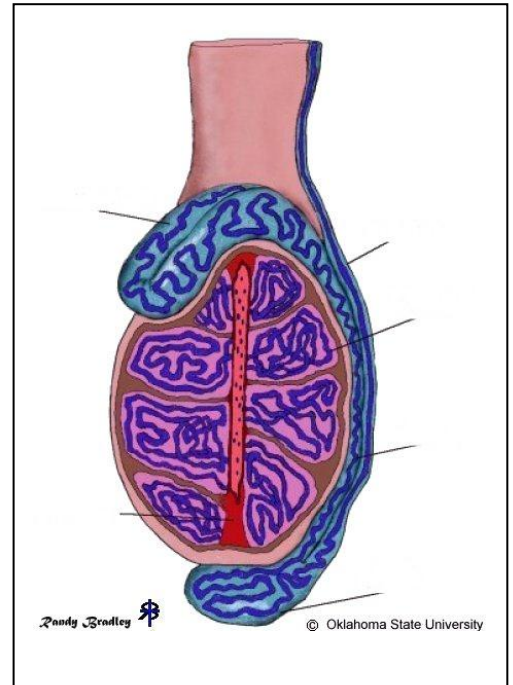
2. Sperm maturation

3. Sperm motility

4. Sperm concentration

5. **Storage** -- Bull = 50-75 billion sperm

6. **Production of compounds** -- Glycerol phosphocholine (GPC)



V. VAS DEFERENS (Ductus deferens or Deferent duct) (Figures 3-19 & 3-20)

A. Paired Ducts

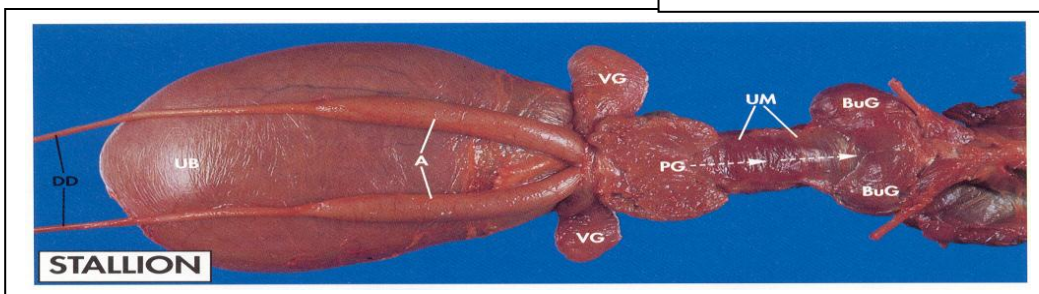
B. Ampulla (wide end of the vas deferens)

C. Function = sperm transport from epididymis to pelvic urethra

D. Ligation = vasectomy

VI. ACCESSORY SEX GLANDS

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Accessory glands contain variety of components and ions including citric acid, inositol, and prostaglandin

A. Vesicular glands (seminal Vesicles) (Figure 3-15)

1. Paired glands

2. Located at junction of urethra & vas deferens
3. Have rough structure
4. Contribute large amount of fluid
5. Add the following
 - a. Fructose & sorbitol -- energy sources
 - b. Phosphate & bicarbonate -- buffers

B. Prostate Gland (Figure 3-15)

1. Located caudal to seminal vesicles and close proximity to pelvic urethra
 - a. Bilobed in bull & boar
 - b. Diffuse in ram
 - c. Surrounds urethra in dogs & humans
2. Only accessory gland in dog
3. Function = cleanse & lubricate
4. Secretes just prior to & during ejaculation

C. Bulbourethral Glands (Cowper's gland) (Figure 3-19 & 20)

1. Paired glands
2. usually buried under bulbospongiosus muscle
3. Small & round in bull, ram, stallion, and man
4. Larger & longer in boar
5. Function:
 - a. Bull, etc.
 - cleanse urethra prior to ejaculation
 - b. Boar
 - produces gel fraction
 - adds considerable volume

D. Colliculus Seminalis

1. Region of urethra where sperm mixes with S.V. secretions
2. Mixing incomplete in stallion, boar
 - a. Sperm-free fraction & Sperm-rich fraction

VII. PENIS

(Figures 3-3 to 3-21 & 3-22)

A. Definition: male copulatory organ consists of a base, a shaft, the glans penis, and crus penis

B. Anatomy

1. Three cavernous bodies:
 - a. **Corpus spongiosum** -- surrounds urethra and involves in erection by allowing rushing of blood into it
 - b. **Corpus cavernosum** – involves in erection by allowing rushing of blood into it

c. Tunica albuginea penis -- boar, ram, buck, bull

d. **Sigmoid flexure** -- boar, ram, buck, bull

- allows the penis to be retracted inside the body until erection occurs

2. Retractor penis muscle (a pair of smooth muscle)

- dorsally attached to tail vertebrae and it holds the penis inside the sheath

- bull, boar, stallion, ram, buck

3. Glans -- distal end of the penis, contains sensory nerves

4. Sheath -- covers penis

C. Two Types

1. Fibroelastic

a. Bull, boar, buck, ram

2. Vasomuscular

a. Stallion, humans

D. Species Differences

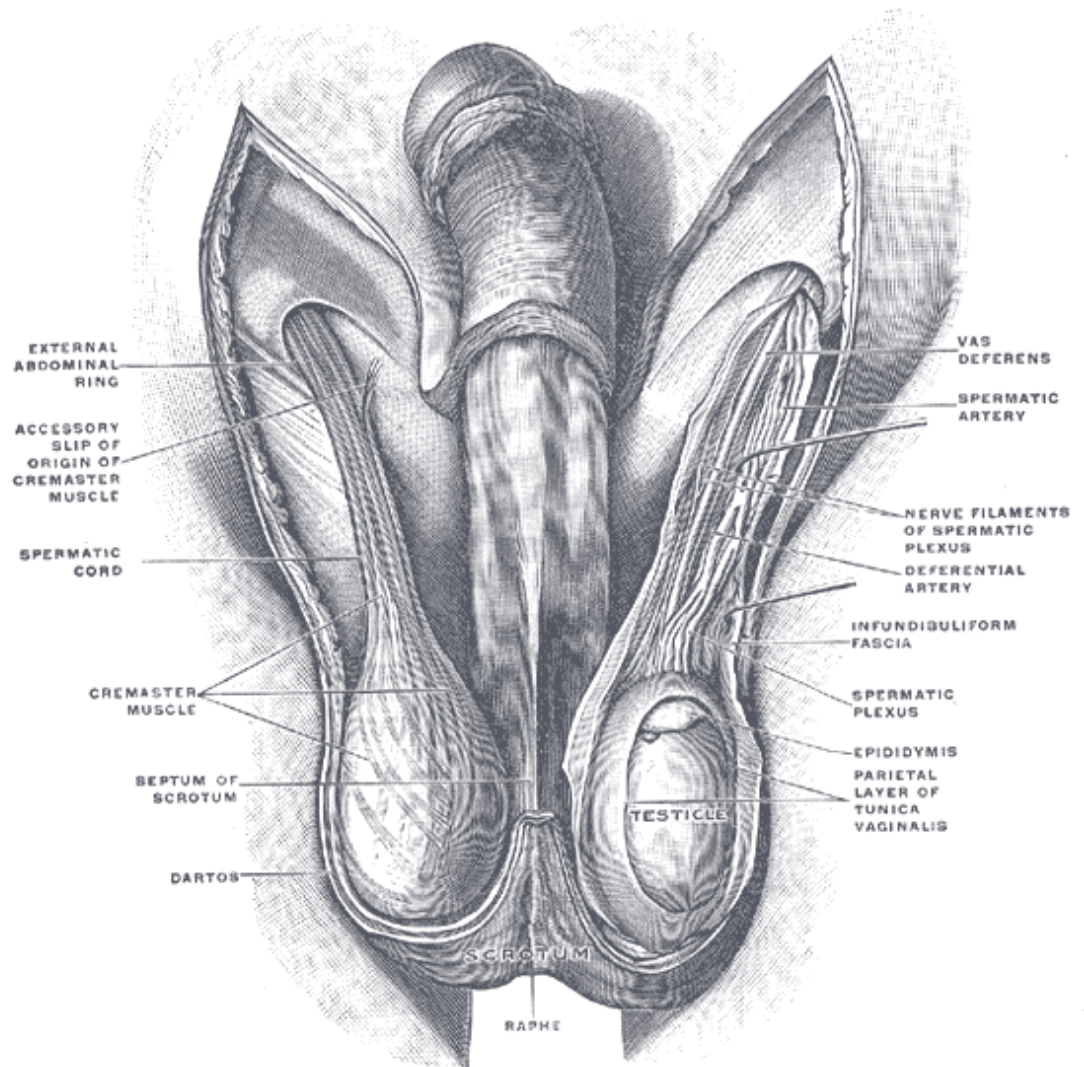
1. Bull: end spirals at ejaculation

2. Ram & Buck: filiform appendage

3. Stallion: urethral process

4. Boar: spiral configuration

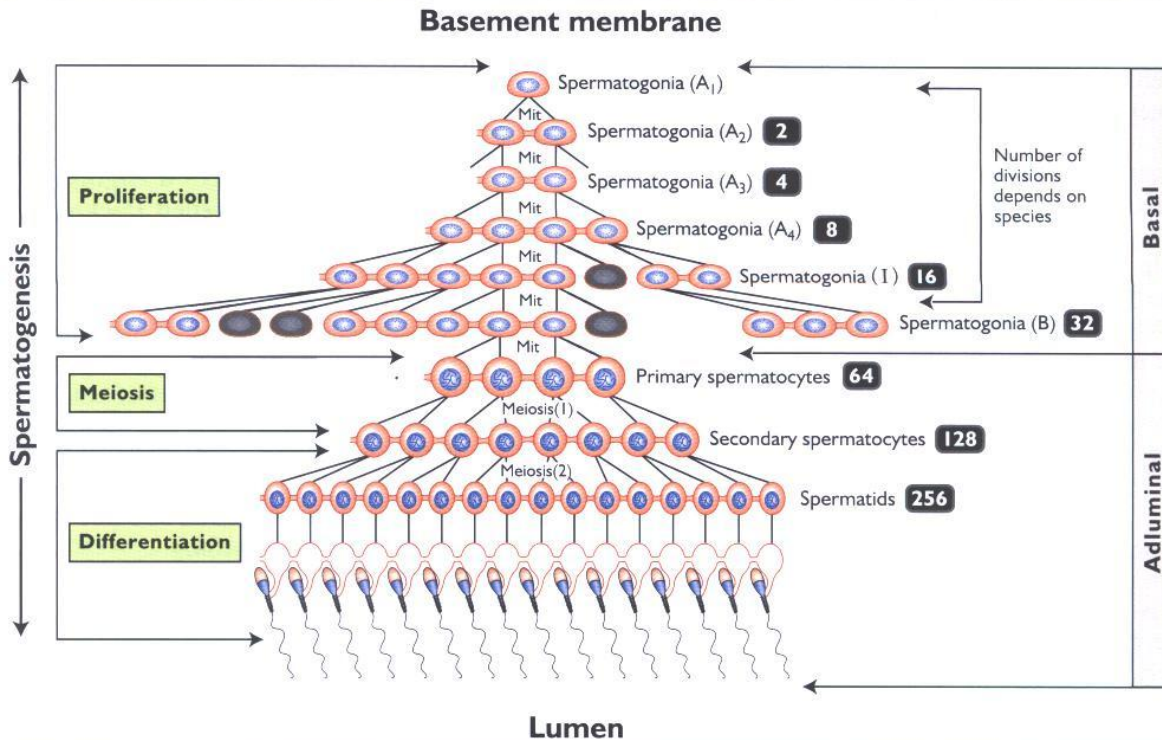
5. Dog : bulbus glandis



Source: <http://www.bartleby.com/107/Images/large/image1144.gif>

Figure 10-5. Typical Sequence of Spermatogenesis in Mammals

Spermatogonia (A_1 - A_4 , I and B) undergo a series of mitotic divisions (Mit) and the last mitotic division gives rise to primary spermatocytes that enter meiosis. This series of mitotic divisions allows for continual proliferation of spermatogonia and replacement of A_1 spermatogonia.



After meiosis, haploid spherical spermatids differentiate into spermatozoa. Meiosis and differentiation take place in the adluminal compartment. Notice that each generation of cells is attached by intercellular cytoplasmic bridges. Thus, each generation divides synchronously in cohorts. Some cells (black) degenerate during the process. Numbers indicate the theoretical number of cells generated by each division.

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