

## Male Genital System

### Components

- \* 2 testes
  - \* Formation of spermatozoa
  - \* Synthesis & release of testosterone
- \* Genital ducts
  - \* Collection, storage & transport of spermatozoa
- \* Accessory glands
  - \* Seminal vesicles
  - \* Prostate gland
  - \* Bulbourethral (Cowper's) glands
  - \* Formation of semen fluid
- \* Penis
  - \* Delivery of spermatozoa

### Scrotum

- \* Highly specialized skin pouch devoid of fat
- \* Maintains testes at 34–35°C
- \* Temperature must be 2–3°C below body temperature
- \* Essential for spermatogenesis
- \* Contains:
  - \* Numerous sweat glands
  - \* Dartos muscle (smooth muscle)

### Testis

#### Stroma

- \* Tunica vaginalis
- \* Tunica albuginea
- \* Tunica vasculosa

#### Tunica Albuginea

- \* Collagenous connective tissue capsule
- \* Sends septa dividing testis into about 250 testicular lobules

#### Each lobule contains

- \* 1–4 seminiferous tubules
- \* Interstitial cells of Leydig

Parenchyma

Seminiferous Tubules

- \* Exocrine part
- \* Produce spermatozoa

Interstitial Cells of Leydig

- \* Endocrine part
- \* Produce testosterone

Seminiferous Tubules

- \* Site of sperm production
- \* Each testis contains 250–1000 seminiferous tubules
- \* Under control of FSH
- \* Highly convoluted with narrow lumen
- \* Lined by stratified spermatogenic epithelium
- \* Basement membrane surrounded by contractile myoid cells

Spermatogenic Epithelium

Contains 2 cell types

1. Spermatogenic cells
2. Sertoli cells

- \* Spermatogenic cells arranged in 4–8 layers

Spermatogenesis

Occurs at puberty:

Spermatogonia → spermatozoa

3 Phases

1) Spermatocytogenesis

- \* Spermatogonia divide by mitosis

Spermatogonia Type A

- \* Remain as stem cells

Spermatogonia Type B

- \* Differentiate into primary spermatocytes

## Primary Spermatocytes

- \* Largest cells of spermatogenic epithelium
- \* Contain:
  - \* 46 chromosomes
  - \* Diploid = 4c DNA
- \* Enter first meiotic division

## 2) Meiosis

## Secondary Spermatocytes

- \* Haploid
- \* 2c DNA
- \* Short-lived
- \* Enter second meiotic division rapidly

## Spermatids

- \* 1c DNA
- \* 23 chromosomes

## 3) Spermiogenesis

Transformation of:  
Spermatids → spermatozoa

## Spermatids

- \* Very small cells
- \* Rounded dark nucleus
- \* Located near lumen
- \* Related closely to Sertoli cells
- \* No further cell division occurs

## Stages of Spermiogenesis

### 1) Golgi Phase

- \* rER forms hydrolytic enzymes
- \* Golgi forms pro-acrosomal granules
- \* Granules fuse → single acrosomal vesicle
- \* Two centrioles migrate opposite nucleus
- \* Formation of developing flagellum

### 2) Acrosomal Phase

- \* Nucleus becomes elongated & condensed
- \* Acrosomal vesicle forms acrosomal cap
- \* One centriole forms flagellum
- \* Mitochondria accumulate around flagellum
- \* Formation of middle piece

### 3) Maturation Phase

- \* Acrosome covers anterior 2/3 of nucleus
- \* Contains hydrolytic enzymes
- \* Excess cytoplasm removed as residual bodies
- \* Sperm released tail first into lumen
- \* Sperm remain immotile until leaving epididymis
- \* Capacitation occurs in female reproductive tract

## Spermatozoa (Sperm)

### Parts

1. Head
2. Middle piece
3. Tail

Tail

- \* Flagellum + supporting fibers

Middle Piece

- \* Flagellum + mitochondrial sheath
- \* Responsible for motility

Head

- \* Flat & elongated
- \* Contains:
  - \* Nucleus
  - \* Acrosome
- \* Acrosome contains hydrolytic enzymes
- \* Helps penetration of oocyte

## Sertoli Cells

### Light Microscopy Features

- \* Tall pyramidal cells
- \* Extend between spermatogenic cells
- \* Base attached to basement membrane
- \* Apex extends into lumen
- \* Elongated nucleus
- \* Prominent nucleolus
- \* Ill-defined borders
- \* Pale acidophilic cytoplasm

## Blood-Testis Barrier

- \* Formed by tight junctions between Sertoli cells
- \* Divides seminiferous tubule into:
  - \* Basal compartment
  - \* Adluminal compartment

## Importance

- \* Sperms appear after puberty
- \* Recognized as foreign by immune system
- \* Barrier prevents autoimmune reaction

## Basal Compartment

### Contains:

- \* Spermatogonia

## Adluminal Compartment

### Contains:

- \* Primary spermatocytes
- \* Secondary spermatocytes
- \* Spermatids
- \* Spermatozoa

## Functions of Sertoli Cells

- \* Support developing sperms
- \* Nourishment
- \* Protection
- \* Phagocytosis
- \* Formation of blood-testis barrier
- \* Secretion of fluid for sperm transport
- \* Secretion of androgen-binding protein (ABP)
- \* Secretion of inhibin

## Hormonal Control

### FSH

- \* Acts on Sertoli cells
- \* Stimulates ABP secretion

### LH

- \* Stimulates Leydig cells
- \* Testosterone secretion

## Interstitial Cells of Leydig

- \* Located between seminiferous tubules
- \* Endocrine part of testis
- \* Surrounded by fenestrated capillaries
- \* Secrete testosterone under LH control

### LM Features

- \* Rounded cells
- \* Acidophilic cytoplasm
- \* Rich in lipid droplets
- \* Central round nuclei

### EM Features

#### Steroid-secreting characteristics:

- \* Abundant SER
- \* Many mitochondria
- \* Lipid droplets

## Male Genital Ducts

### Intratesticular

- \* Tubuli recti
- \* Rete testis

### Extratesticular

- \* Vasa efferentia
- \* Epididymis
- \* Vas deferens
- \* Ejaculatory duct
- \* Male urethra

### Tubuli Recti

- \* Straight ends of seminiferous tubules
- \* Lined only by Sertoli cells

### Rete Testis

- \* Anastomosing network
- \* Lined by cuboidal epithelium

### Vasa Efferentia

- \* 10–20 tubules
- \* Lined by partially ciliated simple cuboidal epithelium
- \* Connect to epididymis
- \* Peristaltic contraction moves sperms
- \* Non-ciliated cells absorb most testicular fluid

### Epididymis

- \* Single coiled tubule
- \* Length: 4–6 meters
- \* Divided into:
  - \* Head
  - \* Body
  - \* Tail

## Epithelium

- \* Pseudostratified columnar with stereocilia

## Functions

- \* Storage of sperm
- \* Gain sperm motility
- \* Glycoprotein secretion
- \* Control capacitation
- \* Absorption of testicular fluid
- \* Phagocytosis
- \* Propulsion by smooth muscle contraction

## Vas Deferens

- \* Single muscular tube
- \* Starts at tail of epididymis
- \* Ends as ampulla

## Ampulla + duct of seminal vesicle

→ Ejaculatory duct

## Histology

- \* Narrow lumen
- \* Thick smooth muscle wall
- \* Pseudostratified columnar epithelium with stereocilia

## Ejaculatory Duct

- \* About 1 cm long
- \* Formed by:
  - \* Ampulla of vas deferens
  - \* Duct of seminal vesicle
- \* Opens into prostatic urethra
- \* Lined by pseudostratified columnar epithelium

## Spermatic Cord Contents

1. Vas deferens
2. Pampiniform plexus
3. Testicular artery
4. Nerves
5. Lymphatics
6. Cremaster muscle

## Accessory Glands

1. Seminal vesicles
2. Prostate
3. Bulbourethral glands

(All regulated by testosterone)

## Seminal Vesicles

### Mucosa

- \* Highly folded
- \* Pseudostratified columnar epithelium

### Function

Produce 70% of seminal fluid

Seminal fluid is:

- \* Alkaline
- \* Yellow
- \* Viscid
- \* Rich in fructose

## Prostate

- \* Exocrine gland around neck of bladder
- \* Contains 30–50 branched tubular glands

## Prostatic Zones

### Transitional Zone (5%)

- \* Site of benign prostatic hyperplasia

### Central Zone (25%)

### Peripheral Zone (70%)

- \* Main zone
- \* Site of prostatic carcinoma

## Prostatic Acini

- \* Highly folded pseudostratified columnar epithelium
- \* Secrete prostatic fluid:
  - \* Thin
  - \* Milky
  - \* Gives semen odor
  - \* Contains fibrinolysin

## Fibrinolysin

- \* Liquefies coagulated semen

## Corpora Amylacea

- \* Rounded calcified glycoproteins
- \* Found in lumen of prostatic acini
- \* Increase with age

## Bulbourethral (Cowper's) Glands

- \* Two glands
- \* Open into proximal penile urethra
- \* Acini lined by simple cuboidal epithelium
- \* Mucus secretion acts as lubricant

## Penis

- \* Contains 3 masses of erectile tissue:
  - \* 2 corpora cavernosa
  - \* 1 corpus spongiosum
- \* Penile urethra runs through corpus spongiosum
- \* Distal expansion forms glans penis

## Erectile Tissue

### Corpora Cavernosa

- \* Surrounded by thick tunica albuginea

### Corpus Spongiosum

- \* Thin tunica albuginea

## Erectile Tissue

- \* Vascular spaces engorged with blood