Male Reproductive System

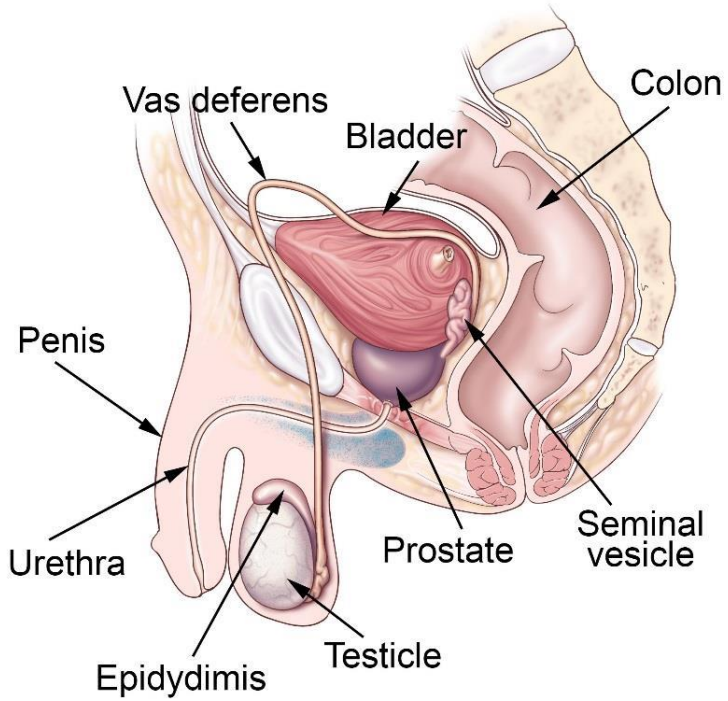
Khushal Khan

KMU-IPMS

Male Reproductive System

External Genital Organs

- Penis
- Scrotum



Internal Genital Organs

- Testes
- Epididymis
- Vas Deference

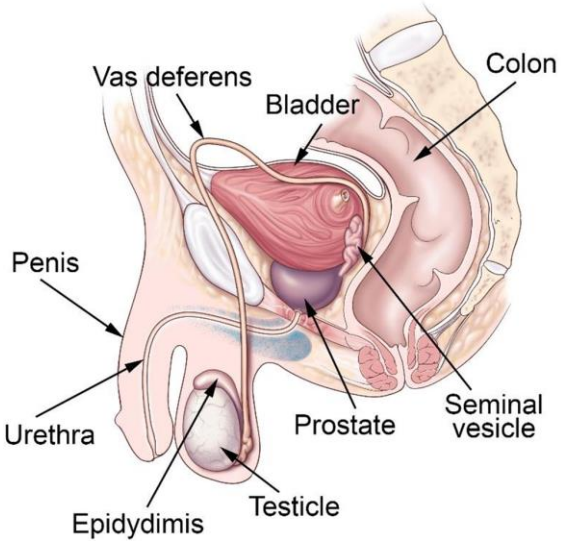
Accessory glands

- Seminal vesicles
- Prostate gland
- Bulbourethral gland

External Genital Organs

1. **Penis**
   - Organ for introducing sperm into the female body during sexual intercourse.
   - Composed of spongy tissue, becomes erect and turgid when filled with blood.

2. **Scrotum**
   - Pouch-like structure located below the symphysis pubis, b/w the upper thighs, and behind the penis.
   - Holds and protects the testicles.
   - Divided into two compartments, each containing:
     - **1 Testis**
     - **1 Epididymis**
     - **Testicular end of a spermatic cord**
   - Contains numerous nerves, blood vessels, and smooth muscles.
   - Scrotum remains connected with the pelvic cavity through the inguinal canal.



Internal Genital Organs

1. **Testis:**
   - Male reproductive glands, equivalent to ovaries in females.
   - Approximately **4.5 cm long, 2.5 cm wide, and 3 cm thick.**
   - Suspended in the scrotum by the **spermatic cords.**

Layers of Tissue Surrounding Testes:

i. **Tunica Vaginalis:** Double membrane serving as the outer covering.
ii. **Tunica Albuginea:** Fibrous covering located beneath the tunica vaginalis.
iii. **Tunica Vasculosa:** Consists of a network of capillaries.

Descent into Scrotum:

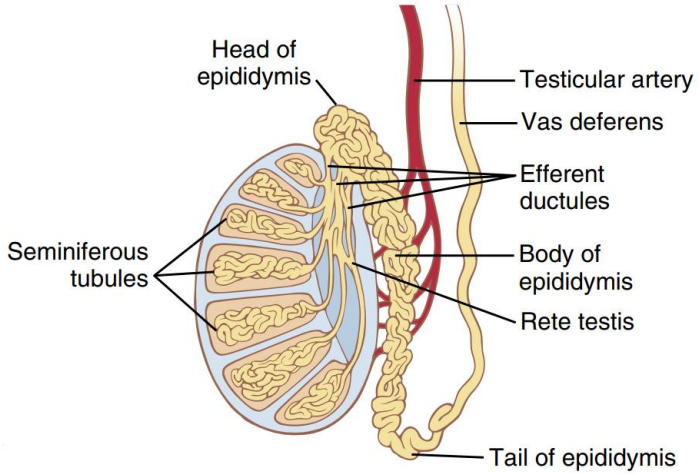
- Descent of the testes into the scrotum is typically completed by the 8th month of fetal life.

Lobules:

- Each testis comprises about **200-300 lobules.**
- Each lobule contains **1-4 convoluted loops of germinal epithelial cells,** known as **seminiferous tubules.**

Seminiferous Tubules:

- Each testis consists of **up to 900 coiled seminiferous tubules.**
- These tubules average more than **one-half meter long.**
- Seminiferous tubules serve as the **site for sperm formation.**



Interstitial Cells of Leydig:

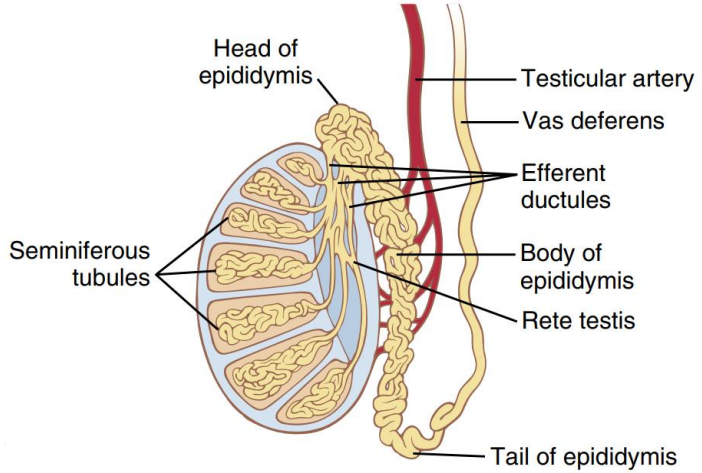
- **Found between** the seminiferous tubules.
- They produce **testosterone after puberty,** contributing to **male sexual characteristics and reproductive functions.**

Epididymis

- Formed by the **combination of seminiferous tubules** at the upper pole of the testis.
- Approximately **6 meters** in its full length.
- Exits the scrotum as the **deferent duct (vas deferens)** within the spermatic cord.
- Blood and lymph vessels pass to the testes within the **spermatic cords.**

Function of Epididymis:

- **Stores, matures, and transports sperm** to the vas deferens (ductus deferens), facilitating their journey for ejaculatio

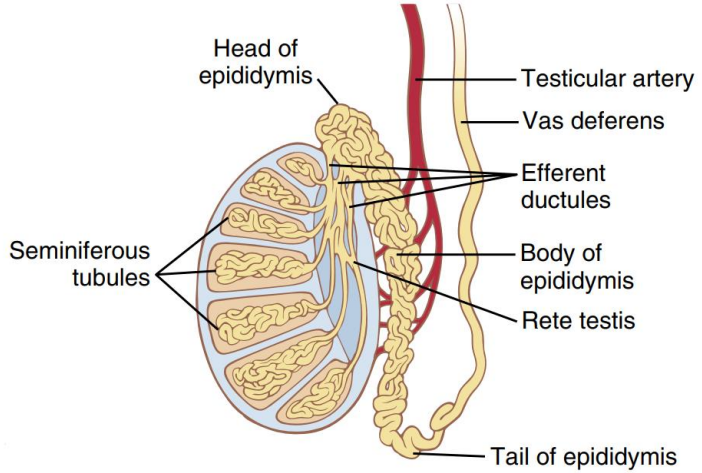


Vas Deference (Ductus Deferens)

- Approximately **45 cm long.**
- It ascends upwards from the testis, passing through the **inguinal canal.**
- Ascends medially towards the **posterior wall of the bladder.**

Formation of Ejaculatory Duct:

- Near the posterior wall of the bladder, it joins with the duct from the **seminal vesicle.**
- Together, they form the **ejaculatory duct,** which serves as a conduit for seminal fluid during ejaculation.



Seminal Vesicles

- Two small **fibromuscular pouches** lined with **columnar epithelium.**
- Located on the **posterior aspect of the bladder.**
- Each seminal vesicle opens into a **short duct at its lower end.**
- This duct joins with the corresponding **deferent duct to form an ejaculatory duct.**

Function:

- Seminal vesicles **contract during ejaculation,** expelling their stored contents – **seminal fluid.**
- Seminal fluid constitutes approx. **60% of the bulk of the fluid ejaculated at male orgasm.**
- Seminal fluid contains nutrients to **support sperm during their journey through the female reproductive tract.**
- It provides an **environment conducive to sperm survival and motility,** aiding in fertilization.

Prostate Gland

- Located in the **pelvic cavity,** in front of the rectum and behind the symphysis pubis.
- Surrounds the **first part** of the urethra.
- Consists of:
  - **Outer fibrous covering**
  - **Layer of smooth muscle**
  - **Glandular substance composed of columnar epithelial cells**

Function:

- Secretes a **thin, milky fluid** that constitutes **about 30% of semen,** giving it its milky appearance.
- Contains a **clotting enzyme** that thickens semen in the vagina, **increasing the likelihood of semen being retained close to the cervix.**

Functions of Male Reproductive System

1. Formation of sperm — spermatogenesis
2. Performance of the male sexual act
3. Regulation of male reproductive functions by the various hormones

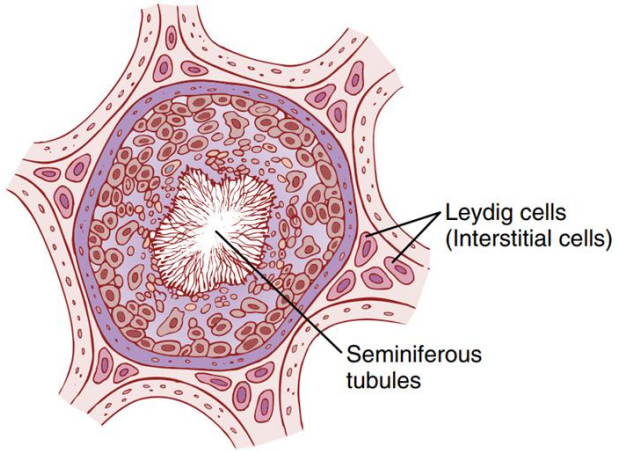
Spermatogenesis

Primordial Germ Cells (PGCs):

- Primary stem cell type that develops into gametes, either spermatozoa or oocytes.
- During embryogenesis, they migrate to the testes and become Spermatogonia, the immature germ cells.

Spermatogonia:

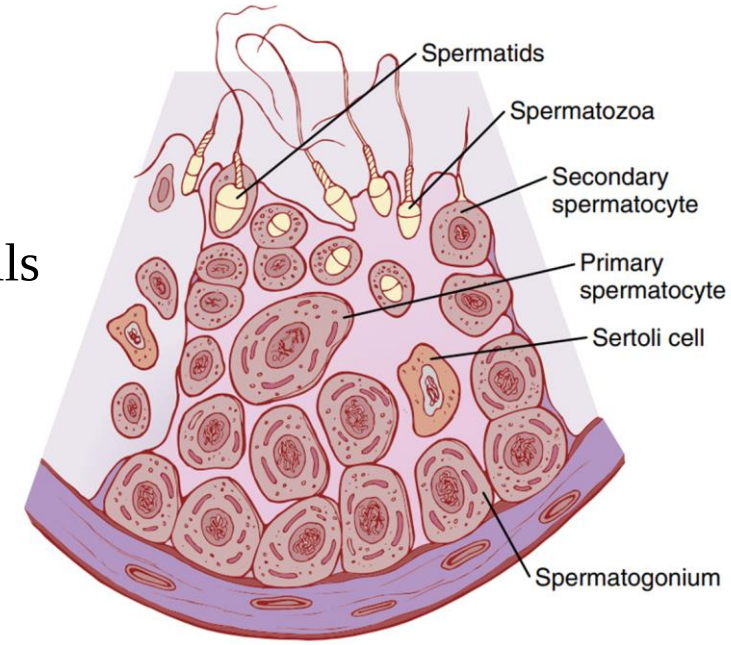
- Located on the inner surfaces of the seminiferous tubules.
- At puberty, undergo continuous mitotic divisions, proliferation, and differentiation.
- Develop into sperm through several stages of maturation.



Steps of Spermatogenesis

- **Spermatogenesis** – occurs in seminiferous tubules
- Stimulus – At puberty, by stimulation of gonadotropic hormones **(FSH, LH)** from anterior pituitary
- **Beginning** – at the **age of 13 years,** continuous throughout life
- **Duration** – spermatogenesis takes **about 74 days**

1. **Spermatogonia**
   - Migrate towards the lumen of seminiferous tubules among Sertoli cells

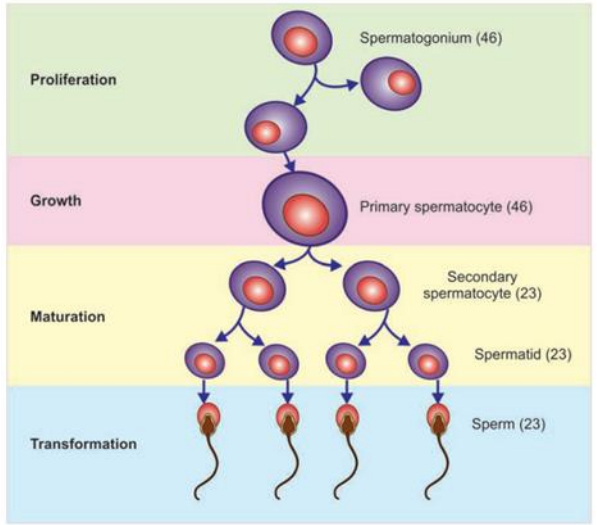


2. **Primary Spermatocytes**
   - Spermatogonia – modified and enlarged to become primary spermatocyte
   - The primary spermatocyte contains 46 number of chromosomes

3. **Secondary Spermatocytes**
   - Primary spermatocytes undergo meiosis to form 2 secondary spermatocytes
   - Then number of chromosomes is reduced – spermatocyte (46), spermatids (23)

4. **Spermatids**
   - A few days later, these secondary spermatocytes also divide to form spermatids
   - Each secondary spermatocytes divides into 2 spermatids
   - The spermatids contains 23 number of chromosomes

5. **Spermatozoa**
   - Spermatids are eventually modified to become spermatozoa (sperm)



Hormonal Influence on Spermatogenesis

Testosterone (Secreted by Leydig Cells):

- Essential for the growth and division of testicular germinal cells, first stage in forming sperm.

Luteinizing Hormone (LH - Secreted by Anterior Pituitary Gland):

- Stimulates Leydig cells to secrete testosterone, supporting sperm production.

Follicle-Stimulating Hormone (FSH - Secreted by Anterior Pituitary Gland):

- Stimulates Sertoli cells, crucial for spermiogenesis, the final stage of sperm maturation.

Hormonal Influence on Spermatogenesis

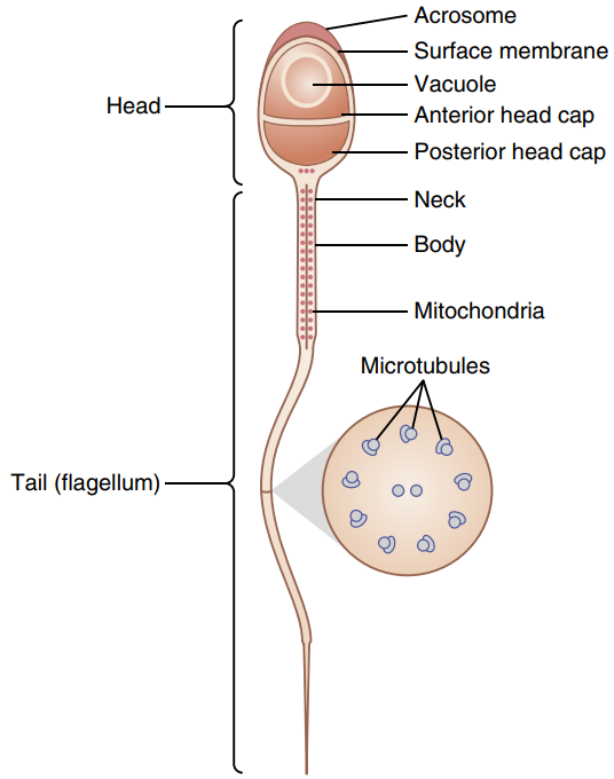
Estrogen (Formed from Testosterone by Sertoli Cells):

- Essential for spermiogenesis, the process of sperm maturation.

Growth Hormone (GH):

- Promotes early division of Spermatogonia, initiating the spermatogenesis process.
- Absence of GH leads to severely deficient or absent spermatogenesis, resulting in infertility.

Sperm (Spermatozoa)



- **Head:**
  - Consists of a nucleus.
  - **Acrosome:**
    - Thick cap
    - Covering anterior **2-3rd of the head**
    - Formed from the Golgi apparatus
    - Contains enzymes like ***hyaluronidase and proteolytic enzymes,*** aiding in fertilization.

- **Tail (Flagellum):**
  - **Axoneme:**
    - Central skeleton made of 11 microtubules.
    - Thin cell membrane covering the axoneme.
  - **Body of the tail:**
    - Collection of mitochondria surrounding the axoneme in the proximal portion of the tail.
    - Flagellar movement provides motility for the sperm.
- **Velocity of Movement:** 1 to 4 mm/min

Thank You