

## **Embryology section**

### **I- Gametogenesis**

Gametogenesis is the process that leads to the formation of gametes (**spermatozoa** and **egg**), which are **haploid** cells (n chromosomes). It takes place in the gonads (testes and ovaries). The transition from diploid to haploid cells occurs during a specific type of cell division called **meiosis**.

Male and female individuals of a species that reproduce sexually exhibit different forms of gametogenesis: **spermatogenesis** (male); **oogenesis** (female).

#### **I-1- Stages of Gametogenesis**

Gametogenesis occurs in three phases.

##### **I-1-1- Multiplication Phase**

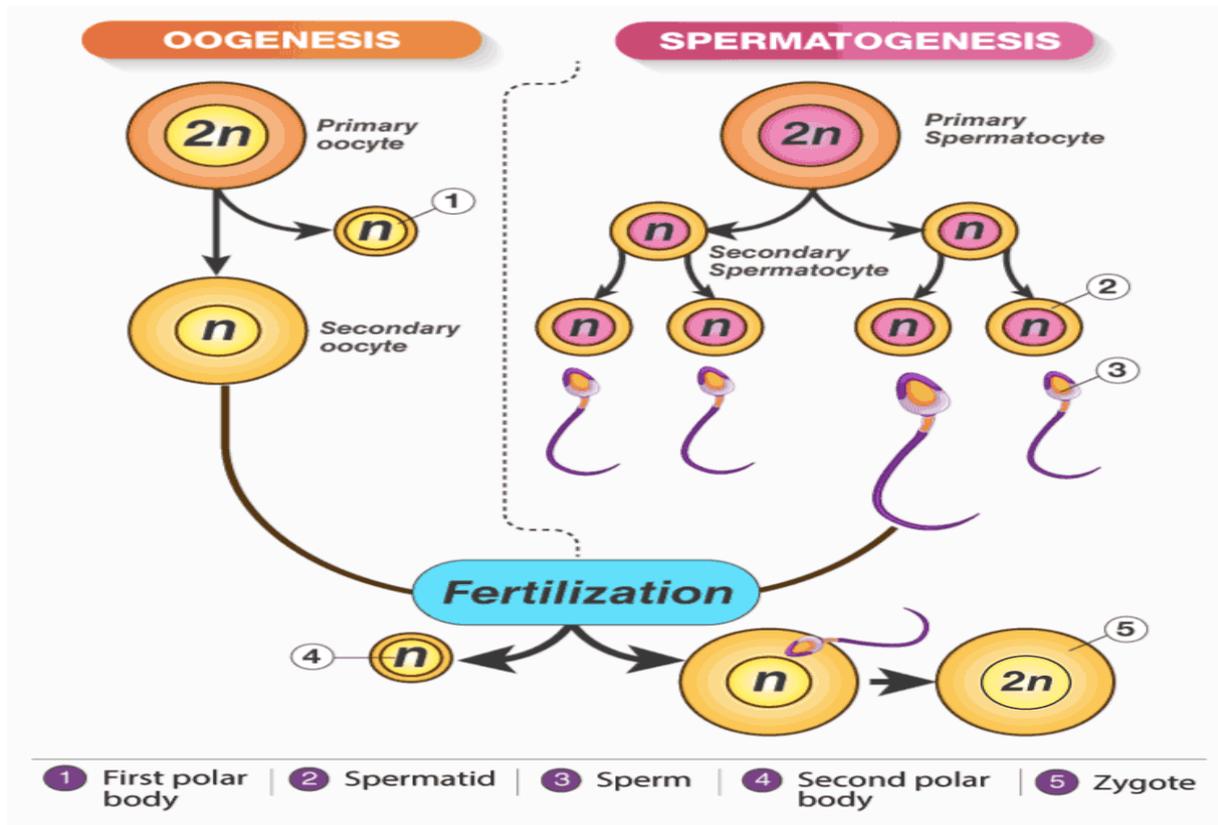
During this phase, diploid germ cells, spermatogonia and oogonia, divide by mitosis and increase in number.

##### **I-1-2- Growth Phase**

In this phase, the oogonia cease dividing by mitosis and are renamed primary spermatocytes and primary oocytes; their volume increases due to cytoplasmic growth. Primary oocytes enter prophase of the first meiotic division and replicate their DNA.

##### **I-1-3- Maturation Phase**

Marked by meiosis. Primary auxocytes become haploid, secondary auxocytes: secondary spermatocytes and secondary oocytes, then, after the second meiotic division, spermatids and ootids. During this phase, cyto-differentiation also occurs, leading to anisogamy and resulting in the formation of functional gametes: male (sperm) and female (egg).



**Figure:** Gametogenesis

## I-2- Spermatogenesis

This is the set of processes of division and differentiation leading to the formation of the spermatozoon (mature cell). It is triggered at puberty by pituitary hormones under the influence of the hypothalamus.

Spermatozoa are produced in the millions per day. This process takes place in the male reproductive glands; the testes, more precisely in the **seminiferous tubules**.

### I-2-1- Male Reproductive Organs

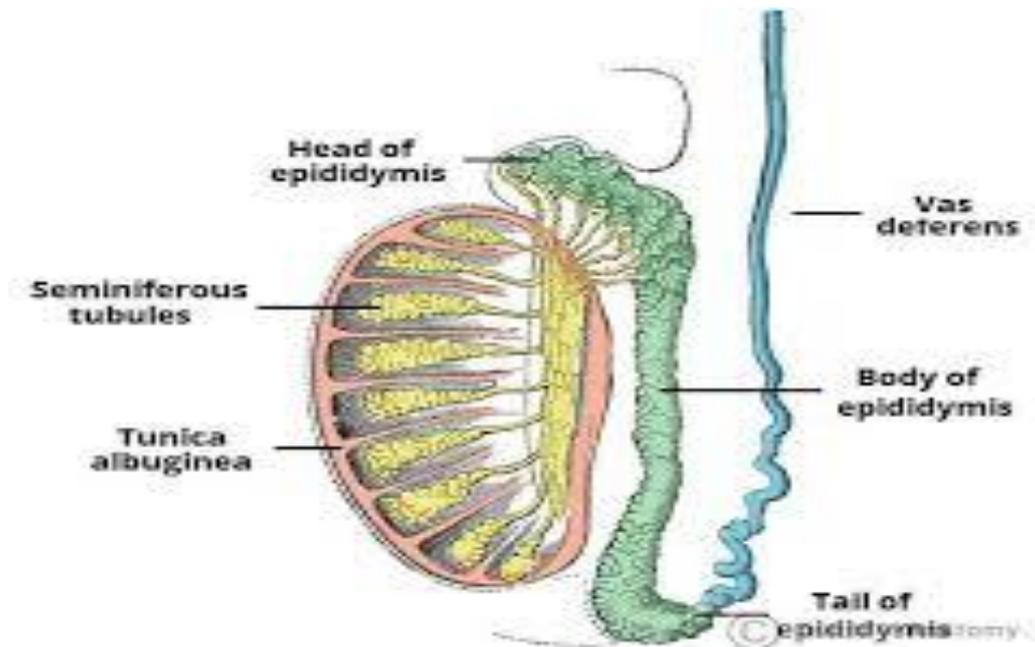
The male reproductive system consists of two gonads, external and internal genital tracts, and accessory glands.

#### a- The Gonads

These consist of two testes, oval in shape, capped by the epididymis and located in the scrotum, which produce:

- \* **Gametes:** spermatozoa.
- \* **Male hormones:** androgens, including testosterone.

The testes contain lobes; each lobe contains seminiferous tubules, which are the site of sperm formation.



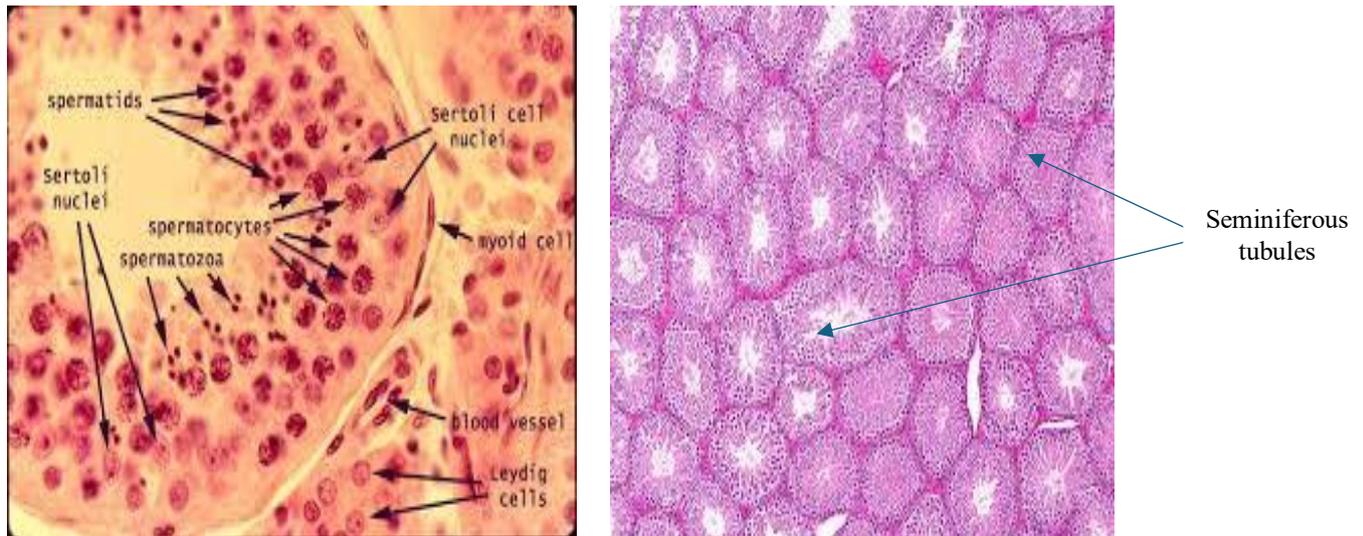
**Figure :** Testis

Each seminiferous tubule, delimited by loose connective tissue, contains several layers of peripheral cells and a central lumen. It is composed of three types of cells:

**1- Germline cells:** These are located in the basal compartment, against the basal lamina, between the Sertoli cells, with which they are connected by various junctional systems. From the periphery to the center of the tubule, they represent the successive stages of spermatogenesis: **spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, and spermatozoa.**

**2- Sertoli cells:** These cells have a close relationship with germ cells and play a role in the maturation (nutrition) and support (migration) of germ cells.

**3- Endocrine glandular tissue (Leydig cells):** Male sex hormones, or androgens (testosterone), are secreted by Leydig cells. These cells are grouped in richly vascularized clusters located between the seminiferous tubules.



**Figure:** Seminiferous tubule

### **b- The Genital Tract**

- **The epididymal duct:** covers the testicle and, from its upper pole, has three parts of decreasing thickness: the head, the body, and the tail. It allows for the maturation and storage of sperm.
- **The vas deferens** follows the epididymal ducts. It passes behind the bladder to join the prostate and seminal vesicles.
- **The urethra:** the common canal for the elimination of semen and urine.

### **c- Accessory Glands**

- **Seminal Glands:** Two glands open into the terminal portion of the vas deferens, one on each side. Their role is to supply fructose for the nourishment of ejaculated sperm.
- **Prostate:** Completely surrounds the urethra. It secretes a clear, alkaline fluid that neutralizes the acidic secretion of the vagina and triggers coagulation, which allows semen to remain in the female reproductive tract after ejaculation.
- **Bulbourethral Glands (Cowper's Glands):** These glands open into the urethra, one on each side. They release mucus before the semen, which helps to cleanse the urethra of urine acidity before the passage of semen.

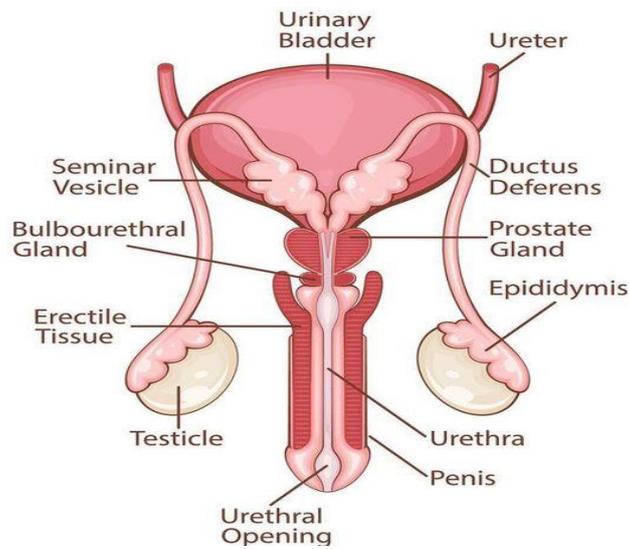


Figure: Male reproductive systeme

I-2-2- The Stages of Spermatogenesis

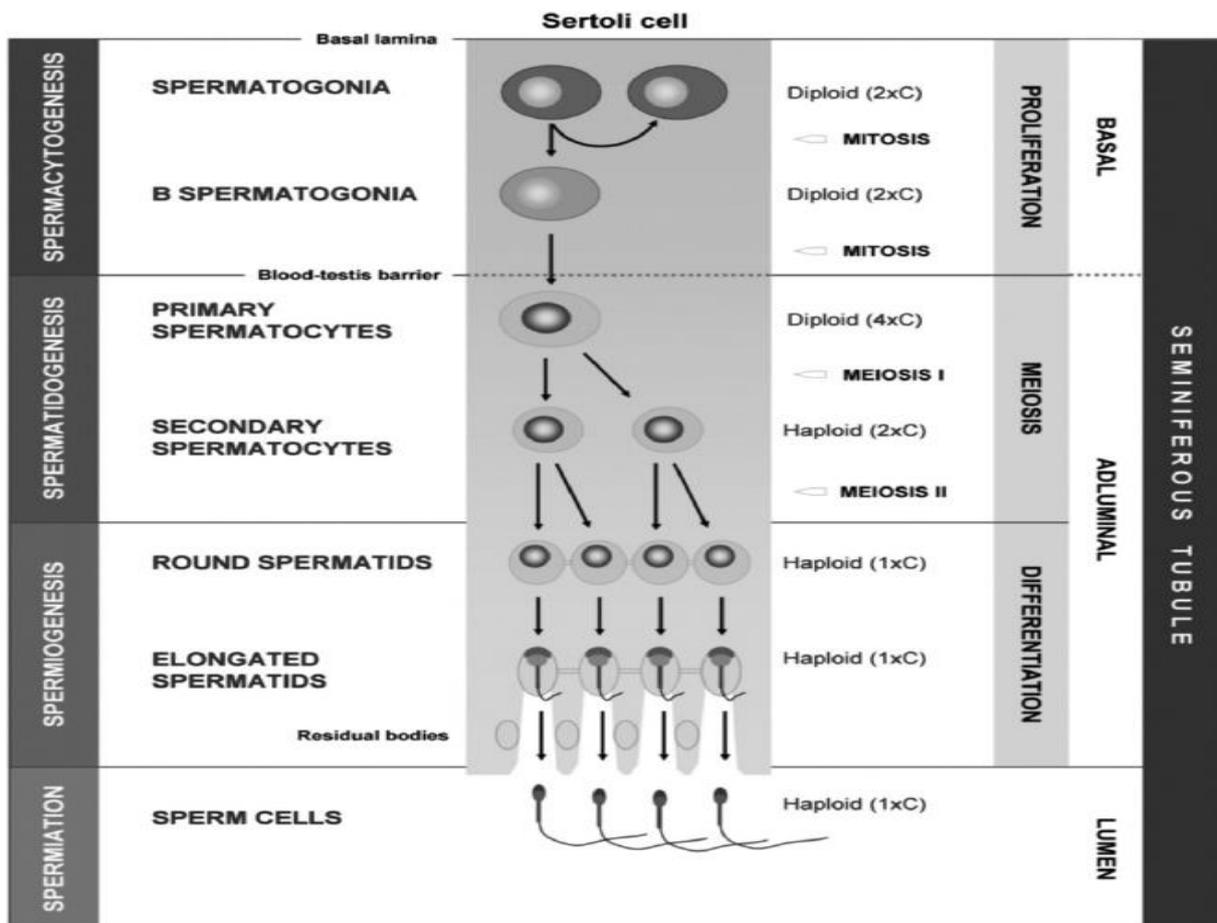


Figure: The stage of spermatogenesis