



## GE-2T: Developmental Biology/Embryology

### Gametogenesis:

#### ❖ Spermatogenesis

Spermatogenesis is the process by which haploid spermatozoa develop from germ cells in the seminiferous tubules of the testis. This process starts with the mitotic division of the stem cells located close to the basement membrane of the tubules. These cells are called spermatogonial stem cells.

#### ❖ Process of spermatogenesis

In the process of spermatogenesis, spermatogonial stem cells develop into mature sperms. It occurs in the male gonads testis. Testes are made up of many seminiferous tubules lined by germinal epithelium. Cells of this layer divide to form spermatozoa in the following four steps:

- (1) Multiplication Phase,
- (2) Growth Phase,
- (3) Maturation Phase, and
- (3) Spermiogenesis.

**1) Multiplication Phase:** At maturity, the primordial germ cells divide by mitosis to produce a large number of spermatogonia. Type A spermatogonia is the stem cells which divide to form spermatogonia. Type B spermatogonia are the precursors of sperms. Spermatogonia have spherical or oval nuclei, and rest on the basement membrane.

**2) Growth Phase:** Type B spermatogonium actively grows to a primary spermatocyte. It obtains nourishment from the nursing cells. Cells in prophase of the first meiotic division are primary spermatocytes. They are characterized by highly condensed chromosomes giving the nucleus a coarse

chromatin pattern and an intermediate position in the seminiferous epithelium. This is a long stage, so many primary spermatocytes can be seen.

- 3) Maturation Phase:** Each primary spermatocyte undergoes two maturation divisions. The first maturation division is reductional and forms two haploid daughter cells called secondary spermatocytes. Both secondary spermatocytes then undergo second maturation division to form four haploid spermatids. Spermatids are spherical cells with interphase nuclei, positioned high in the epithelium. All of these progeny cells remain attached to each other by cytoplasmic bridges. The bridges remain until sperm are fully differentiated.
- 4) Spermiogenesis:** This is the metamorphosis of spherical spermatids into elongated spermatozoa. The spermatozoa are then known as sperms. No further mitosis or meiosis occurs. During spermiogenesis, the acrosome forms, the flagellar apparatus forms, and most excess cytoplasm (the residual body) is separated and left in the Sertoli cell. Spermatozoa are released into the lumen of the seminiferous tubule. A small amount of excess cytoplasm (the cytoplasmic droplet) is shed later in the epididymis.

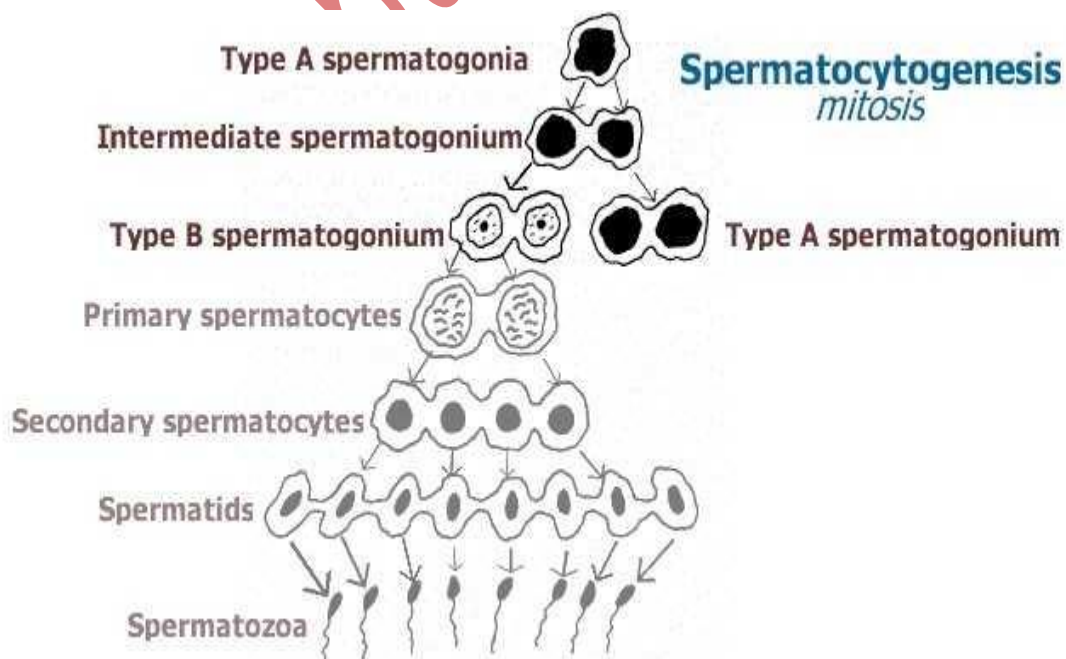


Figure: Process of spermatogenesis