

NAME: Shutti Aishat Olansile

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- SPERMATOGENESIS

Spermatogenesis is the process of the gradual transformation of germ cells into spermatozoa. It occurs mainly within the seminiferous tubules of the testes and can be divided into three phases, each of which is associated with different germ cell types:

- Proliferative phase: spermatogonia → spermatocytes
- Meiotic phase: spermatocytes → spermatids
- Differentiation phase (also known as spermiogenesis): spermatids → spermatozoa

The seminiferous tubules are the site of spermatogenesis. The two main cell types within the tubules involved in spermatogenesis are the germ cells, which will develop into sperm, and somatic cells known as Sertoli cells, which nurture the germ cells throughout the development process. As the germ cells progress through their stages of development they move slowly from the basement membrane of the tubules through the tight junctions between the Sertoli cells into the tubular lumen.

STAGES OF SPERMATOGENESIS

Proliferation phase

Stem or A spermatogonia located in the basal region of the tubular epithelium undergo mitosis. The progeny of these divisions maintain their own numbers as well as giving rise to several interconnected B spermatogonia (the number of these arising from a single A spermatogonia is species dependent). B spermatogonia divide to give rise to primary (1^o) spermatocytes. All descendants

of a B spermatogonium remain connected by cytoplasmic bridges, forming a syncytium - like cell clone which undergoes synchronous development.

Meiotic phase

Each 1° spermatocyte divides to give rise to two short-lived secondary (2°) spermatocytes, which in turn give rise to two spermatids each. The spermatids contain a haploid number of chromosomes (half the number of a somatic cell). 1° spermatocytes are the largest cells in the spermatogenic series and are located approximately midway within the seminiferous epithelium.

The process of meiosis occurs over a long period, with prophase of the first meiotic division taking up to three weeks ^[1]

Differentiation phase

This phase is also known as spermiogenesis.

Spermatids undergo transformation into spermatozoa. Many changes occur within the cells, the three major ones being:

- i) formation of the acrosome, which covers the cranial part of the head. The acrosome will contain hydrolytic enzymes to allow fusion of sperm and egg for fertilisation.
- ii) condensation of nuclear chromatin in the head to form a dark-staining structure
- iii) growth of the tail opposite the acrosome, and loss of excess cytoplasmic material which is shed as a residual body. The body is phagocytosed by the Sertoli cells.

- SEMEN

Semen, also known as seminal fluid, is an organic fluid that contains spermatozoa. It is secreted by the gonads (sexual glands) and other sexual organs of male or hermaphroditic animals and can fertilize the female ovum. In humans, seminal fluid contains several

components besides spermatozoa: proteolytic and other enzymes as well as fructose are elements of seminal fluid which promote the survival of spermatozoa, and provide a medium through which they can move or "swim". Semen is produced and originates from the seminal vesicle, which is located in the pelvis. The process that results in the discharge of semen is called *ejaculation*. During the process of ejaculation, sperm passes through the ejaculatory ducts and mixes with fluids from the seminal vesicles, the prostate, and the bulbourethral glands to form the semen.