**NAME: ORJI OROMA OVUNDA**

**MATRIC NO.,: 18/MHS02/167**

**DEPARTMENT: NURSING**

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**SPERMATOGENESIS**

Spermatogenesis is the origin and development of the sperm cells within the male reproductive organs, the testes. Spermatogenesis is also the production of sperm from the primordial germ cells. Once the vertebrate primordial germ cells arrive at the genital ridge of a male embryo, they become incorporated into the sex cords. They remain there until maturity, at which time the sex cords hollow out to form he seminiferous tubules, and the epithelium of the tubules differentiates into the Sertoli cells. The initiation of spermatogenesis during puberty is probably regulated by the synthesis of BMP8B by the spermatogenic germ cells, the spermatogonia. When BMP8B reaches a critical concentration, the germ cells begin to differentiate. The differentiating cells produce high levels BMP8B, which can then further stimulate their differentiation.

The spermatogenic germs cells are bound to the Sertoli cells by N-cadherin molecules on both cell surfaces and by galactosyltransferase molecules on the spermatogenic cells that bind a carbohydrate receptor on the Sertoli cells. The Sertoli cells nourish and protect the developing sperm cells, and spermatogenesis- the developmental pathway from germ cell to mature sperm occurs in the recesses of the Sertoli cells. The processes by which the primordial germ cells generate sperm have been studied in detail in several organisms, but will focus here on spermatogenesis in mammals.

After reaching gonad, the primordial germ cells divide to form type A1 spermatogonia. These cells are smaller than the primordial germs cells and are characterized by an ovoid nucleus that contains chromatin associated with the nuclear membrane. The A1 spermatogonia are found adjacent to the outer basement membrane of the sex cords. They are stem cells, and at maturity, they are thought to divide so as to make another type A1 spermatogonium as well as a second, paler type of cell, the type A2 spermatogonium. Thus, each type A1 spermatogonium is a stem cell capable of regenerating itself as well as producing a new cell type. The A2 spermatogonia divide to produce A3 spermatogonia, which then beget the type A4 spermatogonia. It is possible that each of the type A spermatogonia are the stem cells, capable of self-renewal. The A4 spermatogonium has three options; it can form another A4 spermatogonia, which (self-renewal); it can undergo cell death (apoptosis); or it can differentiate into the first committed stem cell type, the intermediate spermatogonium. Intermediate spermatogonia are committed to becoming spermatozoa, and they divide mitotically once to form the type B spermatogonia. These cells are the precursors of the spermatocytes and are the last cells of the line that undergo mitosis. They divide once to generate the primary spermatocytes-the cells that enter meiosis. It is not known what causes the spermatogonia to take path toward differentiation rather than self-renewal; nor is known what stimulates the cells to enter meiotic rather than mitotic divisions.

 In the spermatogonial divisions, cytokinesis is not complete. Rather, the cells form a syncytium whereby each cell communicates with the others via cytoplasmic bridges about 1um in diameter. The successive division produce cones of interconnected cells, and because ions and molecules readily pass through these intercellular bridges, each cohort matures synchronously. During this time, the spermatocyte nucleus often transcribes genes whose products will be used later to form the axoneme and acrosome. Each primary spermatocyte undergoes the first meiotic divisions to yield a pair of secondary spermatocytes, which complete the second divisions of meiosis. The haploid cells thus formed are called spermatids, and they are still connected to another through their cytoplasmic bridges. The spermatids that are connected in this manner have haploid nuclei, but are functionally diploid, since a gene product made in one cell can readily diffuse into the cytoplasm of its neighbours. During the divisions from type a1 spermatogonium to spermatid, the cells move farther and farther away from the basement membrane of the seminiferous tubule and closer to its lumen. Thus, each type of cell can be found in a particular layer of the tubule. The spermatids are located at the border of the lumen, and here they lose their cytoplasmic connections and different into sperms cells. in humans, the progression from spermatogonial stem cell to mature sperm takes 65 days.

**TESTOSTERONE**

Testosterone is the hormone responsible for the development of male sexual characteristics. Hormones are chemical messengers that trigger necessary changes in the body. Females also produce testosterones, usually in smaller amounts. It is a type of androgen produced primarily by the testicles in cells called the Leydig cells.

In men, testosterone is thought to regulate a number of functions. These includes: sex drive, bone mass, fat distribution, muscle size and strength and red blood cell production. Without adequate amounts of testosterone, men become infertile. This is because testosterone assists the developmental of mature sperm. Despite being a male sex hormone, testosterone also contributes to sex drive, bone density, and muscle strength in women. However, an excess of testosterone can also cause women to experience male pattern baldness and infertility. The brain and pituitary gland control testosterone levels. Once produced, the hormones moves through the blood to carry out its various important functions.

 High or low levels of testosterone can lead to dysfunction in the parts of the body normally regulated by the hormone. When a man has low testosterone or hypogonadism, he may experience: reduced sex drive, erectile dysfunction, low sperm count, and enlarged or swollen breast tissue. Over time, these symptoms may develop in the following ways: loss of body hair, loss of muscle bulk, loss of strength and increased body fat. Low testosterone may lead to osteoporosis, mood swings, reduced energy, nd testicular shrinkage. The causes include:

. testicular injury, such as castration

. infection of the testicles

. medications, such as opiate analgesics

. disorders that affect the hormones, such as pituitary tumors or high prolactin levels

. chronic diseases, including type 2 diabetes, kidney and liver disease, obesity, and HIV/AIDS

**Problems associated with abnormally high testosterone levels in men include:**

. acne

. liver disease

. Insomnia

**.** headache

**.** increased muscles mas**s**

**.** increased risk of bloodclots

**.** stunted growth in adolescents

**.** High blood pressure and cholesterol

**.** mood swings, euphoria, irritability, impaired judgement, delusions

**.** fluid retention with swelling of the legs and feet

**TESTOSTERONE ROLE**

**.** The development of the penis and testes

**.** The deepening of the voice during puberty

**.** Muscle size and strength

**.** Bone growth and strength

**.** Sperm production

**.** Sex drive (libido)