NAME; WHYTE SOIBI

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**QUESTION;**

Write short notes on the following:

1. Spermatogenesis
2. Testosterone
3. Semen
4. Male orgasm
5. Male infertility

***SPERMATOGENESIS;***

This 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. The mitotic division of these produces two types of cells. Type A cells replenish the stem cells, and type B cells differentiate into primary spermatocytes. The primary spermatocyte divides meiotically (Meiosis I) into two secondary spermatocytes; each secondary spermatocyte divides into two equal haploid spermatids by Meiosis II. The spermatids are transformed into spermatozoa (sperm) by the process of spermiogenesis. These develop into mature spermatozoa, also known as sperm cells. Thus, the primary spermatocyte gives rise to two cells, the secondary spermatocytes, and the two secondary spermatocytes by their subdivision produce four spermatozoa and four haploid cells. Spermatogenesis starts in the bottom part of seminiferous tubes and, progressively, cells go deeper into tubes and moving along it until mature spermatozoa reaches the lumen, where mature spermatozoa are deposited. The division happens asynchronically, if the tube is cut transversally one could observe different maturation states. A group of cells with different maturation states that are being generated at the same time is called a spermatogenic wave.

Spermatogenesis its purpose is for the production of mature male gametes, commonly called sperm but more specifically known as spermatozoa, which are able to fertilize the counterpart female gamete, the oocyte, during conception to produce a single-celled individual known as a zygote. The location in which Spermatogenesis takes place is in several structures of the male reproductive system. The initial stages occur within the testes and progress to the epididymis where the developing gametes mature and are stored until ejaculation. The seminiferous tubules of the testes are the starting point for the process, where spermatogonial stem cells adjacent to the inner tubule wall divide in a centripetal direction, beginning at the walls and proceeding into the innermost part, or lumen—to produce immature sperm. Maturation occurs in the epididymis. The location [Testes/Scrotum] is specifically important as the process of spermatogenesis requires a lower temperature to produce viable sperm, specifically 1°-8 °C lower than normal body temperature of 37 °C (98.6 °F). For humans, the entire process of spermatogenesis is variously estimated as taking 74days and approximately 120 days.

 There are three phases involved in spermatogenesis which are;

 (1) Spermatocytogenesis (Mitosis)

 (2) Meiosis, and

 (3) Spermiogenesis.

1. Spermatocytogenesis (also called Mitosis): Stem cells divide mitotically to replace themselves and to produce cells that begin differentiation. Spermatogonia have spherical or oval nuclei, and rest on the basement membrane.

 2. Meiosis: 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. Primary spermatocytes go through the first meiotic division and become secondary spermatocytes. The cells quickly proceed through this stage and complete the second meiotic division. Because this stage is short there are few secondary spermatocytes to be seen in sections. Meiosis is the process by which the diploid number of chromosomes present in spermatogonia (the stem cells) is reduced to the haploid number present in mature spermatozoa.

The products of the second meiotic division are called spermatids. They are spherical cells with interphase nuclei, positioned high in the epithelium. Since spermatids go through a metamorphosis into spermatozoa, they occur in early through late stages.

3. Spermiogenesis: This is the metamorphosis of spherical spermatids into elongated spermatozoa. 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.

***TESTOSTERONE;***

Testosterone is a hormone produced by the human body. It is mainly produced in men by the testicles. Women’s ovaries also make testosterone, though in much smaller amounts. The production of testosterone starts to increase significantly during puberty and begins to dip after age 40 or so. A man’s testosterone levels can also affect his mood. Testosterone is the major sex hormone in males and plays a number of important roles, such as:

* The development of the penis and testes
* The deepening of the voice during puberty
* The appearance of facial and pubic hair starting at puberty; later in life, it may play a role in balding
* Muscle size and strength
* Bone growth and strength
* Sex drive (libido)
* Sperm production

Without adequate amounts of testosterone, men become infertile. This is because testosterone assists in the development of mature sperm cells. The brain and pituitary gland controls testosterone level. Once produced, the hormone moves through the blood to carry out its various important functions.

High or low level of testosterone can lead to dysfunction in the parts of the body normally regulated by the hormones. When a man has a low testosterone he may experience;

* Reduced sex drive
* Erectile dysfunction
* Low sperm count
* Enlarged or swollen breast tissue

Chronic or ongoing low testosterone may lead to osteoporosis, mood swings, reduced energy and testicular shrinkage. Too much testosterone on the other hand, can lead to the triggering of puberty at a young age. This condition would mainly affect younger men and it is rarer. In women however high testosterone levels can lead to male pattern baldness, a deep voice and menstrual irregularities as well as

* Growth and swelling of the clitoris
* Change in body shape
* Reduction in breast size
* Oily skin
* Acne

***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.

**Composition of semen;** 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. The seminal vesicles produce a yellowish viscous fluid rich in fructose and other substances that makes up about 70% of human semen. The prostatic secretion, influenced by dihydrotestosterone, is a whitish (sometimes clear), thin fluid containing proteolytic enzymes, citric acid, acid phosphatase and lipids. The bulbourethral glands secrete a clear secretion into the lumen of the urethra to lubricate it.

Sertoli cells, which nurture and support developing spermatocytes, secrete a fluid into seminiferous tubules that helps transport sperm to the genital ducts. The ductuli efferentes possess cuboidal cells with microvilli and lysosomal granules that modify the ductal fluid by reabsorbing some fluid. Once the semen enters the ductus epididymis the principal cells, which contain pinocytotic vessels indicating fluid reabsorption, secrete glycerophosphocholine which most likely inhibits premature capacitation. The accessory genital ducts, the seminal vesicle, prostate glands, and the bulbourethral glands, produce most of the seminal fluid. Seminal plasma of humans contains a complex range of organic and inorganic constituents.

The seminal plasma provides a nutritive and protective medium for the spermatozoa during their journey through the female reproductive tract. The normal environment of the vagina is a hostile one for sperm cells, as it is very acidic (from the native microflora producing lactic acid), viscous, and patrolled by immune cells. Basic amines such as putrescine, spermine, spermidine and cadaverine are responsible for the smell and flavor of semen.

***MALE ORGASM;***

Orgasm is a series of muscle contractions in the genital region that is accompanied by sudden release of endorphins. Orgasm normally accompanies male ejaculation as a result of sexual stimulation, and it also occurs in females as a result of sexual stimulation. The fuel for the process leading to orgasm is testosterone, a hormone produced in steady supply by the testicles. The testicles also make millions of sperm each day, which mature and then are mixed with whitish, protein-rich fluids. These fluids nourish and support the sperm so they can live after ejaculation for a limited time. This mixture of fluid and sperm is known as semen, is what is moved through the urethra and out the penis during orgasm.

**There are 4 Phases of the Male Orgasm**

The route to ejaculation in men is actually delineated by four distinct phases, of which orgasm is the third. While the duration and intensity of these phases can vary, the experience will proceed in a strictly specific way. Arousal

AROUSAL; Is the stage in which physical, sensory, and emotional cues prompt the brain to release a neurotransmitter known as acetylcholine. This, in turn triggers the release of nitric oxide into the arteries of the penis, causing them to expand and rapidly fill with blood. The resulting erection is generally accompanied by changes in respiration, increased overall muscle tension, and the retraction of the scrotal sac.

PLATEAU; Plateau is the phase immediately preceding orgasm in which the voluntary thrusts of the body, specifically the pelvis, suddenly become involuntary, increasing both in intensity and speed. It is at this stage that the heart rate increases to between 150 and 175 beats per minute, accompanied by a marked rise in blood pressure and body temperature. All told, the plateau phase lasts between 30 seconds and two minutes.

ORGASM ; The orgasm phase is divided into two parts. The first, known as emission, is the stage where ejaculation is inevitable. This is immediately followed by the second stage, ejaculation, in which strong contractions of the penile muscle, anus, and perineal muscles help propel the semen from the body. During orgasm, the reward center of the brain is flooded with neurochemicals, inciting the intense emotional response associated with an orgasm.

RESOLUTION AND REFRACTION; Resolution is the phase following orgasm where the penis starts to lose its erection. This is often accompanied by feelings of extreme relaxation or even drowsiness. Refraction, also known as the refractory period, is the stage following climax when a man is unable to achieve another erection even with stimulation.

***MALE INFERTILITY;***

Male infertility is due to low sperm production, abnormal sperm function or blockages that prevent the delivery of sperm. Illnesses, injuries, chronic health problems, lifestyle choices and other factors can play a role in causing male infertility.

Making mature, healthy sperm that can travel depends on many things. Problems can stop cells from growing into sperm. Problems can keep the sperm from reaching the egg. Even the temperature of the scrotum may affect fertility. These are the main causes of male infertility;

SPERM DISORDERS; sperm problems can be from traits you’re born with. Lifestyle choices can lower sperm number. Smoking, drinking alcohol and taking certain medications can lower sperm numbers. Other causes of low sperm count include long-term sickness, childhood infections and chromosome or hormone problems.

VARICOCELES; varicoceles are swollen veins in the scrotum. They’re found in 16 out of 100 of all men. They are more common in infertile men, They harm sperm growth by blocking proper blood drainage. It may be that varicoceles cause blood to flow back into the scrotum from the belly. The testicles are then too warm for making sperm. This can cause low sperm count.

RETROGREADE EJACULATION; Retrograde ejaculation is when semen goes backwards in the body. They go into the bladder instead of out the penis. This happens when nerves and muscles in the bladder don’t close during orgasm(climax). Semen may have normal sperm, but the semen cannot reach the vagina. Retrograde ejaculation can be caused by surgery.

IAMMUNOLOGIC INFERTILITY; Sometimes a man’s body makes antibodies that attack his own sperm. Antibodies are most often made because of injury, surgery or infection. They keep sperm from moving and working normally. We don’t know yet exactly how antibodies lower fertility. It can make it hard for the sperm to swim in the fallopian tube and enter the egg.

Some strategies suggested or proposed for avoiding male infertility include the following:

1. Avoiding smoking as it damages sperm DNA
2. Avoiding heavy marijuana and alcohol use.
3. Avoiding excessive heat to the testes.
4. Maintaining optimal frequency of coital activity: sperm counts can be depressed by daily coital activity and sperm motility may be depressed by coital activity that takes place too infrequently (abstinence 10–14 days or more).
5. Wearing a protective cup and jockstrap to protect the testicles, in any sport such as baseball, football, cricket, lacrosse, hockey, softball, paintball, rodeo, motor cross, wrestling, soccer, karate or other martial arts or any sport where a ball, foot, arm, knee or bat can come into contact with the groin.