NAME: **SAMPSON SOPHIA**

MATRIC NO: **19/ENG08/009**

DEPARTMENT: **BIOMEDICAL ENGINEERING**

COURSE CODE: **PHS 212**

COURSE TITLE: **HUMAN PHYSIOLOGY**

QUESTION

Write short notes on the following:

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

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 spermatogonia 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 produces 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. This is the cornerstone of sexual reproduction and involves the two gametes both contributing half the normal set of chromosomes (haploid) to result in a chromosomally normal (diploid) zygote.

To preserve the number of chromosomes in the offspring – which differs between species – one of each gamete must have half the usual number of chromosomes present in other body cells. Otherwise, the offspring will have twice the normal number of chromosomes, and serious abnormalities may result. In humans, chromosomal abnormalities arising from incorrect spermatogenesis results in congenital defects and abnormal birth defects (Down syndrome, Klinefelter syndrome) and in most cases, spontaneous abortion of the developing foetus.

For humans, the entire process of spermatogenesis is variously estimated as taking 74 days.

TESTOSTERONE

Testosterone is the primary male sex hormone and anabolic steroid. In male humans, testosterone plays a key role in the development of male reproductive tissues such as testes and prostate, as well as promoting secondary sexual characteristics such as increased muscle and bone mass, and the growth of body hair. In addition, testosterone is involved in health and well-being, and the prevention of osteoporosis. Insufficient levels of testosterone in men may lead to abnormalities including frailty and bone loss.

Testosterone is the key male sex hormone that regulates fertility, muscle mass, fat distribution, and red blood cell production. 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 testosterone, 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 alongside sperm production. These include:

- sex drive
- muscle size and strength
- red blood cell production

Without adequate amounts of testosterone, men become infertile. This is because testosterone assists the development 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 hormone 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
- enlarged or swollen breast tissue

Causes can 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
- genetic diseases, such as Klinefelter syndrome, Prader-Willi syndrome, hemochromatosis, Kalman syndrome, and myotonic dystrophy

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. Semen is also a form of genetic material. In animals, semen has been collected for cryoconservation. Cryoconservation of animal genetic resources is a practice that calls for the collection of genetic material in efforts for conservation of a particular breed.

Human Semen

Composition

The components and contributions of semen are as follows:

Gland(s)	Approximate Quantity	Description
Testes	2–5%	Approximately 200 million – 500 million spermatozoa (also called sperm or spermatozoans), produced in the testes, are released per ejaculation. If a man has undergone a vasectomy, he will have no sperm in the ejaculation.
Seminal vesicles	65–75%	Amino acids, citrate, enzymes, flavins, fructose (2–5 mg per mL semen, the main energy source of sperm cells, which rely entirely on sugars from the seminal plasma for energy), phosphorylcholine, prostaglandins (involved in suppressing an immune response by the female against the foreign semen), proteins, vitamin C.
Prostate	25–30%	Acid phosphatase, citric acid, fibrinolysin, prostate specific antigen, proteolytic enzymes, zinc. (The zinc level is about 135±40/mL for healthy men. Zinc serves to help to stabilize the DNA-containing chromatin in the sperm cells. A zinc deficiency

		may result in lowered fertility because of increased sperm fragility. Zinc deficiency can also adversely affect spermatogenesis.)
Bulbourethral glands	< 1%	Galactose, mucus (serve to increase the mobility of sperm cells in the vagina and cervix by creating a less viscous channel for the sperm cells to swim through, and preventing their diffusion out of the semen. Contributes to the cohesive jelly-like texture of semen), pre-ejaculate, sialic acid.

Disease transmission

Semen can transmit many sexually transmitted diseases and pathogens, including viruses like HIV and Ebola. Swallowing semen carries no additional risk other than those inherent in fellatio. This includes transmission risk for sexually transmitted diseases such as human papillomavirus (HPV) or herpes, especially for people with bleeding gums, gingivitis or open sores. Viruses in semen survive for a long time once outside the body.

Benefits to females

Females may benefit from absorbing seminal fluid. Such benefits include male insects transferring nutrients to females via their ejaculate; in both humans and bovines, the fluid has antiviral and antibacterial properties; and useful bacteria such as Lactobacillus have been detected in fluid transferred from birds and mammals.

MALE ORGASM

The orgasm is widely regarded as the peak of sexual excitement. It is a powerful feeling of physical pleasure and sensation, which includes a discharge of accumulated erotic tension.

What is an orgasm?

Orgasms can be defined in different ways using different criteria. Medical professionals have used physiological changes to the body as a basis for a definition, whereas psychologists and mental health professionals have used emotional and cognitive changes. A single, overarching explanation of the orgasm does not currently exist.

Types

Unsurprisingly, given that experts are yet to come to a consensus regarding the definition of an orgasm, there are multiple different forms of categorization for orgasms.

Here is a selection of them:

- **Combination or blended orgasms:** a variety of different orgasmic experiences blended together.
- **Multiple orgasms:** a series of orgasms over a short period rather than a singular one.
- **Pressure orgasms:** orgasms that arise from the indirect stimulation of applied pressure. A form of self-stimulation that is more common in children.
- **Relaxation orgasms:** orgasm deriving from deep relaxation during sexual stimulation.
- **Tension orgasms:** a common form of orgasm, from direct stimulation often when the body and muscles are tense.

MALE INFERTILITY

Male infertility refers to a male's inability to cause pregnancy in a fertile female. In humans it accounts for 40–50% of infertility. It affects approximately 7% of all men. Male infertility is commonly due to deficiencies in the semen, and semen quality is used as a surrogate measure of male fecundity.

Causes

Factors relating to male infertility include:

Immune infertility

Antisperm antibodies (ASA) have been considered as infertility cause in around 10–30% of infertile couples. ASA production are directed against surface antigens on sperm, which can interfere with sperm motility and transport through the female reproductive tract, inhibiting capacitation and acrosome reaction, impaired fertilization, influence on the implantation process, and impaired growth and development of the embryo. Risk factors for the formation of antisperm antibodies in men include the breakdown of the blood-testis barrier, trauma and surgery, orchitis, varicocele, infections, prostatitis, testicular cancer, failure of immunosuppression and unprotected receptive anal or oral sex with men.

Klinefelter Syndrome

One of the most commonly known causes of infertility is Klinefelter Syndrome, affecting 1 out of 500–1000 newborn males Klinefelter Syndrome is a chromosomal defect that occurs during gamete formation due to a non-disjunction error during cell division. Resulting in males having smaller testes, reducing the amount of testosterone and sperm production

Y chromosome deletions

Y chromosomal infertility is a direct cause of male infertility due to its effects on sperm production, occurring in 1 out of every 2000 males. Usually affected men show no sign of symptoms other than at times can exhibit smaller teste size. Men with this condition can exhibit azoospermia (no sperm production), oligozoospermia (small number of sperm production), or they will produce abnormally shaped sperm (teratozoospermia). This case of infertility occurs during the development of gametes in the male, where a normal healthy male will produce both X and a Y chromosome, affected males have genetic deletions in the Y chromosome.

Prevention

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

- Avoiding smoking as it damages sperm DNA
- Avoiding heavy marijuana and alcohol use.
- Avoiding excessive heat to the testes.
- 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).