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COURSE TITLE: RENAL PHYSIOLOGY, BODY FLUID AND TEMPERATURE REGULATION AND AUTONOMIC NERVOUS SYSTEM

COURSE CODE: PHS 212

Question

Write short notes on the following:

- Spermatogenesis
- Testosterone
- Semen
- Male orgasm
- Male infertility

1. **SPERMATOGENESIS:** Spermatogenesis is the production or development of mature spermatozoa. It can also be referred to as 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 spermatogenesis. 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.
2. **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.
3. **SEMEN:** Semen is also known as seminal fluid. It 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. It contains spermatozoa and fructose and other enzymes that help the sperm to survive and facilitate successful fertilization. Semen also contains more than 50 different compounds including hormones, endorphins, neurotransmitters and immunosuppressants. Other substances present in the semen include the following:
 - fructose
 - ascorbic acid
 - zinc

- cholesterol
- protein
- calcium
- chlorine
- blood group antigens
- citric acid
- DNA
- magnesium
- vitamin B12
- phosphorus
- sodium
- potassium
- uric acid
- lactic acid
- nitrogen
- vitamin C

4. **MALE ORGASM:** Orgasm is the peak of sexual arousal when all the muscles that were tightened during sexual arousal relax. A male's orgasm is usually accompanied by the release of ejaculatory fluid. Orgasm includes the pelvic contractions and intense pleasure. The typical result of a male orgasm is ejaculation of sperm through muscle contractions. Men achieve orgasm through a series of steps involving a number of organs, hormones, blood vessels, and nerves working together. The typical result is ejaculation of fluid that may contain sperm through strong muscle contractions. The orgasm itself occurs in two phases, emission and ejaculation. In emission, the man reaches ejaculatory inevitability, the "point of no return." Semen is deposited near the top of the urethra, ready for ejaculation. Ejaculation occurs in a series of rapid-fire contractions of the penile muscles and around the base of the anus. Involuntary pelvic thrusting may also occur. The nerves causing the muscle contractions send messages of pleasure to the man's brain.
5. **MALE INFERTILITY:** Male infertility refers to a male's inability to cause pregnancy in a fertile female. It is commonly due to deficiencies in the semen, and semen quality is used as a surrogate measure of male fecundity. 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. The following are medical causes of male infertility:
- **Varicocele:** A varicocele is a swelling of the veins that drain the testicle. It's the most common reversible cause of male infertility.
 - **Infection:** Some infections can interfere with sperm production or sperm health or can cause scarring that blocks the passage of sperm.
 - **Ejaculation issues:** Retrograde ejaculation occurs when semen enters the bladder during orgasm instead of emerging out the tip of the penis. Various health conditions can cause retrograde ejaculation, including diabetes, spinal injuries, medications, and surgery of the bladder, prostate or urethra.
 - **Antibodies that attack sperm:** Anti-sperm antibodies are immune system cells that mistakenly identify sperm as harmful invaders and attempt to eliminate them.
 - **Tumors:** Cancers and nonmalignant tumors can affect the male reproductive organs directly, through the glands that release hormones related to reproduction, such as the pituitary gland, or through unknown causes. In some cases, surgery, radiation or chemotherapy to treat tumors can affect male fertility.

- **Undescended testicles:** In some males, during fetal development one or both testicles fail to descend from the abdomen into the sac that normally contains the testicles (scrotum). Decreased fertility is more likely in men who have had this condition.
- **Hormone imbalanced:** Infertility can result from disorders of the testicles themselves or an abnormality affecting other hormonal systems including the hypothalamus, pituitary, thyroid and adrenal glands. Low testosterone (male hypogonadism) and other hormonal problems have a number of possible underlying causes.
- **Chromosome defects:** Inherited disorders such as Klinefelter's syndrome — in which a male is born with two X chromosomes and one Y chromosome (instead of one X and one Y) — cause abnormal development of the male reproductive organs. Other genetic syndromes associated with infertility include cystic fibrosis, Kallmann's syndrome and Kartagener's syndrome.

Environmental causes that can reduce sperm production or sperm function include the following;

- **Industrial chemicals:** Extended exposure to benzenes, toluene, xylene, pesticides, herbicides, organic solvents, painting materials and lead may contribute to low sperm counts.
- **Heavy metal exposure:** Exposure to lead or other heavy metals also may cause infertility.
- **Radiation or X-rays:** Exposure to radiation can reduce sperm production, though it will often eventually return to normal. With high doses of radiation, sperm production can be permanently reduced.
- **Overheating the testicles:** Elevated temperatures impair sperm production and function. Although studies are limited and are inconclusive, frequent use of saunas or hot tubs may temporarily impair your sperm count. Sitting for long periods, wearing tight clothing or working on a laptop computer for long stretches of time also may increase the temperature in your scrotum and may slightly reduce sperm production. .