

NAME: HARDING-UDOH TITANIA B.

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COURSE: PHS212; HUMAN PHYSIOLOGY II

ASSIGNMENT TITLE: Male reproductive functions

QUESTION

Write short notes on the following:

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

SPERMATOGENESIS

Spermatogenesis is the process of spermatozoa (sperm) formation. The vast majority of the testosterone produced within the testes remains there, and/or within the male reproductive system. The testosterone acts on the Sertoli cells that compose the lining of the seminiferous tubules to stimulate the synthesis of several proteins. Spermatogenesis starts at puberty, when the Leydig cells in the testes start to produce androgens under the influence of the Follicle-Stimulating Hormone (FSH) and the Luteinizing Hormone (LH), which are in turn controlled by the Gonadotrophin-Releasing Hormone (GnRH) produced by the hypothalamus. In the absence of LH and FSH, androgen levels drop, and spermatogenesis stops.

Spermatogenesis begins with spermatogonia (the diploid) immature sperm cells derived from embryonic germ cells) dividing by mitosis. During their prolonged meiotic phase, the spermatocytes are sensitive to damage. Some of the spermatogonia develop into primary spermatocytes.

At puberty, there is an increase in testosterone levels; this initiates meiosis; During this stage, a primary spermatocyte generates two secondary spermatocytes, which then undergo meiosis II. Two haploid spermatids (haploid cells) are generated by each secondary spermatocyte, resulting in a total of four spermatids. Spermiogenesis is the final stage of spermatogenesis, and, during this phase, spermatids mature into spermatozoa (sperm cells)

TESTERONE

Testosterone is a hormone found in humans. The testicles primarily make testosterone in men. Women's ovaries also make testosterone, though in much smaller amounts. It is the major sex hormone in males and plays a number of important roles, such as:

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

Signals sent from the brain to the pituitary gland at the base of the brain control the production of testosterone in men. The pituitary gland then relays signals to the testes to produce testosterone. A "feedback loop" closely regulates the amount of hormone in the blood. When testosterone levels rise too high, the brain sends signals to the pituitary to reduce production.

Testosterone is also produced in the ovaries and adrenal gland. It's one of several androgens (male sex hormones) in females. These hormones are thought to have important effects on:

1. Ovarian function
2. Bone strength
3. Sexual behavior, including normal libido

The proper balance between testosterone (along with other androgens) and estrogen is important for the ovaries to work normally.

SEMEN

Semen, also called seminal fluid is a greyish white bodily fluid that is secreted by the gonads of male animals. It carries sperm or the spermatozoa and fructose and other enzymes that help the sperm to survive to facilitate successful fertilization.

The whitish opalescence is due to the large amount of protein that it contains and it's slightly turbid appearance is due to the spermatozoa contained within it. 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 released during the process of ejaculation and is processed in the seminal vesicle in the pelvis, which is where it is produced

MALE ORGASM

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 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, known as semen, is what is moved through the urethra and out the penis during orgasm. The sexual desire, or libido, is key in kicking off the process that will lead to orgasm.

The steps that lead a man to successful orgasm include;

1. Arousal-The man perceives something or someone that prompts sexual interest. That perception prompts the brain to send a signal down the spinal cord to the sex organs, causing an erection. The penis becomes erect when blood fills spongy tissue inside its shaft, brought by arteries that have expanded to allow blood to race in at up to 50 times its normal speed. The veins in the penis that normally drain blood out squeeze shut so that more blood remains inside, producing a firm erection. The scrotum pulls toward the body, and muscles throughout the body increase in tension.
2. Plateau- The male body prepares for orgasm in this phase, which can last from 30 seconds to 2 minutes. Muscle tension increases even more and involuntary body movements, particularly in the pelvis, begin to take over. The man's heart rate increases to between 150 and 175 beats per

minute. A clear fluid may begin to flow from the urethra. This pre-ejaculatory fluid is meant to change the pH balance of the urethra, to improve the chances of sperm survival.

3. Orgasm- 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.
4. Resolution and refraction after ejaculation, the penis begins to lose its erection. About half of the erection is lost immediately, and the rest fades soon after. Muscle tension fades, and the man may feel relaxed or drowsy. Men usually must undergo a refractory period, or recovery phase, during which they cannot achieve another erection. This period is variable in men. In an 18-year-old, this is typically less than 15 minutes. In elderly men, it can be up to 10 to 20 hours. The average refractory period is about half an hour. Men differ from women in that men usually are satiated after one orgasm. Women can experience more than one orgasm with no loss of sexual arousal, and do not have to undergo a refractory period.

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 of Male Infertility;

1. 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.
2. Genetics- Chromosomal anomalies and genetic mutations account for nearly 10–15% of all male infertility cases.
3. 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.

4. 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 testis 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). [12] 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.
5. Other factors;
 - Age
 - Abnormal set of chromosomes
 - Centriole
 - Neoplasm, e.g. seminoma
 - Idiopathic failure
 - Cryptorchidism
 - Trauma
 - Hydrocele
 - Hypopituitarism in adults, and hypopituitarism untreated in children (resulting in growth hormone deficiency and proportionate dwarfism.)
 - Mumps
 - Malaria
 - Testicular cancer
 - Idiopathic oligospermia - unexplained sperm deficiencies account for 30% of male infertility.