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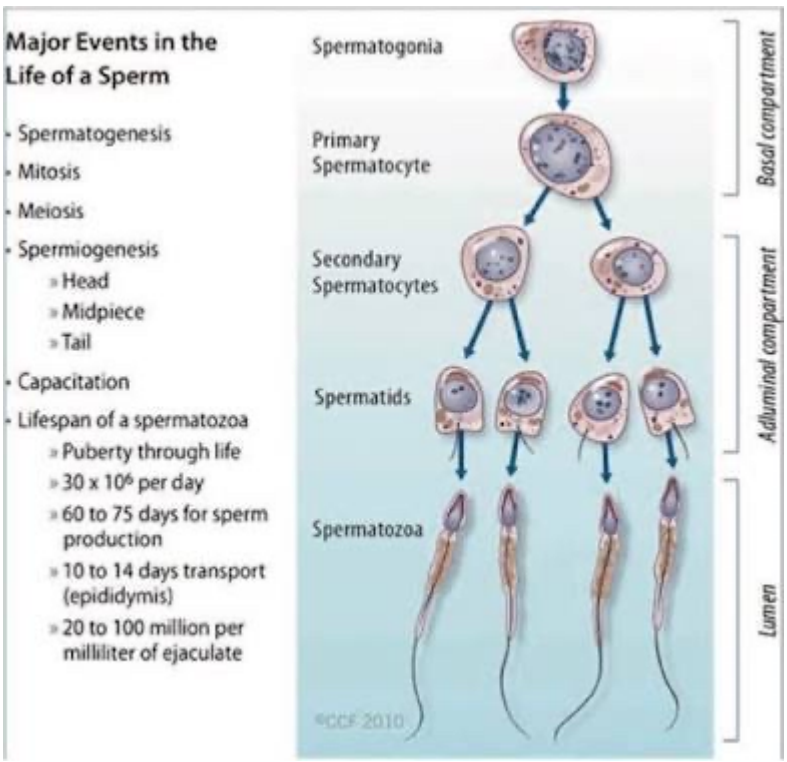
Nursing science
PHS212

1. Spermatogenesis

Description

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 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.

For humans, the entire process of spermatogenesis is variously estimated as taking 74 days (according to tritium-labelled biopsies) and approximately 120 days(according to DNA clock measurements). Including the transport on ductal system, it takes 3 months. Testes produce 200 to 300 million spermatozoa daily. However, only about half or 100 million of these become viable sperm.
Spermatogenesis takes place within 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.[2]Maturation occurs in the epididymis. The process of spermatogenesis is highly sensitive to fluctuations in the environment, particularly hormones and temperature. Testosterone is required in large local concentrations to maintain the process, which is achieved via the binding of testosterone by androgen binding protein present in the seminiferous tubules. Testosterone is produced by interstitial cells, also known as Leydig cells, which reside adjacent to the seminiferous tubules.

2. Testosterone

Description

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.

Testosterone is involved in health and well-being,[5] and the prevention of osteoporosis.[6] Insufficient levels of testosterone in men may lead to abnormalities including frailty and bone loss.

Testosterone is a steroid from the androstaneclass containing a keto and hydroxyl groups at positions three and seventeen respectively. It is biosynthesized in several steps from cholesterol and is converted in the liver to inactive metabolites.It exerts its action through binding to and activation of the androgen receptor.In humans and most other vertebrates, testosterone is secreted primarily by the testicles of males and, to a lesser extent, the ovaries of females. On average, in adult males, levels of testosterone are about 7 to 8 times as great as in adult females. As the metabolism of testosterone in males is more pronounced, the daily production is about 20 times greater in men. Females are also more sensitive to the hormone.

Medical use of Testosterone

Testosterone is used as a medication for the treatment of males with too little or no natural testosterone production, certain forms of breast cancer, and gender dysphoria in transgender men and non-binary individuals. This is known as hormone replacement therapy(HRT) or testosterone replacement therapy (TRT), which maintains serum testosterone levels in the normal range. Decline of testosterone production with age has led to interest in androgen replacement therapy.It

is unclear if the use of testosterone for low levels due to aging is beneficial or harmful.

Testosterone is included in the World Health Organization's list of essential medicines, which are the most important medications needed in a basic health system.It is available as a generic medication. The price depends on the form of testosterone used. It can be administered as a cream or transdermal patch that is applied to the skin, by injection into a muscle, as a tablet that is placed in the cheek, or by ingestion.

Side effects

Common side effects from testosterone medication include acne, swelling, and breast enlargement in males. Serious side effects may include liver toxicity, heart disease, and behavioral changes. Women and children who are exposed may develop virilization. It is recommended that individuals with prostate cancer not use the medication. It can cause harm if used during pregnancy or breastfeeding.

3. Semen

Semen, also called **seminal fluid**, fluid that is emitted from the male reproductive tract and that contains sperm cells, which are capable of fertilizing the female eggs. Semen also contains other liquids, known as seminal plasma, which help to keep the sperm cells viable.

It is secreted by the gonads (sexual glands) and other sexual organs of male or hermaphroditicanimals 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.

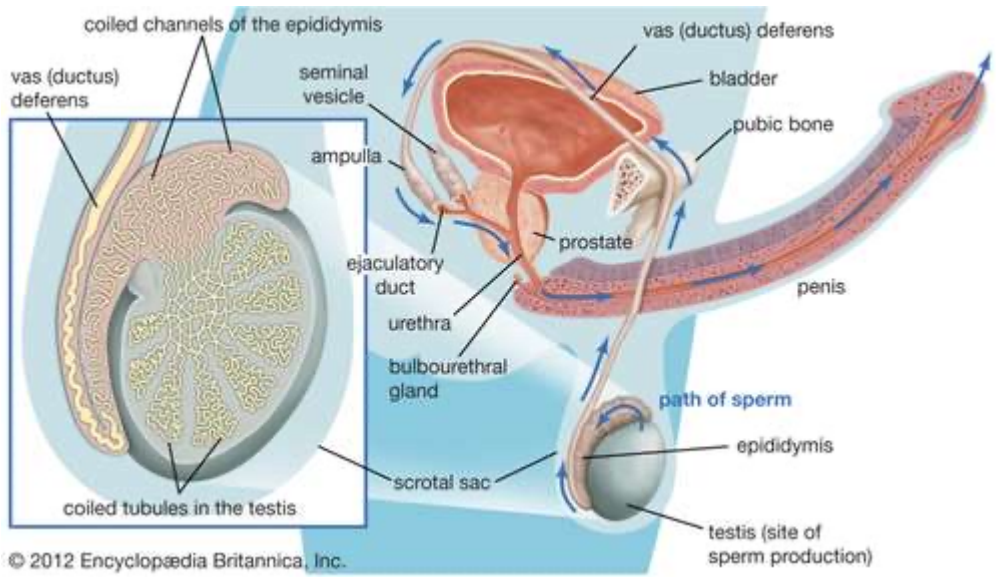
Disease transmission

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.

Appearance

Semen is typically translucent with white, grey or even yellowish tint. Blood in the semen can cause a pink or reddish colour, known as *hematospermia*, and may indicate a medical problem which should be evaluated by a doctor if the symptom persists.

After ejaculation, the latter part of the ejaculated semen coagulates immediately, forming globules, while the earlier part of the ejaculate typically does not. After a period typically ranging from 15 – 30 minutes, prostate-specific antigen present in the semen causes the decoagulation of the seminal coagulum. It is postulated that the initial clotting helps keep the semen in the vagina, while liquefaction frees the sperm to make their journey to the ova.



Storage

Semen can be stored in diluents such as the *Illini Variable Temperature* (IVT) diluent, which have been reported to be able to preserve high fertility of semen for over seven days. The IVT diluent is composed of several salts, sugars and antibacterial agents and gassed with CO_2.

Semen cryopreservation can be used for far longer storage durations. For human sperm, the longest reported successful storage with this method is 21 years.

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.

4. Male orgasm

An **orgasm** is considered the peak of sexual pleasure. It includes a series of muscle contractions in the sexual organs, lower pelvic muscles, and anus.

The male orgasm is a complex experience. The major function of the male orgasm is to ejaculate sperm, although not all men will ejaculate during an orgasm.

The male orgasm is a complex system involving multiple hormones, organs, and nerve pathways.

The hormone testosterone, produced in the testicles, plays a central role by enhancing the sexual desire (libido) that leads to arousal, erection, and ultimately orgasm. By contrast, low testosterone not only decreases a man's energy and mood, it makes him less responsive to sexual stimuli, both physical and mental.

Orgasm models

Sex researchers have defined orgasms within staged models of sexual response. Although the orgasm process can differ greatly between individuals, several basic physiological changes have been identified that tend to occur in the majority of incidences.

The following models are patterns that have been found to occur in all forms of sexual response and are not limited solely to penile-vaginal intercourse.

Master and Johnson’s Four-Phase Model:

1. excitement
2. plateau
3. orgasm
4. resolution

Kaplan's Three-Stage Model:

Kaplan's model differs from most other sexual response models as it includes desire – most models tend to avoid including non-genital changes. It is also important to note that not all sexual activity is preceded by desire.

1. desire
2. excitement
3. orgasm

Causes

It is commonly held that orgasms are a sexual experience, typically experienced as part of a sexual response cycle. They often occur following the continual stimulation of erogenous zones, such as the genitals, anus, nipples, and perineum.

Physiologically, orgasms occur following two basic responses to continual stimulation:

- **Vasocongestion:** the process whereby body tissues fill up with blood, swelling in size as a result.
- **Myotonia:** the process whereby muscles tense, including both voluntary flexing and involuntary contracting.

There have been other reports of people experiencing orgasmic sensations at the onset of epileptic medicine, and foot amputees feeling orgasms in the space where their foot once was. People paralyzed from the waist down have also been able to have orgasms, suggesting that it is the central nervous system rather than the genitals that is key to experiencing orgasms.

Disorders

A number of disorders are associated with orgasms; they can lead to distress, frustration, and feelings of shame, both for the person experiencing the symptoms and their partner(s).

Although orgasms are considered to be the same in all genders, healthcare professionals tend to describe orgasm disorders in gendered terms.

5. 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

- Age
- Abnormal set of chromosomes
- Centriole
- Neoplasm
- Idiopathic failure
- Cryptorchidism
- Trauma

- Hydrocele
- Hypopituitarism
- Mumps
- Malaria
- Testicular cancer
- Defects in USP26 in some cases
- Acrosomal defects affecting egg penetration
- Idiopathic oligospermia

The diagnosis of infertility begins with a medical history and physical exam by a physician, physician assistant, or nurse practitioner. Typically two separate semen analyses will be required. The provider may order blood tests to look for hormone imbalances, medical conditions, or genetic issues.

PREVENTION

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 alcoholuse.
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).

    a) Wearing a protective cup and jockstrap to protect the testicles, in any sport suchas baseball, football, cricket, lacrosse, hockey, softball, paintball, rodeo, motorcross, wrestling, soccer, karate or other martial artsor any sport where a ball, foot, arm, knee or bat can come into contact with the groin.

    b) Diet: Healthy diets (i.e. the Mediterranean diet) rich in such nutrients as omega-3 fatty acids, some antioxidants and vitamins, and low in saturated fatty acids (SFAs) and trans-fatty acids

(TFAs) are inversely associated with low semen quality parameters.

Treatment

Treatments vary according to the underlying disease and the degree of the impairment of the male's fertility. Further, in an infertility situation, the fertility of the female needs to be considered.

Pre-testicular conditions can often be addressed by medical means or interventions.

Testicular-based male infertility tends to be resistant to medication. Usual approaches include using the sperm for intrauterine insemination (IUI), in vitro fertilization (IVF), or IVF with intracytoplasmatic sperm injection(ICSI). With IVF-ICSI even with a few sperm pregnancies can be achieved.

Obstructive causes of post-testicular infertility can be overcome with either surgery or IVF-ICSI. Ejaculatory factors may be treatable by medication, or by IUI therapy or IVF.

Vitamin E helps counter oxidative stress, which is associated with sperm DNA damage and reduced sperm motility. A hormone-antioxidant combination may improve sperm count and motility. Giving oral antioxidants to men in couples undergoing in vitro fertilisation for male factor or unexplained subfertility may lead to an increase in the live birth rate but overall the risk of adverse effects is unclear.