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

1. **SPERMATOGENESIS**

**Spermatogenesis** is the process by which [haploid](https://en.wikipedia.org/wiki/Haploid) [spermatozoa](https://en.wikipedia.org/wiki/Spermatozoa) develop from [germ cells](https://en.wikipedia.org/wiki/Germ_cell) in the [seminiferous tubules](https://en.wikipedia.org/wiki/Seminiferous_tubules) of the [testis](https://en.wikipedia.org/wiki/Testis). This process starts with the [mitotic division](https://en.wikipedia.org/wiki/Mitosis) of the [stem cells](https://en.wikipedia.org/wiki/Stem_cell) located close to the basement membrane of the tubules. These cells are called [spermatogonial stem cells](https://en.wikipedia.org/wiki/Spermatogonial_Stem_Cells%22%20%5Co%20%22Spermatogonial%20Stem%20Cells). 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](https://en.wikipedia.org/wiki/Spermatocyte). The primary spermatocyte divides meiotically ([Meiosis](https://en.wikipedia.org/wiki/Meiosis) I) into two secondary spermatocytes; each secondary spermatocyte divides into two equal haploid [spermatids](https://en.wikipedia.org/wiki/Spermatids) by Meiosis II. The spermatids are transformed into spermatozoa (sperm) by the process of [spermiogenesis](https://en.wikipedia.org/wiki/Spermiogenesis%22%20%5Co%20%22Spermiogenesis). These develop into mature spermatozoa, also known as [sperm cells](https://en.wikipedia.org/wiki/Sperm). 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.[[3]](https://en.wikipedia.org/wiki/Spermatogenesis#cite_note-3)

Spermatozoa are the mature male [gametes](https://en.wikipedia.org/wiki/Gamete) in many sexually reproducing organisms. Thus, spermatogenesis is the male version of [gametogenesis](https://en.wikipedia.org/wiki/Gametogenesis), of which the female equivalent is [oogenesis](https://en.wikipedia.org/wiki/Oogenesis). In [mammals](https://en.wikipedia.org/wiki/Mammal) it occurs in the [seminiferous tubules](https://en.wikipedia.org/wiki/Seminiferous_tubules) of the male [testes](https://en.wikipedia.org/wiki/Testes) in a stepwise fashion. Spermatogenesis is highly dependent upon optimal conditions for the process to occur correctly, and is essential for [sexual reproduction](https://en.wikipedia.org/wiki/Sexual_reproduction). [DNA methylation](https://en.wikipedia.org/wiki/DNA_methylation) and [histone modification](https://en.wikipedia.org/wiki/Histone_modification) have been implicated in the regulation of this process. It starts at [puberty](https://en.wikipedia.org/wiki/Puberty) and usually continues uninterrupted until death, although a slight decrease can be discerned in the quantity of produced sperm with increase in age.

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.

1. **TESTOSTERONE**

A "male hormone" -- a sex hormone produced by the testes that encourages the development of male sexual characteristics, stimulates the activity of the male secondary sex characteristics, and prevents changes in them following castration. Chemically, testosterone is 17-beta-hydroxy-4-androstene-3-one. Testosterone is the most potent of the naturally occurring androgens. The androgens cause the development of male sex characteristics, such as a deep voice and a beard; they also strengthen muscle tone and bone mass. High levels of testosterone appear to promote good health in men, for example, lowering the risks of [high blood pressure](https://www.medicinenet.com/high_blood_pressure_hypertension/article.htm) and [heart](https://www.medicinenet.com/heart_how_the_heart_works/article.htm) attack. High testosterone levels also correlate with risky behavior, however, including increased aggressiveness and [smoking](https://www.medicinenet.com/smoking_and_quitting_smoking/article.htm), which may cancel out these health benefits. Testosterone may be given to treat medical conditions, including female (but not male) [breast cancer](https://www.medicinenet.com/breast_cancer_facts_stages/article.htm), hypogonadism (low gonadal function) in the male, cryptorchism (nondescent of the testis into the scrotum), and menorrhagia (irregular periods).

1. **SEMEN**

**Semen**, also known as **seminal fluid**, is an organic [fluid](https://en.wikipedia.org/wiki/Fluid) that contains [spermatozoa](https://en.wikipedia.org/wiki/Spermatozoon). It is secreted by the [gonads](https://en.wikipedia.org/wiki/Gonad) (sexual glands) and other sexual organs of [male](https://en.wikipedia.org/wiki/Male) or [hermaphroditic](https://en.wikipedia.org/wiki/Hermaphrodite) [animals](https://en.wikipedia.org/wiki/Animal) and can [fertilize](https://en.wikipedia.org/wiki/Fertilization) the [female](https://en.wikipedia.org/wiki/Female) [ovum](https://en.wikipedia.org/wiki/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](https://en.wikipedia.org/wiki/Seminal_vesicle), which is located in the pelvis. The process that results in the discharge of semen is called [*ejaculation*](https://en.wikipedia.org/wiki/Ejaculation). Semen is also a form of genetic material. In animals, semen has been collected for cryoconservation. [Cryoconservation of animal genetic resources](https://en.wikipedia.org/wiki/Cryoconservation_of_animal_genetic_resources%22%20%5Co%20%22Cryoconservation%20of%20animal%20genetic%20resources) is a practice that calls for the collection of genetic material in efforts for conservation of a particular breed.

1. **MALE ORGASM**

Orgasm is the peak of sexual arousal when all the muscles that were tightened during sexual arousal relax. the male orgasm is actually a complex process. Men achieve orgasm through a series of steps involving a number of organs, [hormones](https://www.everydayhealth.com/hormones/guide/), 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](https://www.everydayhealth.com/testosterone/guide/), a hormone produced in steady supply by the testicles. The [testicles](https://www.everydayhealth.com/sexual-health/male-reproductive-organs.aspx) 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.

1. **MALE INFERTILITY**

**Male infertility** refers to a male's inability to cause [pregnancy](https://en.wikipedia.org/wiki/Pregnancy) in a fertile female. In humans it accounts for 40–50% of [infertility](https://en.wikipedia.org/wiki/Infertility). It affects approximately 7% of all men. Male infertility is commonly due to deficiencies in the [semen](https://en.wikipedia.org/wiki/Semen), and [semen quality](https://en.wikipedia.org/wiki/Semen_quality) is used as a surrogate measure of male fecundity. [Antisperm antibodies](https://en.wikipedia.org/wiki/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](https://en.wikipedia.org/wiki/Acrosome_reaction), impaired [fertilization](https://en.wikipedia.org/wiki/Fertilisation), influence on the implantation process, and impaired growth and development of the [embryo](https://en.wikipedia.org/wiki/Embryo). Risk factors for the formation of antisperm antibodies in men include the breakdown of the blood‑testis barrier, trauma and surgery, orchitis, [varicocele](https://en.wikipedia.org/wiki/Varicocele%22%20%5Co%20%22Varicocele), infections, [prostatitis](https://en.wikipedia.org/wiki/Prostatitis), [testicular cancer](https://en.wikipedia.org/wiki/Testicular_cancer), failure of immunosuppression and unprotected receptive anal or oral sex with men.