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**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" \o "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" \o "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](https://en.wikipedia.org/wiki/Spermatocyte" \o "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" \o "Spermatids) by Meiosis II. The spermatids are transformed into spermatozoa (sperm) by the process of [spermiogenesis](https://en.wikipedia.org/wiki/Spermiogenesis" \o "Spermiogenesis). 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.  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" \o "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 (see [Male infertility](https://en.wikipedia.org/wiki/Male_infertility)).

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.

**TESTOSTERONE:**

**Testosterone** is the primary [male](https://en.wikipedia.org/wiki/Male) [sex hormone](https://en.wikipedia.org/wiki/Sex_hormone) and [anabolic steroid](https://en.wikipedia.org/wiki/Anabolic_steroid).In male humans, testosterone plays a key role in the development of [male reproductive](https://en.wikipedia.org/wiki/Male_reproductive_system) tissues such as [testes](https://en.wikipedia.org/wiki/Testes) and [prostate](https://en.wikipedia.org/wiki/Prostate), as well as promoting [secondary sexual characteristics](https://en.wikipedia.org/wiki/Secondary_sexual_characteristic) such as increased [muscle](https://en.wikipedia.org/wiki/Muscle) and [bone](https://en.wikipedia.org/wiki/Bone) mass, and the growth of [body hair](https://en.wikipedia.org/wiki/Androgenic_hair).In addition, testosterone is involved in health and well-being,and the prevention of [osteoporosis](https://en.wikipedia.org/wiki/Osteoporosis" \o "Osteoporosis).Insufficient levels of testosterone in men may lead to abnormalities including frailty and bone loss.

Testosterone is a [steroid](https://en.wikipedia.org/wiki/Steroid) from the [androstane](https://en.wikipedia.org/wiki/Androstane" \o "Androstane) class containing a [keto](https://en.wikipedia.org/wiki/Ketone" \o "Ketone) and [hydroxyl](https://en.wikipedia.org/wiki/Hydroxyl) groups at positions three and seventeen respectively. It is [biosynthesized](https://en.wikipedia.org/wiki/Biosynthesis) 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](https://en.wikipedia.org/wiki/Androgen_receptor).In humans and most other [vertebrates](https://en.wikipedia.org/wiki/Vertebrate), testosterone is secreted primarily by the [testicles](https://en.wikipedia.org/wiki/Testicles) of [males](https://en.wikipedia.org/wiki/Male) and, to a lesser extent, the [ovaries](https://en.wikipedia.org/wiki/Ovaries) of [females](https://en.wikipedia.org/wiki/Female). 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

In addition to its role as a natural hormone, testosterone is used as a [medication](https://en.wikipedia.org/wiki/Medication) in the treatment of [low testosterone levels in men](https://en.wikipedia.org/wiki/Male_hypogonadism), [transgender hormone therapy](https://en.wikipedia.org/wiki/Transgender_hormone_therapy) for [transgender men](https://en.wikipedia.org/wiki/Transgender_men), and [breast cancer](https://en.wikipedia.org/wiki/Breast_cancer) in women.Since [testosterone levels decrease as men age](https://en.wikipedia.org/wiki/Andropause), testosterone is sometimes used in older men to counteract this deficiency. It is also used illicitly to [enhance physique and performance](https://en.wikipedia.org/wiki/Performance-enhancing_substance), for instance in [athletes](https://en.wikipedia.org/wiki/Athlete).

**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" \o "Cryoconservation of animal genetic resources) is a practice that calls for the collection of genetic material in efforts for conservation of a particular breed. During the process of [ejaculation](https://en.wikipedia.org/wiki/Ejaculation), sperm passes through the [ejaculatory ducts](https://en.wikipedia.org/wiki/Ejaculatory_duct) and mixes with fluids from the [seminal vesicles](https://en.wikipedia.org/wiki/Seminal_vesicle), the [prostate](https://en.wikipedia.org/wiki/Prostate), and the [bulbourethral glands](https://en.wikipedia.org/wiki/Bulbourethral_gland" \o "Bulbourethral gland) to form the semen. The seminal vesicles produce a yellowish viscous fluid rich in fructose and other substances that makes up about 70% of human semen. The prostatic secretion, influenced by dihydrotestosterone, is a whitish (sometimes clear), thin fluid containing proteolytic enzymes, citric acid, acid phosphatase and lipids. The bulbourethral glands secrete a clear secretion into the lumen of the [urethra](https://en.wikipedia.org/wiki/Urethra) to lubricate it.

**MALE ORGASM:**

[Orgasm](https://en.wikipedia.org/wiki/Orgasm) causes the discharge of [semen](https://en.wikipedia.org/wiki/Semen) (normally containing [sperm](https://en.wikipedia.org/wiki/Sperm)) from the [male reproductory tract](https://en.wikipedia.org/wiki/Male_reproductive_system) causing an ejaculation. It is the final stage and natural objective of male [sexual stimulation](https://en.wikipedia.org/wiki/Sexual_stimulation), and an essential component of natural [conception](https://en.wikipedia.org/wiki/Fertilisation). In rare cases, ejaculation occurs because of [prostatic](https://en.wikipedia.org/wiki/Prostate) disease. Ejaculation may also occur spontaneously during [sleep](https://en.wikipedia.org/wiki/Sleep) (a [nocturnal emission](https://en.wikipedia.org/wiki/Nocturnal_emission) or "wet dream"). *[Anejaculation](https://en.wikipedia.org/wiki/Anejaculation" \o "Anejaculation)* is the condition of being unable to ejaculate. Ejaculation is usually very pleasurable for men; *[dysejaculation](https://en.wikipedia.org/wiki/Painful_ejaculation" \o "Painful ejaculation)* is an ejaculation that is painful or uncomfortable. [Retrograde ejaculation](https://en.wikipedia.org/wiki/Retrograde_ejaculation) is the condition where semen travels backwards into the [bladder](https://en.wikipedia.org/wiki/Urinary_bladder) rather than out the [urethra](https://en.wikipedia.org/wiki/Urethra). After the start of orgasm, pulses of semen begin to flow from the urethra, reach a peak discharge and then diminish in flow. The typical orgasm consists of 10 to 15 contractions, although the man is unlikely to be consciously aware of that many. Once the first contraction has taken place, ejaculation will continue to completion as an involuntary process. At this stage, ejaculation cannot be stopped. The rate of contractions gradually slows during the orgasm. Initial contractions occur at an average interval of 0.6 seconds with an increasing increment of 0.1 seconds per contraction. Contractions of most men proceed at regular rhythmic intervals for the duration of the orgasm. Many men also experience additional irregular contractions at the conclusion of the orgasm.

**MALE INFERTILITY:**

**Male infertility** refers to a male's inability to cause [pregnancy](https://en.wikipedia.org/wiki/Pregnancy) in a fertile female. 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. It could be causes by genetics, age, antisperm antibodies, abnormal set of chromosomes, testicular cancer, etc. It also has environmental causes like industrial chemicals, heavy metal exposure, radiation or xrays.

References: <https://www.mayoclinic.org/>

<https://en.wikipedia.org/>