**1. Spermatogenesis** is the process by which [haploid](/wiki/Haploid%22%20%5Co%20%22Haploid)[spermatozoa](/wiki/Spermatozoa%22%20%5Co%20%22Spermatozoa) develop from [germ cells](/wiki/Germ_cell%22%20%5Co%20%22Germ%20cell) in the [seminiferous tubules](/wiki/Seminiferous_tubules%22%20%5Co%20%22Seminiferous%20tubules) of the [testis](/wiki/Testis%22%20%5Co%20%22Testis). This process starts with the [mitotic division](/wiki/Mitosis%22%20%5Co%20%22Mitosis) of the [stem cells](/wiki/Stem_cell%22%20%5Co%20%22Stem%20cell)located close to the basement membrane of the tubules. These cells are called [spermatogonial stem cells](/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](/wiki/Spermatocyte%22%20%5Co%20%22Spermatocyte). The primary spermatocyte divides meiotically ([Meiosis](/wiki/Meiosis%22%20%5Co%20%22Meiosis) I) into two secondary spermatocytes; each secondary spermatocyte divides into two equal haploid [spermatids](/wiki/Spermatids%22%20%5Co%20%22Spermatids) by Meiosis II. The spermatids are transformed into spermatozoa (sperm) by the process of [spermiogenesis](/wiki/Spermiogenesis%22%20%5Co%20%22Spermiogenesis). These develop into mature spermatozoa, also known as [sperm cells](/wiki/Sperm%22%20%5Co%20%22Sperm). 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.Spermatozoa are the mature male [gametes](/wiki/Gamete%22%20%5Co%20%22Gamete) in many sexually reproducing organisms. Spermatogenesis is the male version of [gametogenesis](/wiki/Gametogenesis%22%20%5Co%20%22Gametogenesis), of which the female equivalent is [oogenesis](/wiki/Oogenesis%22%20%5Co%20%22Oogenesis). In [mammals](/wiki/Mammal%22%20%5Co%20%22Mammal) it occurs in the [seminiferous tubules](/wiki/Seminiferous_tubules%22%20%5Co%20%22Seminiferous%20tubules) of the male [testes](/wiki/Testes%22%20%5Co%20%22Testes) in a stepwise fashion. Spermatogenesis is highly dependent upon optimal conditions for the process to occur correctly, and is essential for [sexual reproduction](/wiki/Sexual_reproduction%22%20%5Co%20%22Sexual%20reproduction). [DNA methylation](/wiki/DNA_methylation%22%20%5Co%20%22DNA%20methylation)and [histone modification](/wiki/Histone_modification%22%20%5Co%20%22Histone%20modification) have been implicated in the regulation of this process. It starts at [puberty](/wiki/Puberty%22%20%5Co%20%22Puberty) and usually continues uninterrupted until death, although a slight decrease can be discerned in the quantity of produced sperm with increase in agents.

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.

**2. Testosterone** is the primary [male](/wiki/Male%22%20%5Co%20%22Male) [sex hormone](/wiki/Sex_hormone%22%20%5Co%20%22Sex%20hormone) and [anabolic steroid](/wiki/Anabolic_steroid%22%20%5Co%20%22Anabolic%20steroid). In male humans, testosterone plays a key role in the development of [male reproductive](/wiki/Male_reproductive_system%22%20%5Co%20%22Male%20reproductive%20system) tissues such as [testes](/wiki/Testes%22%20%5Co%20%22Testes) and [prostate](/wiki/Prostate%22%20%5Co%20%22Prostate), as well as promoting [secondary sexual characteristics](/wiki/Secondary_sexual_characteristic%22%20%5Co%20%22Secondary%20sexual%20characteristic)such as increased [muscle](/wiki/Muscle%22%20%5Co%20%22Muscle) and [bone](/wiki/Bone%22%20%5Co%20%22Bone) mass, and the growth of [body hair](/wiki/Androgenic_hair%22%20%5Co%20%22Androgenic%20hair). In addition, testosterone is involved in health and well-being, and the prevention of [osteoporosis](/wiki/Osteoporosis%22%20%5Co%20%22Osteoporosis). Insufficient levels of testosterone in men may lead to abnormalities including frailty and bone loss.Testosterone is a [steroid](/wiki/Steroid%22%20%5Co%20%22Steroid) from the [androstane](/wiki/Androstane%22%20%5Co%20%22Androstane) class containing a [keto](/wiki/Ketone%22%20%5Co%20%22Ketone) and [hydroxyl](/wiki/Hydroxyl%22%20%5Co%20%22Hydroxyl) groups at positions three and seventeen respectively. It is [biosynthesized](/wiki/Biosynthesis%22%20%5Co%20%22Biosynthesis) 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](/wiki/Androgen_receptor%22%20%5Co%20%22Androgen%20receptor). In humans and most other [vertebrates](/wiki/Vertebrate%22%20%5Co%20%22Vertebrate), testosterone is secreted primarily by the [testicles](/wiki/Testicles%22%20%5Co%20%22Testicles) of [males](/wiki/Male%22%20%5Co%20%22Male) and, to a lesser extent, the [ovaries](/wiki/Ovaries%22%20%5Co%20%22Ovaries) of [females](/wiki/Female%22%20%5Co%20%22Female). 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 testosterone is used as a [medication](/wiki/Medication%22%20%5Co%20%22Medication) in the treatment of [low testosterone levels in men](/wiki/Male_hypogonadism%22%20%5Co%20%22Male%20hypogonadism), [transgender hormone therapy](/wiki/Transgender_hormone_therapy%22%20%5Co%20%22Transgender%20hormone%20therapy) for [transgender men](/wiki/Transgender_men%22%20%5Co%20%22Transgender%20men), and [breast cancer](/wiki/Breast_cancer%22%20%5Co%20%22Breast%20cancer) in women. Since [testosterone levels decrease as men age](/wiki/Andropause%22%20%5Co%20%22Andropause), testosterone is sometimes used in older men to counteract this deficiency. It is also used illicitly to [enhance physique and performance](/wiki/Performance-enhancing_substance%22%20%5Co%20%22Performance-enhancing%20substance), for instance in [athletes](/wiki/Athlete%22%20%5Co%20%22Athlete).

**3. Semen**, also known as seminal fluid, is an organic [fluid](/wiki/Fluid%22%20%5Co%20%22Fluid) that contains [spermatozoa](/wiki/Spermatozoon%22%20%5Co%20%22Spermatozoon). It is secreted by the [gonads](/wiki/Gonad%22%20%5Co%20%22Gonad) (sexual glands) and other sexual organs of [male](/wiki/Male%22%20%5Co%20%22Male) or [hermaphroditic](/wiki/Hermaphrodite%22%20%5Co%20%22Hermaphrodite) [animals](/wiki/Animal%22%20%5Co%20%22Animal) and can [fertilize](/wiki/Fertilization%22%20%5Co%20%22Fertilization) the [female](/wiki/Female%22%20%5Co%20%22Female) [ovum](/wiki/Ovum%22%20%5Co%20%22Ovum). 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](/wiki/Seminal_vesicle%22%20%5Co%20%22Seminal%20vesicle), 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. [Cryoconservation of animal genetic resources](/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.

**4. Male orgasm:** The fuel for the process leading to orgasm is [testosterone](//www.everydayhealth.com/testosterone/guide/), a hormone produced in steady supply by the testicles. The [testicles](//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.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.The male ejaculate, [semen](https://www.verywellhealth.com/facts-about-semen-an-indication-of-health-status-2328524), is comprised of sperm cells and seminal fluid, the latter of which contains phosphorylcholine (an enzyme that aids in fertility) and fructose (which provides fuel for sperm). The average volume of semen expelled by a healthy man is around a teaspoon.

 **5. Male infertility** refers to a male's inability to cause [pregnancy](/wiki/Pregnancy%22%20%5Co%20%22Pregnancy) in a fertile female. In humans it accounts for 40–50% of [infertility](/wiki/Infertility%22%20%5Co%20%22Infertility). It affects approximately 7% of all men. Male infertility is commonly due to deficiencies in the [semen](/wiki/Semen%22%20%5Co%20%22Semen), and [semen quality](/wiki/Semen_quality%22%20%5Co%20%22Semen%20quality) is used as a surrogate measure of male fecundity.Factors relating to male infertility include:

### **Immune infertility**

[Antisperm antibodies](/wiki/Antisperm_antibodies%22%20%5Co%20%22Antisperm%20antibodies) (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](/wiki/Acrosome_reaction%22%20%5Co%20%22Acrosome%20reaction), impaired [fertilization](/wiki/Fertilisation%22%20%5Co%20%22Fertilisation), influence on the implantation process, and impaired growth and development of the [embryo](/wiki/Embryo%22%20%5Co%20%22Embryo). Risk factors for the formation of antisperm antibodies in men include the breakdown of the blood‑testis barrier, trauma and surgery, orchitis, [varicocele](/wiki/Varicocele%22%20%5Co%20%22Varicocele), infections, [prostatitis](/wiki/Prostatitis%22%20%5Co%20%22Prostatitis), [testicular cancer](/wiki/Testicular_cancer%22%20%5Co%20%22Testicular%20cancer), failure of immunosuppression and unprotected receptive anal or oral sex with men.

**Genetics**

Chromosomal anomalies and genetic mutations account for nearly 10–15% of all male infertility cases.

**Klinefelter Syndrome**

One of the most commonly known causes of infertility is [Klinefelter Syndrome](/wiki/Klinefelter_Syndrome%22%20%5Co%20%22Klinefelter%20Syndrome), 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. Males with this syndrome carry an extra X chromosome (XXY), meaning they have 47 chromosomes compared to the normal 46 in each cell. This extra chromosome directly affects sexual development before birth and during puberty (links to learning disabilities and speech development have also been shown to be affected). There are varieties in Klinefelter Syndrome, where some cases may have the extra X chromosome in some cells but not others, referred to as Mosaic Klinefelter Syndrome, or where individuals have the extra X chromosome in all cells. The reduction of testosterone in the male body normally results in an overall decrease in the production of viable sperm for these individuals thereby forcing them to turn to fertility treatments to father children.

**Y chromosome deletions**

[Y chromosomal infertility](/wiki/Y_chromosome_deletions%22%20%5Co%20%22Y%20chromosome%20deletions) 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 teste size. Men with this condition can exhibit [azoospermia](/wiki/Azoospermia%22%20%5Co%20%22Azoospermia) (no sperm production), [oligozoospermia](/wiki/Oligozoospermia%22%20%5Co%20%22Oligozoospermia) (small number of sperm production), or they will produce abnormally shaped sperm (teratozoospermia). 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. These deletions affect protein production that is vital for [spermatogenesis](/wiki/Spermatogenesis%22%20%5Co%20%22Spermatogenesis). Studies have shown that this is an inherited trait; if a male is fathered by a man who also exhibited y chromosome deletions then this trait will be passed down. These individuals are thereby “Y-linked”, although daughters are not affected due to the lack of the Y chromosome.