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18/ENG08/014

BIOMEDICAL ENGINEERING

PHYSIOLOGY ASSIGNMENT

1. **Spermatogenesis** is the process by which [haploid](https://en.m.wikipedia.org/wiki/Haploid) [spermatozoa](https://en.m.wikipedia.org/wiki/Spermatozoa) develop from [germ cells](https://en.m.wikipedia.org/wiki/Germ_cell) in the [seminiferous tubules](https://en.m.wikipedia.org/wiki/Seminiferous_tubules) of the [testis](https://en.m.wikipedia.org/wiki/Testis). This process starts with the [mitotic division](https://en.m.wikipedia.org/wiki/Mitosis) of the [stem cells](https://en.m.wikipedia.org/wiki/Stem_cell) located close to the basement membrane of the tubules. These cells are called [spermatogonial stem cells](https://en.m.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.m.wikipedia.org/wiki/Spermatocyte). The primary spermatocyte divides meiotically ([Meiosis](https://en.m.wikipedia.org/wiki/Meiosis) I) into two secondary spermatocytes; each secondary spermatocyte divides into two equal haploid [spermatids](https://en.m.wikipedia.org/wiki/Spermatids) by Meiosis II. The spermatids are transformed into spermatozoa (sperm) by the process.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. There are **three phases**: (1) Spermatocytogenesis (Mitosis), (2) Meiosis, and (3) Spermiogenesis. 1. Spermatocytogenesis (also called Mitosis): Stem cells (Type A **spermatogonia**; singular = spermatogonium) divide mitotically to replace themselves and to produce cells that begin differentiation (Type B **spermatogonia.** Sperm cells are continually being produced by the testes, but not all areas of the seminiferous tubules produce sperm cells at the same time. One immature germ [cell](https://www.britannica.com/science/cell-biology) takes as long as 74 days to reach final maturation, and during this growth process there are [intermittent](https://www.merriam-webster.com/dictionary/intermittent) resting phases.



1. **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 a male sex hormone that is important for sexual and reproductive development. The National Institutes of Health regards testosterone as the most important male hormone. Women also produce testosterone, but at lower levels than men.

Testosterone belongs to a class of male hormones called androgens, which are sometimes called steroids or anabolic steroids. In men, testosterone is produced mainly in the testes, with a small amount made in the adrenal glands. The brain's hypothalamus and pituitary gland control testosterone production. The hypothalamus instructs the pituitary gland on how much testosterone to produce, and the pituitary gland passes the message on to the testes. These communications happen through chemicals and hormones in the bloodstream.

Testosterone is involved in the development of male sex organs before birth, and the development of secondary sex characteristics at puberty, such as voice deepening, increased penis and testes size, and growth of facial and body hair.

The hormone also plays a role in sex drive, sperm production, fat distribution, red cell production, and maintenance of muscle strength and mass. In women, the ovaries and adrenal glands produce testosterone. Women's total testosterone levels are about a tenth to a twentieth of men's levels.

1. Semen 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 its slightly turbid appearance is due to the spermatozoa contained within it.

1. The male orgasm is a complex experience. The major function of the male orgasm is to [ejaculate](https://www.verywellhealth.com/facts-about-ejaculation-ejaculate-2329073) sperm, although not all men will ejaculate during an orgasm. Beyond delivering pleasure, the role of the female orgasm is less clear, although it may help move the sperm closer toward the ovum (egg).

In the 1950s, Alfred Kinsey, the first scientist to study human sexuality in detail, described the orgasm as "an explosive discharge of neuromuscular tension." In the years since those initial studies, we have come closer to understanding both the physiological and emotional components of the male orgasm, as well as the conditions that impede or promote it.

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

**Causes.**

**It has a few causes namely**

* Age (*see also:*[*Paternal age effect*](https://en.m.wikipedia.org/wiki/Paternal_age_effect))
* Abnormal set of chromosomes
* [Centriole](https://en.m.wikipedia.org/wiki/Centriole)
* [Neoplasm](https://en.m.wikipedia.org/wiki/Neoplasm), e.g. [seminoma](https://en.m.wikipedia.org/wiki/Seminoma)
* [Idiopathic](https://en.m.wikipedia.org/wiki/Idiopathic) failure
* [Cryptorchidism](https://en.m.wikipedia.org/wiki/Cryptorchidism)
* [Trauma](https://en.m.wikipedia.org/wiki/Physical_trauma)
* [Hydrocele](https://en.m.wikipedia.org/wiki/Hydrocele)
* [Hypopituitarism](https://en.m.wikipedia.org/wiki/Hypopituitarism) in adults, and hypopituitarism untreated in children (resulting in growth hormone deficiency and proportionate dwarfism.)
* [Mumps](https://en.m.wikipedia.org/wiki/Mumps)
* [Malaria](https://en.m.wikipedia.org/wiki/Malaria)
* [Testicular cancer](https://en.m.wikipedia.org/wiki/Testicular_cancer)
* Defects in [USP26](https://en.m.wikipedia.org/wiki/USP26) in some cases
* [Acrosomal](https://en.m.wikipedia.org/wiki/Acrosomal) defects affecting egg penetration
* [Idiopathic oligospermia](https://en.m.wikipedia.org/wiki/Oligospermia) - unexplained sperm deficiencies account for 30% of male infertility. E.t.c

Some strategies suggested or proposed for avoiding male infertility include the following:

* Avoiding [smoking](https://en.m.wikipedia.org/wiki/Smoking)as it damages sperm DNA
* Avoiding heavy [marijuana](https://en.m.wikipedia.org/wiki/Marijuana) and [alcohol](https://en.m.wikipedia.org/wiki/Alcohol_%28drug%29) use.
* Avoiding excessive heat to the testes.
* 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).
* Wearing a [protective cup](https://en.m.wikipedia.org/wiki/Protective_cup) and [jockstrap](https://en.m.wikipedia.org/wiki/Jockstrap) to protect the testicles, in any sport such as [baseball](https://en.m.wikipedia.org/wiki/Baseball), [football](https://en.m.wikipedia.org/wiki/Football), [cricket](https://en.m.wikipedia.org/wiki/Cricket), [lacrosse](https://en.m.wikipedia.org/wiki/Lacrosse), [hockey](https://en.m.wikipedia.org/wiki/Hockey), [softball](https://en.m.wikipedia.org/wiki/Softball), [paintball](https://en.m.wikipedia.org/wiki/Paintball), [rodeo](https://en.m.wikipedia.org/wiki/Rodeo), [motorcross](https://en.m.wikipedia.org/wiki/Motorcross), [wrestling](https://en.m.wikipedia.org/wiki/Wrestling), [soccer](https://en.m.wikipedia.org/wiki/Soccer), [karate](https://en.m.wikipedia.org/wiki/Karate) or other [martial arts](https://en.m.wikipedia.org/wiki/Martial_arts) or any sport where a ball, foot, arm, knee or bat can come into contact with the groin.
* Diet: Healthy diets
* 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](https://en.m.wikipedia.org/wiki/Intrauterine_insemination) (IUI), [in vitro fertilization](https://en.m.wikipedia.org/wiki/In_vitro_fertilization) (IVF), or IVF with [intracytoplasmatic sperm injection](https://en.m.wikipedia.org/wiki/Intracytoplasmic_sperm_injection%22%20%5Co%20%22Intracytoplasmic%20sperm%20injection) (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](https://en.m.wikipedia.org/wiki/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](https://en.m.wikipedia.org/wiki/Live_birth_rate) but overall the risk of adverse effects is unclear.[[45]](https://en.m.wikipedia.org/wiki/Male_infertility#cite_note-45)