

1. Spermatogenesis

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. Spermatozoa are the mature male gametes in many sexually reproducing organisms. Thus, spermatogenesis is the male version of gametogenesis, of which the female equivalent is oogenesis. It starts at 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 produces mature male gametes, commonly called *sperm* but more specifically known as spermatozoa, which are able to fertilize the counterpart female gamete, the oocyte, during conception to produce a single-celled individual known as a zygote. 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. Maturation occurs in the epididymis.

Sertoli cells which are thought to provide structural and metabolic support to the developing sperm cells. Sertoli cells serve a number of functions during spermatogenesis, they support the developing gametes in the following ways:

- Maintain the environment necessary for development and maturation, via the blood-testis barrier

- Secrete substances initiating meiosis
- Secrete supporting testicular fluid
- Secrete androgen-binding protein (ABP), which concentrates testosterone in close proximity to the developing gametes
 - Testosterone is needed in very high quantities for maintenance of the reproductive tract, and ABP allows a much higher level of fertility
- Secrete hormones affecting pituitary gland control of spermatogenesis, particularly the polypeptide hormone, inhibin

2. Male Infertility

Male infertility refers to a male's inability to cause pregnancy in a fertile female. It is caused by abnormal sperm production or function due to undescended testicles, genetic defects, health problems such as diabetes, or infections such as chlamydia, gonorrhea, mumps or HIV. Enlarged veins in the testes (varicocele) also can affect the quality of sperm.

- Problems with the delivery of sperm due to sexual problems, such as premature ejaculation; certain genetic diseases, such as cystic fibrosis; structural problems, such as a blockage in the testicle; or damage or injury to the reproductive organs.
- Overexposure to certain environmental factors, such as pesticides and other chemicals, and radiation. Cigarette smoking, alcohol, marijuana, anabolic steroids, and taking medications to treat bacterial infections, high blood pressure and depression also can affect fertility. Frequent exposure to heat, such as in saunas or hot tubs, can raise body temperature and may affect sperm production.
- Damage related to cancer and its treatment, including radiation or chemotherapy. Treatment for cancer can impair sperm production, sometimes severely.