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Testosterone

Testosterone is a male sex hormone that is important for sexual and reproductive development. It is 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, according to the Mayo Clinic. For these reasons, testosterone is

associated with overall health and well-being in men. One 2008 study published in the journal Frontiers of Hormone. Research even linked testosterone to the prevention of osteoporosis in men.
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.

Low testosterone

Levels of testosterone naturally decrease with age, but exactly what level constitutes "low T," or hypogonadism, is controversial, Harvard Medical School said. Testosterone levels vary wildly, and can even differ depending on the time of day they're measured (levels tend to be lower in the evenings). The National Institutes of Health includes the following as possible symptoms of low testosterone:

- Reduced sex drive
- Erectile dysfunction or impotence
- Increased breast size
- Lowered sperm count
- Hot flashes
- Depression, irritability and inability to concentrate
- Shrunken and softened testes
- Loss of muscle mass or hair
- Bones becoming prone to fracture

It is important to note, however, that conditions other than low T can cause erectile dysfunction, such as diseases in the nerves or blood.

Doctors typically to treat men for hypogonadism if they have symptoms of low testosterone and their testosterone levels are below 300 nanograms per deciliter.

High testosterone

High testosterone levels can cause problems in women, including irregular menstrual cycles, increases in body hair and acne, and a deepening of the voice. Women with polycystic ovarian syndrome have high levels of male hormones, including testosterone, which can be a cause of infertility.

Testosterone therapy

For people who are worried about low or high testosterone, a doctor may perform a blood test to measure the amount of the hormone in the patient's blood. When doctors find low-T, they may prescribe testosterone therapy, in which the patient takes an artificial version of the hormone. This is available in the following forms: a gel to be applied to the upper arms, shoulders or abdomen daily; a skin patch put on the body or scrotum twice a day; a solution applied to the armpit; injections every two or three weeks; a patch put on the gums twice a day; or implants that last four to six months.

Men using testosterone gels must take precautions, such as washing hands and covering areas where the gel is applied, according to the U.S. Food and Drug Administration. Women and children should not touch the gel or the skin where the gel or patch is applied. In older men with true testosterone deficiencies, testosterone treatment has been shown to increase strength and sex drive, experts say. But sometimes, symptoms of erectile dysfunction are due to other conditions, including diabetes and depression, according to the Mayo Clinic. Treating these men with testosterone hormone won't improve symptoms. There are a lot of other claims about what testosterone therapy can do, but are also still being tested. For instance, it was thought that maybe it would help with age-related memory loss. A 2017 placebo-controlled study published in JAMA, found that in the 788 older

men tested, testosterone treatment did not help with age-related memory loss.

It may also become a treatment for anemia, bone density and strength problems. In a 2017 study published in the journal of the American Medical Association (JAMA), testosterone treatments corrected anemia in older men with low testosterone levels better than a placebo. Another 2017 study published in JAMA found that older men with low testosterone had increased bone strength and density after treatment when compared with a placebo.

Side effects

The safety of testosterone treatment is still being researched. It has several possible side effects and some possible long-term effects, as well.

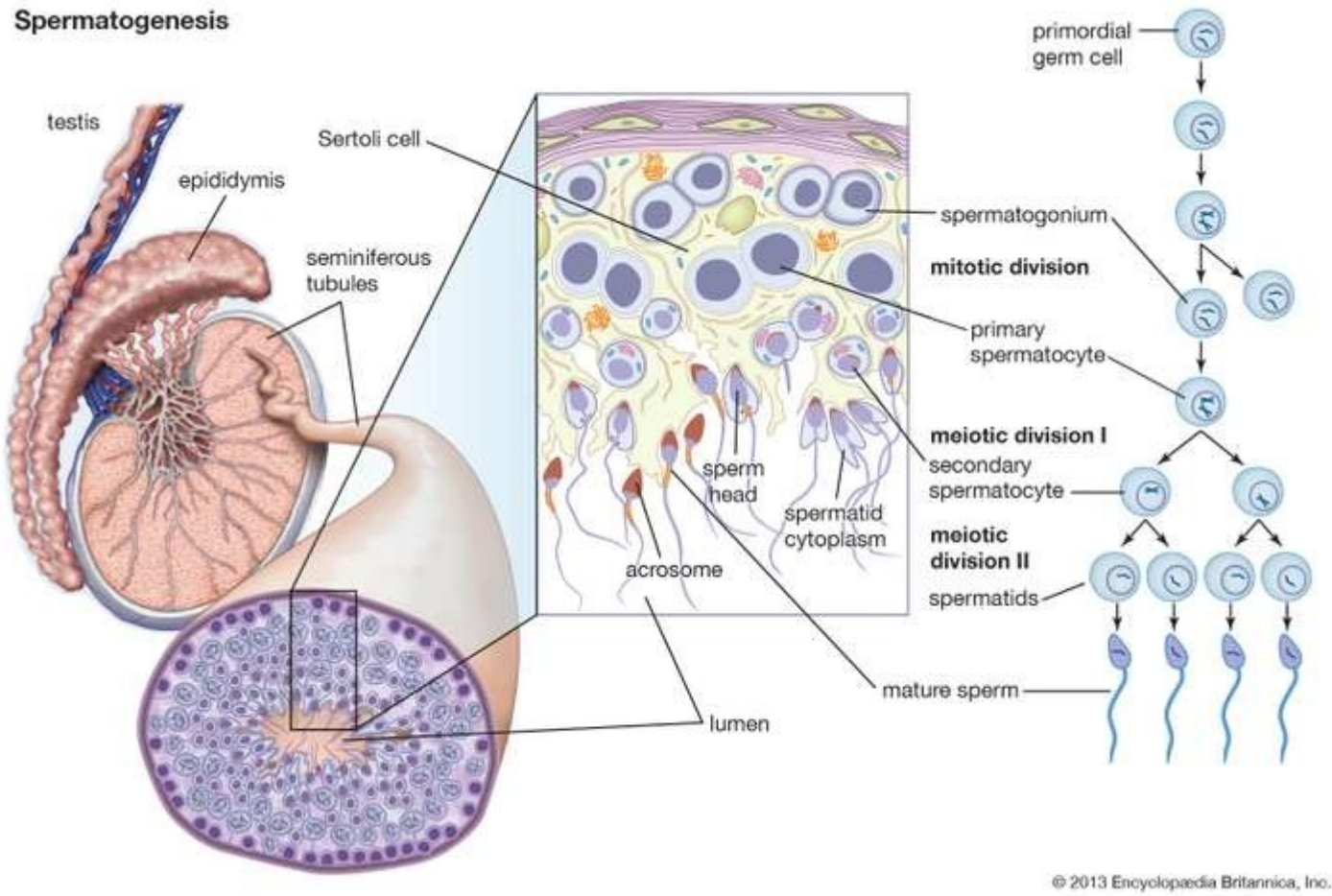
For example, testosterone treatment lowers sperm count, so Michael A. Werner, a specialist in andropause, or "male menopause," recommends that men who desire future fertility avoid testosterone treatments. Other side effects include increased risk of heart problems in older men with poor mobility, according to a study at Boston Medical Center. A 2017 published in JAMA, found that treatments increase coronary artery plaque volume. Additionally, the food and drug administration (FDA) requires manufactures to include a notice on the labeling that states taking testosterone treatments can lead to possible increased risk of heart attacks and strokes. The FDA recommends that patients using testosterone should seek medical attention right away if they have these symptoms:

- Chest pain
- Shortness of breath or trouble breathing
- Weakness in one part or one side of the body
- Slurred speech

The treatment can also increase the risk of sleep apnea, promote prostate and breast growth, and even encourage the development of prostate cancer

Spermatogenesis

Spermatogenesis, the origin and development of the sperm cells within the male reproductive organs, the testes. The testes are composed of numerous thin, tightly coiled tubules known as the seminiferous tubules; the sperm cells are produced within the walls of the tubules. Within the walls of the tubules, also, are many randomly scattered cells, called Sertoli cells, that function to support and nourish the immature sperm cells by giving them nutrients and blood products. As the young germ cells grow, the Sertoli cells help to transport them from the outer surface of the seminiferous tubule to the central channel of the tubule.



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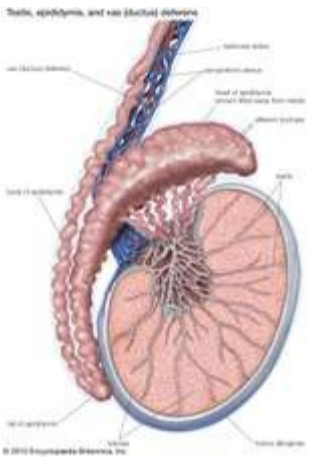

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The seminiferous tubules, in which the sperm are produced, constitute about 90 percent of the testicular mass. In the young male the tubules...

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 takes as long as 74 days to reach final maturation, and during this growth process there are intermittent resting phases.
The immature cells (called spermatogonia) are all derived from cells called stem cells in the outer wall of the seminiferous tubules. The stem cells are composed almost entirely of nuclear material. (The nucleus of the cell is the portion containing the chromosomes.) The stem cells begin their process by multiplying in the process of cell duplication known as mitosis. Half of the new cells from this initial crop go on to become the future sperm cells, and the other half remain as stem cells so that there is a constant source of additional germ cells. Spermatogonia destined to develop into mature sperm cells are known as primary sperm cells. These move from the outer portion of the seminiferous tubule to a more central location and attach themselves around the Sertoli cells. The primary sperm cells then develop somewhat by increasing the amount of cytoplasm (substances outside of the nucleus) and structures called organelles within the cytoplasm. After a resting phase the primary cells divide into a form called a secondary sperm cell. During this cell division there is a splitting of the nuclear material. In the nucleus of the primary sperm cells there are 46 chromosomes; in each of the secondary sperm cells there are only 23 chromosomes, as there are in the egg. When the egg and sperm combine and their chromosomes unite, the characteristics of both individuals blend and the new organism starts to grow.
The secondary sperm cell still must mature before it can fertilize an egg; maturation entails certain changes in the shape and form of the sperm cell. The nuclear material becomes more condensed and oval in shape;

this area develops as the head of the sperm. The head is covered partially by a cap, called the acrosome, which is important in helping the sperm to gain entry into the egg. Attached to the opposite end of the head is the tailpiece. The tail is derived from the secondary sperm cell’s cytoplasm. In the mature sperm, it consists of a long, slender bundle of filaments that propel the sperm by their undulating movement. Once the sperm has matured, it is transported through the long seminiferous tubules and stored in the epididymis of the testes until it is ready to leave the male body.