



WHAT IS THE ROLE OF THE TESTES? HOW IS TESTOSTERONE CONTROLLED?

- The testes (testicles) in men serve two main functions:
 - o Produce testosterone
 - o Produce sperm
- Testosterone production is controlled by the pituitary gland. The pituitary produces two hormones, called luteinizing hormone (LH) and follicle stimulating hormone (FSH), which stimulate the testes to produce testosterone and sperm. In turn, the pituitary can sense the level of testosterone and regulate the LH and FSH to maintain normal levels.

WHAT ARE SYMPTOMS OF LOW TESTOSTERONE?

Symptoms of low testosterone include:

- fatigue
- weakness
- loss of sexual desire (libido)
- difficulty with erections
- loss of endurance
- loss of muscle
- increased body fat
- slowed growth of the beard and body hair

Young men or boys with low testosterone during the teenage years may fail to go through puberty normally. Infertility can occur with low testosterone. Over time, low testosterone can cause weakness in the bones (osteoporosis) and predispose to bones which break easily. The symptoms of low testosterone are "non-specific," meaning that many other conditions cause similar symptoms, and not all men with these symptoms will have low testosterone.

WHAT CAUSES LOW TESTOSTERONE?

Low testosterone can be caused by problems with the testes or problems with the brain or pituitary gland.

1. Testicular problems. These include damage from injury, infection, or medications (such as chemotherapy), and certain inherited genetic abnormalities, such as a condition called Klinefelter's syndrome.
2. Brain/pituitary problems. Often these are idiopathic (unknown cause) and are frequently seen with aging.

Other potential problems include benign pituitary tumors, other tumors/growths near the pituitary, pituitary inflammation, high iron levels, and medications.

WILL I BE MONITORED WHEN TAKING TESTOSTERONE?

When taking testosterone, your doctor will ask you to come to clinic periodically to discuss symptoms and potential side effects, and to perform a physical exam.

Periodically, blood testing will be needed to measure your testosterone level, with the goal typically to have a level into the middle of the normal range.

Additional blood testing is generally performed to monitor your blood counts, and to monitor your PSA level if you are older than 45-50 years and have elected to have prostate cancer screening performed. Bone density testing may be performed to evaluate for osteoporosis.

HOW IS LOW TESTOSTERONE EVALUATED?

Evaluation of low testosterone will try to answer 3 main questions:

1. **Is testosterone low?** For several reasons, this question can be harder to answer than one might think. Testosterone levels are variable from day-to-day, and levels change throughout the day, particularly in younger men. Levels are highest in the morning, which is when testosterone should ideally be measured (8-10 am). Testosterone levels are also affected by protein levels in the blood. Sometimes low levels of protein will cause measurements of "total testosterone" to be low. Low total testosterone levels caused by protein alterations do not actually cause problems because normal amount of testosterone are still available to the tissues. Your doctor will measure "free testosterone" if this type of a problem is suspected. Free testosterone levels are a better, but still not perfect, measurement of testosterone when protein levels are altered.
2. **Why is testosterone low?** Once testosterone is confirmed to be low, the next step is to try and understand why this has occurred. Measurements of LH and FSH will show if the problem arises with the testicles (LH/FSH levels elevated) or the problem is with the brain/pituitary (LH/FSH not elevated). If the problem is at the level of the brain or pituitary, your doctor may ask you to have a pituitary MRI scan, and blood testing for prolactin and iron may be needed.
3. **How should testosterone be treated?** If the cause of low testosterone cannot be fixed, which is common, then testosterone therapy should be considered.



HOW IS LOW TESTOSTERONE TREATED?

There are 3 common options for treating low testosterone. The choice of method for testosterone replacement should be made after considering the pros and cons of each method.

1. Testosterone injection.

Testosterone injections are the oldest form of therapy available, and the least expensive. Injections are typically given every 1-3 weeks into the muscle. Many men find that this method of testosterone delivery has "peak and trough" effects. That is, the symptoms of low testosterone go away right after the injection, when levels are high. Levels then slowly drop, until the next injection, and symptoms gradually return. Some men may become irritable, short-tempered, or have difficulty sleeping for a few days after the injection, when levels are high. The "peak and trough" effects can be limited by giving a smaller dose of testosterone more often.. Also daily subcutaneous injections are an option, you can discuss with our physician. This is a very small amount of testosterone injected just under the skin usually in the fatty abdomen area. These can be done at home and are less likely to cause the "peak and trough" effect.

2. Testosterone gel.

Testosterone gel is placed on the skin daily, and provides consistent levels Gels are usually more expensive than injections. Skin irritation is uncommon. Because testosterone can be transferred to other people if there is vigorous or prolonged skin contact, the hands should be washed after application. *One partner should wear a T-shirt if there is vigorous skin-to-skin contact between a man and a woman, such as during sexual intercourse.*

3. Testosterone Pellets.

Pellets are a longer acting replacement option. Small pellets of testosterone are inserted just below the skin (subcutaneously) in the fatty area near your waist/buttocks. The area will be numbed with local anesthetic and a small incision will be made. A tool called a trocar is used to insert the pellets under your skin. The amount of pellets will be determined by your physician. They slowly release a steady low dose of testosterone into the body for 3-4 months. Pellets will require an appointment every 3 months to insert new pellets. This replacement method tends to keep levels more steady than other replacement methods.

Notes:

- If you are trying to have children, testosterone therapy does not promote sperm production and may cause the sperm count to go down. Please discuss with your doctor what alternative treatments may be available



WHAT ARE RISKS OF TESTOSTERONE THERAPY?

Testosterone therapy is generally safe and well-tolerated, but there are potential problems that can occur. Potential problems are summarized below:

- **Prostate cancer.** Prostate cancer is very common in men as they age. It is currently felt that testosterone therapy does not cause prostate cancer, but may stimulate any prostate cancer which is already present to grow and potentially cause problems. If you are older than 45-50 years old, you will need to decide with your doctor whether to have screening tests for prostate cancer performed.
- **Increased red blood cells.** A condition called "polycythemia" can arise as testosterone stimulates the body to produce red blood cells. If the level of red blood cells is too high, testosterone will need to be adjusted or stopped. Symptoms may include feeling warm or flushed, and looking red or "ruddy" to others.
- **Breast tenderness.** Swelling and tenderness in the breasts can occur, and usually improves after a few weeks.
- **Sleep apnea.** Sleep apnea can be worsened by testosterone. Sleep apnea is a condition in which the airway collapses at night, blocking flow of air. Symptoms include excessive daytime sleepiness and snoring. The sleep partner may witness "apneas" (times where breathing stops). Sleep apnea can be diagnosed by formal monitoring during sleep.
- **Urinary problems.** Blockage in urine flow, caused by growth in the prostate, is an uncommon side effect of testosterone. Symptoms include difficulty starting urination, a weak urine stream, frequent urination, and difficulty emptying the bladder completely.
- **Edema.** Swelling in the legs is occasionally seen, and is generally not a significant problem. If associated with difficulty breathing, your doctor should be notified immediately. If any of these problems occur (or if you have other problems that you think are related to testosterone), you should discuss these with your doctor.