

Secrets on How to

OPTIMIZE YOUR TESTOSTERONE

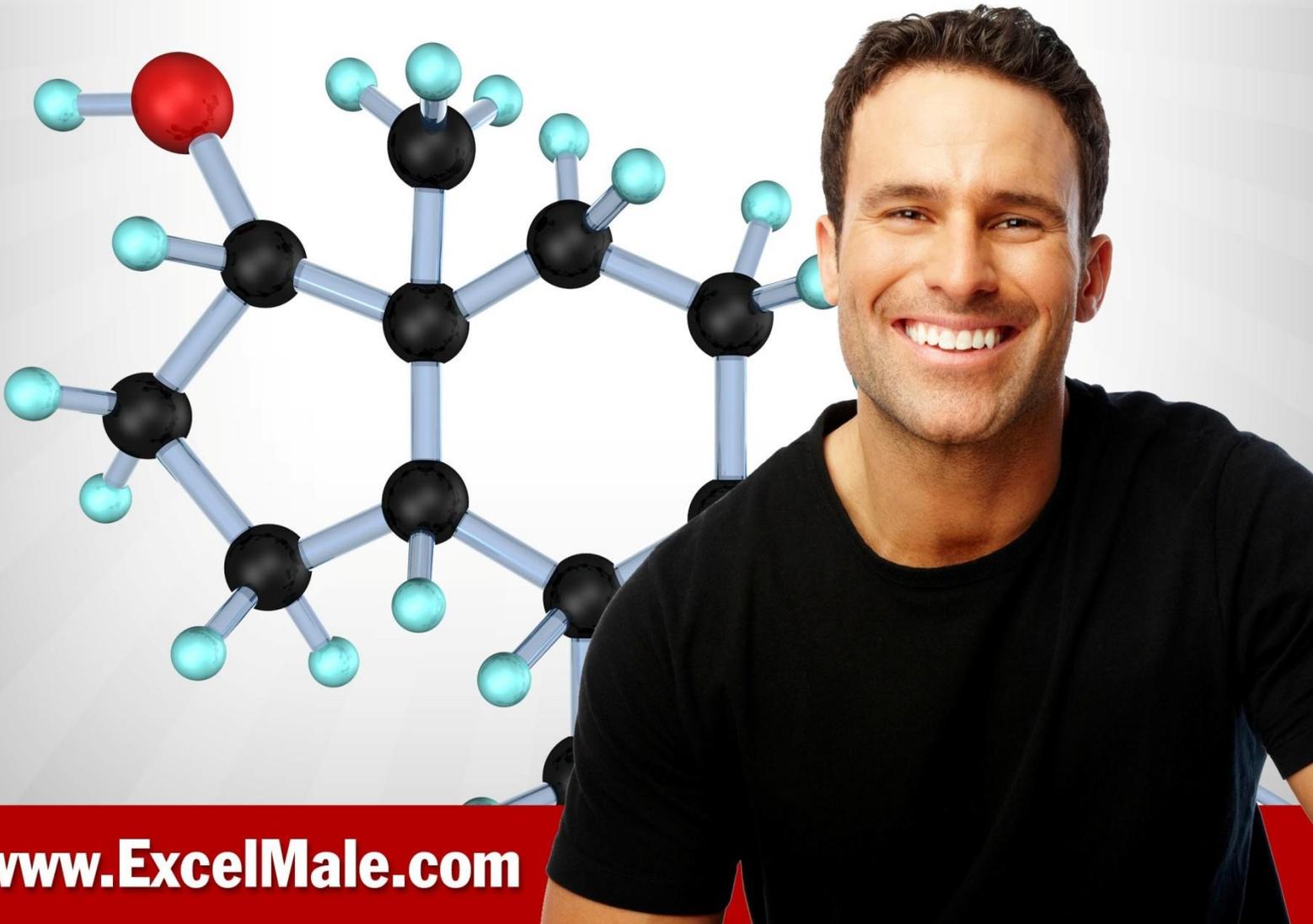


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What Is Testosterone and How Does It Work?

(Excerpts from: Testosterone: A Man's Guide)

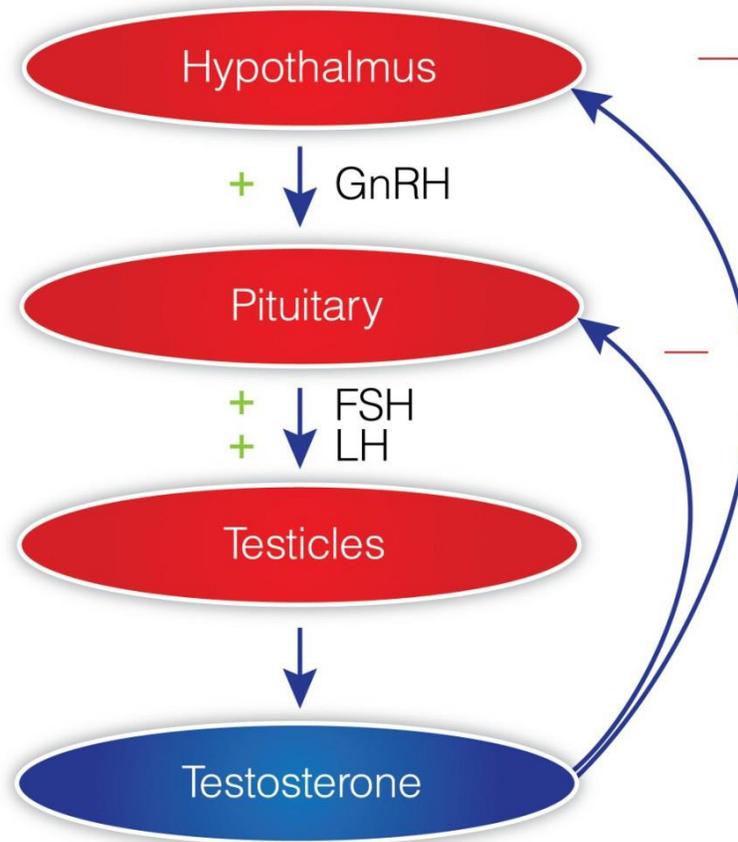
Testosterone is synthesized from cholesterol, which, in spite of its bad reputation, is an essential biochemical building block for many hormones and nervous-system molecules. It is the hormone responsible for normal growth and development and maintenance of male sex characteristics. It also affects lean body mass, mood and sexual function in both males and females. It is the primary androgenic (responsible for masculine characteristics) and anabolic (muscle building) hormone.

Testosterone is produced by the testicles in males and by the ovaries in females, with small amounts also produced by the adrenal glands in both genders. Its production and secretion are regulated by other hormones in a hormonal cascade.

The hormonal and reproductive function of the testicles (gonads) is regulated through interactions among the hypothalamus, the pituitary gland, and the gonads (commonly known as the hypothalamic-pituitary-gonadal axis [HPGA]). The three glands communicate through a cascade of hormones and a self-regulating feedback loop that controls the generation of each hormone.

Release of gonadotropin-releasing hormone (GnRH) from the hypothalamus regulates secretion of other hormones (gonadotropins) that influence the testicles by way of the pituitary. GnRH controls the secretion of two gonadotropin hormones- luteinizing hormone (LH) and follicle-stimulating hormone (FSH)- by the anterior pituitary. Luteinizing hormone regulates the production and secretion of testosterone through the Leydig cells of the testes, while FSH stimulates the production of sperm.

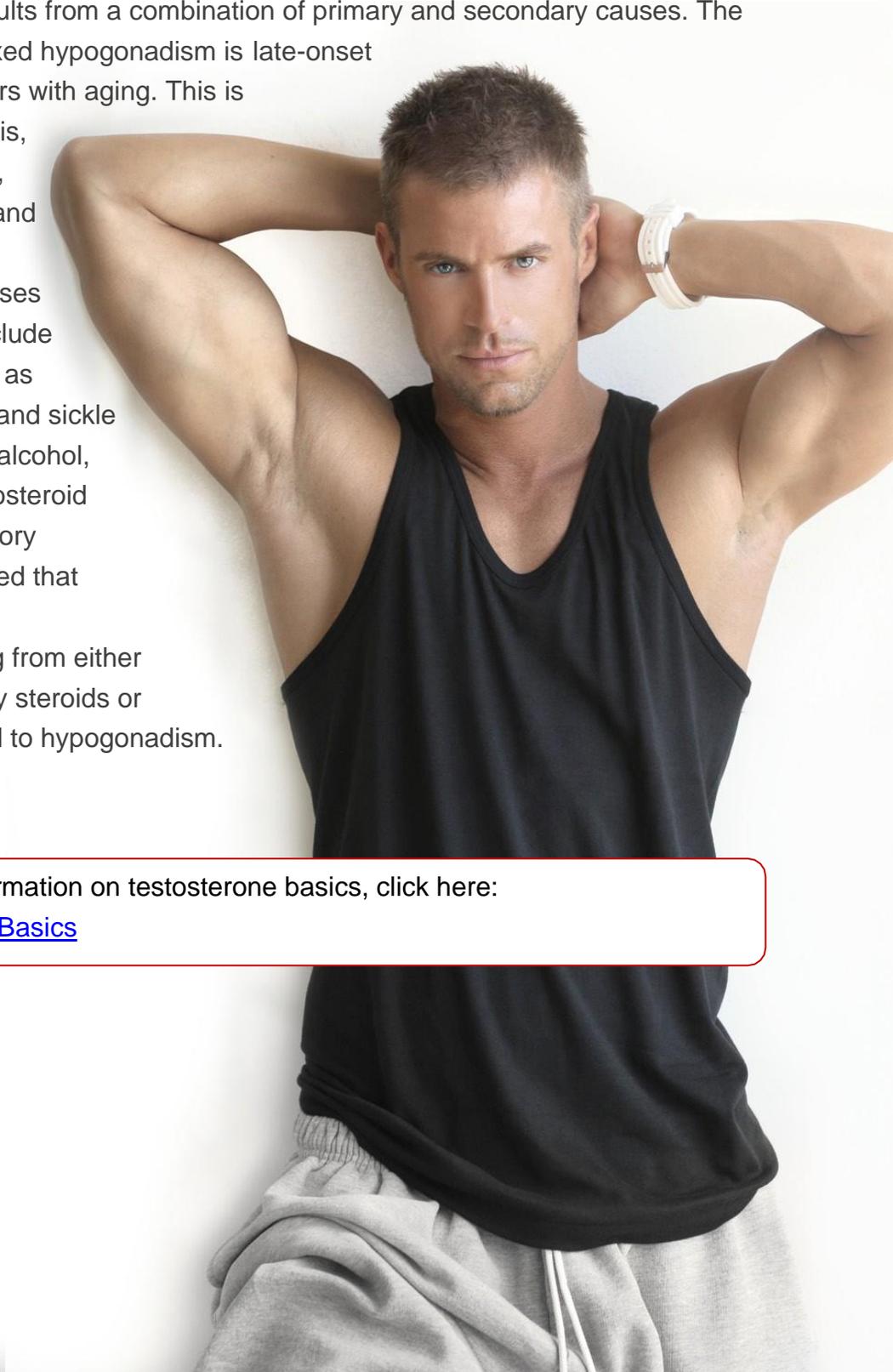




When someone is found to have low testosterone blood levels this is known as “hypogonadism” There are several types of hypogonadism:

- **Primary hypogonadism** is a hypergonadotropic condition (higher than normal levels of LH and FSH). This occurs when the testicles fail to produce sufficient levels of testosterone to suppress production of LH and FSH. As a result, LH and FSH levels are elevated while testosterone levels are decreased. The pituitary gland tries to increase testosterone at no avail even after increasing LH and FSH.
- **Secondary hypogonadism** results from hypothalamic or pituitary dysfunction. It is characterized by disruption of central components of the HPGA resulting in decreased levels of GnRH, LH, or FSH. In this type of hypogonadism, low levels of LH do not allow for the proper stimulation of the production of testosterone by the testes.

- **Mixed hypogonadism** results from a combination of primary and secondary causes. The most common cause of mixed hypogonadism is late-onset hypogonadism, which occurs with aging. This is associated with osteoporosis, decreased lean body mass, reduced cognition, fatigue and impairment of libido and erectile function. Other causes of mixed hypogonadism include alcoholism, diseases (such as uremia, liver failure, AIDS, and sickle cell disease), street drugs/ alcohol, and medications like corticosteroid steroids used for inflammatory conditions. It should be noted that high levels of cortisol (hypercortisolism), resulting from either the use of anti-inflammatory steroids or physical causes, could lead to hypogonadism.



For more information on testosterone basics, click here:

[Testosterone Basics](#)

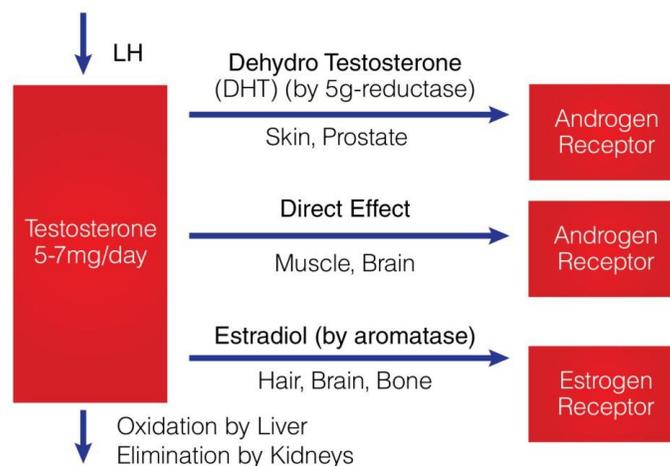
Testosterone Metabolites

Testosterone can convert into other hormones and metabolites. The process in which testosterone is converted into estrogen (a female hormone) by the aromatase enzyme is known as “aromatization”. Males with high body fat, aging males, males taking certain medications, males with sex chromosome genetic conditions such as Klinefelters Syndrome or males with a genetic disposition to having higher than normal amounts of aromatase may experience higher conversion of testosterone into estrogen. Estrogen blood levels are usually measured by detecting **estradiol**, the main estrogen in humans.

Estrogen is a very important hormone for men at the right concentration. It plays an important role in bone, hair, skin, and brain health as well as other functions in men. Large amounts of estrogen can cause mood swings, enlarged breasts (gynecomastia), fat gain, and water retention.

Another metabolite of testosterone is **dihydrotestosterone (DHT)**. DHT has a positive effect on sexual desire but increases the production of excess skin oil, (which can cause acne, hair loss, and prostatic inflammation). So, it is important to monitor and determine the proper dosage of testosterone so that estradiol and DHT are kept within reference ranges needed for healthy body function as well as to prevent unwanted side effects of TRT.

Testosterone Metabolites and Their Functions

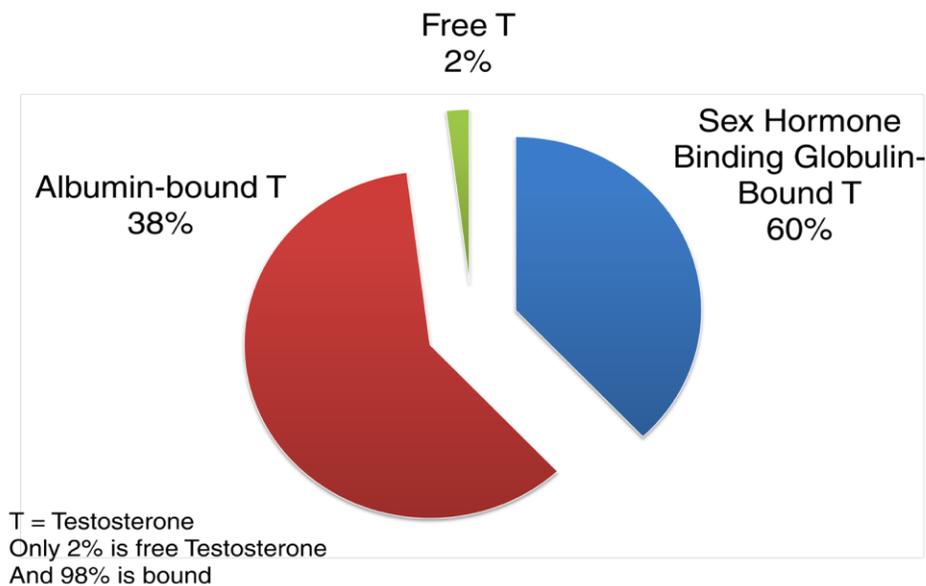


Testosterone Fractions

About 2 to 4 percent of the testosterone in the body is active. This “free testosterone” is not attached to binding proteins that would prevent it from interacting with its receptor.

About 40 percent of the body’s testosterone is attached to albumin. This is a protein that can release the hormone as the need for it arises in the body. Free testosterone and testosterone attached to albumin are referred to as “bioavailable testosterone”.

Testosterone Fractions in the Blood



In a healthy young male, about 60 percent of his testosterone is attached to sex hormone binding globulin (SHBG). Hormones bound to SHBG can’t be used by the body and lose their anabolic effect. As males grow older or if illness is present, SHBG sweeps up more and more testosterone, lowering free testosterone and its benefits.

Total testosterone is the sum of bioavailable testosterone and testosterone bound to SHBG. Measuring just the total testosterone in the blood may not provide the whole picture and let you know how much “active” or usable testosterone you have.

Normal Level of Testosterone

The normal levels of combined bound and free testosterone in male bodies can range anywhere from 300 to 1,100 ng/dL (nanograms per deciliter). Levels will vary with age and individual factors. It is useful to also measure the level of free testosterone as this may be more indicative of how hormone therapy is progressing. Levels of free testosterone can range between 0.3 and 5 percent of the total testosterone blood level, with above 2 percent considered an optimal level.

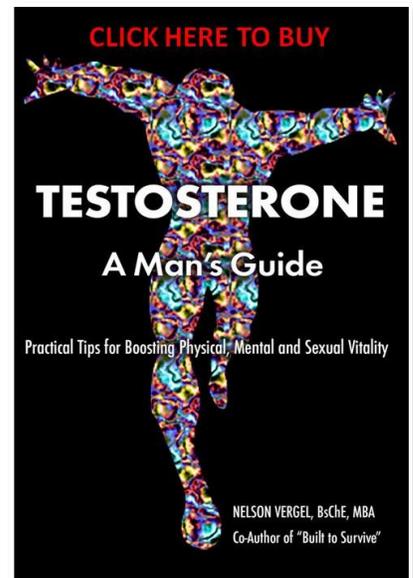
Higher than normal testosterone (i.e., above 1,100 ng/dL of total testosterone) can cause hair loss, acne, mood swings, mania in those with bipolar disorder, water retention, breast enlargement in men, increased aggression and hypersexual behavior, potential prostatic inflammation in older men, increases in the bad cholesterol (low density lipoprotein [LDL]), and decreases in the good cholesterol (high density lipoprotein [HDL]). Like everything in life, balance is key. Too much of a good thing can be detrimental.

Proper monitoring by an experienced physician is extremely important to ensure optimal levels of testosterone, to maximize benefits and to minimize side effects.

What Are the Symptoms of Low Testosterone (Deficiency)?

As mentioned previously, hypogonadism is the medical term for the condition in males that is caused when the body is not producing sufficient amounts of testosterone. What most people don't realize is that in addition to sexual desire, testosterone also affects lean body mass, strength, bone density, mental focus, mood, fat loss, and other important factors in both males and females.

Common complaints for men with hypogonadism include lower sexual desire (libido), erectile dysfunction (softer erections or lack of erections), depression, low energy and appetite, changes in body composition (lower lean body mass and higher abdominal fat), lower



strength, reductions in body and facial hair, less mental focus and decreased height and osteoporosis (decrease in bone density).

Normalizing testosterone in people who have lower than normal levels has dramatic benefits, among which are increased sexual desire, lean body mass, bone density, strength, mood, motivation, mental focus, and stamina. However, these benefits can be erased if proper monitoring, dose adjustment, and appropriate choice of testosterone replacement option are not accomplished.

- Restored sexual desire
- Improved erectile function
- Improved mood/ sense of wellbeing
- Increased lean body mass, strength and stamina
- Improved bone density
- Decreased fat mass

Determining If You Have Testosterone Deficiency

In addition to blood tests and physical examination, a brief screening instrument has also been developed by researchers at St. Louis University to aid in the diagnosis of hypogonadism. Known as the Androgen Deficiency in the Aging Male (ADAM) questionnaire:

- Do you have a decrease in sex drive?
- Do you lack energy?
- Have you experienced a decrease in strength and/or endurance?
- Do you feel shorter? Have you lost height? (Lower bone density can decrease height.)
- Have you noticed a decreased enjoyment of life?
- Are you sad and/or grumpy?
- Are your erections less strong or gone?
- Has it been more difficult to maintain your erection throughout sexual intercourse?

- Are you falling asleep after dinner?
- Has your work performance deteriorated recently?

If you answered Yes to number 1 or 7 or if you answer Yes to more than 3 questions, you may have low testosterone.

Other questions that are usually not asked by doctors, but which I've found to be important are the following:

- Are you relating well with people around you?
- Are you loving to your lover or life partner?
- Are you able to pay attention when someone talks to you?

In my life low testosterone caused problems that went far beyond sex and my body. It affected the way that I related to people and my ability to handle stress at work and in life.

Note that several of the above-mentioned problems can be caused by many other issues unrelated to low testosterone. Depression, anxiety, stress, medications and/or sleep disorders can cause nine of those 10 symptoms (decrease in height would be the only item unrelated to anything but bone loss or back surgery). This questionnaire is not a perfect predictor of low testosterone and should not replace tests for testosterone blood levels.

The benefit of this questionnaire is that it may encourage some men to seek medical advice. Then they can get their testosterone checked and have a physical examination to help determine whether they are indeed hypogonadal.

Causes of Testosterone Deficiency

As discussed before, hypogonadism is caused when the testicles fail to produce normal levels of testosterone. In one type of hypogonadism, testosterone levels are low, while LH and FSH are elevated. In another, there is not enough secretion of LH and FSH needed to tell the testicles to produce needed testosterone.

Some commonly used medications such as Megace (an appetite stimulant), Nizoral (an anti-fungal agent), Prednisone (an anti-inflammatory corticosteroid) and Tagamet (an antacid) can also lower testosterone production. Illness and aging can cause a decrease in testosterone and/ or an increase in sex hormone binding globulin (SHBG). Furthermore, high prolactin hormone levels may suggest a pituitary tumor that may be causing a decrease in testosterone production.

It is important that your doctor measure hormones in the HPGA cascade to diagnose what kind of hypogonadism you have. The most common kind of hypogonadism presents low testosterone with normal or elevated FSH and LH levels, which indicates that your testicles are not responding to the signals of both LH and FSH. This is what is called primary hypogonadism.

There are several reasons that testosterone levels may be low:

- Too much testosterone is being converted into estrogen through the activity of the aromatase enzyme, and/or the liver is failing to remove excess estrogen. This could be caused by heavy alcohol intake or the effect of some medications on estrogen clearance in the liver.
- Too much free testosterone is being bound by SHBG. This would be especially apparent if a male's total testosterone level is in the high reference range but his free testosterone (unbound) level is low. As previously mentioned, aging and illness increase SHBG.
- The pituitary gland, which controls testosterone production through the production of LH, is not secreting enough LH to stimulate production of testosterone by the testicles. In this case, total testosterone would be low.
- The hypothalamus is not functioning properly. LH levels of less than 2 ng/mL suggest a lesion in this part of the HPGA.
- The testicles have lost their ability to produce testosterone, despite adequate amounts of LH. In this case, the level of LH would be high (greater than 10 ng/mL) despite a low testosterone level.
- Disease or infections.
- Street drugs, prescription or over-the-counter medications (more on this later).

- Lab error.
- High prolactin levels, which may indicate the presence of a pituitary tumor that impairs production of hormones that tell your testicles to produce testosterone (rare condition but worth mentioning!)
- Defects in genes that affect LH and FSH production (caused by genetic mutations)
- Low or high thyroid hormones
- Obesity and sleep apnea

Diagnosis of Testosterone Deficiency

Lab work will play an important role in diagnosing hypogonadism. Your doctor will likely check your total testosterone and your free testosterone levels. There are some things you should know about these tests, including what they represent and when they should be done. For more information on required blood work, click here: [Blood Tests Pre and on TRT](#)

A “normal” total testosterone scale from most laboratories is generally between 300 and 1,000 ng/dL for men and between 25 and 90 ng/dL for women. The normal range from most laboratories for free testosterone usually is between 3.06 and 24 ng/dL for men and between 0.09 and 1.28 ng/dL for women. Table 2 shows the reference ranges for free testosterone according to age in men.

As mentioned earlier, free testosterone is not bound to blood carrier proteins, so it is “free” to diffuse readily into cells where it signals them to adjust their activity. Some studies report that free testosterone may be a better indicator for quality of life and lean body mass, but there are some conflicting studies on this issue.

Since aging and illness can increase SHBG, which can attach to testosterone to impair its effectiveness, it becomes more important to test for free testosterone if you are older or being challenged by illness.

Measures of free testosterone are controversial. The only standardized and validated method is equilibrium dialysis or by calculating free testosterone levels based on separate

measurements of testosterone and SHBG. Other measures of free testosterone are less accurate. So, make sure your doctor is using either one of these methods.

Testosterone decreases as we age. This decline is due to many factors that get in the way of retaining a healthy testosterone blood level. Among them are inflammatory states caused by being overweight, diet, medications, alcohol and street drug abuse, stress, lack of adequate sleep, and problems with how the body uses carbohydrates for energy (due to impaired function of the blood sugar controlling hormone insulin). Some experts also think that our own bodies are slowly turning down their engines to get ready for a slower pace and eventual death. However, many physicians in the aging field have now begun to believe that we can grow older while keeping our strength, sexual function, lean tissue, and cognitive function so that we have more “disability-free” years.

Testosterone levels can vary throughout the day. Young and adult men tend to have higher testosterone levels in the morning than in the evening. This variation is less evident as men age, however. This fact may explain why it's not uncommon for men to have morning erections.

Some physicians recommend doing hormone testing in the morning on an empty stomach, as many things can affect free testosterone measurements, including diet. Elevated insulin caused by eating carbohydrates, for instance, can increase free testosterone levels by reducing plasma levels of SHBG.

Some doctors tend to test this hormone in the late afternoon since the levels may be lower then. In my opinion, it is not practical to restrict testing of this hormone to early morning times and in a fasting state since intraday fluctuations are not that great in men over 30 and it may be equal to laboratory variability.

Normal values may vary from lab to lab depending on what reference range they use. Your doctor will have your test results in one to two days. Depending on the country, ranges are in nanograms per deciliter (usually in the United States) or nanomoles per liter (Europe and other countries). The conversion factor is:

$$\text{Testosterone in ng/dL} \times 0.035 = \text{Testosterone in nanomoles per liter}$$

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Total Testosterone for Males	
Age	
7 months to 9 years	Less than 30 ng/dL (< 1.04 nmol/L)
10–13 years	1–619 ng/dL (0.04–21.48 nmol/L)
14–15 years	100–540 ng/dL (3.47–18.74 nmol/L)
16–19 years	200–970 ng/dL (6.94–33.66 nmol/L)
20–39 years	270–1,080 ng/dL (9.00–37.48 nmol/L)
40–59 years	350–890 ng/dL (12.15–30.88 nmol/L)
60 years and older	350–720 ng/dL (12.15–24.98 nmol/L)

Reference Intervals for Free Testosterone (free is about 2-4 percent of total)	
Age	
20–29 years old	9.3–26.5 picograms/milliliter (pg/mL)
30–39 years old	8.7–25.1 pg/mL
40–49 years old	6.8–21.5 pg/mL
50–59 years old	7.2–24.0 pg/mL

How To Increase Testosterone Naturally

There are several lifestyle, nutritional and other factors that can increase testosterone production by testicles in men. The degree of this increase has not been clearly quantified, but there is evidence that the following can help. Some men may require additional testosterone replacement therapy to increase blood levels of total testosterone above the 500 ng/dL that usually enables a man to feel testosterone's benefits (improved sex drive, energy, mental focus, tolerance to stress, etc):

- 1 Sleep well. At least 7 -8 hours and keeping proper sleeping hours. *Reference*
- 2 Moderate alcohol consumption to no more than 2 drinks a day. *Reference*
- 3 Exercise for an hour, 3-4 times a week. Do not over train since this can decrease testosterone. *Reference*
- 4 Lower stress. Learn breathing exercises and set your phone up for alerts every 2 hours to remind you to take a deep breath. *Reference*
- 5 Some men may be deficient in zinc. Zinc is needed for proper testosterone production. 30-50 mg per day plus 3 mg of copper should be enough. *Reference*
- 6 Do not wear tight underwear. Let your testicles hang and cool off since high temperatures can affect sperm quality. Sleep in boxers or naked if you can to allow nocturnal blood flow and erections to your penis. It is nature's way to feed and regenerate your penis' tissues. *Reference*
- 7 Lose weight if overweight. Probably the most effective way to increase testosterone. *Reference*
- 8 Avoid pesticide exposure and do not heat up your food in plastic containers. Toxins can increase the conversion of testosterone to estradiol, a female based hormone. *Reference*
- 9 Have sex or masturbate. People who do tend to have higher testosterone. Even the use of Viagra has been associated with increased testosterone. *Reference*
- 10 Be aware that certain medications can decrease testosterone. These drugs include Ketoconazole, prednisone and corticoid steroids, anabolic steroids, Tagamet, Accutane, Proscar, Propecia, chemotherapy, metformin, statins, ibuprofen, prostate cancer treatments, and others. Cocaine, excessive pot use, and other street drugs can also decrease testosterone. *Reference, Reference, Reference*

If after all these changes your blood level of total testosterone is not above 400-500 ng/dL and you have symptoms of testosterone deficiency (lack of sex drive, fatigue, lack of mental focus, low tolerance to stress, etc.), you may need to talk to your doctor about prescription options to increase your testosterone.



For a review of options, read [Testosterone: A Man's Guide](#)



Testosterone Replacement Treatment Options

For men who have tried to increase their testosterone naturally and still cannot get their testosterone over 450 ng/mL, this information may be useful:



[Testosterone Replacement Therapy Treatment Options](#)

How Long Does Testosterone Take to Show Effects?

A published review of studies attempted to determine, from published studies, the time-course of the effects induced by testosterone replacement therapy from their first manifestation until maximum effects are attained.

This review found that:

- Effects on **sexual interest** appear after 3 weeks plateauing at 6 weeks, no further increments beyond.
- Changes in **erections/ejaculations** may require up to 6 months.
- Effects on **quality of life** manifest within 3-4 weeks, but maximum benefits take longer.
- Effects on **depressive mood** appear after 3-6 weeks with a maximum after 18-30 weeks.
- First effects on erythropoiesis (increased **red blood cells**) after 3 months, peaking at 9-12 months.
- **Prostate specific antigen and volume** rise, marginally, plateauing at 12 months; further increase related to aging rather than therapy.
- Effects on **lipids** appear after 4 weeks, maximal after 6-12 months. **Insulin sensitivity** may improve within few days, but effects on glycemic control become evident only after 3-12 months.

- Changes in **fat mass, lean body mass and muscle strength** occur within 12-16 weeks, stabilize at 6-12 months, but marginally continue to improve over years. Effects on **inflammation** occur within 3 to 12 weeks.
- Effects on **bone** detectable after 6 months but continue at least for 3 years.



Reference:

[Onset of effects of testosterone treatment and time span until maximum effects are achieved](#)

Blood Tests Required In TRT

After ensuring PSA is under 4, then these tests can be performed before starting testosterone.

Optimum Required Lab Work

1. CMP
2. Estradiol [4021X] (13- 54 pg/mL) (sensitive)\
3. Testosterone, Free, Bio/Total (LC/MS/MS) Code: 14966X
4. DHEAs
5. Comprehensive Metabolic Panel w/EGFR
6. CBC w/ diff/PLT
7. Lipid profile
8. T3, Free
9. T4, Free
10. TSH
11. LH & FSH

For follow up, LH and FSH can be dropped. Lipids and thyroid tests only once or twice a year depending on patient metabolic issues. CBC includes hematocrit, one of the main variables to

watch for on TRT at least for the first 6 months to a year. PSA could be added to 6 month follow up specially if over 2 at baseline.

The table below provides a guide to the "normal" ranges in men for the most common components measured in blood.

TEST		UNIT OF MEASURE	NORMAL ADULT MALE
Complete Blood Count (CBC)	Red Cells	million/mm ³	4.7 to 6.1
	White Cells	million/mm ³	5,000 to 10,000
	Hemoglobin	g/dl	14 to 18
	Hematocrit	%	42 to 52
	Platelets	mm ³	150,000 to 400,000
	MCV	µm ³	80 to 95
	MCH	pg	27 to 31
	MCHC	%	32 to 36
	Retics	% of total RBC	0.5 to 2
Iron Studies	Serum Iron	µg/dl	60 to 190
	Ferritin	ng/mL	123
	TIBC	µg/dl	250 to 420
Thyroid Profile	T3	ng/dL	110 to 230
	T4	µg/dL	5 to 10
	TSH	µU/mL	1 to 4
Liver Profile	AST	IU/L	5 to 40
	ALT	IU/L	5 to 35
	ALP	ImU/mL	30 to 85
	Bilirubin	mg/dL	0.1 to 1.0
	Cholesterol	mg/dL	150 to 250
Kidney Profile	Creatinine	mg/dL	0.57 to 1.00
	BUN	mg/dL	7 to 20
Adrenal Profile	Cortisol	µg/dL	4.3 to 22.4
	ACTH	pg/mL	6 to 48
Sex Hormones	GH	ng/mL	0 to 8
	FSH	mIU/mL	1.4 to 18.1
	LH	mIU/mL	1.5 to 9.3
	HCG	mIU/mL	0
	Progesterone	ng/mL	<1
	Estradiol	pg/mL	<54
	Prolactin	ng/mL	< 20
	Testosterone	ng/dL	375 to 1,200
		nmol/L	10 to 35
	Free testosterone	pg/mL	50-175
	pmol/L	260-740	
	nmol/L	6 to 50	



Testosterone Basic Information

1. How long does testosterone take to show effects?
2. Testosterone Replacement Treatment Options
3. How should doctors monitor men receiving testosterone replacement therapy?
4. Download Nelson Vergel's Testosterone and Erectile Function Lecture Handout
5. How to Find a Good Doctor that Prescribes Testosterone?
6. What is a Normal Blood Level of Testosterone?
7. How to Inject Testosterone Safely
8. HCG Information- A MUST READ
9. Excel Male - Code of Conduct
10. How to Increase Testosterone Naturally
11. Top Mistakes Men Make When Using Testosterone Replacement Therapy



How to Manage Side Effects

1. Testosterone Side Effect Management Table
2. The Use of HCG to Prevent / Reverse Testicular Shrinkage and Improve Sex Drive
3. Estradiol and Anastrozole (Arimidex)- What Every Man Should Know
4. How to Manage Polycythemia Caused by Testosterone Replacement Therapy



When Testosterone is Not Enough

1. Fatigue- When Testosterone Is Not Enough
2. Penis Injections for Hard Erections: TRIMIX
3. Erectile Dysfunction Risk Linked To How Many Medications Are Taken
4. When Testosterone Replacement Doesn't Lead to Better Erections



For information of optimum nutrition and supplementation: Click [here](#)



For Exercise suggestions: Click [here](#)

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