

Free Testosterone (FT)

MDL Test Number: 685

Methodology: Calculated
(from total testosterone and SHBG)

CPT Codes: 84403, 84270



Specimen Collection Platform:

Serum in Serum Separator Tube (SST)

Turnaround Time:

24 - 72 hours

Stability:

Room temperature

Test Additions*:

30 days to add tests

Specimen Collection:



1. Immediately after blood collection, invert the tube(s) gently 5 times to ensure mixing of clot activator.



2. Allow the tube to rest upright for at least 30 minutes after collection to ensure proper clotting.



3. Centrifuge for at least 15 minutes at 2200-2500 RPM within one hour of collection.



4. Do not remove the stopper or pour off serum.



What is Free Testosterone?

Most of the testosterone circulating in the blood is not available to the body. Roughly half is held tightly by a carrier protein called sex hormone-binding globulin, or SHBG, and most of the rest is held loosely by albumin, the commonest protein in blood. Only a small fraction

travels free. Free testosterone is that fraction, and it is the part that can enter cells and act.

This result is calculated rather than measured. It is worked out from a total testosterone result, an SHBG result on the same sample, and a standard value for albumin, using a published equation. The reason for doing it that way is that SHBG varies widely between people and moves with weight, thyroid function, insulin resistance, and estrogen. When SHBG is unusual, a total testosterone result can look normal while the amount actually available to the body is not, and the calculated free value is closer to what the tissues see.

Why test for Free Testosterone?

Free testosterone is used where the total result alone would be misleading. It is commonly ordered to:

- **Investigate signs of androgen excess in women**, including unwanted hair growth in a male pattern, acne that persists into adult life, thinning of the scalp hair, and irregular or absent periods.
- **Support the diagnosis of polycystic ovary syndrome, also called polyendocrine metabolic ovarian syndrome (PMOS/PCOS)**. The 2023 international guideline recommends a calculated free testosterone rather than a total one for this purpose, because SHBG is often low in this condition.
- **Look for nonclassical congenital adrenal hyperplasia (nonclassical CAH)**, a milder form of an adrenal enzyme problem that presents in adult women as androgen excess and can closely resemble PCOS/PMOS.
- **Make sense of a testosterone result in someone whose SHBG is expected to be abnormal**, including in obesity, insulin resistance, thyroid disease, and during estrogen treatment.
- **Investigate androgen excess that appears for the first time after menopause**, where the pattern and the speed of onset matter.
- **Assess suspected testosterone deficiency in men**, where professional guidance recommends a free testosterone when the total result is borderline or when SHBG is likely to be altered.



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Special Instructions:

- **Both parts must come from the same sample:** This result cannot be produced without a total testosterone and an SHBG measured on the same draw. If either is missing, or if the two come from samples taken at different times, the calculation is not valid.
- **When the sample should be drawn:** Testosterone is highest in the morning and falls throughout the day, so a morning sample is preferred. In women who are still having periods, the day of the cycle should be recorded on the request.
- **Medicines and hormone treatments:** Anything that changes SHBG changes this result, even when testosterone production has not altered. Estrogen taken by mouth, thyroid hormone, and some anticonvulsants raise SHBG; androgens, steroids, and insulin resistance lower it. Current medicines, including contraception and menopausal hormone therapy, should be listed on the request.
- **When very low levels are expected:** This calculation is built on a total testosterone result. That test is designed for the range typically seen in adult men, and its lowest reportable value is 20 ng/dL; results below that point are reported as less than 20 ng/dL. Levels in women, and particularly after menopause, often fall below this point.
- **Comparing results over time:** Laboratories use different equations and different testosterone and SHBG methods, so a calculated free testosterone from one laboratory cannot be compared with one from another. Repeat testing should be done at the same laboratory whenever possible.

Limitations:

Every laboratory test has limits. For free testosterone, the main ones are:

- This value is calculated, not measured. It carries every limitation of both tests it is built from, and anything that affects either the total testosterone or the SHBG result passes straight through into the calculated number.
- The calculation assumes an average albumin level of 43 grams per liter rather than measuring the patient's own. That assumption holds for most people but not for all. It is least reliable where albumin is genuinely low: in pregnancy, in liver disease, in kidney disease that causes protein loss, and in serious illness or malnutrition.
- The total testosterone measurement behind this calculation has a lowest reportable value of 20 ng/dL. Testosterone levels in women, and particularly after menopause, are often below this point, and those results are reported as less than 20 ng/dL rather than as an exact number. A value calculated from them carries the same limit.
- This is an estimate of the free fraction rather than a direct measurement of it. It agrees well enough with more elaborate methods to be useful in practice, but the number should be read as an estimate.
- A free testosterone result is one piece of a larger picture. It is meant to be read together with the patient's symptoms, medical history, and other test results — never on its own.

Reference Range(s):

Free testosterone is reported in nanograms per deciliter (ng/dL). Because the value is calculated rather than measured, the expected range depends on the two tests it is built from and on the equation used, and a range published by another laboratory does not apply to this one. The range below is established by this laboratory against its own testosterone and SHBG methods.

- **Adult females: PENDING LABORATORY VERIFICATION**
- **Adult males: PENDING LABORATORY VERIFICATION**

A result outside these ranges is not automatically a problem, and a result inside them does not rule one out. Only the ordering provider can interpret what a given number means for a given patient. Patients should always go by the reference range printed on their own laboratory report.

Analyte	Disorder	Expected Value*
Free T	PCOS / PMOS	↑↑
Free T	Nonclassical CAH	↑
Free T	Obesity	↑
Free T	Graves' disease	↓
Free T	Underactive thyroid (Hashimoto)	↑

*↑ – Increased ↓ – Decreased ↑↑ – Markedly Increased.

What are some references that discuss the medical necessity of testing Free Testosterone?

1. Vermeulen A, et al. A critical evaluation of simple methods for the estimation of free testosterone in serum. *J Clin Endocrinol Metab*, **84**, 3666–3672 (1999).
2. Teede HJ, et al. Recommendations from the 2023 International Evidence-based Guideline for the Assessment and Management of Polycystic Ovary Syndrome. *J Clin Endocrinol Metab*, **108**, 2447–2469 (2023).
3. Speiser PW, et al. Congenital adrenal hyperplasia due to steroid 21-hydroxylase deficiency: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*, **103**, 4043–4088 (2018).
4. Thaler MA, et al. The biomarker sex hormone-binding globulin – from established applications to emerging trends in clinical medicine. *Best Pract Res Clin Endocrinol Metab*, **29**, 749–760 (2015).
5. Krassas GE, et al. Thyroid function and human reproductive health. *Endocr. Rev.*, **31**, 702–755 (2010).
6. Bhasin S, et al. Testosterone therapy in men with hypogonadism: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*, **103**, 1715–1744 (2018).



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