

Free Testosterone Testing in Males

July 2012

On June 18, 2012, Legacy Laboratory Services introduced several new tests to the menu:

Description	Mnemonic	Tests Reported
Sex Hormone-Binding Globulin in Males and Females	SHBG S	SHBG (nmol/L)
Free and Total Testosterone in Adult Males (16 and over)	TESTOS FTM	Free Testosterone (pg/mL) % Free Testosterone Total Testosterone (ng/dL) SHBG (nmol/L)
Free Testosterone only in Adult Males (16 and over)	TESTOS FM	Free Testosterone (pg/mL)

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Clinical evaluation of serum testosterone assists in the evaluation of hypogonadal males. Usually, Free Testosterone levels parallel the Total Testosterone level. There are a number of conditions and medications that are known to increase or decrease sex hormone binding globulin (SHBG) concentration. Major causes of lowered testosterone in males include hypogonadotropic hypogonadism, testicular failure, hyperprolactinemia, hypopituitarism, some types of liver and kidney diseases, and critical illness. In adult men, there is a gradual modest, but progressive, decline in testosterone production starting between the fourth and sixth decades of life. Since this is associated with a simultaneous increase of SHBG levels, free testosterone may decline more significantly than apparent total testosterone.

The concentration of Total Testosterone and SHBG in serum is measured by chemiluminescence. The concentration of Free Testosterone is derived from Vermeulen's¹ mathematical expression based on constants for the binding of testosterone to albumin and SHBG. This calculation assumes that the albumin concentration is a constant (4.3 g/dL). **The Free Testosterone tests mentioned above are performed on males greater than or equal to 16 years old only.**

NOTE: The Total Testosterone concentration from males less than 16 years old or females of any age can be too low to use chemiluminescent methods. Specimens from these patients will continue to be referred to a laboratory that uses tandem mass spectrometry to measure Testosterone.

Collection guidelines and reference ranges have changed (please refer to the table below). If you have further questions, please contact Client Services at (503) 413-1234.

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Collection Guidelines

Table 1: Specimen Requirements for SHBG and Free Testosterone

Description	Sex Hormone-Binding Globulin	Testosterone Free and Total Male Adult	Testosterone Free Only Male								
Order Code	SHBG S	TESTOS FTM	TESTOS FM								
Includes	SHBG (nmol/L)	Free Testosterone (pg/mL), % Free Testosterone, Total Testosterone (ng/dL), SHBG (nmol/L)	Free Testosterone (pg/mL)								
Patient Preparation	None	Morning specimen collected between 6-10 AM is preferred.									
Collect	Serum, one 5.0 mL gold (SST) or 7.0 mL red top tube										
Handling	Allow serum to clot completely at room temperature (minimum: 30 minutes). Centrifuge and separate serum from cells within two hours of collection.										
Preferred Volume	1.0 mL serum	2.0 mL serum	2.0 mL serum								
Minimum Volume	0.3 mL serum	0.6 mL serum	0.6 mL serum								
Transport	Refrigerated (2-8°C)										
Rejection Criteria	Grossly hemolyzed specimens. Plasma will not be accepted. Specimens that have been frozen and thawed more than once.										
Performed	Tuesday through Saturday										
Turn-around Time	24-72 hours										
Stability	After separation from cells: <table border="0"> <tr> <td>Temperature</td> <td>Time Period</td> </tr> <tr> <td>Ambient (20-25°C)</td> <td>4 hours</td> </tr> <tr> <td>Refrigerated (2-8°C)</td> <td>5 days</td> </tr> <tr> <td>Frozen (≤ -20°C)</td> <td>1 month</td> </tr> </table>			Temperature	Time Period	Ambient (20-25°C)	4 hours	Refrigerated (2-8°C)	5 days	Frozen (≤ -20°C)	1 month
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Table 2: Reference Ranges for SHBG

Males			Females		
Age	SHBG (nmol/L)		Age	SHBG (nmol/L)	
	Low	High		Low	High
1-30 days	17	92	1-30 days	18	66
31-364 days	76	262	31-364 days	66	226
1-3 years	56	190	1-3 years	66	200
4-6 years	50	185	4-6 years	61	180
7-9 years	33	200	7-9 years	40	180
10-12 years	28	169	10-12 years	22	164
13-15 years	17	149	13-15 years	15	128
16-17 years	14	66	16-17 years	24	154
≥ 18 years	15	87	≥ 18 years	35	143
Tanner I	31	196	Tanner I	35	183
Tanner II	27	179	Tanner II	20	135
Tanner III	17	111	Tanner III	16	105
Tanner IV	15	66	Tanner IV	18	160
Tanner V	15	77	Tanner V	28	174

Table 3: Reference Ranges for Free Testosterone

Age	Free Testosterone in Males
16-17 years	38 to 173 pg/mL
≥18 years	47 to 244 pg/mL
Tanner IV	35 to 169 pg/mL
Tanner V	41 to 239 pg/mL

Age	% Free Testosterone in Males
≥18 years	1.6 to 2.9%

References

1. Vermeulen A, Verdonck L, and Kaufman JM, A critical Evaluation of Simple Methods for the Estimation of Free Testosterone in Serum, 1999. J Clin Endocrinol Metab 84: 3666-3672.
2. De Ronde, W, et al. Calculation of Bioavailable and Free Testosterone in Men: A Comparison of 5 Published Algorithms, Clin Chem, 2006. 52: 777-1784.