


Clinical Use


- Assess androgen status in male hypogonadism; female hirsutism, virilization, acne, and amenorrhea; or in pediatric patients

Reference Range

See next page.

Interpretive Information

-  • Polycystic ovarian disease
- Cushing's disease
- Congenital adrenal hyperplasia
- Androgen resistance

-  • Hypogonadism
- P-450_{c17} enzyme deficiency
- Delayed puberty in boys
- Gonadotropin deficiency
- Testicular defects

Clinical Background

Most testosterone is transported in blood by sex hormone binding globulin (SHBG). Free testosterone is the small amount of testosterone circulating unbound. Blood testosterone levels are dependent on rates of production, interconversion, metabolic clearance, and SHBG concentration. SHBG levels are altered by medications, disease, sex steroids, and insulin. SHBG increases with age in men and decreases with androgen excess in hirsute women. Thus, determination of free testosterone more accurately reflects the level of bioactive testosterone than measurements of total testosterone and offers greater sensitivity in diagnosis of hypogonadism in aging men and evaluation of mildly hyperandrogenic women.

In general, total testosterone by ICMA, a less technically demanding and more economical procedure, is satisfactory for screening potential male hypogonadism. The Endocrine Society has stated that ICMA or other "direct" assays are unreliable for diagnosing patients with low levels (eg, <300 ng/dL) of testosterone.

Method

Testosterone, Total

- Liquid chromatography tandem mass spectrometry (LC/MS/MS)

Testosterone, Free

- Calculation

Testosterone, Bioavailable

- Calculation

SHBG

- Immunochemiluminometric assay (ICMA)

Albumin

- Spectrophotometry

Specimen Requirements

2.8 mL refrigerated serum (no additive red top tube); 1.3 mL minimum

SST red top unacceptable

Continued

Testosterone, Calculated Free, Bioavailable, and Total *(continued)*

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Alphabetical Test Section

Reference Range		
Testosterone, Free	Males	Females
Adults	pg/mL	pg/mL
18-69 y	46.0-224.0	0.2-5.0
70-89 y	6.0-73.0	0.3-5.0
Children		
1-10.9 y	≤1.3	≤1.5
11-11.9 y	≤1.3	≤1.5
12-13.9 y	≤64.0	≤1.5
14-17.9 y	4.0-100.0	≤3.6
Testosterone, Bioavailable	ng/dL	ng/dL
Adults		
18-69 y	110.0-575.0	0.5-8.5
70-89 y	15.0-150.0	0.5-8.8
Children		
1-11.9 y	≤5.4	≤3.4
12-13.9 y	≤140.0	≤3.4
14-17.9 y	8.0-210.0	≤7.8
SHBG	nmol/L	nmol/L
Adults		
18-29 y	7-44	8-112
30-39 y	5-49	9-107
40-49 y	8-46	8-96
50-59 y	15-49	10-89
60-69 y	23-38	20-102
70-79 y	21-68	21-76
80-91 y	20-63	
80-84 y		26-77
Children		
3-9 y	18-136	18-136
10-13 y	17-123	17-123
14-17 y	11-71	11-71
Tanner stages		
I	39-155	38-114
II	33-135	24-90
III	21-72	22-112
IV	11-92	22-69
V	18-54	18-76
Albumin	3.6-5.1 g/dL	

See *Testosterone, Total (Women, Children, Hypogonadal Males), LC/MS/MS* for total testosterone reference ranges.