EAGLE BIOSCIENCES

Free Testosterone ELISA Kit

Catalog Number:
TSF31-K01 (1 x 96 wells)
For Research Use Only. Not for use in diagnostic procedures.
v. 9.0 (effective 23JAN2023)

EAGLE BIOSCIENCES, INC.
20A Northwest Blvd., Suite 112, Nashua, NH 03063
Phone: 617-419-2019 Fax: 617-419-1110
WWW.EAGLEBIO.COM

INTENDED USE

The Eagle Biosciences Free Testosterone ELISA Kit (enzyme-linked immunoassay kit) is intended for the quantitative measurement of free testosterone in human serum. The Eagle Biosciences Free Testosterone ELISA Kit is for research use only and not to be used in diagnostic procedures.

For further information about this kit, its application, or the procedures in this insert, please contact the Technical Service Team at Eagle Biosciences, Inc at www.EagleBio.com or at 866-411-8023.

LIMITATIONS RELATED TO INTENDED USE

1. This test is not intended to be used for screening purposes.
2. This test is not intended for home testing or self-testing.
3. The kit is calibrated for the determination of free testosterone in human serum. The kit is not calibrated for the determination of free testosterone in other specimens of human or animal origin.
4. The results obtained with this kit shall never be used as the basis for a clinical diagnosis or for therapeutic decisions.
5. Although common interfering substances have been evaluated with this test, other substances that have not been evaluated such as drugs and the occurrence of heterophilic antibodies in individuals regularly exposed to animals or animal products have the potential of causing interferences.

ASSAY BACKGROUND

Testosterone is a C-19 steroid secreted from the testis and the adrenal cortex in men and from the adrenal cortex and ovaries in women. Testosterone is also produced by peripheral tissues from androstenedione, which is of little physiological significance in men; in women however, about half of the circulating testosterone is derived from this origin. Testosterone measurements are used mainly for clinical evaluation of hypogonadism in males and hyperandrogenic states in females.

Testosterone circulates in the blood bound to three proteins: sex hormones binding globulin (60-80%), albumin and cortisol binding globulin. Only about 1-2% of the total circulating testosterone remains unbound or free. Even though it is still under investigation, most researchers accept the free testosterone determination as a measure of the biologically active fraction. Free testosterone determinations are recommended to overcome the influences caused by variations in transport proteins on the total testosterone concentration.

PRINCIPLE OF THE ASSAY

This Eagle Biosciences Free Testosterone ELISA Kit is a competitive immunoassay. Competition occurs between free testosterone present in standards, controls, specimen samples and an enzyme-labelled antigen (HRP conjugate) for a limited number of anti-free testosterone antibody binding sites on the microplate wells. After a washing step that removes unbound materials, the TMB substrate (enzyme substrate) is added which reacts with HRP to form a blue colored product that is inversely proportional to the amount of free testosterone present. Following an incubation, the enzymatic reaction is terminated by the addition of the stopping solution, converting the color from blue to yellow. The absorbance is measured on a microplate reader at 450 nm. A set of standards is used to plot a standard curve from which the amount of free testosterone in specimen samples and controls can be directly read.

PROCEDURAL WARNINGS AND PRECAUTIONS

- This kit is for use by trained laboratory personnel (professional use only). For research use only.
- Practice good laboratory practices when handling kit reagents and specimens. This includes:
- Do not pipette by mouth.
- Do not smoke, drink, or eat in areas where specimens or kit reagents are handled.

- Wear protective clothing and disposable gloves.
- Wash hands thoroughly after performing the test.
- Avoid contact with eyes, use safety glasses; in case of contact with eyes, flush eyes with water immediately and contact a doctor.
- Users should have a thorough understanding of this protocol for the successful use of this kit. Reliable performance will only be attained by strict and careful adherence to the instructions provided.
- Do not use this kit beyond the expiry date stated on the label.
- If the kit reagents are visibly damaged, do not use the test kit.
- Do not use kit components from different kit lots within a test and do not use any component beyond the expiration date printed on the label.
- All kit reagents and specimens must be brought to room temperature and mixed gently but thoroughly before use. Avoid repeated freezing and thawing of specimens.
- When the use of water is specified for dilution or reconstitution, use deionized or distilled water.
- Immediately after use, each individual component of the kit must be returned to the recommended storage temperature stated on the label.
- A standard curve must be established for every run.
- It is recommended to all customers to prepare their own control materials or sample pools which should be included in every run at a high and low level for assessing the reliability of results.
- The controls (if applicable with this kit) must be included in every run and their results must fall within the ranges stated in the quality control certificate; a failed control result might indicate improper reagent storage.
- When dispensing the substrate and stopping solutions, do not use pipettes in which these liquids will come into contact with any metal parts.
- The TMB Substrate is sensitive to light and should remain colorless if properly stored. Instability or contamination may be indicated by the development of a blue color, in which case it should not be used.
- Do not use grossly hemolyzed, grossly lipemic, icteric or improperly stored serum.
- Samples or controls containing azide or thimerosal are not compatible with this kit, they may lead to false results.
- Avoid microbial contamination of reagents.
- To prevent the contamination of reagents, use a new disposable pipette tip for dispensing each reagent, sample, standard, and control.
- To prevent contamination of reagents, do not pour reagents back into the original containers.
- Kit reagents must be regarded as hazardous waste and disposed of according to local and/or national regulations.
- Consumables used with the kit that are potentially biohazardous (e.g., pipette tips, bottles or containers containing human materials) must be handled according to biosafety practices to minimize the risk of infection and disposed of according to local and/or national regulations relating to biohazardous waste.
- This kit contains 1 M sulfuric acid in the stopping solution component. Do not combine acid with waste material containing sodium azide or sodium hypochlorite.
- The use of safety glasses, and disposable plastic, is strongly recommended when manipulating biohazardous or bio-contaminated solutions.
- Proper calibration of the equipment used with the test, such as the pipettes and absorbance microplate reader, is required.
- If a microplate shaker is required for the assay procedure, the type and speed of shaker required is stated in the REAGENTS AND EQUIPMENT NEEDED BUT NOT PROVIDED section. Both the type

and speed of shaker used can influence the optical densities and test results. If a different type of shake and/or speed is used, the user is responsible for validating the performance of the kit.

- Do not reuse the microplate wells, they are for SINGLE USE only.
- To avoid condensation within the microplate wells in humid environments, do not open the pouch containing the microplate until it has reached room temperature.
- Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the participant is established.
- When reading the microplate, the presence of bubbles in the wells will affect the optical densities (ODs). Carefully remove any bubbles before performing the reading step.

SAFETY CAUTIONS AND WARNINGS

BIOHAZARDS

The reagents should be considered a potential biohazard and handled with the same precautions applied to human specimens, All human specimens should be considered a potential biohazard and handled as if capable of transmitting infections and in accordance with good laboratory practices.

CHEMICAL HAZARDS

Avoid direct contact with any of the kit reagents. Specifically avoid contact with the TMB Substrate (contains tetramethylbenzidine) and Stopping Solution (contains sulfuric acid). If contacted with any of these reagents, wash with plenty of water and refer to SDS for additional information.

SPECIMEN COLLECTION, STORAGE, AND PRE-TREATMENT

Specimen Collection & Storage

Approximately 0.1 mL of serum is required per duplicate determination. Collect 4-5 mL of venous blood into an appropriately labeled tube and allow it to clot. Centrifuge at room temperature and carefully transfer the serum into a new storage tube or container. Serum samples may be stored at 2-8°C for up to 24 hours or at -10°C or lower if the analyses are to be done at a later date.

Specimen Pre-Treatment

Specimen pre-treatment is not required.

REAGENTS AND EQUIPMENT NEEDED BUT NOT PROVIDED

- Calibrated single-channel pipette to dispense 25 µL.
- Calibrated multi-channel pipette to dispense 50 µL. 100 µL, and 150 µL
- Calibrated multi-channel pipettes to dispense 350 µL (if washing manually)
- Automatic microplate washer (recommended)
- Disposable pipette tips
- Distilled or deionized water
- Calibrated absorbance microplate reader with a 450 nm and an upper OD limit of 3.0 or greater
- A 37°C incubator.

REAGENTS PROVIDED

1. **Microplate**

Contents:	One anti-free testosterone polyclonal antibody-coated 96-well (12x8) microplate in a resealable pouch with desiccant.
Format:	Ready to Use
Storage:	2-8°C

Stability: Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks.

2. **HRP-Conjugate (51x)**

Contents: One bottle containing free testosterone-Horse Radish Peroxidase (HRP) conjugate in a protein-based buffer with a non-mercury preservative.
Format: Concentrated; Requires Preparation
Volume: 0.3 mL/bottle
Storage: 2-8°C
Stability: Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks.
Preparation: **Dilute 1:51** in assay buffer before use (e.g., 40 µL of conjugate concentrate in 2 mL of assay buffer). If the whole plate is to be used dilute 240 µL of conjugate concentrate in 12 mL of assay buffer. Discard any that is left over.

3. **Standard A - F**

Contents: Six bottles of standard containing specified free testosterone concentrations. Human serum-based buffer with a non-mercury preservative. Prepared by spiking buffer with defined quantities of testosterone.

Listed below are approximate concentration, please refer to vial labels for exact concentrations.
Concentrations: 0, 0.1, 1, 5, 20, 60 pg/mL
Format: Ready to Use
Volume: 0.5 mL/bottle
Storage: 2-8°C
Stability Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks.

4. **Control 1 - 2**

Contents: Two bottles of control containing different free testosterone concentrations. Human serum-based buffer with a non-mercury preservative. Prepared by spiking buffer with defined quantities of testosterone.
Refer to the QC certificate for the target values and acceptable ranges.
Format: Ready to Use
Volume: 0.5 mL/bottle
Storage: 2-8°C
Stability: Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks.

5. **Assay Buffer**

Contents: One bottle containing a protein-based buffer with a non-mercury preservative.
Format: Ready to Use
Volume: 15 mL/bottle
Storage: 2-8°C

Stability: Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks.

6. **TMB Substrate**

Contents:	One bottle containing a tetramethylbenzidine and hydrogen peroxide in a non-DMF or DMSO containing buffer.
Format:	Ready to Use
Volume:	16 mL/bottle
Storage:	2-8°C
Stability:	Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks.

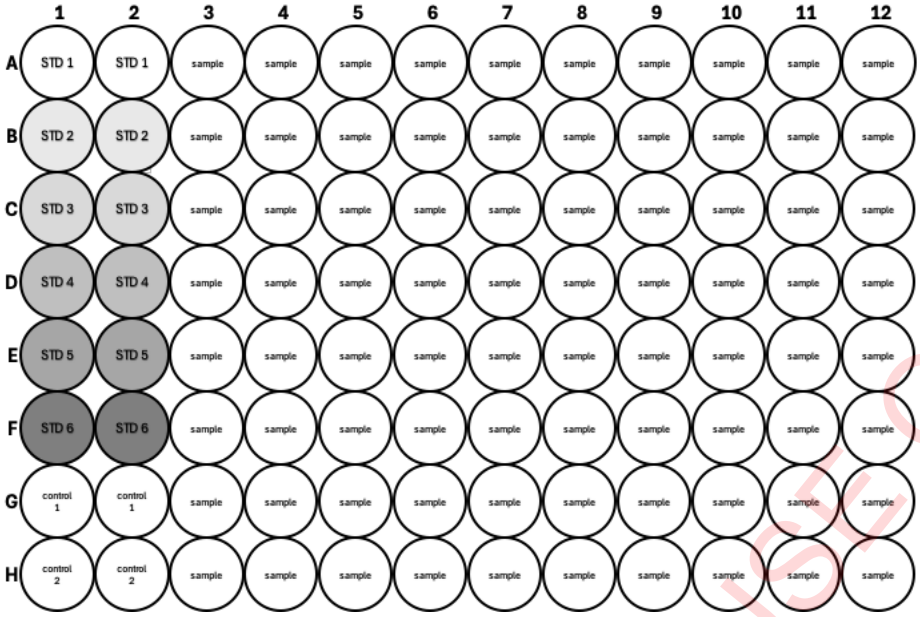
7. **Stopping Solution**

Contents:	One bottle containing 1M sulfuric acid.
Format:	Ready to Use
Volume:	6 mL/bottle
Storage:	2-8°C
Stability	Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks

8. **Wash Buffer Concentrate (10x)**

Contents:	One bottle containing buffer with a non-ionic detergent and a non-mercury preservative
Format:	Concentrated; Requires Preparation
Volume:	50 mL/ bottle
Storage:	2-8°C
Stability:	Unopened: Stable until the expiry date printed on the label. After Opening: Stable for four weeks. Following Preparation: The wash buffer working solution is stable for 2 weeks following preparation, assuming Good Laboratory Practices are adhered to. To prevent microbial growth, prepare the wash buffer working solution in a clean container and store under refrigerated conditions (2-8°C) when not in use.
Preparation:	**Dilute 1:10** in distilled or deionized water before use. If the whole microplate is to be used dilute 50 mL of the wash buffer concentrate in 450 mL of distilled or deionized water.

RECOMMENDED ASSAY LAYOUT*



***** *Layout subject to change based on standard and control quantities*

ASSAY PROCEDURE

All kit components, controls, and specimen samples must reach room temperature prior to use. Standards, controls, and specimen samples should be assayed in duplicate. Once the procedure has been started, all steps should be completed without interruption.

1. After all kit components have reached room temperature, mix gently by inversion.
2. Prepare the HRP Conjugate Working Solution and Wash Buffer Working Solution (see Reagents Provided).
3. Plan the microplate wells to be used for standards, controls, and samples. (See Recommended Assay Layout). Remove the strips from the microplate frame that will not be used and place them in the bag with desiccant. Reseal the bag with the unused strips and return it to the refrigerator.
4. **Pipette 25 µL** of each standard, control and specimen sample into assigned wells.
5. **Pipette 100 µL** of the HRP Conjugate Working solution into each well (the use of a multichannel pipette is recommended.)
6. Gently shake the microplate frame for 10 seconds to mix the contents of the well.
7. **Incubate** the microplate inside a **37°C incubator** for **1 hour**.
8. Wash the microplate wells with an automatic microplate washer (preferred) or manually as stated below.
    a. Automatic: Using an automatic microplate washer, perform a 3-cycle wash using **350 µL/well** of Wash Buffer Working Solution (3 x 350 µL). One cycle consists of aspirating all wells then filling each well with 350 µL of Wash Buffer Working Solution. After the final wash cycle, aspirate all wells and then tap the microplate firmly against absorbent paper to remove any residual liquid.
    b. Manually: Using an automatic microplate washer, perform a 3-cycle wash using **350 µL/well** of Wash Buffer Working Solution (3 x 350 µL). One cycle consists of aspirating all wells by briskly emptying the contents of the wells over a waste container, then pipetting 350 µL of Wash Buffer Working Solution into each well using a multi-channel pipette. After the final wash cycle, aspirate all wells by briskly emptying the contents over a waste container and then tap the microplate firmly against absorbent paper to remove any residual liquid.

9. **Pipette 150 µL** of TMB substrate into each well (the use of a multi-channel pipette is recommended).
10. **Incubate** the microplate inside a **37°C incubator** for **10-15 minutes** (or until standard A attains dark blue color for desired OD).
11. **Pipette 50 µL** of Stopping Solution into each well (the use of a multi-channel pipette is recommended) in the same order and speed as was used for addition of the TMB Substrate. Gently tap the microplate frame to mix the contents of the wells.
12. Measure the optical density (absorbance) in the microplate wells using an absorbance microplate reader set to 450 nm, within 20 minutes after addition of the Stopping Solution.

CALCULATIONS

1. Calculate the mean optical density of each standard, control, and specimen sample duplicate.
2. Use a 4-parameter or 5-parameter curve fit with immunoassay software to generate a standard curve.
3. The immunoassay software will calculate the concentrations of the controls and specimen samples using the mean optical density values and the standard curve.

QUALITY CONTROL

When assessing the validity of the test results, the following criteria should be evaluated:

1. The standard A mean optical density meets the acceptable range as stated in the QC Certificate.
2. The standard with the highest concentration meets the % binding acceptable ranges as stated in the QC Certificate. % Binding = (OD of standard/OD of standard A) x 100.
3. The values obtained for the kit controls are within the acceptable ranges as stated in the QC certificate.
4. The results of any external controls that were used meet the acceptable ranges.

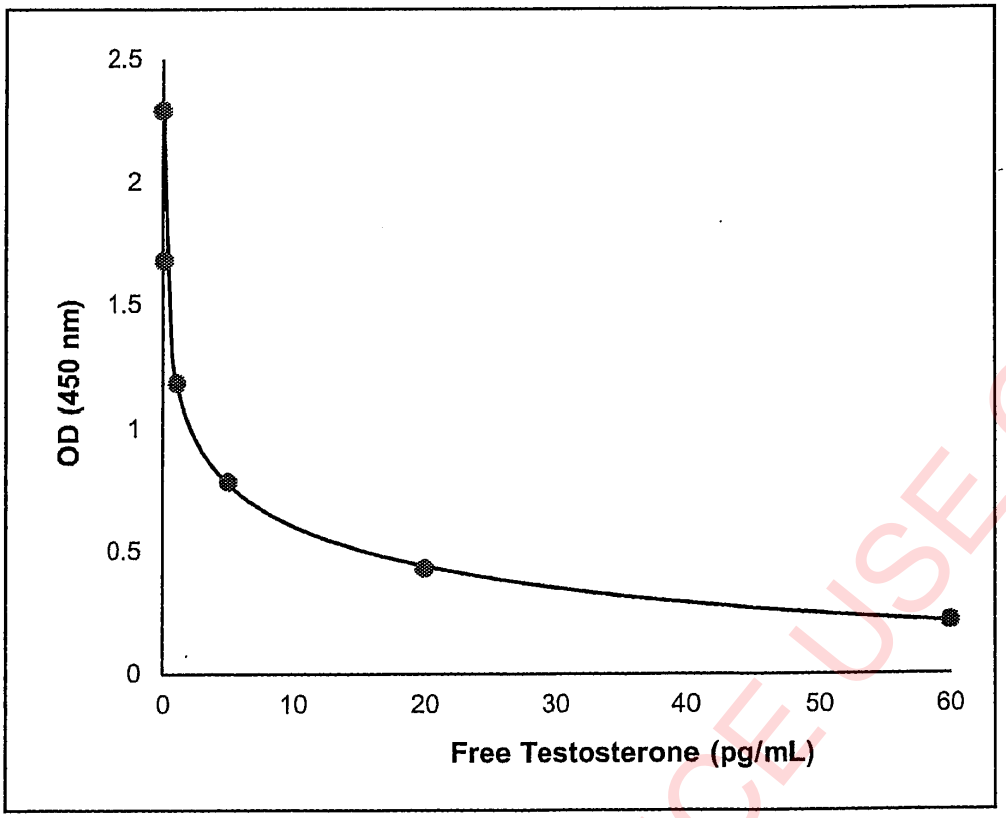
TYPICAL DATA

Sample data only. Do not use to calculate results.

Standard	Mean OD (450 nm)	% Binding	Value (ng/mL)
A	2.292	100	0
B	1.680	73	0.1
C	1.181	52	1
D	0.780	34	5
E	0.426	19	20
F	0.214	9	60
Unknown	1.066	-	1.59

TYPICAL STANDARD CURVE

Sample curve only. Do not use to calculate results.



PERFORMANCE CHARACTERISTICS

Sensitivity

The limit of detection (LoD) was determined from the analysis of 64 replicates of a low value sample and from the LoB.

LoD = LoB + 1.645σS

where σS is the standard deviation of the low value sample. σS was determined to be 0.0093 based on 64 measurements of a low value sample.

LoD = 0.0025 + (1.645 * 0.0093) = 0.018 pg/mL.

Specificity (Cross-Reactivity)

The following compounds were tested for cross-reactivity with free testosterone cross-reacting at 100%.

Compound	% Cross-Reactivity
Testosterone	100
5α-DHT	3.5
Androstenedione	0.17
Progesterone	0.007
Androsterone	0.075
Aldosterone	< 0.008
Cholesterol	< 0.0001
Cortisone	0.0025
DHEA	0.071

DHEAS	0.0014
17β-Estradiol	0.15
Estriol	< 0.008
Pregnenolone	0.028

Intra-Assay
Five samples were assayed 24 times each on the same standard curve. The results (in pg/mL) are tabulated below:

Sample	Mean	CV%
1	2.24	6.7
2	3.81	6.4
3	13.6	6.0
4	13.7	5.9
5	23.7	4.8

Inter-Assay Precision
Three serum samples were assayed twenty times in duplicate over a period of greater than ten days. The results (in pg/mL) are tabulated below:

Sample	Mean	CV%
1	3.53	8.1
2	13.8	11.5
3	23.3	6.9

Effect of Sex Hormone Binding Globulin (SHBG)
The purpose of this study was to investigate a possible interference caused by the binding of SHBG to the free testosterone-HRP conjugate. A charcoal-stripped human serum pool was spiked precisely with SHBG at concentrations ranging from 6.25 – 200 µg/mL and was assayed with the Free Testosterone ELISA Kit. Results tabulated below (in pg/mL):

SHBG Added	OD 450 nm	Percent B/Bo (%)
0	2.37	100.0
6.25	2.37	99.9
12.5	2.34	98.7
50	2.36	99.5
200	2.27	95.6

The results showed a % binding values between 95 – 100% (Bo = unspiked serum) even at higher than normal SHBG levels. In conclusion, the results showed that there is no significant binding by SHBG on the free testosterone-HRP conjugate.

Comparative Studies
The Free Testosterone ELISA Kit (y) was compared with a competitors Free Testosterone Coated Tube RIA Kit (x). The comparison of 60 serum samples syielded the following linear regression results:

y (Eagle) = 0.9362x (competitor) = 3.8794, r = 0.97

REFERENCE RANGES
The results of an expected range study with apparently normal healthy subjects yielded the following results (all values are reported in pg/mL). Each laboratory shall establish their own reference ranges.

Cohort Group; Gender / Age	N	95% Confidence Range	Absolute Range
Males / <13	44	-	ND – 1.6

Males / 13 – 19	37	-	ND – 22.3
Males / 20 – 39	120	9.1 – 32.2	-
Males / 40 – 59	120	5.7 – 30.7	-
Males / ≥ 60	120	5.9 – 27.0	-
Females / < 13	63	-	ND – 1.3
Females / 13 – 19	17	-	0.2 – 2.0
Females / 20 – 39	120	0.1 – 6.3	-
Females / 40 – 59	120	0.2 – 4.1	-
Females / ≥ 60	60	0.5 – 3.9	-

LITERATURE

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WARRANTY INFORMATION

Eagle Biosciences, Inc. warrants its Product(s) to operate or perform substantially in conformance with its specifications, as set forth in the accompanying package insert. This warranty is expressly limited to the refund of the price of any defective Product or the replacement of any defective Product with new Product. This warranty applies only when the Buyer gives written notice to the Eagle Biosciences within the expiration period of the Product(s) by the Buyer. In addition, Eagle Biosciences has no obligation to replace Product(s) as result of a) Buyer negligence, fault, or misuse, b) improper use, c) improper storage and handling, d) intentional damage, or e) event of force majeure, acts of God, or accident.

Eagle Biosciences makes no warranties, either expressed or implied, except as provided herein, including without limitation thereof, warranties as to marketability, merchantability, fitness for a particular purpose or use, or non-infringement of any intellectual property rights. In no event shall the company be liable for any indirect, incidental, or consequential damages of any nature, or losses or expenses resulting from any defective product or the use of any product. Product(s) may not be resold, modified, or altered for resale without prior written approval from Eagle Biosciences, Inc.

For further information about this kit, its application or the procedures in this kit, please contact the Technical Service Team at Eagle Biosciences, Inc. at info@eaglebio.com or at 866-411-8023.