

BioLegend[®]

LEGEND MAX[™]

ELISA Kit with Pre-coated Plates



High Sensitivity Human TNF- α

Cat. No. 430217

ELISA Kit for Accurate Quantitation of Human TNF- α in
Serum, Plasma, Cell Culture Supernatant, and Urine

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It is highly recommended that this manual be read in its entirety before using this product. Do not use this kit beyond the expiration date.

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LEGEND MAX™ High Sensitivity Human TNF-α ELISA Kit

Introduction:

Human TNF-α (Tumor Necrosis Factor α), also termed Cachectin, Cytotoxic Factor (CF), Hemorrhagic Factor, Macrophage Cytotoxic Factor (MCF), is a potent multifunctional cytokine that can exert regulatory, inflammatory, and cytotoxic effects on a wide range of normal lymphoid, non-lymphoid cells, and tumor cells. TNF-α is secreted by macrophages, monocytes, neutrophils, T-cells, NK-cells, and many transformed cell lines. It exists as a soluble 17.5 kD protein and a 26 kD membrane-associated protein. The soluble protein form derives from the membrane form by way of proteolytic processing. The membrane form protein, but not the soluble form, is phosphorylated on serine residues. Dephosphorylation of the membrane occurs by binding to soluble TNFRSF1A/ TNFR1. TNF-α binding to surface receptors elicits a wide array of biological activities, including cytolysis and cytostasis of many tumor cell lines in vitro, hemorrhagic necrosis of tumors in vivo, increased fibroblast proliferation, and enhanced chemotaxis and phagocytosis in neutrophils. It has been shown that TNF-α plays a critical role in many physiological and pathological conditions, including neurodegenerative diseases and cancer.

The BioLegend LEGEND MAX™ High Sensitivity Human TNF-α ELISA Kit is a Sandwich Enzyme-Linked Immunosorbent Assay (ELISA) with a 96-well strip plate that is pre-coated with a monoclonal mouse anti-human TNF-α capture antibody. The detection antibody is a biotinylated monoclonal mouse anti-human TNF-α antibody. This kit is specifically designed for the accurate quantitation of human TNF-α in serum, plasma, cell culture supernatant, and urine. This kit is analytically validated with ready-to-use reagents.

Materials Provided:

Description	Quantity	Volume (per bottle)	Part #
Anti-human TNF-α Pre-coated 96-well Strip Microplate	1 plate		78189
Human TNF-α Detection Antibody (200X)	1 bottle	12 mL	750004308
Human TNF-α Standard	1 vial	lyophilized	79019
Streptavidin-Polymer HRP	1 bottle	12 mL	750002513
Assay Buffer A	2 bottles	25 mL	78232
Assay Buffer D	1 bottle	25 mL	79383
Wash Buffer (20X)	1 bottle	50 mL	78233
Substrate Solution F	1 bottle	12 mL	79132
Stop Solution	1 bottle	12 mL	79133
Plate Sealers	4 sheets		78101

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Materials to be Provided by the End-User:

- Microplate reader able to measure absorbance at 450 nm
- Adjustable pipettes to measure volumes ranging from 1 μ L to 1,000 μ L
- Deionized water
- Wash bottle or automated microplate washer
- Log-log graph paper or software for data analysis
- Polypropylene tubes to prepare standard dilutions
- Timer
- Plate Shaker
- Polypropylene vials

Storage Information:

Store unopened kit components between 2°C and 8°C. Do not use this kit beyond its expiration date.

Opened or Reconstituted Components	
Microplate wells	If not all microplate strips are used, remove the excess strips by pressing up from underneath each strip. Place excess strips back in the foil pouch with the included desiccant pack and reseal. Store between 2°C and 8°C for up to one month.
Standard	The remaining reconstituted standard stock solution can be aliquoted into polypropylene vials and stored at -70°C for up to one month. Avoid repeated freeze-thaw cycles.
Detection Antibody	Store opened reagents between 2°C and 8°C and use within one month.
Streptavidin-Polymer HRP	
Assay Buffer A	
Assay Buffer D	
Wash Buffer (20X)	
Substrate Solution F	
Stop Solution	

Health Hazard Warnings:

1. Reagents that contain preservatives may be harmful if ingested, inhaled, or absorbed through the skin. Refer to the MSDS online at BioLegend's website for details (www.biolegend.com/msds).

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2. Substrate Solution F is harmful if inhaled or ingested. Avoid skin, eye and clothing contact.
3. To reduce the likelihood of blood-borne transmission of infectious agents, handle all serum, plasma, and other biological fluids in accordance with NCCLS regulations.
4. Stop Solution contains strong acid. *Wear eye, hand, and face protection.*
5. Before disposing of the plate, rinse it with an excess amount of tap water.

Specimen Collection and Handling:

Specimens should be clear and non-hemolyzed. If possible, unknown samples should be run at a number of dilutions to determine the optimal dilution factor that will ensure accurate quantitation.

Serum: Use a serum separator tube and allow clotting for at least 30 minutes, then centrifuge for 10 minutes at 1,000 x *g*. Remove serum layer and assay immediately or store serum samples at < -70°C. Avoid repeated freeze-thaw cycles.

Plasma: Collect blood samples in citrate, EDTA, or heparin containing tubes. Centrifuge for 10 minutes at 1,000 x *g* within 30 minutes of collection. Assay immediately or store plasma samples at < -70°C. Avoid repeated freeze-thaw cycles.

Cell Culture Supernatant: If necessary, centrifuge all samples to remove debris prior to analysis. It is recommended that samples be stored at < -70°C. Avoid repeated freeze-thaw cycles.

Urine: If necessary, centrifuge to remove debris prior to analysis. Samples can be stored at < -20°C. Avoid repeated freeze/thaw cycles.

Reagent and Sample Preparation:

Note: All reagents should be diluted immediately prior to use.

1. Dilute the 20X Wash Buffer to 1X with deionized water. For example, make 1 liter of 1X Wash Buffer by adding 50 mL of 20X Wash Buffer to 950 mL of deionized water. If crystals have formed in the 20X Wash Buffer, bring to room temperature and vortex until dissolved.
2. Reconstitute the lyophilized Human TNF- α Standard by adding the volume of Assay Buffer A to make the 20 ng/mL standard stock solution (Refer to LEGEND MAX Kit Lot-Specific Certificate of Analysis). Allow the reconstituted standard to sit at room temperature for 15-20 minutes, then briefly vortex to mix completely.

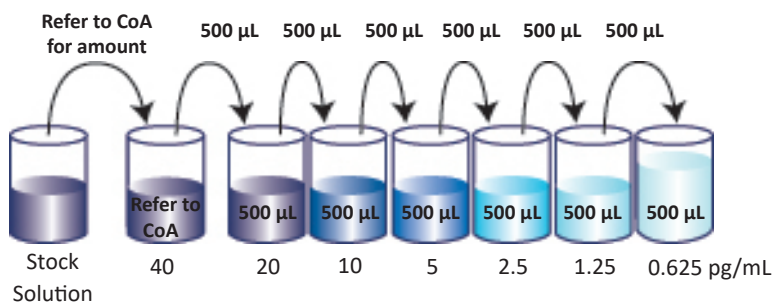
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3. Dilute the 200X Human TNF- α Detection Antibody to 1X with Assay Buffer A. For example, make 12 mL of 1X Detection Antibody by adding 60 μ L of 200X Detection Antibody to 11.94 mL of Assay Buffer A.
4. Dilute serum and heparin plasma samples 1:2 in Assay Buffer A. Dilute citrate and EDTA samples 1:2 in Assay Buffer D. Urine samples should be analyzed without dilution. The cell culture supernatant dilution factor should be determined by the end user; use Assay Buffer A for supernatant dilutions.

Assay Procedure:

Note: Do not mix reagents from different kits or lots. Reagents and/or antibodies from different manufacturers should not be used with this kit.

1. Bring all reagents to room temperature prior to use. It is strongly recommended that all standards and samples be run in duplicate or triplicate. A standard curve is required for each assay.
2. If not all microplate strips will be used, remove the excess strips by pressing up from underneath each strip. Place excess strips back in the foil pouch with the included desiccant pack and reseal.
3. Prepare 500 μ L of the 40 pg/mL top standard by diluting the appropriate amount of the standard stock solution in Assay Buffer A (refer to the LEGEND MAX™ Kit Lot-Specific Certificate of Analysis). Perform six two-fold serial dilutions of the 40 pg/mL top standard in separate tubes using Assay Buffer A as the diluent. Thus, the human TNF- α standard concentrations in the tubes are 40 pg/mL, 20 pg/mL, 10 pg/mL, 5 pg/mL, 2.5 pg/mL, 1.25 pg/mL, and 0.625 pg/mL, respectively. Assay Buffer A serves as the zero standard (0 pg/mL). ***If testing citrate or EDTA samples, use Assay Buffer D instead of Assay Buffer A for standard dilutions.***



4. Wash the plate 4 times with at least 300 μ L of 1X Wash Buffer per well and blot any residual buffer by firmly tapping the plate upside down on absorbent paper. All subsequent washes should be performed similarly.

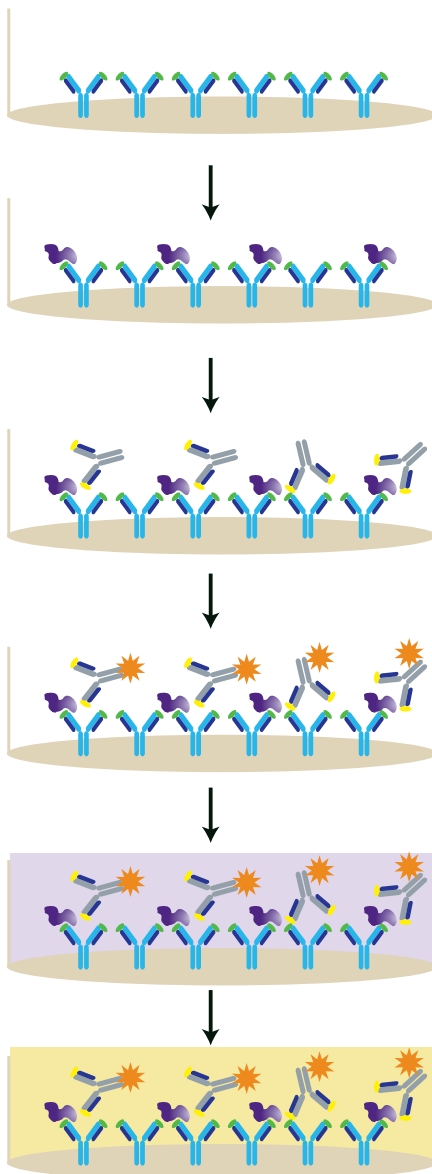
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5. Add 50 μ L of Assay Buffer A to each well that will contain either standard dilutions or samples. ***If testing citrate or EDTA samples, use Assay Buffer D instead of Assay Buffer A.*** Then add 50 μ L of standard dilutions or samples to the appropriate wells.
6. Seal the plate with a plate sealer included in the kit and incubate the plate at room temperature with shaking for 2 hours.
7. Discard the contents of the plate into a sink, then wash the plate 4 times with 1X Wash Buffer as in step 4.
8. Add 100 μ L of 1X Human TNF- α Detection Antibody to each well, seal the plate, and incubate at room temperature with shaking for 1 hour.
9. Discard the contents of the plate into a sink, then wash the plate 4 times with 1X Wash Buffer as in step 4.
10. Add 100 μ L of Streptavidin-Polymer HRP to each well, seal the plate, and incubate at room temperature with shaking for 30 minutes.
11. Discard the contents of the plate into a sink, then wash the plate 5 times with 1X Wash Buffer as in step 4. For this final wash, soak wells in 1X Wash Buffer for 30 seconds to 1 minute for each wash. This will help minimize background.
12. Add 100 μ L of Substrate Solution F to each well and incubate for 15 minutes **in the dark**.^{*} Wells containing human TNF- α should turn blue in color with an intensity proportional to its concentration. It is not necessary to seal the plate during this step.
13. Stop the reaction by adding 100 μ L of Stop Solution to each well. The solution color should change from blue to yellow.
14. Read absorbance at 450 nm within 15 minutes. If the reader is capable of reading at 570 nm, the absorbance at 570 nm can be subtracted from the absorbance at 450 nm.

*** Optimal substrate incubation time depends on laboratory conditions and the optical linear ranges of ELISA plate readers.**

Assay Procedure Summary

1. Wash 4 times.
Add 50 μ L Assay Buffer A. *If testing citrate or EDTA samples, use Assay Buffer D.*
2. Add 50 μ L of diluted standards or samples.
Incubate 2 hours, **RT with shaking**.
3. Wash 4 times.
Add 100 μ L 1X Detection Antibody.
Incubate 1 hour, **RT with shaking**.
4. Wash 4 times.
Add 100 μ L Streptavidin-Polymer HRP.
Incubate 30 minutes, **RT with shaking**.
5. Wash 5 times.
Add 100 μ L Substrate Solution F.
Incubate 15 minutes*, **RT, in the dark**.
6. Add 100 μ L Stop Solution.
7. Read absorbance at 450 nm and 570 nm.



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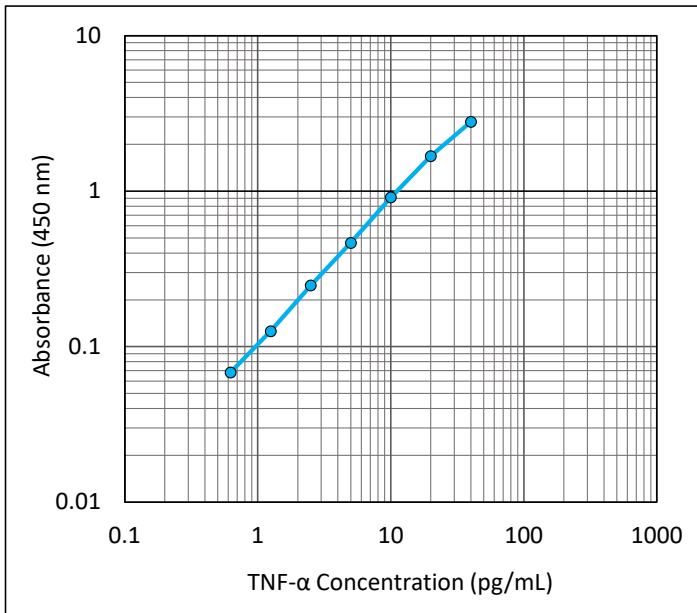
Calculation of Results:

The data can be best calculated with computer-based curve-fitting software using a 5- or 4-parameter logistics curve-fitting algorithm. If an appropriate software is not available, use log-log graph paper to determine sample concentrations. Determine the mean absorbance for each set of duplicate or triplicate standards, controls, and samples. Plot the standard curve on log-log graph paper with analyte concentration on the X-axis and absorbance on the Y-axis. Draw a best fit line through the standard points. To determine the unknown analyte concentrations, find the mean absorbance value of the unknown concentration on the Y-axis and draw a horizontal line to the standard curve. At the point of intersection, draw a vertical line to the X-axis and read the analyte concentration.

If samples were diluted, multiply the concentration by the appropriate dilution factor. If a test sample's absorbance value falls outside the linear portion of the standard curve, the test sample needs to be re-analyzed at a higher (or lower) dilution as appropriate.

Typical Data:

This standard curve was generated at BioLegend for demonstration purposes only. A standard curve must be run with each assay.



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Performance Characteristics:

Specificity: No cross reactivity was observed when this kit was used to analyze human TNF-β, mouse TNF-α, rat TNF-α, human TNFR2, and mouse TNFR2 at 50 ng/mL. No significant interference by human TNFR2 was observed.

Sensitivity: The minimum detectable concentration of TNF-α is 0.190 pg/mL.

Recovery: Cell culture supernatant (from PBMCs stimulated with 50 ng/mL PMA and 1 μg/mL ionomycin for 2 days) was spiked into serum (diluted 1:2), plasma (diluted 1:2), neat cell culture supernatant (from unstimulated PBMCs), and neat urine samples at three different concentrations. Then, sample recovery was analyzed with the LEGEND MAX™ High Sensitivity Human TNF-α ELISA kit.

Sample Type	N	Recovery (%)
Serum	3	72.3
Citrate Plasma	3	94.7
EDTA Plasma	5	83.6
Heparin Plasma	3	77.2
Cell Culture Supernatant (PBMC)	1	112.1
Urine	1	88.6

Linearity: Serum (diluted 1:2), plasma (diluted 1:2), and urine (neat) samples were spiked with a high concentration of recombinant human TNF-α. Cell culture supernatant (from PBMCs stimulated with 50 ng/mL PMA and 1 μg/mL ionomycin for 2 days) was not spiked. The samples were serially diluted two-fold to produce samples with concentrations within the dynamic range. Then, linearity was analyzed with the LEGEND MAX™ High Sensitivity Human TNF-α ELISA kit.

Sample Type	N	Linearity (%)
Serum	3	105.1
Citrate Plasma	3	92.0
EDTA Plasma	3	112.0
Heparin Plasma	3	99.4
Cell Culture Supernatant (PBMC)	1	99.3
Urine	1	104.6

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Intra-Assay Precision: Sixteen replicates of each of two samples containing different human TNF-α concentrations were tested in one assay.

Concentration	Sample 1	Sample 2
Number of Replicates	16	16
Mean Concentration (pg/mL)	7.18	1.80
Standard Deviation	0.30	0.08
%CV	4.16	4.46

Inter-Assay Precision: Two samples containing different concentrations of human TNF-α were tested in ten independent assays.

Concentration	Sample 1	Sample 2
Number of Assays	10	10
Mean Concentration (pg/mL)	7.01	1.87
Standard Deviation	0.60	0.20
%CV	8.61	10.56

Biological Samples: Human serum, plasma (citrate and heparin), cell culture supernatant (from PBMCs stimulated with 50 ng/mL PMA and 1 µg/mL ionomycin for 2 days), and urine samples were tested using the LEGEND MAX™ High Sensitivity Human TNF-α ELISA kit.

Sample Type	N	Mean (pg/mL)	Range (pg/mL)
Serum	6	0.35	ND - 0.44
Citrate Plasma	6	0.36	ND - 0.40
Heparin Plasma	5	0.39	ND - 0.48

Sample Type	N	Concentration (pg/mL)
PBMC Supernatant (PMA/ionomycin stimulation)	1	328.90
Urine	1	0.48

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Troubleshooting Guide:

Problem	Probable Cause	Solution
High Background	Background wells were contaminated	Avoid cross-well contamination by using the provided plate sealers. Use multichannel pipettes and change tips between pipetting samples and reagents.
	Insufficient washes	Increase number of washes. Increase soaking time between washes prior to addition of substrate solution.
	TMB Substrate Solution was contaminated	TMB Substrate Solution should be clear and colorless prior to addition to wells. Use a clean container prior to pipetting substrate solution into wells.
No or poor signal	Detection Antibody, Avidin-HRP or Substrate solution were NOT added	Rerun the assay and follow the protocol.
	Wrong reagent or reagents were added in wrong sequential order	
	Insufficient plate agitation	The plate should be agitated during all incubation steps using a plate shaker at a speed where solutions in wells are within constant motion without splashing.
	The wash buffer contains Sodium Azide (NaN ₃)	Avoid Sodium Azide contamination in the wash buffer as it inhibits HRP activity.
	Incubations were done at an inappropriate temperature, timing or without agitation	Rerun the assay and follow the protocol.
Low or poor standard curve signal	The standard was incorrectly reconstituted or diluted	Adjust the calculations and follow the protocol.
	Standard was inappropriately stored	Store the reconstituted standard stock solution in polypropylene vials at -70°C. Avoid repeated freeze-thaw cycles.
	Reagents added to wells with incorrect concentrations	Check for pipetting errors and the correct reagent volume.

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Problem	Probable Cause	Solution
Signal is high, standard curves have saturated signal	Standard reconstituted with less volume than required	Reconstitute new lyophilized standard with the correct volume of solution recommended in the protocol.
	Standards/samples, detection antibody, Avidin-HRP or substrate solution were incubated for too long	Rerun the assay and follow the protocol.
Sample readings are out of range	Samples contain no or below detectable levels of the analyte	If samples are below detectable levels, it may be possible to use a larger sample volume. Contact technical support for appropriate protocol modifications.
	Samples contain analyte concentrations greater than highest standard point	Samples may require dilution and analysis.
High variation in samples and/or standards	Multichannel pipette errors	Confirm that pipette calibrations are accurate.
	Plate washing was not adequate or uniform	Ensure pipette tips are tightly secured. Ensure uniformity in all wash steps.
	Non-homogenous samples	Thoroughly mix samples before assaying.
	Samples may have high particulate matter	Remove particulate matter by centrifugation.
	Cross-well contamination	Do not reuse plate sealers. Always change tips for reagent additions. Ensure that pipette tips do not touch the reagents on the plate.

ELISA Plate Template:

ELISA Plate Template												
	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												
G												
H												

BioLegend®

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