

biosensis[®] Human TGF-beta-1 (TGFβ1) ELISA Kit Protocol

Catalog No: BEK-2093-1P

*For quantitative detection of human TGF-beta-1 in cell culture supernatants, serum,
EDTA treated plasma, and urine samples only when used as directed*

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I. Materials Provided

Kit Components	Unit Size/Volume
Lyophilized recombinant human TGFβ1 standard	10ng/tube x 2
96 wells plate pre-coated with anti-human TGFβ1 antibody	1 plate
Sample diluent buffer	30ml x 1
Biotinylated anti- human TGFβ1 antibody (dilution 1:100)	130µl x 1
Antibody diluent buffer	12ml x 1
Avidin-Biotin-Peroxidase Complex (ABC) (dilution 1:100)	130µl x 1
ABC diluent buffer	12ml x 1
TMB colour developing agent	10ml x 1
TMB stop solution	10ml x 1

WARNING: DO NOT MIX REAGENTS SUCH AS ANTIBODY BUFFERS ETC BETWEEN DIFFERENT ASSAYS IF USING MULTIPLE KITS. USE ONLY THE BUFFERS, STANDARDS & SOLUTIONS INCLUDED FOR YOUR SPECIFIC LOT. MIXING SOLUTIONS FROM DIFFERENT TARGET KITS CAN LEAD TO POOR KIT PERFORMANCE

II. Equipment Required but Not Supplied

1. Wash buffer (0.01M PBS or TBS). *See technical hints*
 2. Activating agent solution for treatment of TGF-beta-1 samples prior to use.
 3. Automated plate washer is desirable
 4. Multi-channel or repeating pipette.
 5. Clean tubes and Eppendorf tubes.
 6. Plate shaker (300-500 rpm)
 7. Mechanical Vortex.
 8. Microplate reader with 450nm filter.
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III. Technical Hints

1. Spin all kit components to get liquid to the bottom of tubes before use.
2. Duplicate well assays are recommended for both standard and sample testing.
3. In order to avoid marginal effects of plate incubation due to temperature differences, it is suggested that the ABC and TMB solutions be brought to room temperature (or 37° C if using option protocol) 30 min before use.

4. Recommended method for manual plate washing.

- Emptying of wells on the plate:
Place the plate on the palm of the hand in a position that enables easy flicking movement using the wrist. Holding the plate over a sink, quickly invert the plate, whilst accelerating the arm downward toward the sink. Abruptly stop the downward acceleration to force the liquid from the wells into the sink. When done correctly the technique should prevent liquid from getting on to the fingers or on the outside of the strip wells or plate holder. *Note: Retain the upside down position of the plate to avoid any back flow into the wells. DO NOT LET THE PLATE DRY OUT.*
- Blotting the plate:
Immediately blot the inverted plate by lightly tapping the plate 3-4 times on blotting paper.
- Washing: Forcefully pipette Wash Buffer into each well with a multi-channel pipette. Empty the wells of wash buffer using technique described above. Repeat washing and flicking procedures thrice. Wash plate 0.01M TBS or 0.01M PBS, and each time let washing buffer stay in the wells for 1-2 min before rinsing with more wash buffer as directed above. *Note: **Avoid touching the inside surface of the wells with the pipette tips.***

Do not let the wells dry out at any time or enzymatic activity will be lost.

5. Preparation of Wash buffer: (not provided in the kit)
- Preparation of 0.01M **TBS**: Add 1.2g Tris, 8.5g NaCl; 450µl of purified acetic acid or 700µl of concentrated hydrochloric acid to 1000ml H₂O and adjust pH to 7.2-7.6. Finally, adjust the total volume to 1L.
- Preparation of 0.01 M **PBS**: Add 8.5g sodium chloride, 1.4g Na₂HPO₄ and 0.2g NaH₂PO₄ to 1000ml distilled water and adjust pH to 7.2-7.6. Finally, adjust the total volume to 1L.
- Note: PBS buffers typically work more reliably than TBS buffers in most cases are recommended.*
- Note: if blank values are over 0.2 the addition of 0.05% Tween-20 to either TBS or PBS wash buffers will usually help lower them as well as overall assay backgrounds and can help improve signal/noise ratios.*

IV. Storage of Kit Components

This kit may be stored for up to 6 months at 2°C to 8°C from the date of shipment. Standards should be stored at -20°C or -80°C (recommended at -80°C) after reconstitution. Coated strips or reagents may be store for up to 1 month at 2°C to 8°C.

Return unused wells to the pack and reseal pack. *Note: the kit can be used within 8 months if the whole kit is stored at -20°C. Avoid repeated freeze-thaw cycles.*

V. Sample Preparation and Dilution

- Cell culture supernatant:** Remove particulates by centrifugation (10,000 x g 5 min), analyze immediately or aliquot and store at -20°C-80°C. Divide samples into aliquots to prevent multiple freeze thaws; use appropriate protease inhibitor cocktails for best results. **Note:** Animal serum used in the preparation of cell culture media may contain high levels of latent TGF-beta 1. For best results, do not use animal serum for growth of cell cultures when assaying for TGF-beta-1 production. If animal serum is used as a supplement in the media, precautions should be taken to prepare the appropriate control and run the control in the immunoassay to determine the baseline concentration of TGF-beta-1.
- Serum:** Allow the serum to clot in a serum separator tube (about 30 minutes-4 hours) at room temperature. Centrifuge at approximately 1000 X g for 10 min. Analyze the serum immediately or aliquot and store frozen at -20°C-80°C.
- Plasma:** Collect plasma using EDTA as an anticoagulant. Centrifuge for 15 min. at 1500 x g within 30 min. of collection. Assay immediately for divide into aliquots and store at -20°C-80°C.
- Urine:** Aseptically collect. Remove particular impurities and precipitates by centrifugation, and/or particle removal via syringe or another filtration device. Solution must be particle and cell free for best results. Assay immediately or aliquot and store samples at -20°C to -80°C. **Note:** treatment of urine with Thimerosal or other proteinase inhibitors can increase signal yields in ELISA assays for some targets, please see: (Hoyer, J. et al. (1999). Effects of microgravity on urinary osteopontin. J. Am. Soc. Nephrol. 10: S389-S393.) **Note 2:** Urine can be quite acidic; neutralize with mild base the final assay sample to pH 7.0-7.5 for best results.

Activating Reagent: TGF beta-1 is mostly contained as an inactive protein bound form in samples. It is necessary to activate via acidification prior to using the samples in the ELISA assay. It is not necessary to activate the recombinant TGF-beta-1 standard included in this ELISA, as it is free of inactivating binding proteins already.

Needed solutions: Solution A: 1N HCl, pH < 1.0: add 8.33ml of 12N HCl into 91.67ml of H₂O. **Solution B:** 1.2N NaOH/0.5M HEPES, pH 14: add 12ml of 10N NaOH and 11.9g HEPES into 75ml of H₂O, add H₂O to adjust volume to 100ml.

Activation/Acidification the samples:

Cell culture supernate, urine: (1:5 treatment ratio): Add activating reagent proportionally, i.e. add 20 microliters of Solution A into 100 microliters of undiluted sample, 10 min later, add 20 microliters of Solution B to the tube to neutralize the acidification step. If precipitate forms, samples can be centrifuged at 16,000 x g for 5 minutes at 4 degrees centigrade to pellet any material. Use only the clear supernatants for the ELISA. The final pH of the sample solution should be ~7.0 to 7.6 for use in the ELISA. Use pH paper or microprobe to check final pH.

Serum, plasma (EDTA): (1:2 treatment ratio) Add activating reagent proportionally, i.e. add 20 microliters of Solution A into 40 microliters of undiluted sample, 10 min later, add 20 microliters of Solution B to the tube to neutralize the acidification step. If precipitate forms, samples can be centrifuged at 16,000 x g for 5 minutes at 4 degrees centigrade to pellet any material. Use only the clear supernatants for the ELISA. The final pH of the sample solution should be ~7.0 to 7.6 for use in the ELISA. Use pH paper or microprobe to check final pH.

Note: Sample activation will dilute experimental samples partly after adding activating reagent, so please pay attention to this when calculating target protein concentration for the most accurate results.

Also, the user needs to estimate the concentration of the target protein in the sample and select a proper dilution factor so that the diluted target protein concentration falls near the middle of the linear regime in the standard curve. Also with certain growth factors and target proteins, binding proteins and location can influence over all signal. It is recommended that researchers confirm by literature an effective lysis, cell membrane preparations and/or extraction buffer formulations and treatments that are suitable for the precise target being assayed.

The following table can be used as a guideline for sample dilution. Dilute the sample using the provided diluent buffer. Mix the sample thoroughly with diluent buffer.

Target protein concentration	Concentration range	Working dilution	Amount of sample diluent buffer to be added
High target protein concentration	10-100 ng/ml	1:100	Add 1 µl sample into 99 µl of sample diluent buffer
Medium target protein concentration	1-10 ng/ml	1:10	Add 10 µl sample into 90 µl of sample diluent buffer
Low target protein concentration	15.6-1000 pg/ml	1:2	Add 50 µl sample to 50 µl of sample diluent buffer
Very Low target protein concentration	≤15.6 pg/ml	No dilution necessary	(working dilution is 1:2)

Assay Precision:

Sample	Intra-Assay Precision			Inter-Assay Precision		
	1	2	3	1	2	3
n	16	16	16	24	24	24
Mean (pg/mL)	30	156	497	28	164	537
Std. Dev.	1.38	8.42	34.79	1.73	8.85	38.1
CV(%)	4.6	5.4	7.0	6.2	5.4	7.19

Range 15.6 pg/mL to 1000 pg/mL; Sensitivity: < 1 pg/mL. Cross reactivity: < 1% with TGF-beta 2, TGF-beta 3, TGF-beta 5.

VI. Reagent Preparation

1. Preparation of Standards

- Reconstitution of standard with the sample diluent provided.
 - (a) 10,000 pg/ml (10 ng/ml) of human TGFβ1 standard solution: Add 1ml of sample diluent buffer into **one** tube of standard, mix thoroughly and keep the tube at room temperature for 10 min. Standard is recombinant human TGFβ1 amino acids 279-390 expressed in and purified from a CHO cell expression system.
 - (b) 1000pg/ml of human TGFβ1 standard solution: Add 0.1ml of the above 10ng/ml TGF-beta-1 standard solution into 0.9ml sample diluent buffer and mix thoroughly.
 - (b) 500 pg/ml to 15.6 pg/ml of human TGFβ1 standard solutions: Label 6 Eppendorf tubes with 500 pg/ml, 250 pg/ml, 125 pg/ml, 62.5 pg/ml, 31.2 pg/ml, 15.6 pg/ml respectively. Aliquot 0.3 ml of sample diluent buffer into each tube. Transfer 0.3ml from 1st tube into 2nd and mix. Continue performing serial dilutions.
- *Note: Standard solution should be prepared no more than 2 hours prior to the experiment. The working standard solution may be stored at 4°C for up to 12 hours, or at -20°C for up to 48 hours. Avoid repeated freeze-thaw cycles.*

2. Preparation of Biotinylated antibody working solution

- The total volume should be: 0.1ml/well x (the number of wells). (Allowing 0.1-0.2 ml more than total volume).
- Biotinylated antibody (Reagent B) should be diluted in 1:99 with the antibody diluent buffer and mixed thoroughly.
- *Note: the solution should be prepared no more than two hours prior to the experiment.*

3. Avidin-Biotin-Peroxidase Complex (ABC)

- The total volume should be: 0.1ml/well x (the number of wells). (Allowing 0.1-0.2 ml more than total volume).
- ABC should be diluted in 1:99 with the ABC diluent buffer and mixed thoroughly.
- *Note: the solution should be prepared no more than one hour prior to the experiment.*

VII. Assay Procedure

We recommend that standard solution dilutions and each sample are plated in duplicate. Read entire protocol before beginning; if using optional method the ABC working solution and TMB color developing agent must be kept warm at 37°C for 30 min before use.

1. Aliquot out the standards into each well of the pre-coated plate. Add 0.1ml of the sample diluent buffer into the control well (Zero well). Add 0.1ml of each properly diluted sample into each empty well. We recommend at least duplicate standards and samples. *Note: See “VII. Sample Preparation and Dilution Guideline” above for details.*
2. Seal the plate with parafilm and incubate the plate at 4°C overnight. *Note: we recommend users leave the plate on a shaker if possible.* (Optional method: 37°C, 90 minutes but it is slightly less sensitive)
3. Remove the cover, discard the plate contents and blot the plate onto paper towels or other absorbent material. **DO NOT** let the wells completely dry at any time. Wash plate 3-5 times using wash buffer as described in the technical hints. *Note: See “V. Technical Hints - Recommended method for manual plate washing” above for details.*
4. Add 0.1ml of biotinylated antibody working solution into each well. Cover and incubate the plate at room temperature on a plate shaker for 2-3 hours. (Optional 37°C, 60 minutes with shaking) Wash 3X as described in the technical hints.
5. Add 0.1ml of prepared ABC working solution (*Note: See “VIII. Reagent Preparation” above for details*) into each well. Cover and incubate the plate at room temperature on a plate shaker for 1 hour. (Optional 37°C, 30 minutes with shaking). Wash 5X as described in technical hints allowing the wash buffer to remain in the wells for 1-2 minutes.
6. Warm TMB to room temperature (37° if using optional protocol). Add 90µl of prepared TMB color developing agent into each well and incubate plate at room temperature for 5-20 min in the dark (shades of blue can be seen in the wells with the four most concentrated standard solutions; the other wells show no obvious color).
7. Stop the reaction by adding 0.1ml of prepared TMB stop solution into each well. The color will change into yellow.
8. Immediately read the plate at 450nm with a microplate reader. *Note: Color will fade over time; hence, we recommend plate to be read within 30 min after adding the stop solution.*

CAUTION: Bubbles in the wells will cause inaccurate readings. Ensure that all bubbles are removed prior to taking the absorbance reading.

VIII. Calculation of Results

(a) Manual Plate Reading:

(The relative O.D.₄₅₀) = (the O.D.₄₅₀ of each well) – (the O.D.₄₅₀ of Zero well).

The standard curve can be plotted as the relative O.D.₄₅₀ of each standard solution (Y) vs. the respective concentration of the standard solution (X). Known concentrations of the target protein are plotted on the X-axis and the corresponding O.D.₄₅₀ on the Y-axis. The standard curve should result in a graph that shows a direct relationship between target protein concentrations and the corresponding O.D.₄₅₀. The greater the concentration of target protein in the sample, the higher the O.D.₄₅₀.

Note: if the samples measured were diluted, multiply the dilution factor to the concentrations from interpolation to obtain the concentration before dilution.

Determine concentration of target protein in unknown sample:

The target protein concentration of the samples can be interpolated from the standard curve. Draw a horizontal line to intersect with the standard curve. A vertical line dropped from this point intersects the X-axis at the concentration of antibody in the unknown sample.

(b) PC Interface Plate Reading

Enter the data into computer program curve fitting software. Existing spreadsheet software can perform a good fit with a linear regression analysis.

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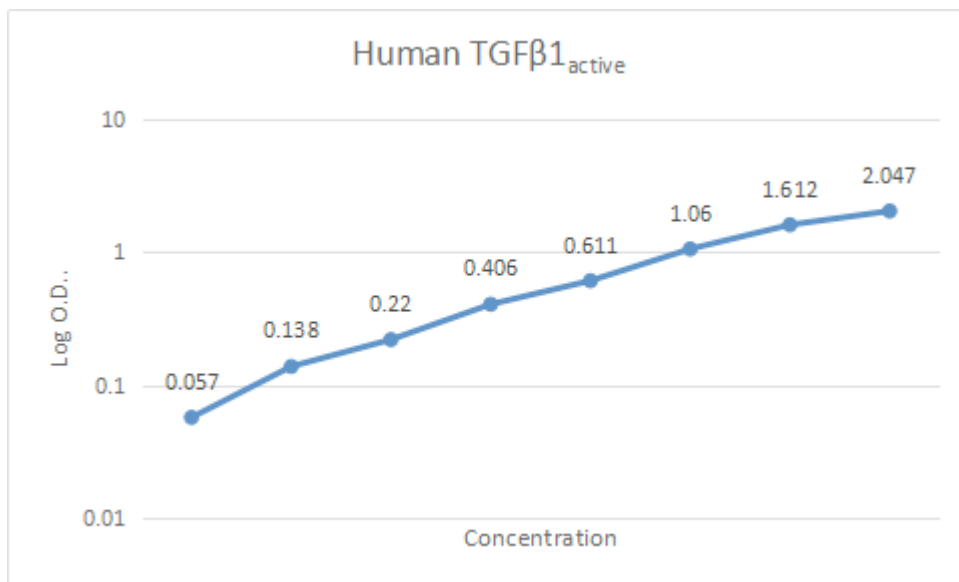
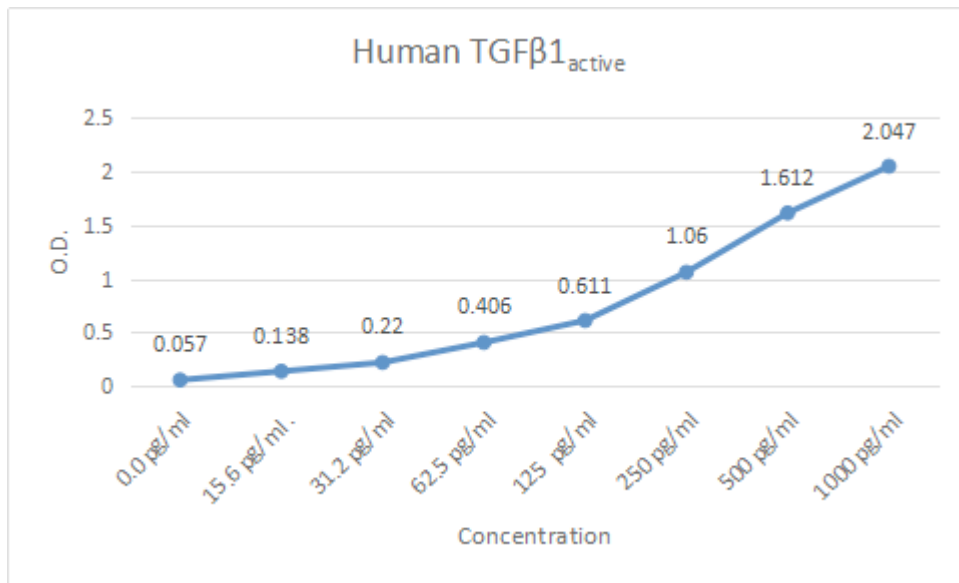
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IX: Typical Standard Curve (for reference only, not to be used for actual data)

Concentration pg/ml	0.0 pg/ml	15.6 pg/ml	31.2 pg/ml	62.5 pg/ml	125 pg/ml	250 pg/ml	500 pg/ml	1000 pg/ml
O.D.	0.057	0.138	0.220	0.406	0.611	1.060	1.612	2.047



(TMB reaction incubate at 37°C for 15-20 min)