



ab212166 – Human BDNF SimpleStep ELISA[®] Kit

Instructions for use:

For the quantitative measurement of free BDNF in human serum, plasma, and cell culture supernatant.

This product is for research use only and is not intended for diagnostic use.

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1. BACKGROUND

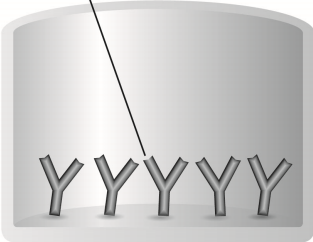
BDNF *in vitro* SimpleStep ELISA® (Enzyme-Linked Immunosorbent Assay) kit is designed for the quantitative measurement of BDNF protein in serum, plasma, and cell culture supernatant.

The SimpleStep ELISA® employs an affinity tag labeled capture antibody and a reporter conjugated detector antibody which immunocapture the sample analyte in solution. This entire complex (capture antibody/analyte/detector antibody) is in turn immobilized via immunoaffinity of an anti-tag antibody coating the well. To perform the assay, samples or standards are added to the wells, followed by the antibody mix. After incubation, the wells are washed to remove unbound material. TMB substrate is added and during incubation is catalyzed by HRP, generating blue coloration. This reaction is then stopped by addition of Stop Solution completing any color change from blue to yellow. Signal is generated proportionally to the amount of bound analyte and the intensity is measured at 450 nm. Optionally, instead of the endpoint reading, development of TMB can be recorded kinetically at 600 nm.

BDNF (brain derived neurotrophic factor) is a member of the neurotrophin family of growth factors that includes nerve growth factor. BDNF is expressed as a proprotein that is cleaved to form mature BDNF (residues 129-247). This assay measures mature BDNF. Mature BDNF protein sequence is identical between human, mouse, rat and many additional species. BDNF binds to at least 2 receptors: TrkB and LNGFR.

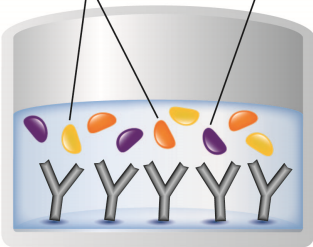
2. ASSAY SUMMARY

Immobilization Antibody



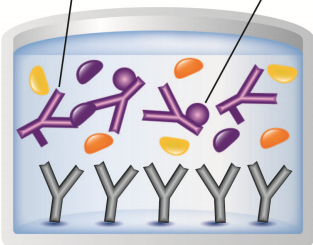
Remove appropriate number of antibody coated well strips. Equilibrate all reagents to room temperature. Prepare all reagents, samples, and standards as instructed.

Matrix Proteins Target Analyte



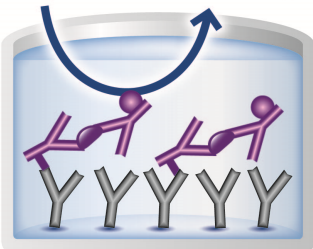
Add standard or sample to appropriate wells.

Capture Antibody Detector Antibody



Add Antibody Cocktail to all wells. Incubate at room temperature.

Substrate Color Development



TMB substrate addition.

Aspirate and wash each well. Add TMB Substrate to each well and incubate. Add Stop Solution at a defined endpoint. Alternatively, record color development kinetically after

3. PRECAUTIONS

Please read these instructions carefully prior to beginning the assay.

All kit components have been formulated and quality control tested to function successfully as a kit. Modifications to the kit components or procedures may result in loss of performance.

4. STORAGE AND STABILITY

Store kit at +4°C immediately upon receipt.

Refer to list of materials supplied for storage conditions of individual components. Observe the storage conditions for individual prepared components in the Reagent and Standard Preparation sections.

5. LIMITATIONS

- Assay kit intended for research use only. Not for use in diagnostic procedures.
- Do not mix or substitute reagents or materials from other kit lots or vendors. Kits are QC tested as a set of components and performance cannot be guaranteed if utilized separately or substituted.

GENERAL INFORMATION

6. MATERIALS SUPPLIED

Item	Amount	Storage Condition (Before Preparation)
10X Human BDNF Capture Antibody	600 µL	+4°C
10X Human BDNF Detector Antibody	600 µL	+4°C
Human BDNF Lyophilized Recombinant Protein	2 Vials	+4°C
Antibody Diluent CPI	6 mL	+4°C
10X Wash Buffer PT	20 mL	+4°C
TMB Substrate	12 mL	+4°C
Stop Solution	12 mL	+4°C
Sample Diluent NS	50 mL	+4°C
Pre-Coated 96 Well Microplate (12 x 8 well strips)	96 Wells	+4°C
Plate Seal	1	+4°C

7. MATERIALS REQUIRED, NOT SUPPLIED

These materials are not included in the kit, but will be required to successfully utilize this assay:

- Microplate reader capable of measuring absorbance at 450 or 600 nm.
- Method for determining protein concentration (BCA assay recommended).
- Deionized water.
- Multi- and single-channel pipettes.
- Tubes for standard dilution.
- Plate shaker for all incubation steps.
- Optional: Phenylmethylsulfonyl Fluoride (PMSF) (or other protease inhibitors).

8. TECHNICAL HINTS

- Samples generating values higher than the highest standard should be further diluted in the appropriate sample dilution buffers.
- Avoid foaming or bubbles when mixing or reconstituting components.
- Avoid cross contamination of samples or reagents by changing tips between sample, standard and reagent additions.
- Ensure plates are properly sealed or covered during incubation steps.
- Complete removal of all solutions and buffers during wash steps is necessary to minimize background.
- As a guide, typical ranges of sample concentration for commonly used sample types are shown below in Sample Preparation (section 11).
- All samples should be mixed thoroughly and gently.
- Avoid multiple freeze/thaw of samples.
- Incubate ELISA plates on a plate shaker during all incubation steps.
- When generating positive control samples, it is advisable to change pipette tips after each step.
- The provided Antibody Diluents and Sample Diluents contain protease inhibitor aprotinin. Additional protease inhibitors can be added if required.
- **To avoid high background always add samples or standards to the well before the addition of the antibody cocktail.**
- **This kit is sold based on number of tests. A ‘test’ simply refers to a single assay well. The number of wells that contain sample, control or standard will vary by product. Review the protocol completely to confirm this kit meets your requirements. Please contact our Technical Support staff with any questions.**

9. REAGENT PREPARATION

- Equilibrate all reagents to room temperature (18-25°C) prior to use. The kit contains enough reagents for 96 wells. **The sample volumes below are sufficient for 48 wells (6 x 8-well strips); adjust volumes as needed for the number of strips in your experiment.**
- Prepare only as much reagent as is needed on the day of the experiment. Capture and Detector Antibodies have only been tested for stability in the provided 10X formulations.

9.1 1X Wash Buffer PT

Prepare 1X Wash Buffer PT by diluting 10X Wash Buffer PT with deionized water. To make 50 mL 1X Wash Buffer PT combine 5 mL 10X Wash Buffer PT with 45 mL deionized water. Mix thoroughly and gently.

9.2 Antibody Cocktail

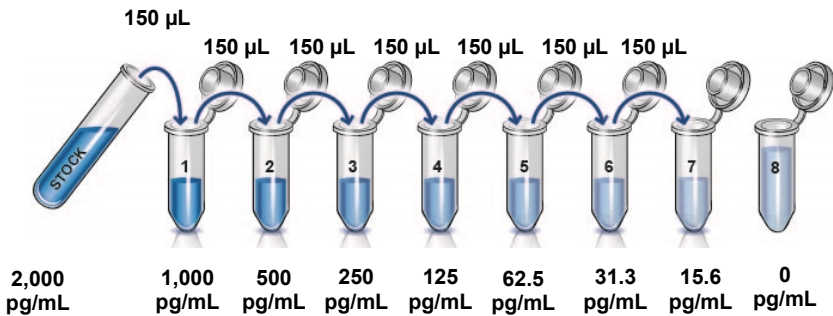
Prepare Antibody Cocktail by diluting the capture and detector antibodies in Antibody Diluent. To make 3 mL of the Antibody Cocktail combine 300 μ L 10X Capture Antibody and 300 μ L 10X Detector Antibody with 2.4 mL Antibody Diluent CPI. Mix thoroughly and gently.

10. STANDARD PREPARATION

Prepare serially diluted standards immediately prior to use. Always prepare a fresh set of positive controls for every use.

The following section describes the preparation of a standard curve for duplicate measurements (recommended).

- 10.1 Reconstitute the human BDNF standard sample by adding 400 μL Sample Diluent NS. Mix thoroughly and gently. Hold at room temperature for 10 minutes and mix gently. This is the 2,000 pg/mL **Stock Standard** Solution.
- 10.2 Label eight tubes, Standards 1– 8 and add 150 μL Sample Diluent NS into tube numbers 1-8.
- 10.3 Use the Stock Standard to prepare the following dilution series. Standard #8 contains no protein and is the Blank control:



11. SAMPLE PREPARATION

TYPICAL SAMPLE DYNAMIC RANGE	
Sample Type	Range
Human Plasma - Heparin	1% - 10%
Human Plasma - EDTA	1% - 10%
Human Plasma - Citrate	1% - 10%
Human Serum	1% - 10%

11.1 Plasma

Collect plasma using citrate, EDTA or heparin. Centrifuge samples at 2,000 x g for 10 minutes. Dilute samples into Sample Diluent NS and assay. Store un-diluted plasma samples at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

11.2 Serum

Samples should be collected into a serum separator tube. After clot formation, centrifuge samples at 2,000 x g for 10 minutes and collect serum. Dilute samples into Sample Diluent NS and assay. Store un-diluted serum at -20°C or below. Avoid repeated freeze-thaw cycles.

11.3 Cell Culture Supernatants

Centrifuge cell culture media at 2,000 x g for 10 minutes to remove debris. Collect supernatants and assay or dilute samples into Sample Diluent NS and assay. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

12. PLATE PREPARATION

- The 96 well plate strips included with this kit are supplied ready to use. It is not necessary to rinse the plate prior to adding reagents.
- Unused plate strips should be immediately returned to the foil pouch containing the desiccant pack, resealed and stored at 4°C.
- For each assay performed, a minimum of two wells must be used as the zero control.
- For statistical reasons, we recommend each sample should be assayed with a minimum of two replicates (duplicates).
- Differences in well absorbance or “edge effects” have not been observed with this assay.

13. ASSAY PROCEDURE

- **Equilibrate all materials and prepared reagents to room temperature prior to use.**
- **It is recommended to assay all standards, controls and samples in duplicate.**

- 13.1. Prepare all reagents, working standards, and samples as directed in the previous sections.
- 13.2. Remove excess microplate strips from the plate frame, return them to the foil pouch containing the desiccant pack, reseal and return to 4°C storage.
- 13.3. Add 50 µL of all sample or standard to appropriate wells.
- 13.4. Add 50 µL of the Antibody Cocktail to each well.
- 13.5. Seal the plate and incubate for 1 hour at room temperature on a plate shaker set to 400 rpm.
- 13.6. Wash each well with 3 x 350 µL 1X Wash Buffer PT. Wash by aspirating or decanting from wells then dispensing 350 µL 1X Wash Buffer PT into each well. Complete removal of liquid at each step is essential for good performance. After the last wash invert the plate and blot it against clean paper towels to remove excess liquid.
- 13.7. Add 100 µL of TMB Substrate to each well and incubate for 10 minutes in the dark on a plate shaker set to 400 rpm.
- 13.8. Add 100 µL of Stop Solution to each well. Shake plate on a plate shaker for 1 minute to mix. Record the OD at 450 nm. This is an endpoint reading.

Alternative to 13.7 – 13.8: Instead of the endpoint reading at 450 nm, record the development of TMB Substrate kinetically. Immediately after addition of TMB Development Solution begin recording the blue color development with elapsed time in the microplate reader prepared with the following settings:

ASSAY PROCEDURE

Mode:	Kinetic
Wavelength:	600 nm
Time:	up to 15 min
Interval:	20 sec - 1 min
Shaking:	Shake between readings

Note that an endpoint reading can also be recorded at the completion of the kinetic read by adding 100 μ L Stop Solution to each well and recording the OD at 450 nm.

13.9. Analyze the data as described below.

14. CALCULATIONS

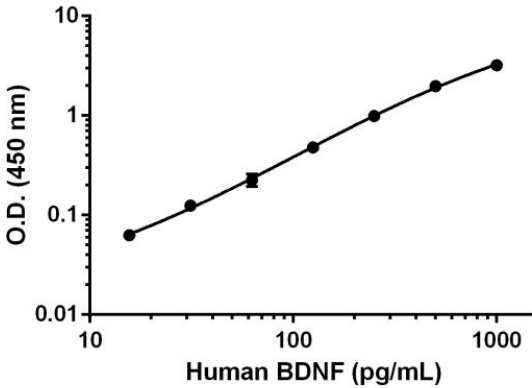
- 14.1 Calculate the average absorbance value for the blank control (zero) standards. Subtract the average blank control standard absorbance value from all other absorbance values.
- 14.2 **Create a standard curve** by plotting the average blank control subtracted absorbance value for each standard concentration (y-axis) against the target protein concentration (x-axis) of the standard. Use graphing software to draw the best smooth curve through these points to construct the standard curve.

Note: Most microplate reader software or graphing software will plot these values and fit a curve to the data. A four parameter curve fit (4PL) is often the best choice; however, other algorithms (e.g. linear, semi-log, log/log, 4 parameter logistic) can also be tested to determine if it provides a better curve fit to the standard values.

- 14.3 Determine the concentration of the target protein in the sample by interpolating the blank control subtracted **absorbance values against the standard curve**. Multiply the resulting value by the appropriate sample dilution factor, if used, to obtain the concentration of target protein in the sample.
- 14.4 Samples generating absorbance values greater than that of the highest standard should be further diluted and reanalyzed. Similarly, samples which measure at an absorbance values less than that of the lowest standard should be retested in a less dilute form.

15. TYPICAL DATA

TYPICAL STANDARD CURVE – Data provided for **demonstration purposes only**. A new standard curve must be generated for each assay performed.



Standard Curve Measurements			
Conc. (pg/mL)	O.D. 450 nm		Mean O.D.
	1	2	
0	0.082	0.081	0.081
15.6	0.149	0.139	0.144
31.3	0.209	0.203	0.206
62.5	0.330	0.284	0.307
125	0.557	0.566	0.561
250	1.077	1.067	1.072
500	2.022	2.089	2.055
1,000	3.294	3.282	3.288

Figure 1. Example of human BDNF standard curve. The BDNF standard curve was prepared as described in Section 10. Raw data values are shown in the table. Background-subtracted data values (mean +/- SD) are graphed.

16. TYPICAL SAMPLE VALUES

SENSITIVITY –

The calculated minimal detectable dose (MDD) is 2.4 pg/mL. The MDD was determined by calculating the mean of zero standard replicates (n=33) and adding 2 standard deviations then extrapolating the corresponding concentration.

RECOVERY –

Three concentrations of BDNF were spiked in duplicate to the indicated biological matrix to evaluate signal recovery in the working range of the assay.

Sample Type	Average % Recovery	Range (%)
10% Human Serum	97	94-104
5% Human Plasma -Citrate	103	95-111
25% Human Plasma -EDTA	98	85-108
5% Human Plasma - Heparin	103	96-112
25% Mouse Serum	108	106-113
2.5% Rat Serum	107	103-110
50% Cell Culture Supernatant	106	103-109

LINEARITY OF DILUTION –

Linearity of dilution is determined based on interpolated values from the standard curve. Linearity of dilution defines a sample concentration interval in which interpolated target concentrations are directly proportional to sample dilution.

DATA ANALYSIS

Native BDNF was measured in the following biological samples in a 2-fold dilution series. Sample dilutions are made in Sample Diluent NS.

Dilution Factor	Interpolated value	10% Human Serum	10% Human Plasma (Citrate)	10% Human Plasma (EDTA)	10% Human Plasma (Heparin)	20% Rat Serum
Undiluted	pg/mL	93.5	207.6	70.2	90.4	238.3
	% Expected value	100	100	100	100	100
2	pg/mL	51.0	104.4	35.2	41.3	123.2
	% Expected value	109	101	100	91	103
4	pg/mL	24.4	56.0	17.1	21.5	59.9
	% Expected value	104	108	97	95	101
8	pg/mL	11.1	29.4	8.4	10.4	30.4
	% Expected value	95	113	96	92	102
16	pg/mL	ND	15.3	ND	ND	16.8
	% Expected value		118			112

ND- Not Detectable

Recombinant BDNF was spiked into the following biological samples and diluted in a 2-fold dilution series in Sample Diluent NS.

Dilution Factor	Interpolated value	10% Mouse Serum	50% Cell culture media	50% L929 Stimulated Supernatant
Undiluted	pg/mL	316.3	529.2	573.4
	% Expected value	100	100	100
2	pg/mL	161	248.8	247.9
	% Expected value	102	94	86
4	pg/mL	77.8	128.3	128.8
	% Expected value	98	97	90
8	pg/mL	35.3	63.5	61.6
	% Expected value	89	96	86
16	pg/mL	16.0	32.9	32.2
	% Expected value	81	99	90

DATA ANALYSIS

PRECISION –

Mean coefficient of variations of interpolated values of BDNF in 3 concentrations of human serum within the working range of the assay.

	Intra- Assay	Inter- Assay
n=	5	3
CV (%)	2.8	5.3

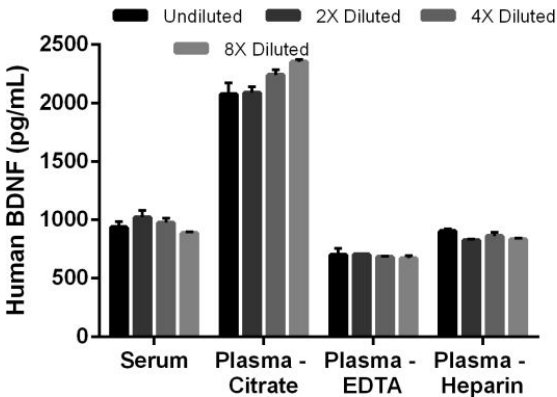


Figure 2. Interpolated concentrations of native BDNF in human serum, and plasma samples. The concentrations of BDNF were measured in duplicates, interpolated from the BDNF standard curves and corrected for sample dilution. Undiluted samples are as follows: serum 10%, plasma (citrate) 10%, plasma (EDTA) 10%, and plasma (heparin) 10%. The interpolated dilution factor corrected values are plotted (mean +/- SD, n=2). The mean BDNF concentration was determined to be 954 pg/mL in serum, 2,189 pg/mL in plasma (citrate), 690 pg/mL in plasma (EDTA) and 856 pg/mL in plasma (heparin).

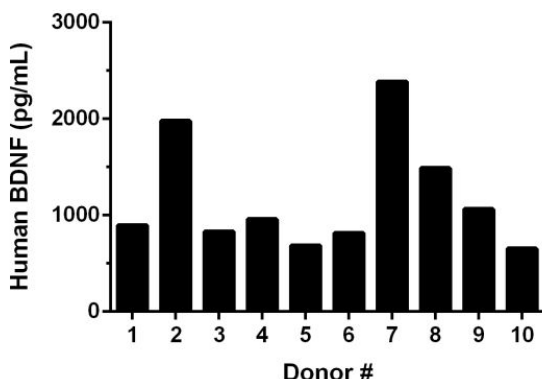


Figure 3. Serum from ten individual healthy human male and female donors was measured in duplicate. Interpolated dilution factor corrected values are plotted (mean \pm SD, $n=2$). The mean BDNF concentration was determined to be 1,176 pg/mL with a range of 653 – 2,387 pg/mL.

17. ASSAY SPECIFICITY

This kit recognizes both native and recombinant free BDNF protein in serum, plasma, and cell culture supernatant.

Cell and tissue extract samples have not been tested with this kit.

CROSS REACTIVITY

Recombinant TRKB was prepared at 50 ng/mL and 500 pg/mL and assayed for cross reactivity. No cross-reactivity was observed.

INTERFERENCE

Recombinant TRKB was prepared at 50 ng/mL and 1 ng/mL and tested for interference with human BDNF at 200 pg/mL. 39% Inference was observed with 1ng/mL and 76% Interference was observed with 50 ng/mL.

18. SPECIES REACTIVITY

This kit recognizes human, mouse, and rat free BDNF protein

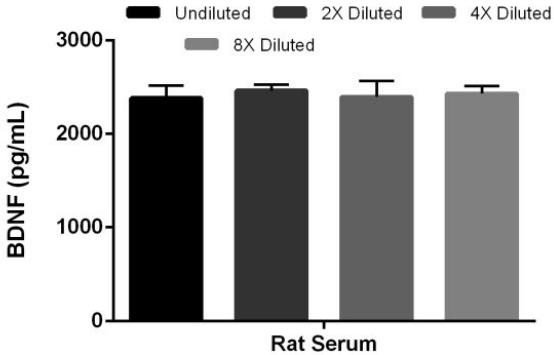


Figure 4. Interpolated concentrations of native BDNF in rat serum sample. The concentrations of BDNF were measured in duplicates, interpolated from the BDNF standard curves and corrected for sample dilution. Undiluted samples are as follows: serum 10%. The interpolated dilution factor corrected values are plotted (mean \pm SD, n=2). The mean BDNF concentration was determined to be 2,471 pg/mL in serum.

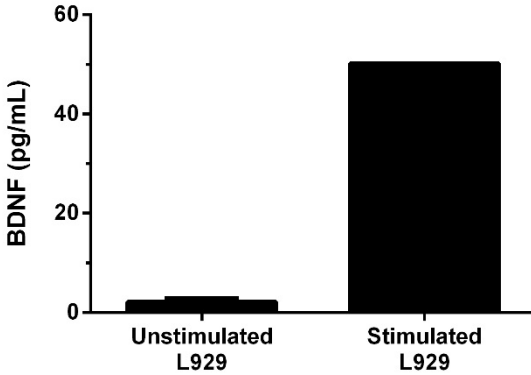


Figure 5. Comparison of secreted BDNF in unstimulated and PMA/PHA-stimulated L929 Cells. L929 cells were grown in the absence (unstimulated) or presence of Phorbol Myristate Acetate (PMA) and phytohemagglutinin (PHA) (stimulated) for 3 days. BDNF was measured in 2-fold diluted cell culture supernatants of unstimulated and PMA/PHA stimulated L929 and cell culture media. Measured values were interpolated from the BDNF Standard Curve diluted in Sample Diluent NS and corrected for dilution factor. Mean of duplicate values +/-SD are graphed: 2.3 pg/mL unstimulated, 50 pg/mL stimulated, and undetectable in media

Please contact our Technical Support team for more information.

RESOURCES

19. TROUBLESHOOTING

Problem	Cause	Solution
Poor standard curve	Inaccurate Pipetting	Check pipettes
	Improper standard dilution	Prior to opening, briefly spin the stock standard tube and dissolve the powder thoroughly by gentle mixing
Low Signal	Incubation times too brief	Ensure sufficient incubation times; increase to 2 or 3 hour standard/sample incubation
	Inadequate reagent volumes or improper dilution	Check pipettes and ensure correct preparation
	Incubation times with TMB too brief	Ensure sufficient incubation time until blue color develops prior addition of Stop solution
Large CV	Plate is insufficiently washed	Review manual for proper wash technique. If using a plate washer, check all ports for obstructions.
	Contaminated wash buffer	Prepare fresh wash buffer
Low sensitivity	Improper storage of the ELISA kit	Store your reconstituted standards at -80°C, all other assay components 4°C. Keep TMB substrate solution protected from light.
Precipitate in Diluent	Precipitation and/or coagulation of components within the Diluent.	Precipitate can be removed by gently warming the Diluent to 37°C.

20. NOTES

UK, EU and ROW

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