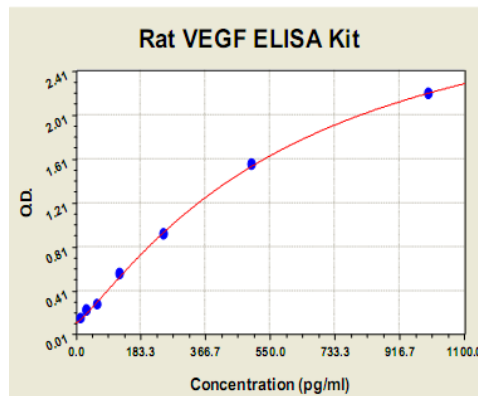


### KIT COMPONENTS

Component	Amount
96-well plate pre-coated with anti-rat VEGF antibody	1 Plate
Protein Standard: Lyophilized recombinant rat VEGF	2 tubes, 10 ng/tube
Sample Diluent Buffer	30 ml
Biotinylated Antibody (Anti-rat VEGF)	130 $\mu$ l (100x)
Antibody Diluent Buffer	12ml
Avidin-Biotin-Peroxidase Complex (ABC) Solution	130 $\mu$ l (100x)
ABC Diluent Buffer	12 ml
Tetramethylbenzidine (TMB) Color Developing Agent	10 ml
TMB Stop Solution	10 ml

#### Storage

Store at 4°C. Cell Applications, Inc. recommends using the kit within 6 months of order.



X	pg/ml	0.0	15.6	31.2	62.5	125	250	500	1000
Y	O.D.	0.450	0.094	0.155	0.234	0.275	0.558	0.918	1.555

**Figure 1: VEGF Standard Curve.** Using the Rat VEGF ELISA Kit, O.D. data was graphed against VEGF protein concentration. The TMB reaction was incubated at 37°C for 12 min.

### BACKGROUND

Vascular endothelial growth factor (VEGF, also designated as VEGF-A) is the founding member of a family of homodimeric glycoproteins that are structurally related to the platelet-derived growth factors (PDGF); this family also includes placenta growth factor (PIGF), VEGF-B, VEGF-C, VEGF-D and VEGF-E. This VEGF family of proteins binds selectively with different affinities to at least five distinct receptors. Three of them belong to the superfamily of receptor tyrosine kinases and are termed VEGF receptor-1 (VEGFR-1), also called Flt-1 (fms-like tyrosine kinase 1), VEGFR-2, also called KDR (kinase insert-domain containing receptor) in humans, and Flk-1 (fetal liver kinase 1) in rodents, respectively, as well as VEGFR-3, also called Flt-4. The fourth and fifth receptors are neuropilin-1 and neuropilin-2.<sup>1</sup> VEGF is a highly specific mitogen for vascular endothelial cells. Five VEGF isoforms of 121, 145, 165, 189 and 206 amino acids (VEGF121-206) are generated as a result of alternative splicing from a single VEGF gene. These isoforms differ in their molecular mass and in biological properties such as their ability to bind to cell-surface heparan-sulfate proteoglycans. The expression of VEGF is potentiated in response to hypoxia, by activated oncogenes, and by a variety of cytokines. VEGF induces endothelial cell proliferation, promotes cell migration, and inhibits apoptosis. *In vivo* VEGF induces angiogenesis as well as permeabilization of blood vessels, and plays a central role in the regulation of vasculogenesis.<sup>2</sup> Deregulated VEGF expression contributes to the development of solid tumors by promoting tumor angiogenesis and to the etiology of several additional diseases that are characterized by abnormal angiogenesis. Consequently, inhibition of VEGF signaling abrogates the development of a wide variety of tumors.<sup>3</sup>

### References

1. Kurebayashi J et al.: Jpn J Cancer Res. 90:977-81, 1999.
2. Shinkaruk S et al.: Curr Med Chem Anticancer Agents. 3:95-117, 2003.
3. Rini BI: Oncologist 10:191-197,2005.

### ELISA OVERVIEW

Cell Applications ELISA Kits are based on standard sandwich enzyme-linked immunosorbent assay technology. Freshly prepared standards, samples, and solutions are recommended for best results.

1. Prepare test samples.
2. Prepare a protein standard of the target protein.
3. Add test samples and standards to the pre-coated 96-well plate. Do not wash.
4. Add biotinylated detection antibodies. Wash.
5. Add Avidin-Biotin-Peroxidase Complex (ABC) Solution. Wash.
6. Add Tetramethylbenzidine (TMB) Color Developing Agent, containing HRP substrate.
7. Add TMB Stop Solution
8. Subject the plate to analysis.

### NOTES:

- Before using the kit, quick spin tubes to bring down all solution to the bottom of tube.
- Duplicate assay wells are recommended for both standard and sample testing.
- Do not let the 96-well plate dry, this will lead to inactivation of plate components.
- When diluting samples and reagents, ensure that they are mixed completely and evenly.
- Pre-warm diluted ABC and TMB solutions at 37°C for 30 min before use to avoid variable temperature effects.
- For washes, use TBS or PBS. Do not touch well walls.
- A protein standard is included in the kit. A protein standard detection curve should be generated with each experiment, no more than 2 hours prior to the experiment.
- The user will determine sample dilution fold by estimation of target protein amount in samples.

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## ELISA PROTOCOL

### Preparation of Test Samples

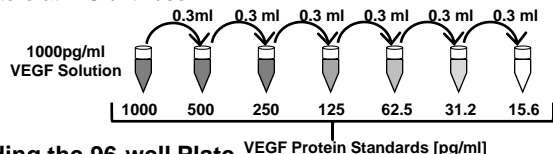
- Process Test Samples in the following manner:
  - Cell culture supernate, tissue lysate or body fluids:** Remove particulates by centrifugation, analyze immediately or aliquot and store at -20° C.
  - Serum:** Allow the serum to clot in a serum separator tube (about 2 hours) at room temperature. Centrifuge at approximately 1500 X g for 15 min. Analyze the serum immediately or aliquot and store frozen at -20°C.
  - Plasma:** Collect plasma using EDTA as an anticoagulant. Centrifuge for 15 min at 1500 x g at 2-8°C within 30 min of collection. Analyze immediately or aliquot and store frozen at -20°C. Heparin and citrate are not recommended as the anticoagulant.
- Estimate the concentration of the target protein in the sample and select a proper dilution factor such that the diluted target protein concentration falls within the 15.6-1000 pg/ml standard curve range. Depending on the sample, several trial dilutions may be necessary. Dilute the sample using the provided diluent buffer, mixing well. Suggested working dilutions of samples are as follows:

Target Protein Concentration Range	Sample Working Dilution	Sample Vol.	Diluent Buffer Vol.
10-100 ng/ml	1:100	1 µl	99 µl
1-10 ng/ml	1:10	10 µl	90 µl
15.6-1000 pg/ml	1:2	50 µl	50 µl
≤15.6 pg/ml	n/a	100µl	n/a

- If samples will be assayed within 24 hours, store at 2-8°C. For long-term storage, aliquot and freeze samples at -20°C. Avoid repeated freeze-thaw cycles.

### Preparation of Standard Solutions (15.6-1000 pg/ml)

- Reconstitute the Lyophilized Recombinant Protein to make a 10,000 pg/ml VEGF solution. Add 1 ml Sample Diluent Buffer to a tube of lyophilized protein, keep the tube at room temperature for 10 min. Mix thoroughly.
- Aliquot 0.9 ml of the Sample Diluent Buffer to an eppendorf tube, and label as 1000 pg/ml Protein Standard.
- Add 0.1 ml of the mixed 10,000 pg/ml VEGF solution to the eppendorf tube containing 0.9 ml diluent buffer and mix to make a 1000 pg/ml VEGF solution.
- Label 6 eppendorf tubes with the VEGF protein concentrations to be prepared by serial dilution: 500pg/ml, 250pg/ml, 125pg/ml, 62.5pg/ml, 31.2pg/ml, 15.6pg/ml.
- Aliquot 0.3 ml of the Sample Diluent Buffer to the labeled tubes.
- Serially dilute the protein standards into their respectively labeled tubes. Transfer 0.3 ml from the 1000pg/ml VEGF Solution to the 500pg/ml eppendorf tube and mix thoroughly. Transfer 0.3 ml of the 500 pg/ml solution to the 250pg/ml tube and mix thoroughly, Transfer 0.3 ml of the 250pg/ml solution to the 125pg/ml tube and mix, and so on to make the 62.5, 31.2, and 15.6 pg/ml solutions.
- Store at 4°C until use.



### •Loading the 96-well Plate

- Aliquot 0.1 ml of the sample diluent buffer into a control well to serve as the Blank. This will yield the O.D.450(Blank) reading.
- Aliquot 0.1 ml of the standard solutions of the **Preparation of Standard Solutions** (15.6-1000 pg/ml) into empty wells of the precoated 96-well plate. Duplicate measurements of standards are recommended.

- Aliquot 0.1 ml of each properly diluted test sample to empty wells prepared in **Step 2**. Duplicate measurements of each test sample are recommended.
- Cover the 96-well plate and incubate at 37°C for 90 min.
- During the **Step 14** incubation period, prepare a stock of Biotinylated 1:100 Antibody Working Solution. Count the number of reactions and multiply by 0.1 ml/well for the Working Solution total volume (preparation of 1-2 reactions in excess of the number of wells is recommended). Dilute the Biotinylated Antibody to 1:100 in Antibody Diluent Buffer and mix thoroughly. Use the working solution within 2 hours.
- Upon completion of the 90 min incubation of **Step 14**, remove the cover of the 96 well plate and discard plate well contents. Blot the plate onto paper towels or other absorbent material. DO NOT let the wells completely dry at any time.
- Add 0.1 ml of the Biotinylated 1:100 Antibody Working Solution (prepared in **Step 15**) to each well and incubate the plate at 37°C for 60 min.
- During the incubation period of **Step 17**, prepare a stock of ABC Working Solution. Count the number of reactions and multiply by 0.1 ml/well for the Working Solution total volume (preparation of 1-2 reactions in excess of the number of wells is recommended). Dilute the ABC Stock Solution to 1:100 in ABC Diluent Buffer and mix thoroughly. Pre-warm the ABC working solution at 37°C for 30 min before use. Use the working solution within 1 hour.
- Upon completion of the 60 min incubation of **Step 17**, wash the plate 3 times with 0.3 ml TBS or PBS. For each wash, leave washing buffer in the wells for 1-2 min. Discard the washing buffer and blot the plate onto paper towels or other absorbent material.
- Add 0.1 ml of prepared ABC Working Solution (prepared in **Step 18**) to each well and incubate the plate at 37°C for 30 min.
- During the incubation period of **Step 20**, pre-warm TMB Color Developing Agent at 37°C for 30 min before use.
- Upon completion of the 30 min incubation of **Step 20**, wash the plate 5 times with 0.3 ml TBS or PBS. For each wash, leave the washing buffer in the wells for 1-2 min. Discard the washing buffer and blot the plate onto paper towels or other absorbent material.
- Add 90 µl of the pre-warmed TMB Color Developing Agent into each well and incubate at 37°C for 8-12 min (shades of blue can be seen in the wells with the four most concentrated Protein Standard Solutions; the other control wells should show no obvious color).
- Add 0.1 ml of the TMB Stop Solution to each well. The acidic stop solution will change the mixture color to yellow. The yellow intensity is proportional to the amount of target protein captured by the plate.
- Read the O.D. absorbance at 450nm in a microplate reader within 30 min after adding the stop solution. These readings are the O.D.450(Reading).

### Calculating Protein Concentration

- For all wells, determine O.D.450(Relative):  
O.D.450(Relative) = O.D.450(Reading) – O.D.450(Blank)
- Plot the standard curve: plot O.D.450(Relative) of each standard solution (Y) vs. the respective concentration of the standard solution (X). See **Figure 1** for a typical standard curve.
- The VEGF concentration of the samples can be interpolated from the standard curve. Multiply the interpolated concentration by the dilution factor to obtain the target protein concentration in the sample.

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