# Human Total MMP-1 Colorimetric ELISA Kit

**Catalog #: OKAG00170**

**Detection and Quantification of Human Total MMP-1 Concentrations in Cell Lysates, Sera and Plasma.**

**Please read the provided manual as suggested experimental protocols may have changed.**

**Research Purposes Only. Not Intended for Diagnostic or Clinical Procedures.**

## CONTENTS PAGE

# INTRODUCTION

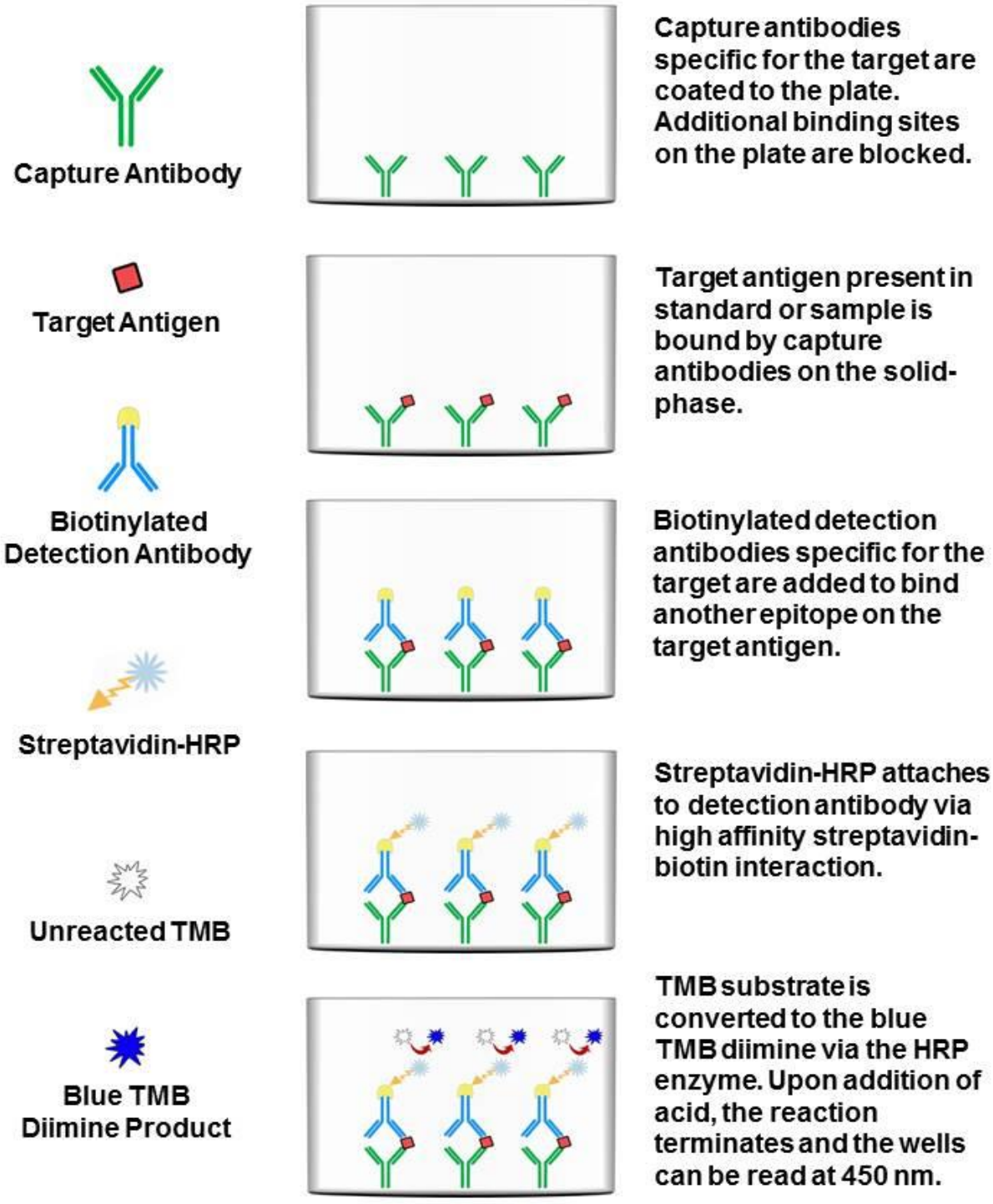
Proteins of the matrix metalloproteinase (MMP) family are involved in the breakdown of extracellular matrix in normal physiological processes, such as embryonic development, reproduction, and tissue remodeling, as well as in disease processes, such as arthritis and metastasis. Most MMP's are secreted as inactive proproteins which are activated when cleaved by extracellular proteinases. This gene encodes a secreted enzyme which breaks down the interstitial collagens, types I, II, and III. The gene is part of a cluster of MMP genes which localize to chromosome 11q22.3. . Alternatively spliced transcript variants encoding different isoforms have been identified. Human total MMP-1 cleaves collagens of types I, II, and III at one site in the helical domain and also cleaves collagens of types VII and X. In case of HIV infection, MMP-1 interacts and cleaves the secreted viral Tat protein, leading to a decrease in neuronal Tat's mediated neurotoxicity. Cleavage of the triple helix of collagen occurs at about three-quarters of the length of the molecule from the N-terminus, at 775-Gly-|-Ile-776 in the alpha-1(I) chain. The proteinase cleaves synthetic substrates and alpha-macroglobulins at bonds where P1' is a hydrophobic residue.There are two distinct domains in this protein: the catalytic N-terminal, and the C-terminal which is involved in substrate specificity and in binding TIMP (tissue inhibitor of metalloproteinases). The conserved cysteine present in the cysteine-switch motif binds the catalytic zinc ion, thus inhibiting the enzyme. The dissociation of the cysteine from the zinc ion upon the activation-peptide release activates the enzyme. MMP-1 undergoes autolytic cleavage to two major forms (22 kDa and 27 kDa). A minor form (25 kDa) is the glycosylated form of the 22 kDa form. The 27 kDa form has no activity while the 22/25 kDa form can act as activator for collagenase.

*Source: Entrez Gene; Swiss-Prot*

# ASSAY PRINCIPLES

The Human Total MMP-1 ELISA Kit contains the components necessary for quantitative determination of natural or recombinant Human Total MMP-1 concentrations within any experimental sample including cell lysates, serum and plasma. This particular immunoassay utilizes the quantitative technique of a “Sandwich” Enzyme-Linked Immunosorbent Assay (ELISA) where the target protein (antigen) is bound in a “sandwich” format by the primary capture antibodies coated to each well-bottom and the secondary detection antibodies added subsequently by the investigator. The capture antibodies coated to the bottom of each well are specific for a particular epitope on Human Total MMP-1 while the user-added detection antibodies bind to epitopes on the captured target protein. Amid each step of the procedure, a series of wash steps must be performed to ensure the elimination of non-specific binding between proteins to other proteins or to the solid phase. After incubation and “sandwiching” of the target antigen, a peroxidase enzyme is conjugated to the constant heavy chain of the secondary antibody (either covalently or via Avidin/Streptavidin-Biotin interactions), allowing for a colorimetric reaction to ensue upon substrate addition. When the substrate TMB (3, 3’, 5, 5’-Tetramethylbenzidine) is added, the reaction catalyzed by peroxidase yields a blue color that is representative of the antigen concentration. Upon sufficient color development, the reaction can be terminated through addition of Stop Solution (2 N Sulfuric Acid) where the color of the solution will turn yellow. The absorbance of each well can then be read by a spectrophotometer, allowing for generation of a standard curve and subsequent determination of protein concentration.

# ASSAY FORMAT



# ASSAY RESTRICTIONS

- This ELISA kit is intended for research purposes only, NOT diagnostic or clinical procedures of any kind.
- Materials included in this kit should NOT be used past the expiration date on the kit label.
- Reagents or substrates included in this kit should NOT be mixed or substituted with reagents or substrates from any other kits.
- Variations in pipetting technique, washing technique, operator laboratory technique, kit age, incubation time or temperature may cause differences in binding affinity of the materials provided.
- The assay is designed to eliminate interference and background by other cellular macromolecules or factors present within any biological samples. However, the possibility of background noise cannot be fully excluded until all factors have been tested using the assay kit.
- Individual results may vary due to differences in technique, plasticware and water sources.

# MATERIALS INCLUDED

| Component | Quantity Per Plate | Container |
|---|---|---|
| Microstrips Coated w/ Capture Antibody | 12 x 8-Well Microstrips | - |
| Protein Standard | Lyophilized | Red |
| Biotinylated Detection Antibody | Lyophilized | Yellow |
| 400x Streptavidin-HRP | 30 µl | Blue |
| Wash Buffer (15x) | 50 ml | Clear |
| Assay Diluent | 50 ml | Clear |
| Ready-to-Use Substrate | 12 ml | Brown |
| Stop Solution | 12 ml | Clear |
| Adhesive Plate Sealers | 2 Sheets | - |
| Technical Manual | 1 Manual | - |

# ADDITIONAL MATERIALS REQUIRED

The following materials and/or equipment are NOT provided in this kit but are necessary to successfully conduct the experiment:

- Microplate reader able to measure absorbance at 450 nm (with correction wavelength set to 540 nm or 570 nm)
- Micropipettes with capability of measuring volumes ranging from 1 µl to 1 ml
- Distilled, deionized, and or purified water (recommended TOC 1-50 ppb, MΩ-cm 18.0)
- Squirt bottle, manifold dispenser, multichannel pipette reservoir or automated microplate washer
- Graph paper or computer software capable of generating or displaying logarithmic functions
- Absorbent paper or vacuum aspirator
- Test tubes or microfuge tubes capable of storing ≥1 ml
- Bench-top centrifuge (optional)
- Bench-top vortex (optional)
- Orbital shaker (optional)

# HEALTH AND SAFETY PRECAUTIONS

- Reagents provided in this kit may be harmful if ingested, inhaled or absorbed through the skin. Please carefully review the MSDS for each reagent before conducting the experiment.

- Stop Solution contains 2 N Sulfuric Acid ($H_2SO_4$) and is an extremely corrosive agent. Please wear proper eye, hand and face protection when handling this material. When the experiment is finished, be sure to rinse the plate with copious amounts of running water to dilute the Stop Solution prior to disposing the plate.

# STORAGE INFORMATION

**Note:** If used frequently, reagents may be stored at 4°C.

**Unopened Kits:** Store at 4°C for 6 months.

| Component | Storage Time | Storage Information |
|---|---|---|
| Microstrips Coated w/ Capture Antibody | 6 Months | 4°C |
| 400x Streptavidin-HRP | | |
| Wash Buffer (15x) | | |
| Assay Diluent | | |
| Ready-to-Use Substrate | | |
| Stop Solution | | |
| Protein Standard | Lyophilized: 6 Months<br>Reconstituted: 1 Month | 4°C |
| Biotinylated Detection Antibody | | |
| Adhesive Plate Sealers | - | - |
| Technical Manual | - | - |

# SAMPLE STORAGE AND PREPARATION

If samples are to be used within 24 hours, aliquot and store at 4°C. If samples are to be used over a long period of time, aliquot and store between -20°C and -80°C, depending on the duration of storage.

**Note:** Samples containing a visible precipitate or pellet must be clarified prior to use in the assay.

**Caution:** Avoid repeated freeze/thaw cycles to prevent loss of biological activity of proteins in experimental samples.

### *Cell Lysate and Supernatants*

Remove large cell components via centrifugation and perform the assay. Cell lysates and supernatants require a dilution using Assay Diluent. A serial dilution may be performed to determine a suitable dilution factor for the sample.

### *Serum*

Allow samples to clot in a serum separator tube (SST) for 30 minutes. After sufficient clotting, centrifuge at 1000 x g for 15 minutes and remove serum from SST in preparation for the assay. A serial dilution may be performed to determine a suitable dilution factor for the sample. For serum sample dilutions refer to Serum and Plasma Sample Dilution Protocol.

### *Plasma*

Use heparin, citrate or EDTA as an anticoagulant to gather plasma from original biological sample. After collection of the plasma, centrifuge for 15 minutes at 1000 x g. This step must be performed within 30 minutes of plasma collection. A serial dilution may be performed to determine a suitable dilution factor for the sample. For plasma sample dilutions refer to Serum and Plasma Sample Dilution Protocol.

***Serum and Plasma Sample Dilution Protocol***

a. Dilute the serum or plasma samples with PBS supplemented with 10-50% animal serum (Serum/Plasma Diluent).

b. Reconstitute and dilute the Protein Standards using the Serum/Plasma Diluent, instead of Assay Diluent, so it reflects the environment of the samples being measured.

c. Reconstitute the Biotin-Conjugated Detection Antibody in Assay Diluent and dilute the Streptavidin-HRP in Assay Diluent. Do not use the Serum/Plasma Diluent to reconstitute or dilute the Detection Antibody or Streptavidin-HRP.

# SAMPLE EXPERIMENT LAYOUT

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **A** | Standard (High Point) | Standard (High Point) | Standard (High Point) | Sample | Sample | Sample |
| **B** | Standard (1:2) | Standard (1:2) | Standard (1:2) | Sample | Sample | Sample |
| **C** | Standard (1:4) | Standard (1:4) | Standard (1:4) | Sample | Sample | Sample |
| **D** | Standard (1:8) | Standard (1:8) | Standard (1:8) | Sample | Sample | Sample |
| **E** | Standard (1:16) | Standard (1:16) | Standard (1:16) | Sample | Sample | Sample |
| **F** | Standard (1:32) | Standard (1:32) | Standard (1:32) | Sample | Sample | Sample |
| **G** | Standard (1:64) | Standard (1:64) | Standard (1:64) | Sample | Sample | Sample |
| **H** | Negative Control | Negative Control | Negative Control | Sample | Sample | Sample |

# IMMUNOASSAY PROTOCOL

**Note:** Spin down the Protein Standard, Biotin-Conjugated Detection Antibody vials before opening. If possible, all incubation steps should be performed on an orbital shaker to equilibrate solutions when added to the microplate wells. Also, all provided solutions should be at ambient temperature prior to use.

### *Reconstitution of Provided Materials*

1. Reconstitute the Protein Standard in 83µl of Assay Diluent for a concentration of 180ng/ml. **Note:** If working with serum or plasma, see page 9 prior to reconstitution.

2. Reconstitute the Biotin-Conjugated Detection Antibody in 55µl of Assay Diluent for a concentration of 18ug/ml.

3. Dilute the 15x Wash Buffer to 1x Wash Buffer using 14 volumes of dd$H_2O$ and 1 volume of 15x Wash Buffer.

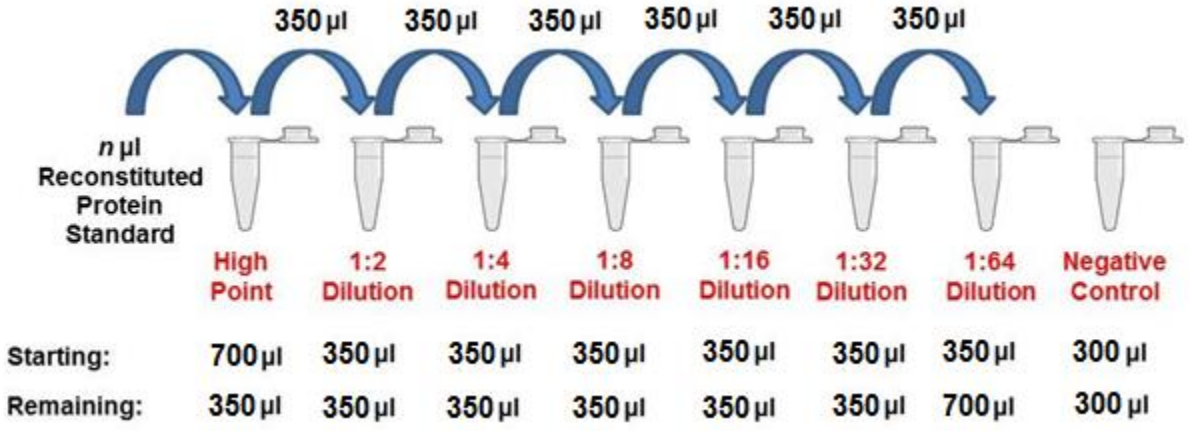
### *Addition of Known Standard and Unknown Sample to Immunoassay*

The Human Total MMP-1 ELISA Kit allows for the detection and quantification of endogenous levels of natural and/or recombinant Human Total MMP-1 proteins within the range of 157-10000 pg/ml.

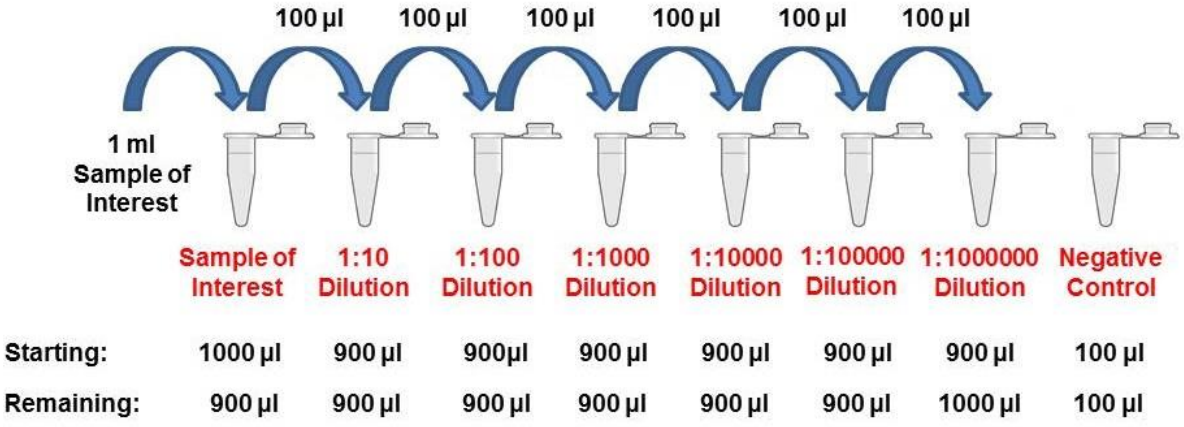
1. Prepare the appropriate diluent for the sample type. Ensure that the Protein Standard is reconstituted and diluted with the same diluent as the sample. Dilute Protein Standard within the range of 10000 pg/ml to 157 pg/ml in a series of microfuge tubes. Mix each tube thoroughly by inverting several times or by vortexing lightly to ensure proper equilibration. Add 100 µl of each serial dilution step into the wells of a specified row or column of the 96-well microtiter plate in duplicate or triplicate and incubate at room temperature for 2 hours. Unknown Samples of Interest can be serial diluted with the appropriate diluent to the concentrations within the detection range of this assay kit and added to the plate at 100 µl per well. See next page for illustration. Blank Control is defined as 100 ul of diluent used to dilute samples and standard per well. Seal the plate.

# STANDARD AND SAMPLE SERIAL DILUTION

To obtain serial dilution high point, dilute reconstituted Protein Standard to the maximum concentration for serial dilution by adding *n* µl reconstituted Protein Standard to serial dilution high point tube and then raising the volume to 700 µl. Shown below is a diagram illustrating an example 2-fold serial dilution on a given reconstituted Protein Standard.




For samples of unknown protein concentrations, serial dilute the experimental sample using Assay Diluent to determine range of detection and acceptable dilutions. Shown below is a diagram illustrating a 10-fold serial dilution on a given Sample of Interest.



### *Addition of Detection Antibody to Capture Antibody-Bound Samples*

2. Aspirate the protein standard solution out of the microplate wells. If your lab does not have a vacuum-based aspirator, you may dump the solutions from the microplate into a waste container and blot 3-4 times on a stack of paper towels until most or all of the liquid is removed from the wells. Dilute the 15x Wash Buffer to 1x using dd$H_2O$. Add 300-400 µl of 1x Wash Buffer to each well and gently shake for 5-7 minutes on an orbital shaker. Perform this wash step 4 times consecutively.

3. After the 4$^{th}$ wash step, dilute the detection antibody solution 1:180 in Assay Diluent to 0.1ug/ml. Mix the test tube either by inverting several times or vortexing to ensure proper equilibration. Ensure that there is enough detection antibody solution for all wells. Add 100 µl of the diluted detection antibody solution into each well, seal the plate and incubate at room temperature for 2 hours.

### *Conjugation of Streptavidin-HRP to Biotinylated Detection Antibody*

4. Remove the detection antibody solution out of the microplate wells by either vacuum-based aspirator or paper towel blotting. Perform 4 consecutive wash steps with gentle shaking between each wash.

5. Dilute the 400x Streptavidin-HRP by 1:400 using Assay Diluent to a 1x Streptavidin-HRP solution.

6. After the 4$^{th}$ wash step, add 100 µl of 1x Streptavidin-HRP solution into each well and incubate at room temperature for 30 minutes. Avoid placing the plate in direct light.

### *Application of Liquid Substrate for Colorimetric Reaction*

7. Remove the 1x Streptavidin-HRP solution out of the microplate wells by either vacuum-based aspirator or paper towel blotting. Prepare the Ready-to-Use Substrate by bringing it to room temperature without exposure to fluorescent or UV light as these may degrade the substrate. Perform 4 consecutive wash steps with gentle shaking between each wash.

8. After the 4th wash step, add 100 µl of Ready-to-Use Substrate solution into each well and incubate at room temperature for approximately 15-20 mins. Avoid placing the plate in direct light. Closely monitor the color development as some wells may turn blue very quickly depending on analyte and/or detection antibody-HRP concentrations. Dispense 100 µl of Stop Solution into each well. The color in the wells should immediately change from blue to yellow.

9. The microplate is now ready to be read by a microplate reader. Within 30 minutes of adding the Stop Solution, determine the optical density (absorbance) of each well by reading the plate with the microplate reader set to 450 nm. If wavelength correction is available, set to 540 nm or 570 nm. If wavelength correction is not available, subtract readings at 540 nm or 570 nm from the readings at 450 nm.

   **Caution:** Readings made directly at 450 nm without correction may be higher and less accurate.

***Generation of Standard Curve and Interpretation of Data***

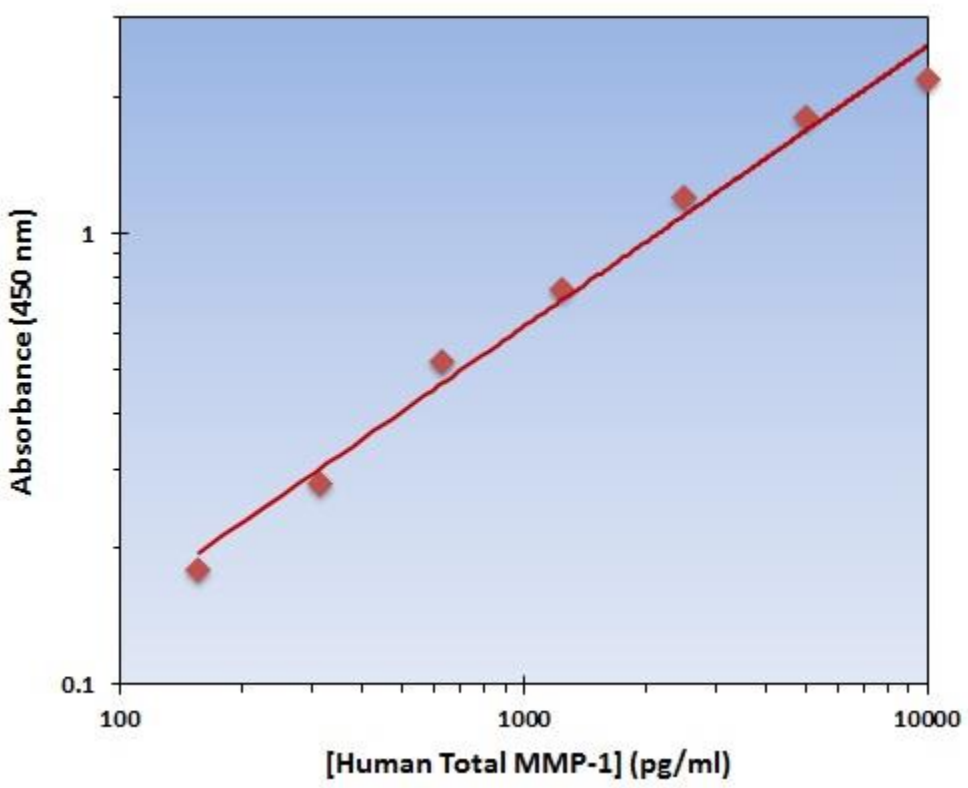
10. Average the duplicate or triplicate readings for each standard, control and sample and subtract the average zero standard optical density.

11. Generate a standard curve by using Microsoft Excel or other computer software capable of establishing a 4-Parameter Logistic (4-PL) curve fit. If using Excel or an alternative graphing tool, plot the average optical density values in absorbance units (y-axis) against the known standard concentrations in pg/ml (x-axis).

    **Note:** Only use the values in which a noticeable gradient can be established. Afterwards, generate a best fit curve or “trend-line” through the plotted points via regression analysis.

    **Note:** Shown on the next page is an example of typical data produced by analysis of the standard sample.

The data and subsequent graph was obtained after performing a cytokine ELISA for Human Total MMP-1. Each known sample concentration was assayed in triplicate.



# SUMMARIZED PROTOCOL

**Reconstitute Biotinylated Detection Antibody and Protein Standard and dilute the 15x Wash Buffer as specified.**

**Perform serial dilution of Protein Standard and prepare samples as desired. See sample preparation section for instructions to dilute serum and plasma samples.**

**Add 100ul of Protein Standard, sample or control to each well and incubate for 2 hours at room temperature.**

**Aspirate Protein Standards, samples or controls out and wash plate 4 times.**

**Dilute Biotinylated Detection Antibody as specified. Add 100ul to each well and incubate for 2 hours at room temperature.**

**Aspirate Biotinylated Detection Antibody out and wash plate 4 times.**

**Dilute 400x Streptavidin-HRP as specified. Add 100ul of 1x Streptavidin-HRP to each well and incubate at room temperature for 30 minutes.**

**Aspirate 1x Streptavidin-HRP out and wash plate 4 times.**

**Add 100ul of Ready-to-Use Substrate to each well and incubate at room temperature for color development.**

**Add 100ul of Stop Solution and read plate at 450nm.**

## SENSITIVITY

The Human Total MMP-1 ELISA Kit allows for the detection and quantification of endogenous levels of natural and/or recombinant Human Total MMP-1 proteins within the range of 157-10000 pg/ml.

## CROSS REACTIVITY AND SPECIFICITY

The OmniKine™ Human MMP-1 ELISA is capable of recognizing both recombinant and naturally produced Human MMP-1 proteins. The antigens listed below were tested at 50 ng/ml and did not exhibit significant cross reactivity or interference.

• Human: MMP-2, MMP-3, MMP-7, MMP-8, MMP-9, MMP-10, MMP-12, MMP-13, MMP-16, TIMP-1, TIMP-2, TIMP-3, TIMP-4

# TECHNICAL SUPPORT

For troubleshooting, information or assistance, please go online to www.avivasysbio.com or contact us at:

Aviva Systems Biology Corporation
10211 Pacific Mesa Blvd, Ste 401
San Diego, CA 92121
United States of America

Email: info@avivasysbio.com or techsupport@avivasysbio.com

Phone: (858) 552-6979
Toll-Free Phone: (888) 880-0001
Fax: (858) 552-6975

# ELISA PLATE TEMPLATE