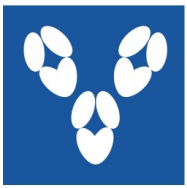

LSBio
an Absolute Biotech Company

Human ESM1 / Endocan ELISA Kit (Sandwich ELISA)

User Manual

Catalog No. LS-F2665

It is important that you read this entire manual carefully before starting your experiment.

This kit is for Research Use Only and not for Diagnostic Use.
This kit is not approved for use in humans or for clinical diagnosis.

SAMPLE ONLY

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ASSAY SPECIFICATIONS

Target:	ESM1 / Endocan
Synonyms:	ESM1 / Endocan, ESM1, endothelial cell-specific molecule 1, ESM-1, Endocan
Specificity:	This kit is for the detection of natural and recombinant human ESM1. No significant cross-reactivity or interference between ESM1 and analogs was observed. This claim is limited by existing techniques therefore cross-reactivity may exist with untested analogs.
Sample Types:	This kit is intended for use with samples such as Human Cell Culture Supernatants, Cell Lysates, Plasma, and Serum(Plasma collected using heparin or EDTA). It has been empirically tested using the standard supplied with the kit (typically a recombinant protein).
Detection:	Colorimetric - 450nm (TMB)
Measurement:	Quantitative
Detection Range:	31.2–2000 pg/ml
Sensitivity:	Typically less than 10 pg/ml
Performance:	Intra-Assay CV (<7.9%); Inter-Assay CV (<8.8%)
Limitations:	This kit is for **Research Use Only** and is not intended for diagnostic use. This kit is not approved for use in humans or for clinical diagnosis.

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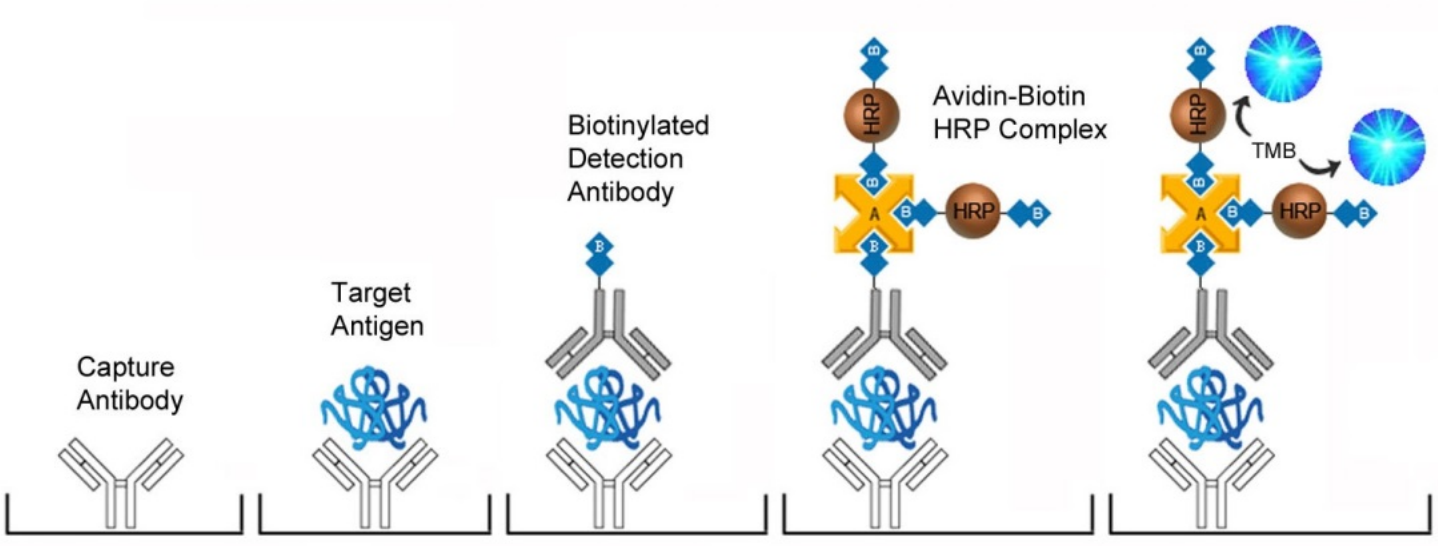
ASSAY PRINCIPLE

This assay is based on the sandwich ELISA principle. Each well of the supplied microtiter plate has been pre-coated with a target specific capture antibody. Standards or samples are added to the wells and the target antigen binds to the capture antibody. Unbound Standard or sample is washed away. A biotin-conjugated detection antibody is then added which binds to the captured antigen. Unbound detection antibody is washed away. An Avidin Biotin-Peroxidase Complex (ABC) is then added which binds to the biotin and amplifies the signal. Unbound ABC is washed away. A TMB substrate is then added which reacts with the peroxidase enzyme resulting in color development. A sulfuric acid stop solution is added to terminate color development reaction and then the optical density (OD) of the well is measured at a wavelength of 450 nm ± 2 nm. The OD of an unknown sample can then be compared to an OD standard curve generated using known antigen concentrations in order to determine its antigen concentration.

SAMPLE ONLY

ASSAY PRINCIPLE IMAGE



KIT COMPONENTS AND STORAGE

Component	Quantity
Coated 96-well Strip Plate	1
Standard (Lyophilized)	2 vials
Sample Diluent	1 vial x 30 mL
Wash Buffer (25x)	20ml
Biotinylated Detection Antibody (100x)	1 vial x 130 µL
ABC Complex (100x)	1 vial x 130 µL
Detection Antibody Diluent	1 vial x 12 mL
ABC Complex Diluent	1 vial x 12 mL
TMB Substrate	1 vial x 10 mL
Stop Solution	1 vial x 10 mL
Adhesive Plate Sealers	4
Instruction Manual	1

KIT STORAGE

The unopened kit can be stored at 2°C to 8°C through the expiration date. Once opened all kit components can be stored at 2°C to 8°C of up to 1 month. For long term storage the Standard, Biotin-antibody, and HRP-avidin should be stored at -20°C. TMB Substrate should always be stored at 4°C. Unused strips should be kept in a sealed bag with the desiccant provided to minimize exposure to damp air.

OTHER REQUIRED SUPPLIES

- Microplate reader with 450 nm wavelength filter
- High-precision pipette and sterile pipette tips
- Eppendorf tubes
- 37°C incubator
- Deionized or distilled water
- Absorbent paper
- Plate Sealers

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ASSAY PLANNING

Before using this kit researchers should consider the following:

1. Read this manual in its entirety in order to minimize the chance of error.
2. Confirm that you have the appropriate non-supplied equipment available.
3. Confirm that the species, target antigen, and sensitivity of this kit are appropriate for your intended application.
4. Confirm that your samples have been prepared appropriately based upon recommendations (see **Sample Preparation**) and that you have sufficient sample volume for use in the assay.
5. When first using the kit appropriate validation steps should be taken before using valuable samples. Confirm that the kit adequately detects the target antigen in your intended sample type(s) by running control samples.
6. If the concentration of target antigen within your samples is unknown a preliminary experiment should be run using a control sample to determine the optimal sample dilution (see Experimental Layout and Sample Preparation).
7. Ensure that the kit is properly stored and do not use it beyond its expiration date.
8. When using multiple lots of the same kit do not substitute reagents from one kit to another. Review each manual carefully as changes can occur between lots. To control for inter-assay variability include a carry-over control sample.

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EXPERIMENTAL LAYOUT

The following is an example of how to layout a study. A dilution series of the positive control Standard should be run in duplicate or triplicate, with the last well in each series being the negative control blank. Samples should also be run in duplicate or triplicate. Unknown samples should be run as a dilution series in order to identify the optimal dilution that produces an OD reading within the OD range of the positive control Standard dilution series.

Example 1: Standard Curve and dilution series of an unknown sample.

	1	2	3	4	...
A	Standard Dilution 1	Standard Dilution 1	Sample (1:1)	Sample (1:1)	...
B	Standard Dilution 2	Standard Dilution 2	Sample (1:10)	Sample (1:10)	...
C	Standard Dilution 3	Standard Dilution 3	Sample (1:100)	Sample (1:100)	...
D	Standard Dilution 4	Standard Dilution 4	Sample (1:1k)	Sample (1:1k)	...
E	Standard Dilution 5	Standard Dilution 5	Sample (1:10k)	Sample (1:10k)	...
F	Standard Dilution 6 or Negative Control	Standard Dilution 6 or Negative Control	Sample (1:100k)	Sample (1:100k)	...
G	Standard Dilution 7 or Negative Control	Standard Dilution 7 or Negative Control	Sample (1:1,000k)	Sample (1:1,000k)	...
H	Negative Control	Negative Control	Sample (1:10,000k)	Sample (1:10,000k)	...

Example 2: Standard Curve and samples run in duplicate.

	1	2	3	4	...
A	Standard Dilution 1	Standard Dilution 1	Sample A	Sample E	...
B	Standard Dilution 2	Standard Dilution 2	Sample A	Sample E	...
C	Standard Dilution 3	Standard Dilution 3	Sample B	Sample F	...
D	Standard Dilution 4	Standard Dilution 4	Sample B	Sample F	...
E	Standard Dilution 5	Standard Dilution 5	Sample C	Sample G	...
F	Standard Dilution 6 or Negative Control	Standard Dilution 6 or Negative Control	Sample C	Sample G	...
G	Standard Dilution 7 or Negative Control	Standard Dilution 7 or Negative Control	Sample D	Sample H	...
H	Negative Control	Negative Control	Sample D	Sample H	...

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SAMPLE COLLECTION

This assay is recommended for use with Cell Culture Supernatants, Cell Lysates, Plasma, and Serum(Plasma collected using heparin or EDTA). The sample collection protocols below have been provided for your reference.

Breast Milk - Centrifuge samples for 20 minutes at 1,000 × g to remove particulates. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Cell Lysates - Collect and pellet the cells by centrifugation and remove the supernatant. Wash the cells three times with PBS* then resuspend in PBS*. Lyse the cells by ultrasonication four times. Alternatively freeze the cells to -20°C and thaw to room temperature three times. Centrifuge at 1,500 × g for 10 minutes at 2°C to 8°C to remove cellular debris. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Erythrocyte Lysates - Centrifuge whole blood for 20 minutes at 1,000 × g to pellet the cells and remove the supernatant. Wash the cells three times with PBS* then resuspend in PBS*. Freeze the cells to -20°C and thaw to room temperature three times. Centrifuge at 5,000 × g for 10 minutes at 2°C to 8°C to remove cellular debris. Collect the supernatant for assaying. Erythrocyte lysates must be diluted with Sample Diluent before running. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Plasma - Collect plasma using heparin or EDTA as an anticoagulant. Centrifuge samples for 15 minutes at 1,000 × g at 2°C to 8°C within 30 minutes of collection. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Platelet-Poor Plasma - Collect plasma using EDTA as an anticoagulant. Centrifuge samples for 15 minutes at 1,000 × g at 2°C to 8°C within 30 minutes of collection. It is recommended that samples should be centrifuged for 10 minutes at 10,000 × g for complete platelet removal. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Sperm and Seminal Plasma – Allow semen to liquefy at room temperature or 37°C. After liquefaction, centrifuge at 2,000 × g for 10 to 15 minutes. Collect seminal plasma supernatant for assaying. Wash the precipitated protein three times with PBS* then resuspend in PBS*. Lyse

SAMPLE ONLY

the cells by ultrasonication then centrifuge at 2,000 × g for 10 to 15 minutes. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Serum - Use a serum separator tube and allow samples to clot for 2 hours at room temperature or overnight at 4°C before centrifugation for 20 minutes at approximately 1,000 × g. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Tissue Homogenates–Because preparation methods for tissue homogenates vary depending upon tissue type, users should research tissue specific conditions independently; the following is one example only. Rinse tissues in PBS* to remove excess blood and weigh before homogenization. Finely mince tissues and homogenize them in 5mL to 10mL of PBS*with a glass homogenizer on ice. Lyse the cells by ultrasonication or freeze the cells to -20°C and thaw to room temperature three times. Centrifuge homogenate at 5,000 × g for 5 minutes. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Urine - Aseptically collect the first urine of the day, mid-stream, voided directly into a sterile container. Centrifuge to remove particulate matter and collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

Cell culture supernatants, cerebrospinal, follicular, and lung lavage fluids, saliva, sweat, tears, and other biological fluids - Centrifuge samples for 20 minutes at 1,000 × g to remove particulates. Collect the supernatant for assaying. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

* 1xPBS (0.02 mol/L pH 7.0-7.2)

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SAMPLE COLLECTION NOTES

1. LSBio recommends that samples are used immediately upon preparation.
2. Avoid repeated freeze/thaw cycles for all samples.
3. In the event that a sample type not listed above is intended to be used with the kit, it is recommended that the customer conduct validation experiments in order to be confident in the results.
4. Due to chemical interference, the use of tissue or cell extraction samples prepared by chemical lysis buffers may result in inaccurate results.
5. Due to factors including cell viability, cell number, or sampling time, samples from cell culture supernatant may not be detected by the kit.
6. Samples should be brought to room temperature (18°C to 25°C) before performing the assay without the use of extra heating.
7. Sample concentrations should be predicted before being used in the assay. If the sample concentration is not within the range of the standard curve, users must determine the optimal sample dilutions for their particular experiments.
8. LSBio is responsible for the quality and performance of the kit components but is NOT responsible for the performance of customer supplied samples used with the kit.

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REAGENT PREPARATION

Bring all reagents to room temperature (18°C to 25°C) before use.

1x Detection Antibody: Centrifuge the vial before opening. Prepare 1 mL of working Detection Antibody solution by diluting 10 µL of Detection Antibody concentration (100x) with 990 µL of Detection Antibody Diluent. Use within 2 hours.

1x ABC Complex: Centrifuge the vial before opening. Prepare 1 mL of working ABC Complex solution by diluting 10 µL of ABC Complex concentration (100x) with 990 µL of ABC Complex Diluent. Use within 2 hours.

Wash Buffer: Prepare 500 ml of Working Wash Buffer by diluting the supplied 20 ml of Wash Buffer (25x) with 480 ml of deionized or distilled water. If crystals have formed in the concentrate, warm to room temperature and mix it gently until crystals have completely dissolved.

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REAGENT PREPARATION NOTES

1. It is highly recommended that standard curves and samples are run in duplicate within each experiment.
2. In the case of lyophilized Standards once resuspended Standards should be used immediately and used only once. Long-term storage of reconstituted Standards is NOT recommended.
3. All solutions prepared from concentrates are intended for one-time use. Do not reuse solutions.
4. Do not prepare Standard dilutions directly in wells.
5. Prepared Reagents may adhere to the tube wall or cap during transport; centrifuge tubes briefly before opening.
6. All solutions should be gently mixed prior to use.
7. Reconstitute stock reagents in strict accordance with the instructions provided.
8. To minimize imprecision caused by pipetting ensure that pipettes are calibrated. Pipetting volumes of less than 10µL is not recommended.
9. Substrate solutions are easily contaminated; sterility precautions should be taken. Substrate solutions should also be protected from light.
10. Do not substitute reagents from one kit lot to another. Use only those reagents supplied within this kit.
11. Due to the antigen specificity of the antibodies used in this assay, native or recombinant proteins from other manufacturers may not be detected by this kit.

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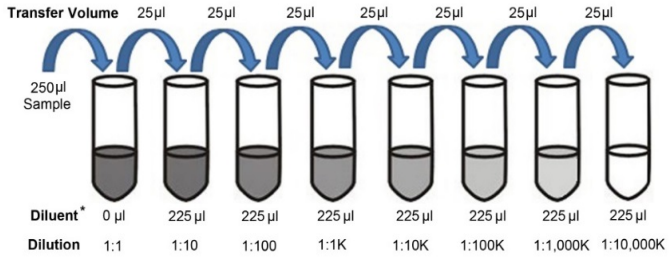
SAMPLE PREPARATION

The resulting Optical Density (OD) values of your sample must fall within the OD values of the standard curve in order for the calculated antigen concentration to be accurate. In many cases samples will need to be diluted in order to lower the antigen concentration to sufficient levels. Information about antigen concentrations within various sample types may be available from the published literature; however it is often necessary to run a dilution series of each sample type. The following will prepare sufficient volumes to run the Sample dilution series in triplicate. In the case of small volume samples a preliminary step dilution, such as 1:5 or 1:10, can be made using PBS (0.02 mol/L pH 7.0-7.2) as the diluent.

* **The final dilution should always be made using the same buffer that is used to dilute the Standards, and/or generate the Standard Curve.** Running duplicate or triplicate wells for each sample is recommended.



SAMPLE ONLY

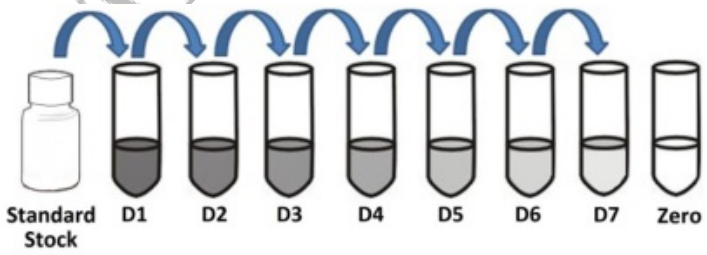
STANDARD PREPARATION

The following are instructions for the preparation of a Standard dilution series which will be used to generate the standard curve. The standard curve is then used to determine the concentration of target antigen in unknown samples (see the **Calculation of Results** section). The following will prepare sufficient volumes to run the Standard dilution series in duplicate. Reconstituted Standard and prepared standard dilutions should be used immediately and not stored for future use.

Standard Stock Solution (10,000 pg/ml): Reconstitute 1 tube of lyophilized Standard with 1.0 mL of Sample Diluent. Incubate at room temperature for 10 minutes with gentle agitation (avoid foaming).

D1 (2000 pg/ml): Pipette 200µL of Stock Standard into 800µL of Sample Diluent
D2 (1000 pg/ml): Pipette 250µL of D1 into 250µL of Sample Diluent
D3 (500 pg/ml): Pipette 250µL of D2 into 250µL of Sample Diluent
D4 (250 pg/ml): Pipette 250µL of D3 into 250µL of Sample Diluent
D5 (125 pg/ml): Pipette 250µL of D4 into 250µL of Sample Diluent
D6 (62.5 pg/ml): Pipette 250µL of D5 into 250µL of Sample Diluent
D7 (31.25 pg/ml): Pipette 250µL of D6 into 250µL of Sample Diluent

Zero Standard (0 pg/ml): Use Sample Diluent alone



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ASSAY PROCEDURE

Bring all reagents and samples to room temperature without additional heating and mix thoroughly by gently swirling before pipetting (avoid foaming). Prepare all reagents, working standards, and samples as directed in the previous sections.

1. Add 100 µL of **Standard, Blank, or Sample** per well, cover with a plate sealer, and incubate for 90 minutes at 37°C.
2. Aspirate the liquid of each well, don't wash.
3. Add 100 µL of **1x Detection Antibody** working solution to each well, cover with a plate sealer, and gently agitate to ensure thorough mixing. Incubate for 1 hour at 37°C.
4. Aspirate the liquid from each well and wash 3 times. Wash by adding approximately 350 µL of Wash Buffer using a squirt bottle, multi-channel pipette, manifold dispenser or automated washer. Allow each wash to sit for 1-2 minutes before completely aspirating. After the last wash, aspirating remove any remaining Wash Buffer then invert the plate and tap against clean absorbent paper.
5. Add 100 µL of **1x ABC Complex** working solution to each well, cover with a new plate sealer, and incubate for 30 minutes at 37°C.
6. Aspirate the liquid from each well and wash 5 times as outlined in step 4.
7. Add 90 µL of **TMB Substrate** to each well, cover with a new plate sealer, and incubate for 15-25 minutes at 37°C while protecting from light. Incubation time is estimated and wells should be monitored periodically until the optimal color development has been achieved. Wells with high concentrations of Standard will turn blue.
8. Add 100 µL of **Stop Solution** to each well. The blue color will change to yellow immediately. If color change does not appear uniform, gently tap the plate to ensure thorough mixing. The Stop Solution should be added to wells in the same order and timing as was the substrate solution.
9. Determine the optical density (OD value) of each well immediately using a microplate reader set to 450 nm.

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ASSAY PROCEDURE NOTES

1. **ELISA Plate**: Keep appropriate numbers of strips for 1 experiment and remove extra strips from microtiter plate. Removed strips should be placed in a sealed bag containing desiccant and stored at -20°C.
2. **Solutions**: To avoid cross-contamination, change pipette tips between additions of each standard, between sample additions, and between reagent additions. Also, use separate reservoirs for each reagent.
3. **Applying Solutions:** All solutions should be added to the bottom of the ELISA plate well. Avoid touching the inside wall of the well. Avoid foaming when possible.
4. **Assay Timing**: The interval between adding sample to the first and last wells should be minimized. Delays will increase the incubation time differential between wells, which will significantly affect the experimental accuracy and repeatability. For each step in the procedure, total dispensing time for addition of reagents or samples should not exceed 10 minutes.
5. **Incubation**: To prevent evaporation and ensure accurate results, proper adhesion of plate sealers during incubation steps is necessary. Do not allow wells to sit uncovered for extended periods of time between incubation steps. Do not let wells dry out at any time during the assay. Strictly observe the recommended incubation times and temperatures.
6. **Washing**: Proper washing procedure is critical. Insufficient washing will result in poor precision and falsely elevated absorbance readings. Residual liquid in the reaction wells should be patted dry against absorbent paper during the washing process. Do not put absorbent paper directly into the reaction wells.
7. **Controlling Substrate Reaction Time**: After the addition of the TMB Substrate, periodically monitor the color development. Stop color development before the color becomes too deep by adding Stop Solution. Excessively strong color will result in inaccurate absorbance readings.
8. **Reading**: The microplate reader should be preheated and programmed prior to use. Prior to taking OD readings, remove any residual liquid or fingerprints from the underside of the plate and confirm that there are no bubbles in the wells.

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9. **Reaction Time Control**: Control reaction time should be strictly followed as outlined.
10. **Stop Solution**: The Stop Solution contains an acid, therefore proper precautions should be taken during its use, such as protection of the eyes, hands, face, and clothing.
11. **Mixing**: During incubation times, the use of a micro-oscillator at low frequency is recommended. Sufficient and gentle mixing is particularly important in producing reliable results.
12. To minimize external influence on the assay performance, operational procedures and lab conditions such as room temperature, humidity and incubator temperature should be strictly controlled. It is also strongly suggested that the whole assay is performed by the same operator from the beginning to the end.

SAMPLE ONLY

ASSAY PROCEDURE SUMMARY

Prepare all reagents, samples and standards.

Add 100 µl of **Standard** or **Sample** to each well and incubate for 90 minutes at 37°C.

Aspirate and add 100 µl of **Detection Antibody** and incubate of 1 hour at 37°C.

Aspirate and wash 3 times.

Add 100 µl of **ABC Complex** and incubate for 30 minutes at 37°C.

Aspirate and wash 5 times.

Add 90 µl of **TMB Substrate** and incubate for 15-25 minutes at 37°C.

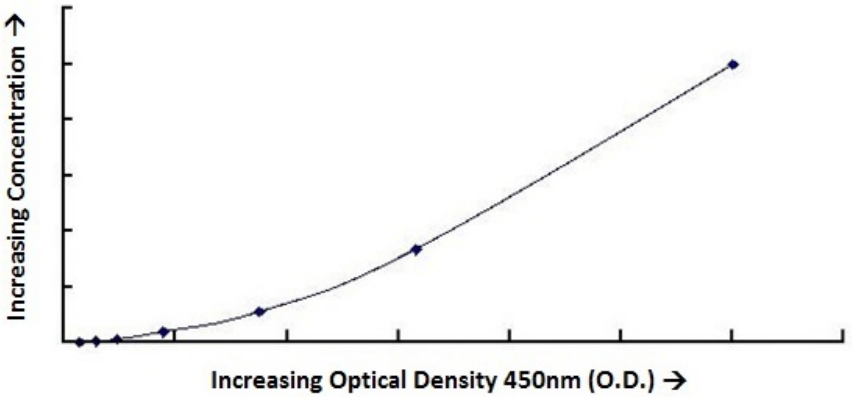
Add 100 µl of **Stop Solution**.

Read immediately at 450nm.

CALCULATION OF RESULTS

Average the duplicate readings for each standard, control, and sample and subtract the average zero standard optical density. Create a standard curve by reducing the data using computer software capable of generating a four parameter logistic (4-PL) curve-fit. As an alternative, construct a standard curve by plotting the mean absorbance for each standard on the x-axis against the concentration on the y-axis and draw a best fit curve through the points on the graph. The data may be linearized by plotting the log of the target antigen concentrations versus the log of the O.D. and the best fit line can be determined by regression analysis. Use of a commercial software program such as CurveExpert is recommended for performing these calculations. This procedure will produce an adequate but less precise fit of the data. If samples have been diluted, the concentration read from the standard curve must be multiplied by the dilution factor.

Typical Data: The following standard curve is an example only and should not be used to calculate results for tested samples. A new standard curve must be generated for each set of samples tested.



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TROUBLESHOOTING GUIDE

Problem	Possible Cause	Solution
Poor standard curve	Inaccurate pipetting	Check pipettes
	Improper standard dilution	Briefly spin the vial of standard and dissolve the powder thoroughly by a gentle mix.
	Wells not completely aspirated	Completely aspirate wells between steps.
Low signal	Too brief incubation times	Ensure sufficient incubation time.
	Incorrect assay temperature	Use recommended incubation temperature. Bring substrate to room temperature before use.
	Inadequate reagent volumes	Check pipettes and ensure correct preparation.
	Improper dilution	
Deep color but low value	Plate reader settings not optimal	Verify the wavelength and filter setting in the plate reader.
		Turn on and warm-up the plate reader prior to use.

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Troubleshooting Guide (continued)

Problem	Possible Cause	Solution
Large CV	Inaccurate pipetting	Check pipettes
High background	Concentration of detector too high	Use recommended dilution factor.
	Plate is insufficiently washed	Review the manual for proper wash. If using a plate washer, check that all ports are unobstructed.
	Contaminated wash buffer	Make fresh wash buffer.
Low sensitivity	Improper storage of the ELISA kit	All the reagents should be stored according to the instructions.
	Stop solution not added	Stop solution should be added to each well before measurement.

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ASSAY USAGE AND SUPPORT

This kit is for **Research Use Only** and is not intended for diagnostic use. This kit is not approved for use in humans or for clinical diagnosis. This kit should not be used beyond the expiration date printed on the lot specific kit label.

Warning: This reagent may contain sodium azide and sulfuric acid. The chemical, physical, and toxicological properties of these materials have not been thoroughly investigated. Standard Laboratory Practices should be followed. Avoid skin and eye contact, inhalation, and ingestion. Sodium azide forms hydrazoic acid under acidic conditions and may react with lead or copper plumbing to form highly explosive metal azides. On disposal, flush with large volumes of water to prevent accumulation.

The LifeSpan Guarantee: LifeSpan guarantees the integrity of all components contained with an immunoassay kit, and that the standards provided will produce a standard curve sufficient for the quantification of target antigen concentrations that fall within the specified range of the kit. Due to the variable nature of sample types and preparations, LifeSpan cannot guarantee that the target antigen will be detectable in customer-supplied samples. For this reason, LifeSpan strongly recommends that customers conduct validation experiments, using positive control samples generated in a similar manner to the experimental samples, before using valuable research specimens. Due to the perishable nature of ELISA kits, orders of greater than 5 units of a single catalog number cannot be returned upon shipment, and are not eligible for refund.

Technical Support: LifeSpan's knowledgeable staff scientists are available to answer any questions about this kit. Email your detailed questions to Technical.Support@LSBio.com.

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RETURNS, REFUNDS, CANCELLATIONS

Any problems with LifeSpan products must be reported to LifeSpan within 10 days of product receipt. The customer must obtain written authorization from LifeSpan before returning items. To request that goods be returned, please contact LifeSpan Technical Support. If an error by LifeSpan Biosciences results in shipment of an incorrect order, LifeSpan will, at its option, either ship a replacement order at no charge, or credit the customer's account for the original product shipped in error. Returns and cancellations may be subject to a 30% restocking fee. Conditions & Warranty: All LifeSpan products are intended for Research Use Only and are not for use in human therapeutic or diagnostic applications. The information supplied with each product is believed to be accurate, but no warranty or guarantee is offered for the products, because the ultimate conditions of use are beyond LifeSpan′s control. The information supplied with each product is not to be construed as a recommendation to use this product in violation of any patent, and LifeSpan will not be held responsible for any infringement or other violation that may occur with the use of its products. Under no event will LifeSpan be responsible for any loss of profit or indirect consequential damage, including, but not limited to, personal injuries resulting from use of these products. LifeSpan's liability to any user of Products for damages that do not result from any fault of the user, will be limited to replacement of the Product(s) only, and in no event shall LifeSpan's liability exceed the actual price received by LifeSpan for the Product(s) at issue. LifeSpan shall not be liable for any indirect, special, incidental or consequential damages. LIFESPAN FURTHER DISCLAIMS ANY AND ALL EXPRESS AND IMPLIED OR STATUTORY WARRANTIES WITH RESPECT TO THE PRODUCTS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. LifeSpan disclaims any and all responsibility for any injury or damage which may be caused by the fault of the user.

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