



**LS Bio**  
an Absolute Biotech Company

# **Human Anti-SARS-CoV-2 IgG ELISA Kit (Direct ELISA)**

# **User Manual**

Catalog No. LS-F74078

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

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

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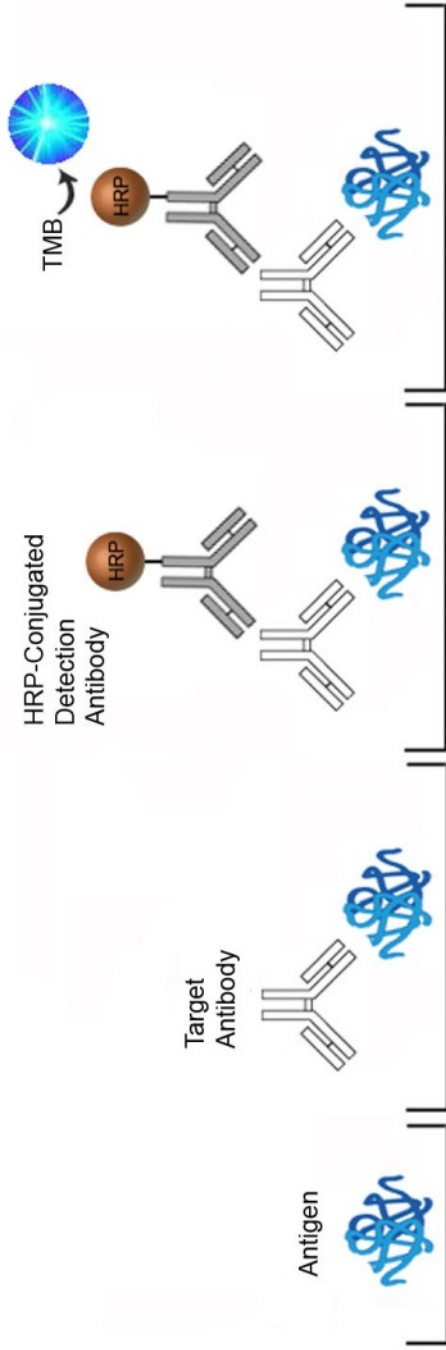
## ASSAY SPECIFICATIONS

|                         |                                                                                                                                                                                                                                                                            |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Target:</b>          | Anti-SARS-CoV-2 IgG                                                                                                                                                                                                                                                        |
| <b>Specificity:</b>     | This kit is for the detection of Human Anti-SARS-CoV-2 IgG. No significant cross-reactivity or interference between Anti-SARS-CoV-2 IgG and analogs was observed. This claim is limited by existing techniques therefore cross-reactivity may exist with untested analogs. |
| <b>Sample Types:</b>    | This kit is intended for use with samples such as Serum and Plasma. It has been empirically tested using the standard supplied with the kit (typically a recombinant protein).                                                                                             |
| <b>Measurement:</b>     | Quantitative                                                                                                                                                                                                                                                               |
| <b>Detection Range:</b> | 3.906-250 ng/ml                                                                                                                                                                                                                                                            |
| <b>Sensitivity:</b>     | Typically less than 2.344 ng/ml                                                                                                                                                                                                                                            |
| <b>Limitations:</b>     | This kit is for <b>Research Use Only</b> and is not intended for diagnostic use. This kit is not approved for use in humans or for clinical diagnosis.                                                                                                                     |

## ASSAY PRINCIPLE

This assay is based on a direct detection principle. Each well of the supplied microtiter plate has been pre-coated with an antigen. Standards or samples are added to the wells. Antibodies within the samples bind to the antigen on the plate. Unbound antibody is washed away. A Horseradish Peroxidase (HRP)-conjugated detection antibody is added with binds to the antibody/antigen complex. Unbound HRP-conjugated detection antibody is washed away. A TMB substrate is then added which reacts with the HRP 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  $450\text{ nm} \pm 2\text{ nm}$ . The OD of an unknown sample can then be compared to an OD standard curve generated using known antibody concentrations in order to determine its antibody concentration.

## ASSAY PRINCIPLE IMAGE



## KIT COMPONENTS

| Component                      | Volume              |
|--------------------------------|---------------------|
| Coated 96-well Strip Plate     | 12 x 8 Strips       |
| Standard                       | 1 vial              |
| Sample Diluent                 | 1 vial x 20ml       |
| HRP Detection Antibody (100x)  | 1 vial x 60 $\mu$ l |
| HRP Detection Antibody Diluent | 1 vial x 5 ml       |
| Wash Buffer (25x)              | 1 vial x 30 ml      |
| TMB Substrate                  | 1 vial x 5 ml       |
| Stop Solution                  | 1 vial x 5 ml       |
| Adhesive Plate Sealers         | 4                   |
| Instruction Manual             | 1                   |

## KIT STORAGE

The unopened kit can be stored at 2-8°C through the expiration date. Once opened, the kit can be stored at 2-8°C until the expiration date. For long term storage, the Strip Plate should be stored at -20°C. HRP-Conjugate Antibody (100x) and TMB Substrate should be protected from light. 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 450nm wavelength filter
- High-precision pipette and sterile pipette tips
- Eppendorf tubes
- 37°C incubator
- Deionized or distilled water
- Absorbent paper

## 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 | Standard Dilution 6 | Sample (1:100k)    | Sample (1:100k)    | ... |
| G | Standard Dilution 7 | Standard Dilution 7 | 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 | Standard Dilution 6 | Sample C | Sample G | ... |
| G | Standard Dilution 7 | Standard Dilution 7 | Sample D | Sample H | ... |
| H | Negative Control    | Negative Control    | Sample D | Sample H | ... |

## SAMPLE COLLECTION

This assay is recommended for use with Plasma and Serum. No other sample types are supported. The following are a collection of sample collection protocols for your reference.

**Breast Milk** - Centrifuge samples for 20 minutes at 1000×g to remove particulates. Collect the supernatant for assaying.

**Cell Lysates** - Collect and pellet the cells by centrifugation and remove the supernatant. Wash the cells 3 times with PBS\* then resuspend in PBS\*. Lyse the cells by ultrasonication 4 times. Alternatively freeze the cells freeze to -20°C and thaw to room temperature 3 times. Centrifuge at 1500×g for 10 minutes at 2 - 8°C to remove cellular debris. Collect the supernatant for assaying.

**Erythrocyte Lysates** - Centrifuge whole blood for 20 minutes at 1000×g to pellet the cells and remove the supernatant. Wash the cells 3 times with PBS\* then resuspend in PBS\*. Freeze (-20°C)/thaw (room temperature) the cells 3 times. Centrifuge at 5,000×g for 10 minutes at 2-8°C to remove cellular debris. Collect the supernatant for assaying. Erythrocyte lysates must be diluted with Standard Dilute before running.

**Plasma** - Collect plasma using heparin or EDTA as an anticoagulant. Centrifuge samples for 15 minutes at 1000×g at 2–8°C within 30 minutes of collection. Collect the supernatant for assaying. Avoid hemolysis and high cholesterol samples.

**Platelet-Poor Plasma** - Collect plasma using heparin or EDTA as an anticoagulant. Centrifuge samples for 15 minutes at 1000×g at 2–8°C within 30 minutes of collection. It is recommended to centrifuge samples for 10 minutes at 10,000×g for complete platelet removal. Collect the supernatant for assaying.

**Sperm and Seminal Plasma** – Allow semen to liquefy at room temperature or 37°C. After liquefaction, centrifuge at 2,000×g for 10-15 minutes. Collect seminal plasma supernatant for assaying. Wash the precipitated protein 3 times with PBS\* then resuspend in PBS\*. Lyse the cells by ultrasonication then centrifuge at 2,000×g for 10-15 minutes. Collect the supernatant for assaying.

**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 1000×g. Collect the supernatant for assaying. Blood collection tubes should be disposable, non-pyrogenic, and non-endotoxin.

**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 weighed before homogenization. Finely minced tissues and homogenized them in 5-10mL of PBS\* with a glass homogenizer on ice. Lyse the cells by ultrasonication or freeze (-20°C)/thaw (room temperature) 3 times. Centrifuge homogenate at 5000×g for 5 minutes. Collect the supernatant for assaying.

**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.

**Cell culture supernatants, cerebrospinal, follicular, and lung lavage fluids, saliva, sweat, tears, and other biological fluids** - Centrifuge samples for 20 minutes at 1000×g to remove particulates. Collect the supernatant for assaying.

\* 1xPBS (0.01mol/L pH7.0-7.2)

## SAMPLE COLLECTION NOTES

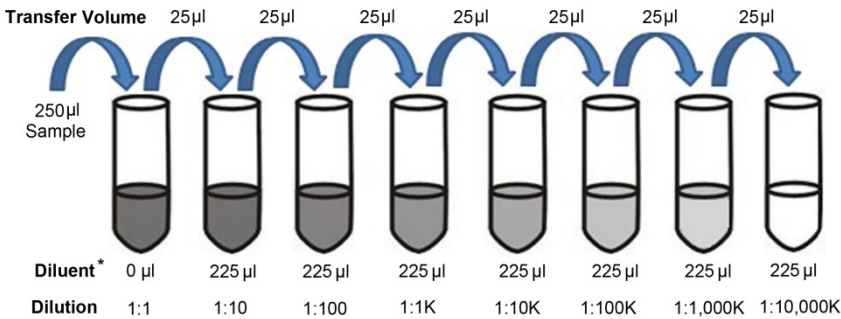
1. LSBio recommends that samples are used immediately upon preparation. Alternatively samples stored at 2-8°C should be used within 5 days. For long-term storage sample aliquots should be prepared and stored at -20°C if used within 1 month, or -80°C if used within 6 months. Long term storage can result in protein degradation and denaturalization, which may result in inaccurate results.
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. Influenced by the 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 (18-25°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 use with the kit.

# 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 (0.01mol/L pH7.0-7.2) 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.



Serum and plasma typically require a 50-fold dilution in order for their OD readings to fall within the Standard Curve of this assay. However, due to sample variation, it is recommended that researchers determine the optimal dilution for their samples as described above.

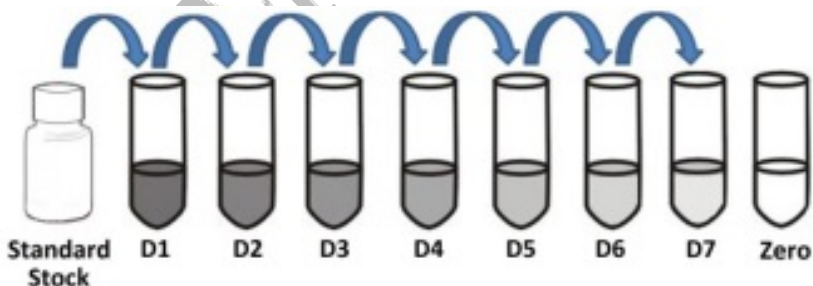
## STANDARD PREPARATION

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. Diluted Standard and prepared standard dilutions should be used immediately and not stored for future use.

### Standard Stock Solution (250 ng/ml):

- D1** (250 ng/ml): Pipette 500  $\mu$ l of Stock Standard into 0  $\mu$ l of Sample Diluent
- D2** (125 ng/ml): Pipette 300  $\mu$ l of D1 into 300  $\mu$ l of Sample Diluent
- D3** (62.5 ng/ml): Pipette 300  $\mu$ l of D2 into 300  $\mu$ l of Sample Diluent
- D4** (31.25 ng/ml): Pipette 300  $\mu$ l of D3 into 300  $\mu$ l of Sample Diluent
- D5** (15.63 ng/ml): Pipette 300  $\mu$ l of D4 into 300  $\mu$ l of Sample Diluent
- D6** (7.815 ng/ml): Pipette 300  $\mu$ l of D5 into 300  $\mu$ l of Sample Diluent
- D7** (3.908 ng/ml): Pipette 300  $\mu$ l of D6 into 300  $\mu$ l of Sample Diluent

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



## REAGENT PREPARATION

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

**HRP Detection Antibody Working Solution:** Calculate the required amount needed before beginning the experiment (50 $\mu$ l/well) and include a 50 $\mu$ L excess. Dilute the HRP Detection Antibody to the working concentration using the HRP Detection Diluent (1:100).

**Wash Buffer Working Solution Preparation:** Prepare 750 ml of Working Wash Buffer Solution by diluting 30ml of the 25X Wash Buffer Concentrate with 720 ml of distilled or deionized water. Wash Buffer can be stored at 4°C once prepared.

## REAGENT PREPARATION NOTES

1. It is highly recommended that standard curves and samples are run in duplicate within each experiment.
2. Once diluted, standards should be used immediately, and used only once. Long-term storage of diluted 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. Reagents may adhere to the tube wall or cap during transport so 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 10  $\mu\text{L}$  is not recommended.
9. TMB Substrate solution is easily contaminated; sterility precautions should be taken. TMB Substrate solution 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.

## ASSAY PROCEDURE

Prepare all reagents, working standards and samples as directed in the previous sections. Bring all reagents and samples to room temperature without additional heating for 30 minutes and mix thoroughly by gently swirling before pipetting (avoid foaming). The HRP-Detection Antibody working Solution and TMB Substrate Solution must be kept warm at 37°C for 30 minutes before use.

1. Wash plate 2 times before adding standard, sample or blank wells. Wash by adding approximately 350  $\mu$ l of **Wash Buffer Working Solution** 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, aspirate to remove any remaining Wash Buffer then invert the plate and tap against clean absorbent paper.
2. Add 50  $\mu$ l of **Standard, Blank, or Sample** per well, cover with a plate sealer, and incubate for 30 minutes at 37°C.
3. Aspirate the liquid from each well and wash 3 times as outlined in step 1.
4. Add 50  $\mu$ l of **HRP Detection Antibody Working Solution** to each well, cover with a new plate sealer, and incubate for 30 minutes at 37°C.
5. Aspirate the liquid from each well and wash 5 times as outlined in step 1.
6. Add 50  $\mu$ l of **TMB Substrate** to each well, cover with a new plate sealer, and incubate for ~10-15 minutes at 37°C while protected 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.
7. Add 50  $\mu$ l 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 the TMB Substrate solution.

8. Determine the optical density (OD value) of each well immediately using a microplate reader set to 450 nm.

## 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 4°C.
2. **Solutions:** In the event that Detection Reagent A working solution appears cloudy, warm to room temperature and mix gently until solution appears uniform. To avoid cross-contamination, change pipette tips between additions of each standard level, 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 experiment's 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 Substrates, periodically monitor the color development. Stop color development before the color become too deep by adding Stop Solution. Excessively strong color will result in inaccurate absorbance reading.
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.
9. **Reaction Time Control:** Control reaction time should be strictly followed as outline.
10. **Stop Solution:** The Stop Solution is 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 result.
12. Kits from different batches may be a little different in detection range, sensitivity and color developing time. Please perform the experiment exactly according to the supplied instructions.
13. Due to inter- and intra-assay variability, it is recommended that appropriate carry over controls be included between assays.
14. Prior to running valuable samples LSBio recommends that the user runs a preliminary experiment using the supplied controls in order to validate the assay.
15. To minimize extra influence on the performance, operation procedures and lab conditions, especially room temperature, air humidity, 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.
16. The kit should not be used beyond the expiration date on the kit label.

## ASSAY PROCEDURE SUMMARY

Prepare all reagents, samples and standards.

Wash plate 2 times before starting.

Add 50  $\mu$ l of **Standard, Sample, or Blank** to each well and incubate for 30 minutes at 37°C.

Aspirate and wash 3 times.

Add 50  $\mu$ l of **HRP Detection Antibody** and incubate for 30 minutes at 37°C.

Aspirate and wash 5 times.

Add 50  $\mu$ l of **TMB Substrate** solution and incubate for ~10-15 minutes at 37°C in the dark.

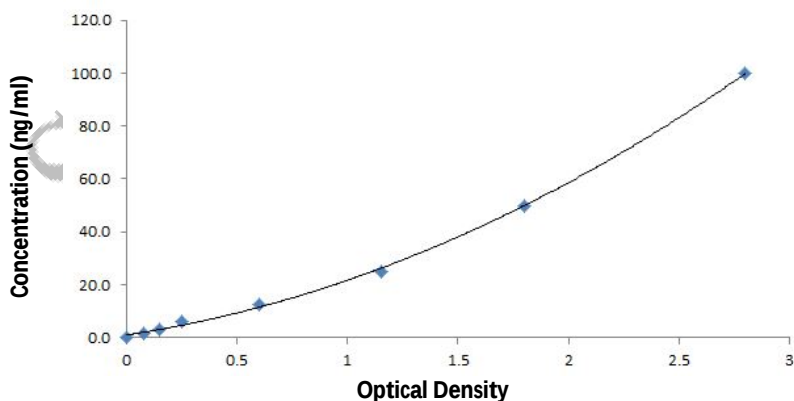
Add 50  $\mu$ l of **Stop Solution**.

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.



## 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.                           |
|                          |                                   | Open the Plate Reader ahead to pre-heat.                                                |

## 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 washing instructions. 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.                                                     |

**Important Note:** During shipment, small volumes of product will occasionally become entrapped in the seal of the product vial. We recommend briefly centrifuging the vial to dislodge any liquid in the container's cap prior to opening.

**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.

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2 Shaker Rd Suite B101 Shirley, MA 01464

Tel: 206.374.1102

Fax: 206.577.4565

[Technical.Support@LSBio.com](mailto:Technical.Support@LSBio.com)