



Sino Biological
Biological Solution Specialist

SARS-CoV-2 (2019-nCoV) Spike ELISA Kit

Catalog Number: KIT40591

Please read this instruction manual carefully before using the product.

For Research Use Only. Not for use in diagnostic or therapeutic procedures.
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BACKGROUND

The spike (S) glycoprotein of coronaviruses contains protrusions that will only bind to certain receptors on the host cell. Known receptors bind S1 are ACE2, angiotensin-converting enzyme 2; DPP4, dipeptidyl peptidase-4; APN, aminopeptidase N; CEACAM, carcinoembryonic antigen-related cell adhesion molecule 1; Sia, sialic acid; O-ac Sia, O-acetylated sialic acid. The spike is essential for both host specificity and viral infectivity. The term 'peplomer' is typically used to refer to a grouping of heterologous proteins on the virus surface that function together. The spike (S) glycoprotein of coronaviruses is known to be essential in the binding of the virus to the host cell at the advent of the infection process. It's been reported that 2019-nCoV can infect the human respiratory epithelial cells through interaction with the human ACE2 receptor. The spike protein is a large type I transmembrane protein containing two subunits, S1 and S2. S1 mainly contains a receptor binding domain (RBD), which is responsible for recognizing the cell surface receptor. S2 contains basic elements needed for the membrane fusion. The S protein plays key parts in the induction of neutralizing-antibody and T-cell responses, as well as protective immunity. The main functions for the Spike protein are summarized as: Mediate receptor binding and membrane fusion; Defines the range of the hosts and specificity of the virus; Main component to bind with the neutralizing antibody; Key target for vaccine design; Can be transmitted between different hosts through gene recombination or mutation of the receptor binding domain (RBD), leading to a higher mortality rate.

INTENDED USE

The kit has been verified by high purity SARS-CoV-2 (2019-nCoV) Spike S1 Protein (Cat# 40591-V08H), and SARS-CoV-2 (2019-nCoV) Spike Pseudoviruses.

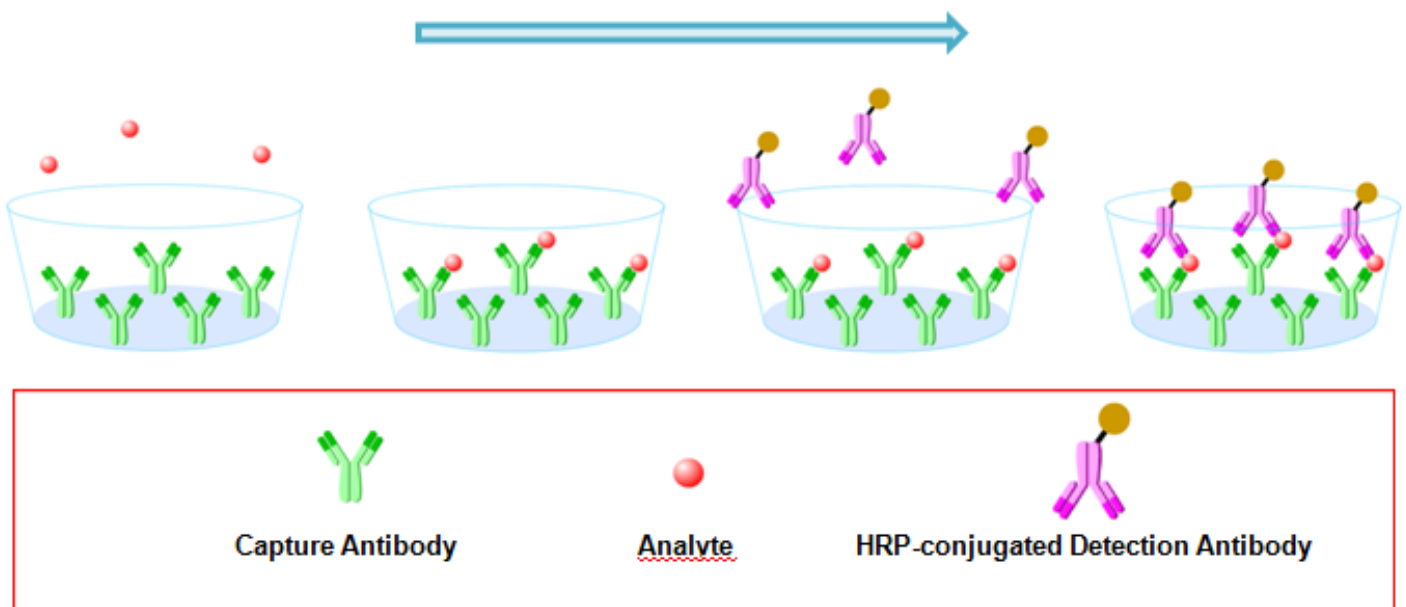
The use of this kit for natural samples need be validated by the end user due to the complexity of natural targets and unpredictable interference.

ALTERNATIVE NAMES

SARS-CoV-2, 2019-nCoV, COVID-19, NCP, Spike, S1, RBD

PRINCIPLE OF THE ASSAY

The principle of this ELISA kit is based on the solid phase sandwich enzyme immunoassay technique. A monoclonal antibody specific for SARS-CoV-2 (2019-nCoV) Spike has been pre-coated onto well plate strips. Standards and samples are added to the wells and SARS-CoV-2 (2019-nCoV) Spike present in the sample is bound by the immobilized antibody. After incubation the wells are washed and a horseradish peroxidase conjugated anti-SARS-CoV-2 (2019-nCoV) Spike antibody is added, producing an antibody-antigen-antibody "sandwich complex". Following a wash to remove any unbound antibody a TMB substrate solution is loaded and color develops in proportion to the amount of SARS-CoV-2 (2019-nCoV) Spike bound. The reaction is stopped by the addition of a stop solution and the intensity of the color can be measured at 450 nm (See schematics below).



MATERIALS PROVIDED

SARS-CoV-2 (2019-nCoV) Spike Microplate - 96 well polystyrene microplate (12 strips of 8 wells) coated with chimeric mAb antibody against SARS-CoV-2 (2019-nCoV) Spike.

SARS-CoV-2 (2019-nCoV) Spike Detection Antibody - 0.2 mg/mL of chimeric mAb antibody against SARS-CoV-2 (2019-nCoV) Spike conjugated to horseradish peroxidase (HRP) with preservatives.

SARS-CoV-2 (2019-nCoV) Spike Standard - Recombinant SARS-CoV-2 (2019-nCoV) Spike in a buffer with preservatives, lyophilized. The amount of standard is lot specific and indicated on the label of standard vial.

Wash Buffer Concentrate - 25 mL of a 20-fold concentrated solution of buffered surfactant with preservatives.

Dilution Buffer Concentrate - 8 mL of a 20-fold concentrated dilution buffer with preservatives.

1 × Standard Dilution Buffer - 2 mL

Color Reagent A - 13 mL of stabilized hydrogen peroxide.

Color Reagent B - 13 mL of stabilized chromogen (tetramethylbenzidine).

Stop Solution - 8 mL of 2 N sulfuric acid.

STORAGE

| | | |
|---|---|---|
| Unopened Kit | Store at 2 - 8°C and the kit is stable for 6 months upon receipt. | |
| Opened/ Reconstituted Reagents | Diluted Wash Buffer | Stored for up to 1 week at 2 - 8°C |
| | Diluted Dilution Buffer | |
| | 1 × Standard Dilution Buffer | |
| | Conjugate | Stored for up to 1 month at 2 - 8°C |
| | Stop Solution | |
| | Unmixed Color Reagent A | |
| | Unmixed Color Reagent B | |
| | Standard | After reconstitution, store for up to 1 month at -80°C. The reconstituted standards should be aliquoted and avoid repeated freeze-thaw cycles. |
| | Microplate Wells | Return unused strips to the foil pouch containing the desiccant pack and reseal along entire edge of zip-seal. Stored for up to 1 month at 2 - 8°C |

OTHER SUPPLIES REQUIRED

Microplate reader capable of measuring absorbance at 450 nm

Pipettes and pipette tips

Deionized or distilled water

Multi -channel pipette, squirt bottle, manifold dispenser, or automated microplate washer

500 mL graduated cylinder

Tubes for standard dilution

Well plate cover or seals

PRECAUTIONS

1. This kit is **for research use only** and is not for use in diagnostic or therapeutic procedures.
2. The kit should not be used beyond the expiration date.
3. Do not mix reagents from different lots.
4. The kit is designed and tested to detect the specific targets and samples shown in the manual. The use of this kit for other purpose should be verified carefully by the end user.

SAFETY INSTRUCTIONS

5. The Stop Solution provided with this kit is an acid solution. Take care when using the reagent to avoid the risk.
6. All biological materials should be handled and discarded as potentially hazardous following local laws and regulations.
7. Personal protective equipments such as lab coats, gloves, surgical masks and goggles are necessary in experiments for safety reasons.

TECHINICAL TIPS

8. Bring all reagents and samples to room temperature before use.
9. Samples should be thawed completely and mixed well prior to analysis. Avoid repeated freeze-thaw cycles of frozen samples.
10. A standard curve should be generated for each set of sample assayed. **DO NOT USE** the standard curves from other plates or other days.
11. Use a new disposable reagent reservoir and new disposable pipette tips for each transfer to avoid cross-contamination.
12. Read the absorbance of each well within 20 minutes after adding the stop solution.

SAMPLE COLLECTION AND STORAGE

Cell Culture Supernates - Remove particulates by centrifugation and assay immediately or aliquot and store samples at -20°C or lower temperature. **Avoid repeated freeze-thaw cycles. If the use of original supernate sample or low dilution (<5 fold) are necessary due to the expected low concentration of antigen supernates need be adjust to neutral pH condition before assay.**

Note:

The sample should be diluted to within the working range of the assay in 1 × dilution buffer. The exact dilution must be determined based on the concentration of specific target in individual samples.

REAGENT PREPARATION

Bring all reagents to room temperature before use. If crystals have formed in buffer solution, warm to room temperature and mix gently until the crystals have completely dissolved.

Wash Buffer - Prepare 1 × wash buffer by adding 20 mL of Wash Buffer Concentrate to deionized or distilled water to prepare 400 mL of Wash Buffer.

Dilution Buffer - Prepare 1 × dilution buffer by adding 5 mL of Dilution Buffer Concentrate to deionized or distilled water to prepare 100 mL of Dilution Buffer.

Detection Antibody - Centrifuge at 10,000 x g for 20 seconds. Dilute to **work concentration** of 0.4 µg/mL in Dilution Buffer before use.

Substrate Solution - Color Reagents A and B should be mixed together in equal volumes within 15 minutes of use. Protect from light. 200 µL of the resultant mixture is required per well. **Take care not to contaminate the Color Reagent. If the mixed color reagent is blue. DO NOT USE.**

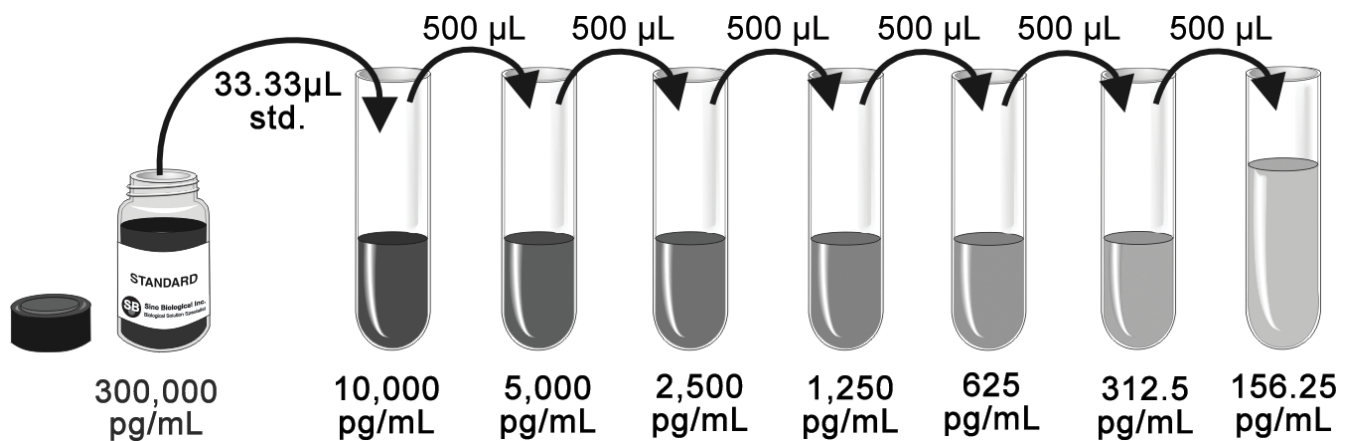
SARS-CoV-2 (2019-nCoV) Spike Standard - Reconstitute the SARS-CoV-2 (2019-nCoV) Spike Standard with 1 mL of 1 × Standard Dilution Buffer to make stock solution. Shake the vial gently until the lyophilized powder totally dissolved (**Do not turn the vial upside down**). Mix the standard to ensure complete

reconstitution prior to making dilutions.

Prepare serially diluted standards as described in the following step:

Pipette 966.67 μL of Dilution Buffer into the 10000 pg/mL tube. Pipette 500 μL of Dilution Buffer into the remaining tubes. Use the stock solution to produce a dilution series as the following figure. Mix each tube thoroughly before the next transfer. The 10000 pg/mL standard serves as the high standard. The Dilution Buffer serves as the zero standard (0 pg/mL). **Ensures each assay has a standard curve. DO NOT USE the standard curve on other plates or other days.**

The following graph is only for demonstration purposes. The concentration of stock solution is lot specific and need be calculated with the actual amount of standard labeled on the standard vial.



ASSAY PROCEDURE

Bring all reagents and samples to room temperature before use. It is recommended that all samples and standards be assayed in duplicate.

1. Prepare all reagents, working standards, and samples as directed in the previous sections.
2. Remove unused microplate strips from the plate frame, return them to the foil pouch containing the desiccant pack, and reseal.
3. Wash each well three times with Wash Buffer (300 μ L/well) using a squirt bottle, multi-channel pipette, manifold dispenser or autowasher. **Complete removal of liquid at each step is essential to good performance. Remove any remaining Wash Buffer by aspirating or decanting. Invert the plate and blot it against clean paper towels.**
4. Add 100 μ L of each serially diluted protein standard or test sample per well including a zero standard. **Ensure reagent addition is uninterrupted and completed within 15 minutes.** Cover/seal the plate and incubate for 2 hours at room temperature.
5. Repeat the aspiration/wash as in Step 3.
6. Add 100 μ L of Detection Antibody in working concentration to each well. Cover/seal the plate and incubate for 1 hour at room temperature.
7. Repeat the aspiration/wash as in Step 3.
8. Add 200 μ L of Substrate Solution to each well. Incubate for 20 minutes at room temperature. **Protect from light.**
9. Add 50 μ L of Stop Solution to each well. If color change does not appear uniform, gently tap the plate to ensure thorough mixing.
10. **Determine the optical density of each well within 20 minutes**, using a microplate reader set to 450 nm.

CALCULATION OF RESULTS

If samples generate values higher than the highest standard, dilute the samples and repeat the assay.

Calculate the mean absorbance for each standard, control and sample and subtract average zero standard optical density (O.D.) .

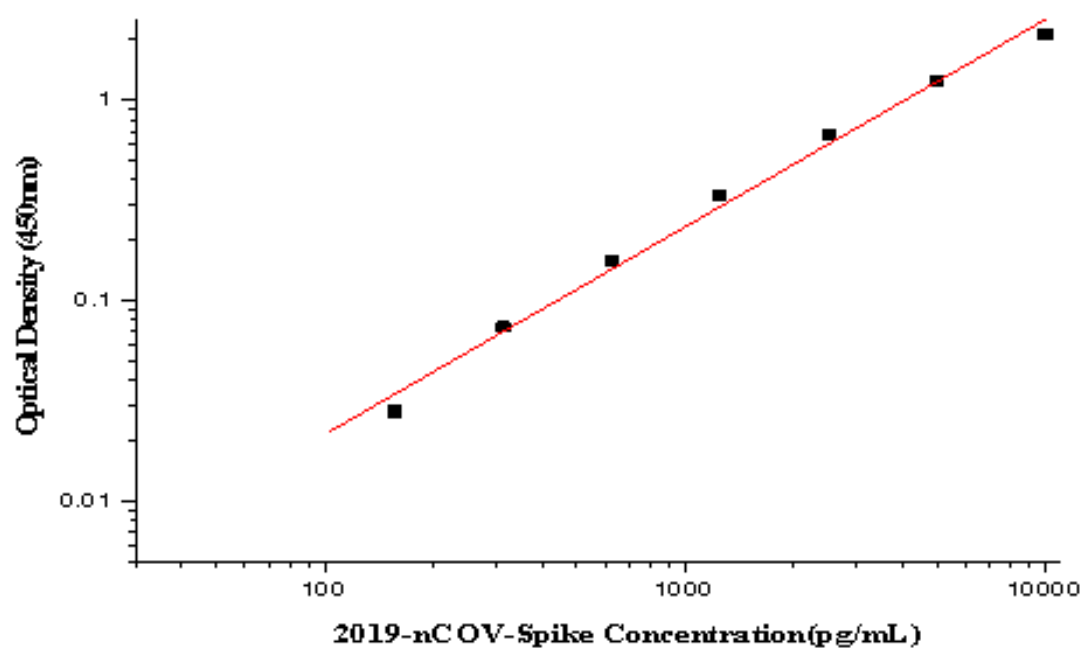
Construct a standard curve by plotting the mean absorbance for each standard on the y-axis against the concentration on the x-axis and draw a best fit curve through the points on the graph. Most graphing software can help make the curve and a four parameter logistic (4-PL) usually provide the best fit, though other equations (e.g. linear, log/log) can also be tried to see which provides the most accurate.

Extrapolate the target protein concentrations for unknown samples from the standard curve plotted.

TYPICAL DATA

This standard curve is only for demonstration purposes. A standard curve should be generated for each assay.

| Concentration (pg/mL) | Zero standard subtracted OD |
|------------------------|-----------------------------|
| 0 | 0 |
| 156.2 | 0.028 |
| 312.5 | 0.074 |
| 625 | 0.157 |
| 1250 | 0.332 |
| 2500 | 0.665 |
| 5000 | 1.249 |
| 10000 | 2.129 |



PRECISION

Intra-assay Precision (Precision within an assay)

Three samples of known concentration were tested twenty times on one plate to assess intra-assay precision.

Inter-assay Precision (Precision between assays)

Three samples of known concentration were tested in five separate assays to assess inter-assay precision.

| | Intra -assay Precision | | | Inter -assay Precision | | |
|--------------|------------------------|-------|--------|------------------------|--------|--------|
| Sample | 1 | 2 | 3 | 1 | 2 | 3 |
| N | 20 | 20 | 20 | 3 | 3 | 3 |
| Mean (pg/mL) | 1432 | 2940 | 5715 | 1622 | 3125 | 6182 |
| SD | 73.48 | 94.68 | 189.42 | 78.05 | 148.23 | 273.75 |
| CV (%) | 5.1% | 3.2% | 3.3% | 4.8% | 4.7% | 4.4% |

RECOVERY

The recovery of SARS-CoV-2 (2019-nCoV) Spike spiked to different levels throughout the range of the assay in related matrices was evaluated.

| Sample | Average % Recovery | Range |
|-------------------------------|--------------------|--------|
| Cell culture supernates (n=3) | 95% | 91-98% |

LINEARITY

| | | Cell culture supernates |
|------|----------------------|-------------------------|
| 1:2 | recovery of detected | 86% |
| 1:4 | recovery of detected | 100% |
| 1:8 | recovery of detected | 113% |
| 1:16 | recovery of detected | 130% |

SENSITIVITY

The minimum detectable dose (MDD) of SARS-CoV-2 (2019-nCoV) Spike is typically less than 131.5 pg/mL. The MDD was determined by adding three standard deviations to the mean optical density value of twenty zero standard replicates and calculating the corresponding concentration.

CALIBRATION

This immunoassay is calibrated against a highly purified recombinant SARS-CoV-2 (2019-nCoV) Spike S1 produced at Sino Biological Inc., (Cat# 40591-V08H).

SAMPLE VALUES

The Pseudoviruses (10^{10} copies/mL) (Cat# PSV001) expressing SARS-CoV-2 (2019-nCoV) Spike protein on the surface were used as samples.

| Sample | S1 (ng/mL) |
|---------------------------------------|------------|
| Denatured Pseudovirus (56°C, 30 mins) | 301.5 |
| Pseudovirus | 717.0 |

TROUBLE SHOOTING

| Problems | Possible Sources | Solutions |
|-----------------------------|--|--|
| No signal | Incorrect or no Detection Antibody was added | Add appropriate Detection Antibody and continue |
| | Substrate solution was not added | Add substrate solution and continue |
| | Incorrect storage condition | Check if the kit is stored at recommended condition and used before expiration date |
| Poor Standard Curve | Standard was incompletely reconstituted or was inappropriately stored | Aliquot reconstituted standard and store at -80°C . The reconstituted standards should be aliquoted and avoid repeated freeze-thaw cycles. |
| | Imprecise / inaccurate pipetting | Check / calibrate pipettes |
| | Incubations done at inappropriate temperature, timing or agitation | Follow the general ELISA protocol |
| | Background wells were contaminated | Avoid cross contamination by using the sealer appropriately |
| Poor detection value | The concentration of antigen in samples was too low | Enriching samples to increase the concentration of antigen |
| | Samples were ineffective | Check if the samples are stored at cold environment. Detect samples in timely manner |
| High Background | Insufficient washes | Use multichannel pipettes without touching the reagents on the plate |
| | | Increase cycles of washes and soaking time between washes |
| | Color Reagent should be clear and colorless prior to addition to wells | Color Reagent should be clear and colorless prior to addition to wells |
| | Use clean tubes and pipettes tips | Use clean plates, tubes and pipettes tips |
| Non-specificity | Samples were contaminated | Avoid cross contamination of samples |
| | The concentration of samples was too high | Try higher dilution rate of samples |

PRECAUTIONS_中文版

注意事项:

1. 本产品仅用于研究，不能用于临床诊断或治疗。
2. 试剂盒必须在保质期内使用。
3. 不允许混用来自不同试剂盒和不同批次号的试剂。
4. 本产品仅能够应用于检测说明书中标注的靶点抗原与样本。其它应用需经使用者设计验证后，根据结果评估使用的可靠性与准确性。

SAFETY INSTRUCTIONS_中文版

安全提示:

1. 本试剂盒中的终止液为酸溶液,应注意小心操作。
2. 所有生物样本均具有潜在生物安全风险，使用者应严格按照当地法律和相关规定操作处理和丢弃样本。
3. 出于安全原因，操作者应穿戴个人防护装备，如实验服，手套，口罩和护目镜。

TECHINICAL TIPS_中文版

应用技巧:

1. 使用前应将试剂盒的所有组分和待检样本温度恢复到室温。
2. 冻存样本检测前应彻底化冻并混匀，并注意避免反复冻融。
3. 每次试验均需制备相应的标准曲线，不同试剂盒以及不同天的标准曲线不能混用。
4. 注意在不同样本和步骤间及时更换加样槽和枪头，避免交叉污染。
5. 读取光吸收值应在加入终止液后二十分钟内完成。

REAGENT PREPARATION_中文版

试剂准备:

使用前应将试剂盒的所有组分和待检样本温度恢复到室温。

1×洗涤缓冲液配制 - 如浓缩洗涤缓冲液中已形成结晶，请平衡到室温至结晶完全溶解，混匀后取 20 mL 20×浓缩洗涤缓冲液至去离子水或超纯水中，定容至 400 mL。

1×稀释缓冲液的配制 - 如果浓缩稀释缓冲液中已形成结晶，请平衡到室温至结晶完全溶解，混匀后取 5 mL 20×浓缩稀释缓冲液至去离子水或超纯水中，定容至 100 mL。

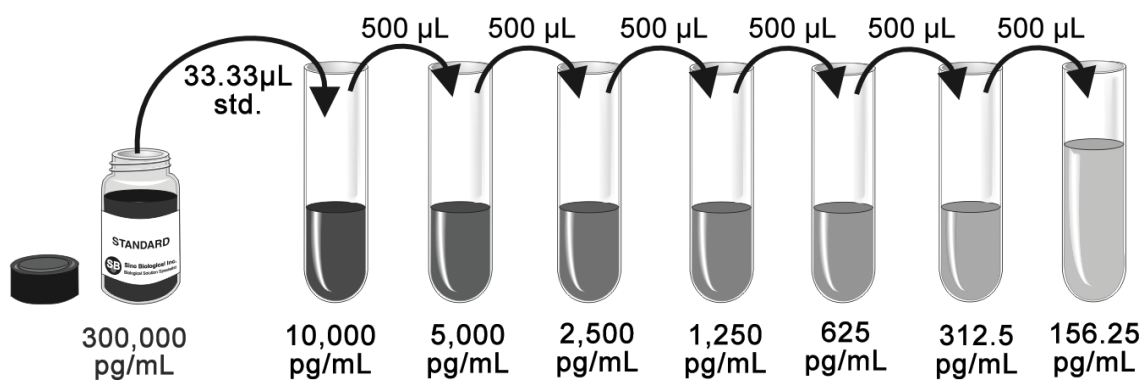
检测抗体的配制 - 使用前 10,000g 离心 20 秒，然后用 1×稀释缓冲液将酶标检测抗体稀释至工作浓度，0.3 μg/mL。

底物液的配制 - 使用前 15 分钟将显色 A 液、显色 B 液等体积混合，避光。确保底物液不被污染，如混合后的底物液已经变蓝，请勿使用。

标准品复溶 - 将 1mL 1×标准品稀释液加入到冻干标准品的安瓶中制备标准品储液，充分溶解，混匀后（勿翻转管子）等体积分装，-80 度保存，复溶后的储液浓度应根据冻干标准品标签上的标注蛋白量进行计算。

标准曲线的制备 - 取 8 个管，按照标准品浓度依次进行标记，移取 966.67 μL 1×稀释缓冲液至标记为 10000 pg/mL 的离心管中，其余各管移取 500 μL，根据标准品储液浓度计算 10000 pg/mL 标准品应移取的储液体积，加至离心管中，混匀，取 500 μL 至下一标记浓度的离心管中，混匀…进行一系列倍比稀释；10000 pg/mL 为标准曲线最高点，1×稀释缓冲液为空白（0 pg/mL）。每次试验均需制备相应的标准曲线，不同试剂盒以及不同天的标准曲线不能混用。

下图仅用于标准曲线制备范例展示，由于冻干标准品的批次差异，复溶后标准品储液的蛋白浓度不同，应根据实际浓度计算配制标准曲线所需的储液体积。



ASSAY PROCEDURE_中文版

试验流程:

使用前应将试剂盒的所有组分和待检样本温度恢复到室温。强烈建议所有的标准品和待检样本进行双复孔测定。

1. 按前述试剂准备项准备好各种试剂、标准品和待测样本。
2. 计算检测样本所需酶标条，将酶标条从铝箔袋取出，剩余的酶标条放回铝箔袋中并封好袋口，低温保存。
3. 洗板：用 1×洗涤缓冲液 (300 μ L/孔) 洗板三次，拍干酶标板。洗板对试验结果有重要影响，确保最后一次拍板没有洗液残留。
4. 样本孵育：加入标准品和待测样本，100 μ L/孔, 确保 15 分钟内完成点样，室温孵育 2 小时。
5. 洗板：弃去孔中液体，加入 1×洗涤缓冲液 (300 μ L/孔) 洗板三次，拍干酶标板。
6. 酶标检测抗体孵育：将预先配制至工作浓度的检测抗体加入酶标板中，100 μ L/孔，混匀，室温孵育 1 小时。
7. 洗板：弃去孔中液体，加入 1×洗涤缓冲液 (300 μ L/孔) 洗板三次，拍干酶标板。
8. 显色：将预先配制的底物液加入酶标板中，200 μ L/孔，混匀，室温避光孵育 20 分钟。
9. 终止：加入 50 μ L/孔终止液至酶标板中，轻轻震动酶标板至显色均匀。
10. 读值：20 分钟内读取 450nm 的光吸收值。

CALCULATION OF RESULTS_中文版

结果处理：

如果待测样本 OD 值超出标准曲线最高点 OD 值，需将样本进行稀释后重新测定。

取标准品、空白对照、样本的平均光吸收值，减去空白对照的平均光吸收值，得到标准品、样品的光吸收校准值。以标准品浓度为横坐标，校准后的标准品光吸收值为纵坐标绘制标准曲线。

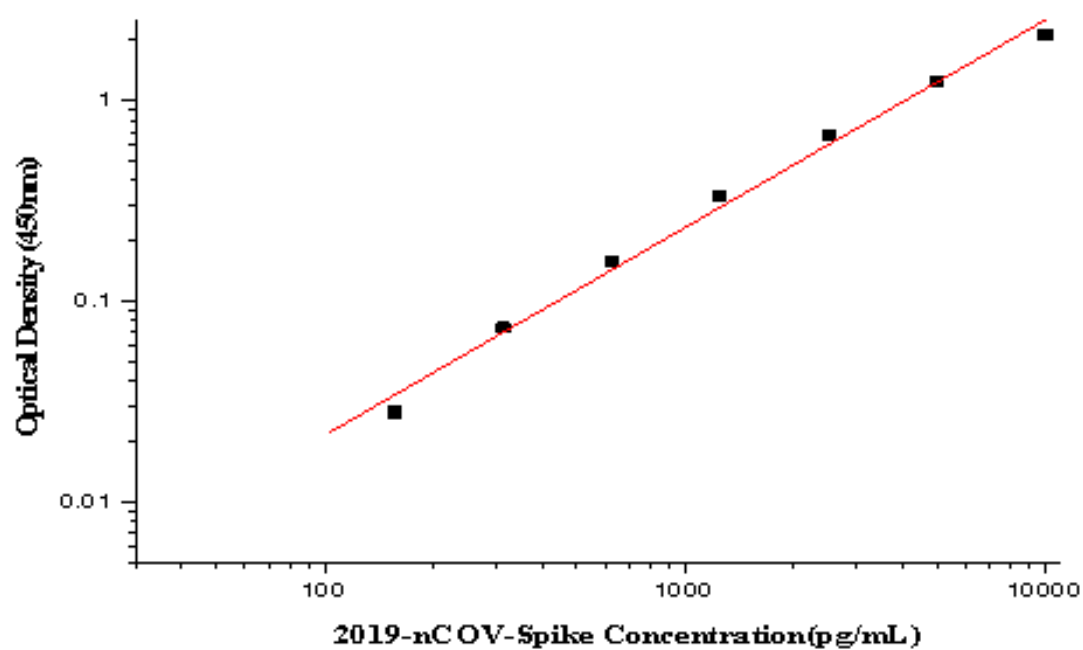
多种绘图和统计学软件可以用于辅助绘制标准曲线并进行未知样本浓度的计算。四参数拟合法往往曲线拟合效果较好，但其它方法如线性，双对数法也可能获得较好拟合结果，需要根据具体实验数据进行分析。

TYPICAL DATA_中文版

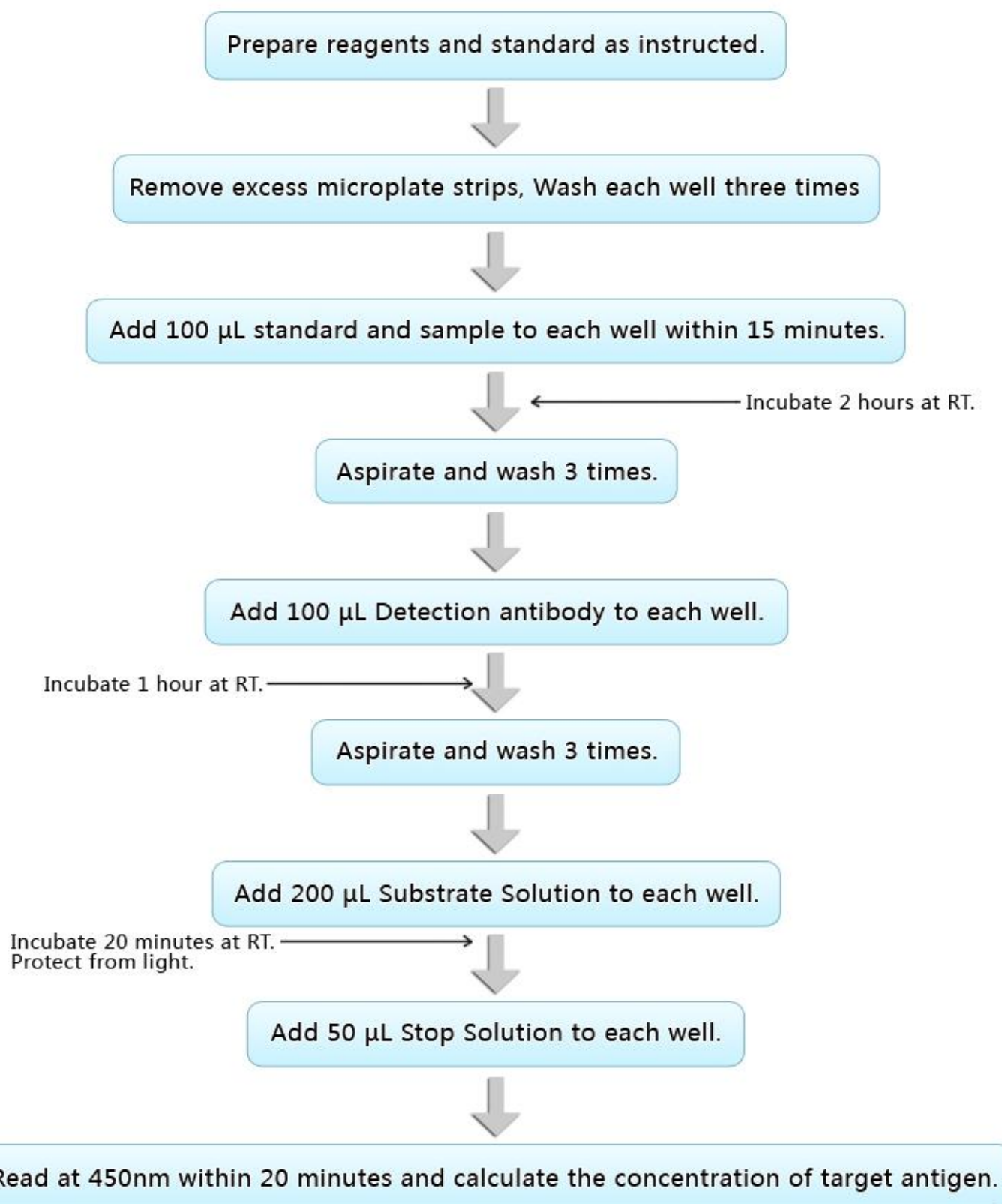
示例数据

以下标准曲线图仅供参考，应以同次实验标准品所绘标准曲线计算标本含量。

| Concentration (pg/mL) | Zero standard subtracted OD |
|------------------------|-----------------------------|
| 0 | 0 |
| 156.2 | 0.028 |
| 312.5 | 0.074 |
| 625 | 0.157 |
| 1250 | 0.332 |
| 2500 | 0.665 |
| 5000 | 1.249 |
| 10000 | 2.129 |

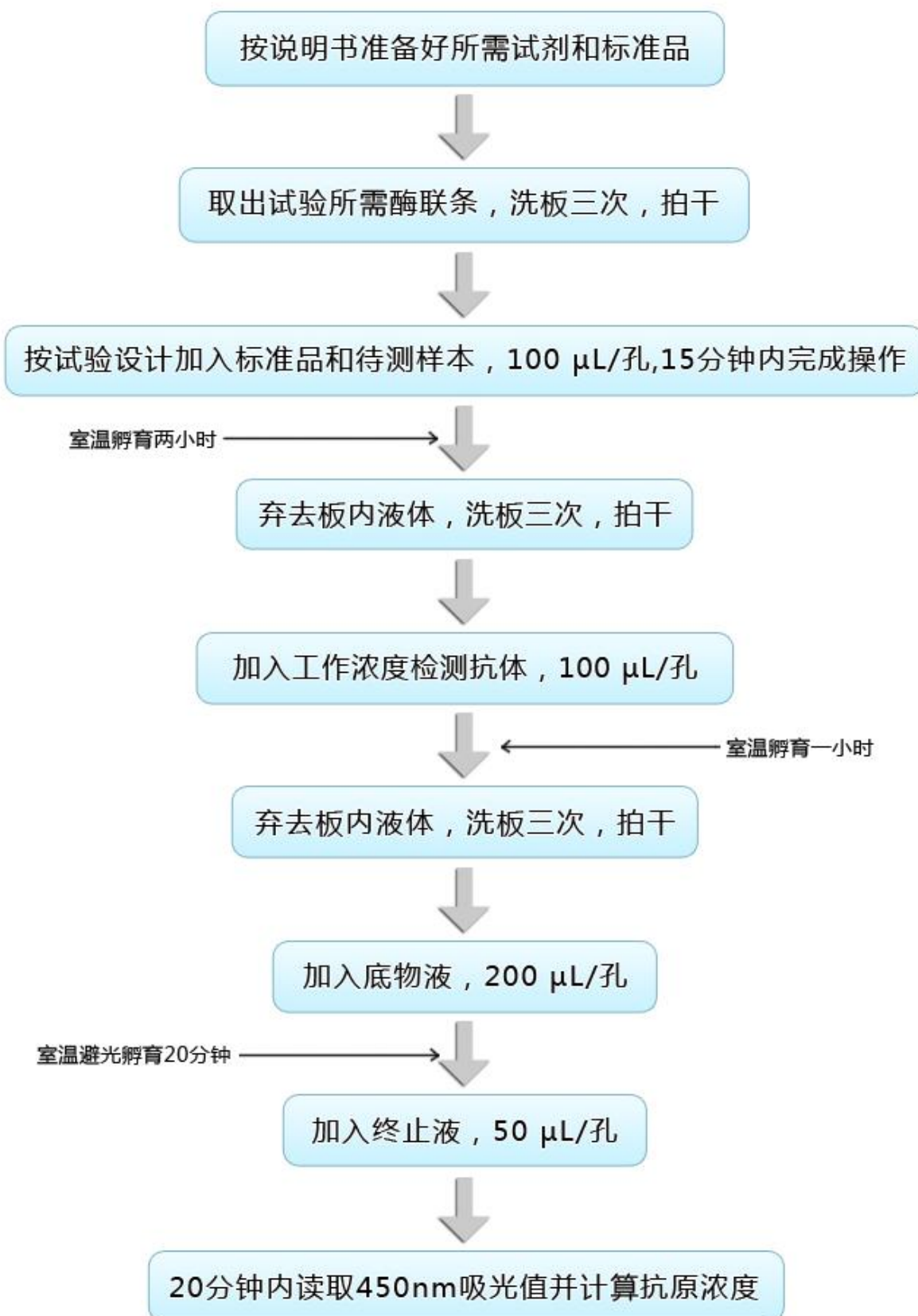


ASSAY SUMMARY



ASSAY SUMMARY_中文版

实验流程汇总简图





<http://www.sinobiological.com>



Face book



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