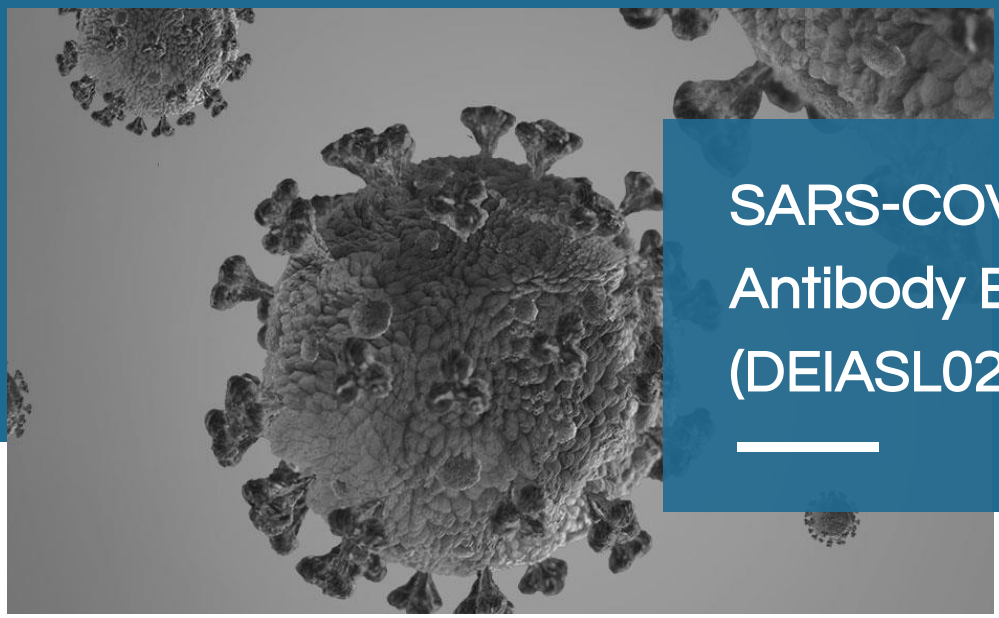


SARS-COV-2 Total Antibody ELISA Kit (DEIASL024)

This product is for research use only and is not intended for diagnostic use.

PRODUCT INFORMATION

Size	96T

Intended Use

SARS-CoV-2 Total Antibody ELISA Kit is an enzyme-linked immunosorbent assay (ELISA) for qualitative detection of total antibodies to SARS-CoV-2 virus in human serum or plasma specimens.

General Description

Coronavirus disease 2019 (COVID-19) is a respiratory disease caused by infection with the SARS-CoV-2 virus. Common signs of infection include respiratory symptoms, fever, and cough, shortness of breath and breathing difficulties. In severe cases, infection can cause pneumonia, severe acute respiratory syndrome (SARS), kidney failure and death.

Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). The 2019 Novel Coronavirus, formerly known as 2019-nCoV and now known as SARS-COV-2, is a new strain of coronavirus that was first identified during an outbreak in Wuhan, China which started in December 2019.

Principles of Testing

SARS-CoV-2 Antibody ELISA is a two-step incubation antigen "sandwich" enzyme immunoassay kit, which uses polystyrene microwell strips pre-coated with recombinant SARS-CoV-2 antigen. Patient's serum or plasma specimen is added, and during the first incubation, the specific SARS-CoV-2 antibodies will be captured inside the wells if present. The microwells are then washed to remove unbound serum proteins. Second recombinant SARS-CoV-2 antigen conjugated to the enzyme Horseradish Peroxidase (HRP-

Conjugate) is added, and during the second incubation, the conjugated antigen will bind to the captured antibody inside the wells. The microwells are then washed to remove unbound conjugate, and Chromogen solutions are added into the wells. In wells containing the antigen-antibody-antigen (HRP) "sandwich" immunocomplex, the colorless Chromogens are hydrolyzed by the bound HRP conjugate to a blue colored product. The blue color turns yellow after the reaction is stopped with sulfuric acid. The amount of color intensity can be measured and it is proportional to the amount of antibody captured inside the wells, and to the specimen respectively. Wells containing specimens negative for SARS-CoV-2 antibodies remain colorless.

Reagents And Materials Provided

1. **Microwell Plate (8×12/12×8-wells)**: Blank microwell strips fixed on white strip holder. The plate is sealed in aluminum pouch with desiccant. Each well contains recombinant SARS-CoV-2 antigen. The microwell strips can be broken to be used separately. Place unused wells or strips in the provided plastic sealable storage bag together with the desiccant and return to 2-8 °C. Once opened, stable for 4 weeks at 2-8 °C.
2. **Negative Control (0.5 mL)**: Yellowish liquid filled in a vial with green screw cap. Protein-stabilized buffer tested non-reactive for SARS-CoV-2 antibodies. Ready to use as supplied. Once opened, stable for 4 weeks at 2-8°C.
3. **Positive Control (0.3 mL)**: Yellowish liquid filled in a vial with red screw cap. SARS-CoV-2 positive material diluted in protein-stabilized buffer. Ready to use as supplied. Once opened, stable for 4 weeks at 2-8°C.
4. **HRP-Conjugate (12 mL)**: Red-colored liquid in a white vial with red screw cap. Horseradish peroxidase-conjugated recombinant SARS-CoV-2 antigen. Ready to use as supplied. Once opened, stable for 4 weeks at 2-8°C.
5. **Wash Buffer (20X)**: Colorless liquid filled in a clear bottle with white screw cap. Buffer solution containing surfactant. The concentrate must be diluted 1 to 20 with distilled/ deionized water before use. Once diluted, stable for 1 week at room temperature, or for 2 weeks when stored at 2-8°C.
6. **Chromogen Solution A (6 mL)**: Colorless liquid filled in a white vial with green screw cap. Urea peroxide solution. Ready to use as supplied. Once opened, stable for 4 weeks at 2-8°C.
7. **Chromogen Solution B (6 mL)**: Colorless liquid filled in a black vial with black screw cap. TMB (Tetramethyl benzidine), N,N-dimethylformamide. Ready to use as supplied. Once opened, stable for 4 weeks at 2-8°C.
8. **Stop Solution (6 mL)**: Colorless liquid in a white vial with yellow screw cap. Diluted sulfuric acid solution (0.5M H_2SO_4). Ready to use as supplied. Once opened, stable for 4 weeks at 2-8°C.
9. **Plastic Sealable Bag (1 unit)**: For enclosing the strips not in use.
10. **Package Insert (1 copy)**
11. **Cardboard Plate Cover (2 sheets)**

Materials Required But Not Supplied

1. Freshly distilled or deionized water
2. Disposable gloves

3. Timer
4. Appropriate waste containers for potentially contaminated materials
5. Dispensing system and/or pipette, disposable pipette tips
6. Absorbent tissue or clean towel
7. Dry incubator or water bath, 37±1°C
8. Plate reader, single wavelength 450nm or dual wavelength 450/600~650nm
9. Microwell aspiration/wash system

Storage

The components of the kit will remain stable through the expiration date indicated on the label and package when stored between 2-8°C, do not freeze. To assure maximum performance of SARS-CoV-2 Antibody ELISA, during storage, protect the reagents from contamination with microorganism or chemicals.

Specimen Collection And Preparation

1. **Specimen Collection**: No special patient's preparation required. Collect the specimen in accordance with the normal laboratory practice. Either fresh serum or plasma specimens can be used with this assay. Blood collected by venipuncture should be allowed to clot naturally and completely – the serum/plasma must be separated from the clot as early as possible as to avoid haemolysis of the RBC. Care should be taken to ensure that the serum specimens are clear and not contaminated by microorganisms. Any visible particulate matters in the specimen should be removed by centrifugation at 3000 RPM (round per minutes) for 20 minutes at room temperature or by filtration.
2. Plasma specimens collected into EDTA, sodium citrate or heparin can be tested, but highly lipaemic, icteric, or hemolytic specimens should not be used as they can give false results in the assay. Do not heats inactivate specimens. This can cause deterioration of the target analyte. Specimens with visible microbial contamination should never be used.
3. SARS-CoV-2 Antibody ELISA is intended ONLY for testing of individual serum or plasma specimens. Do not use the assay for testing of cadaver specimens, saliva, urine or other body fluids, or pooled (mixed) blood.
4. Transportation and Storage: Store specimens at 2-8°C. Specimens not required for assaying within 1 week should be stored frozen (-20°C or lower). Multiple freeze-thaw cycles should be avoided. For shipment, specimens should be packaged and labeled in accordance with the existing local and international regulations for transportation of clinical specimens and ethological agents.

Reconstitution And Storage

Allow the reagents to reach room temperature (18-30°C). Check the Wash buffer concentrate for the presence of salt crystals. If crystals have formed, resolubilize by warming at 37°C until crystals dissolve. **Dilute the Wash buffer (20X)** as indicated in the instructions for washing. Use **distilled or deionized water** and only clean vessels to dilute the buffer. All other reagents are READY TO USE AS SUPPLIED.

Assay Procedure

1. **Preparation**: Mark three wells as Negative control (e.g. B1, C1, D1), two wells as Positive control (e.g. E1, F1) and one Blank (e.g. A1, neither specimens nor HRP-Conjugate should be added into the Blank well). If the results will be determined by using dual wavelength plate reader, the requirement for use of Blank well could be omitted. Use only number of strips required for the test.
2. **Adding controls and specimen**: Add **50 µL of Positive control, Negative control, and 100 µL of Specimen** into their respective wells except the Blank. Note: Use a separate disposal pipette tip for each specimen, Negative Control, Positive Control to avoid cross-contamination. Mix by tapping the plate gently.
3. **Incubating**: Cover the plate with the plate cover and incubate at **37°C for 30 minutes**.
4. **Washing**: At the end of the incubation, remove and discard the plate cover. Wash each well **5 times** with **diluted Wash Buffer**. Each time allow the microwells to soak for **30-60 seconds**. After the final washing cycle, turn down the plate onto blotting paper or clean towel, and tap it to remove any remainders.
5. **Adding HRP-Conjugate**: Add **100 µL of HRP-Conjugate** into each well except the Blank.
6. Incubating: Cover the plate with the plate cover and incubate at **37°C for 30 minutes**.
7. **Washing**: At the end of the incubation, remove and discard the plate cover. Wash each well **5 times** with **diluted Wash Buffer**. Each time allow the microwells to soak for **30-60 seconds**. After the final washing cycle, turn down the plate onto blotting paper or clean towel, and tap it to remove any remainders.
8. **Coloring**: Add **50 µL of Chromogen Solution A** and then **50 µL of Chromogen Solution B** into each well including the Blank, mix gently. Incubate the plate at **37°C for 15 minutes** avoiding light. The enzymatic reaction between the Chromogen solutions and the HRP-Conjugate produces blue color in Positive control and SARS-CoV-2 antibody positive specimen wells.
9. **Stopping Reaction**: Using a multichannel pipette or manually, add **50 µL of Stop Solution** into each well and mix gently. Intensive yellow color develops in Positive control and SARS-CoV-2 antibody positive specimen wells.
10. **Measuring the Absorbance**: Calibrate the plate reader with the Blank well and read the absorbance at **450** nm. If a dual filter instrument is used, set the reference wavelength at 600~650nm. Calculate the Cut-off value and evaluate the results. (Note: read the absorbance within 10 minutes after stopping the reaction).

Instructions for Washing:

(1) A good washing procedure is essential in order to obtain correct and precise analytical data.

(2) It is therefore, recommended to use a good quality ELISA microplate washer, maintained at the best level of washing performances. In general, no less than 5 automatic washing cycles of **350-400 µL/well** are sufficient to avoid false positive reactions and high background.

(3) To avoid cross-contaminations of the plate with specimen or HRP-conjugate, after incubation, do not discard the content of the wells but allow the plate washer to aspirate it automatically.

(4) Assure that the microplate washer liquid dispensing channels are not blocked or contaminated and sufficient volume of Wash buffer is dispensed each time into the wells.

(5) In case of manual washing, we suggest to carry out 5 washing cycles, dispensing **350-400 µL/well** and aspirating the liquid for 5 times. If poor results (high background) are observed, increase the washing cycles or soaking time per well.

(6) In any case, the liquid aspirated out the strips should be treated with a sodium hypochlorite solution at a final concentration of 2.5% for 24 hours, before they are wasted in an appropriate way.

(7) The concentrated Wash buffer should be diluted 1:20 before use. If less than a whole plate is used, prepare the proportional volume of solution.

Calculation

Each microplate should be considered separately when calculating and interpreting the results of the assay, regardless of the number of plates concurrently processed. The results are calculated by relating each specimen absorbance (A) value to the Cut-off value (C.O.) of the plate. If the Cut-off reading is based on single filter plate reader, the results should be calculated by subtracting the Blank well A value from the print report values of specimens and controls. In case the reading is based on dual filter plate reader, do not subtract the Blank well A value from the print report values of specimens and controls.

Calculation of the **Cut-off value (C.O.) = Nc + 0.16**

(Nc = the mean absorbance value for three negative controls). If Nc is < 0.03, take it as 0.03.

Quality Control

The test results are valid if the Quality Control criteria are fulfilled. It is recommended that each laboratory must establish appropriate quality control system with quality control material similar to or identical with the patient specimen being analyzed.

- The A value of the Blank well, which contains only Chromogen and Stop solution, is < 0.080 at 450 nm.
- The A values of the Positive control must be ≥ 0.190 at 450/600~650 nm or at 450 nm after blanking.
- The A values of the Negative control must be ≤ 0.100 at 450/600~650 nm or at 450 nm after blanking.

If one of the Negative control A values does not meet the Quality Control criteria, it should be discarded and the mean value calculated again using the remaining two values. If more than one Negative control A values do not meet the Quality Control Range specifications, the test is invalid and must be repeated.

Example:

1. **Quality Control**

Blank well A value: A1= 0.025 at 450 nm (Note: blanking is required only when reading with single filter at 450 nm)

Well No.:	**B1**	**C1**	**D1**
Negative control A values after blanking:	0.020	0.012	0.016

Well No.:	E1	F1
Positive control A values after blanking:	2.421	2.369

All control values are within the stated quality control range

2. **Calculation of Nc**: = (0.020+0.012+0.016)/3 = 0.016. Nc is < 0.03 so the value of 0.03 is used in the next step.
3. **Calculation of the Cut-off**: (C.O.) = 0.03 + 0.16 = 0.190

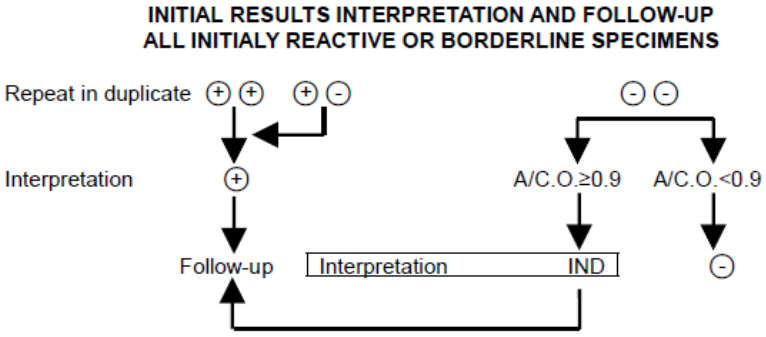
Interpretation of Results

Negative Results (A / C.O. < 1): Specimens giving absorbance less than the Cut-off value are negative for this assay, which indicates that no SARS-CoV-2 antibodies have been detected with SARS-CoV-2 Ab ELISA, therefore there are no serological indications for current or past coronavirus disease COVID-19.

Positive Results (A / C.O. ≥ 1): Specimens giving an absorbance equal to or greater than the Cut-off value are considered initially reactive, which indicates that SARS-CoV-2 antibodies have probably been detected using SARS-CoV-2 Ab ELISA. All initially reactive specimens should be retested in duplicate using SARS-CoV-2 Ab ELISA before the final assay results interpretation. Repeatedly reactive specimens can be considered positive for antibodies to SARS-CoV-2 therefore there are serological indications for current or past coronavirus disease COVID-19.

Borderline (A / C.O. = 0.9-1.1): Specimens with absorbance to Cut-off ratio between 0.9 and 1.1 are considered borderline and retesting of these specimens in duplicate is required to confirm the initial results.

Follow-up, confirmation and supplementary testing of any positive specimen with other analytical system is required. Clinical diagnosis should not be established based on a single test result. It should integrate clinical and other laboratory data and findings.



IND = non interpretable

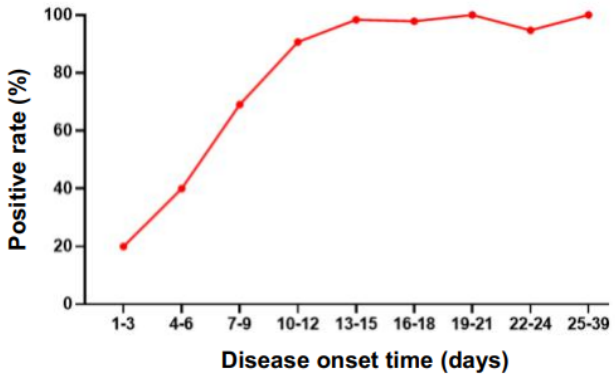
- If, after retesting of the initially reactive specimens, both wells are negative results (A/C.O.<0.9), these specimens should be considered as non-repeatable positive (or false positive) and recorded as negative. As with many very sensitive ELISA assays, false positive results can occur due to the several reasons, most of which are connected with, but not limited to, inadequate washing step.

- If after retesting in duplicate, one or both wells are positive results, the final result from this ELISA test should be recorded as repeatedly reactive. Repeatedly reactive specimens could be considered positive for antibodies to SARS-CoV-2 and therefore the patient is probably infected with the virus.
- After retesting in duplicate, specimens with values close to the Cut-off value should be interpreted with caution and considered as "borderline" zone specimen, or uninterpretable for the time of testing.

Performance Characteristics

Clinical validation study of SARS-CoV-2 antibody ELISA was conducted in 2020 in Shenzhen, China. 310 specimens from confirmed COVID-19 patients and 333 specimens from healthy individuals were tested. The kit demonstrated the sensitivity of 94.5% (293/310) and the specificity of 100% (333/333).

Samples were collected from COVID-19 confirmed cases with clinical symptoms, laboratory abnormalities or pulmonary imaging manifestations. No tests have been performed on specimens from latent infections or patients in the incubation period. It was observed that the detection rate of the kit was closely related to the time of disease onset, the kit showed higher positive detection rate in specimens from patients with delayed onset. Therefore, the interpretation of the test results should consider the specimen's collection time.



Precautions and Safety

TO BE USED ONLY BY QUALIFIED PROFESSIONALS

The ELISA assays are time and temperature sensitive. To avoid incorrect result, ***strictly follow the test procedure steps and do not modify them.***

1. Do not exchange reagents from different lots or use reagents from other commercially available kits. The components of the kit are precisely matched for optimal performance of the tests.
2. Make sure that all reagents are within the validity indicated on the kit box and of the same lot. Never use reagents beyond their expiry date stated on labels or boxes.
3. **CRITICAL STEP:** Allow the reagents and specimens to reach room temperature (18-30°C) before use. Shake reagent gently before use. Return at 2-8°C immediately after use.
4. Use only sufficient volume of specimen as indicated in the procedure steps. Failure to do so, may cause

low sensitivity of the assay.

5. Do not touch the exterior bottom of the wells; fingerprints or scratches may interfere with the reading. When reading the results, ensure that the plate bottom is dry and there are no air bubbles inside the wells.
6. Never allow the microplate wells to dry after the washing step. Immediately proceed to the next step. Avoid the formation of air bubbles when adding the reagents.
7. Avoid long time interruptions of assay steps. Assure same working conditions for all wells.
8. Calibrate the pipette frequently to assure the accuracy of specimens/reagents dispensing. Use different disposal pipette tips for each specimen and reagents in order to avoid cross- contaminations.
9. Assure that the incubation temperature is 37°C inside the incubator.
10. When adding specimens, do not touch the well's bottom with the pipette tip.
11. When measuring with a plate reader, determine the absorbance at 450nm or at 450/600~650nm.
12. The enzymatic activity of the HRP-conjugate might be affected from dust and reactive chemical and substances like sodium hypochlorite, acids, alkalis etc. Do not perform the assay in the presence of these substances.
13. If using fully automated equipment, during incubation, do not cover the plates with the plate cover. The tapping out of the remainders inside the plate after washing, can also be omitted.
14. All specimens from human origin should be considered as potentially infectious. Strict adherence to GLP (Good Laboratory Practice) regulations can ensure the personal safety.
15. **WARNING:** Materials from human origin may have been used in the preparation of the Negative Control of the kit. These materials have been tested with tests kits with accepted performance and found negative for HBsAg and antibodies to HIV 1/2, HCV, TP. However, there is no analytical method that can assure that infectious agents in the specimens or reagents are completely absent. Therefore, handle reagents and specimens with extreme caution as if capable of transmitting infectious diseases. Bovine derived sera have been used for stabilizing of the positive and negative controls. Bovine serum albumin (BSA) and fetal calf sera (FCS) are derived from animals from BSE/TSE free-geographical areas.
16. Never eat, drink, smoke, or apply cosmetics in the assay laboratory. Never pipette solutions by mouth.
17. Chemical should be handled and disposed of only in accordance with the current GLP (Good Laboratory Practices) and the local or national regulations.
18. The pipette tips, vials, strips and specimen containers should be collected and autoclaved for not less than 2 hours at 121°C or treated with 10% sodium hypochlorite for 30 minutes to decontaminate before any further steps of disposal. Solutions containing sodium hypochlorite should NEVER be autoclaved. Materials Safety Data Sheet (MSDS) available upon request.
19. Some reagents may cause toxicity, irritation, burns or have carcinogenic effect as raw materials. Contact with the skin and the mucosa should be avoided but not limited to the following reagents: Stop solution,

the Chromogens, and the Wash buffer.

20. The Stop solution 0.5M H_2SO_4 is an acid. Use it with appropriate care. Wipe up spills immediately and wash with water if come into contact with the skin or eyes.
21. ProClin™ 300 0.1% used as preservative, can cause sensation of the skin. Wipe up spills immediately or wash with water if come into contact with the skin or eyes.

INDICATIONS OF INSTABILITY DETERIORATION OF THE REAGENT: Values of the Positive or Negative controls, which are out of the indicated quality control range, are indicators of possible deterioration of the reagents and/or operator or equipment errors. In such case, the results should be considered as invalid and the specimens must be retested. In case of constant erroneous results and proven deterioration or instability of the reagents, immediately substitute the reagents with new one or contact CD technical support for further assistance.

Limitations

1. Positive results must be confirmed with another available method and interpreted in conjunction with the patient clinical information.
2. Antibodies may be undetectable during the early stage of the disease and in some immunosuppressed individuals. Therefore, negative results obtained with SARS-CoV-2 Ab ELISA are only indication that the specimen does not contain detectable level of antibodies and any negative result should not be considered as conclusive evidence that the individual is not infected with the virus.
3. If, after retesting of the initially reactive specimens, the assay results are negative, these specimens should be considered as non-repeatable (false positive) and interpreted as negative. As with many very sensitive ELISA assays, false positive results can occur due to the several reasons, most of which are related but not limited to inadequate washing step.
4. The most common assay mistakes are: using kits beyond the expiry date, bad washing procedures, contaminated reagents, incorrect assay procedure steps, insufficient aspiration during washing, failure to add specimens or reagents, improper operation with the laboratory equipment, timing errors, the use of highly hemolyzed specimens or specimens containing fibrin, incompletely clotted serum specimens.
5. The prevalence of the marker will affect the assay's predictive values.
6. This assay cannot be utilized to test pooled (mixed) serum or plasma. The kit has been evaluated only with individual serum or plasma specimens.
7. SARS-CoV-2 Ab ELISA is a qualitative assay and the results cannot be used to measure antibody concentration.