SARS-CoV-2 IgG (CLIA)

Severe Acute Respiratory Syndrome Coronavirus 2 IgG (CLIA)

Assay Principles

The CL-series SARS-CoV-2 IgG assay is a two step assay to qualitatively detect IgG antibodies to SARS-CoV-2.

In the first step, sample, sample treatment solution, paramagnetic microparticles coated with SARS-CoV-2 antigens are added into a reaction vessel. After incubation, SARS-CoV-2 IgG antibodies in the sample will bind to SARS-CoV-2 antigen coated microparticles. Afterwards, microparticles are magnetically captured while other unbound substances are removed by washing.

In the second step, diluted solution, ALP labeled anti-human IgG monoclonal antibody are added to the reaction vessel. After incubation, ALP labeled anti-huamn IgG monoclonal antibody will form sandwich with microparticle captured SARS-CoV-2 IgG antibodies. Afterwards, microparticles are magnetically captured while other unbound substances are removed by washing.

In the third step, the substrate solution is added to the reaction vessel. It is catalyzed by anti-human IgG antibody -ALP conjugate in the immune-complex retained on the microparticles. The resulting chemiluminescent reaction is measured as relative light units (RLUs) by a photomultiplier built into the system. The amount of SARS-CoV-2 IgG antibodies present in the sample is proportional to the relative light units (RLUs) generated during the reaction. The SARS-CoV-2 IgG antibodies concentration can be determined via a calibration curve, which is built on an encoded Master Calibration Curve and three level product calibrators.

Reagent Components

The reagent kit is composed of four components: Ra, Rb, Rc, and Rd. The components cannot be exchanged, and the detailed information of each component is listed below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ra</td>
<td>Paramagnetic microparticles coated with SARS-CoV-2 specific antigens in MES buffer with preservative.</td>
</tr>
<tr>
<td>Rb</td>
<td>ALP labeled anti-human IgG monoclonal antibody (mouse IgG) in MES buffer with preservative.</td>
</tr>
<tr>
<td>Rc</td>
<td>Sample diluted in TRIS buffer with preservative.</td>
</tr>
<tr>
<td>Rd</td>
<td>Blockers in TRIS buffer with preservative.</td>
</tr>
</tbody>
</table>

The position of each component is shown in the figure below (front view on the left and top view on the right).

Storage and Stability

The unopened SARS-CoV-2 IgG reagent kit is stable up to the expiration date as indicated on the label when stored at 2-8 °C. The actual expiration date is stated on the label.

The SARS-CoV-2 IgG reagent kit can be stored onboard at 2-8 °C and used for a maximum of 7 days after opening for use.

Reagent Preparation

Ra: Ready to use
Rb: Ready to use
Rc: Ready to use
Rd: Ready to use
Cd: Ready to use
Cl: Ready to use

Materials Required but not Provided

Mindray CL-series Chemiluminescence Immunoassay Analyzer

Cat. No. CS511: Substrate Solution, 4×11.5mL
Cat. No. WB411: Wash Buffer

Instrument System

Mindray CL-series Chemiluminescence Immunoassay Analyzer

Specimen Collection and Preparation

Human serum, heparin plasma or EDTA plasma is suitable for the test. Human serum is recommended.

Specimens must be separated from clots or red blood cells using centrifugation as recommended by the tube manufacturer after clot formation is complete. Specimens should be tested as soon as possible after sample collection and pre-analytical treatment.

If testing is not completed within 24 hours, transfer the supernatant into tubes for storage. Specimens tightly capped are stable for 7 days refrigerated at 2-8 °C. If testing will be delayed for more than 7 days, specimens should be frozen at -20 °C or below. The specimen can be stored at -20 °C for as long as 10 days.

Avoid repeated freeze and thaw cycles, which may cause sample deterioration. Specimen can be used after a maximum of five cycles of freeze and thaw.

Do not use specimen with the following conditions:
- grossly hemolyzed
- obvious microbial contamination
- visible fibrin or other debris

Assay Procedure

For optimal performance of this assay, operators should read the related system operation manual carefully to get sufficient information such as: specimen preparations, sample preservation and management, safety precautions, and maintenance. Prepare all required materials for the assay as well.

Before loading the SARS-CoV-2 IgG reagent kit on the instrument for the first time, inject unopened reagent bottle gently for at least 30 times to resuspend the microparticles, which have settled during shipment or storage. Visually inspect the bottle to ensure the microparticles have been well mixed. If the microparticles remain adhered to the bottle, continue inverting until the microparticles have been completely mixed. If the microparticles cannot be homogenized, it is recommended not to use this bottle of reagent. Contact Mindray Customer Service for help. Do not invert opened reagent bottle.

This assay requires 10 μL of sample volume for a single test. This volume does not include the dead volume of the sample container. Additional volume is required when performing additional tests from the same sample. Operators should refer to the system operation manual and specific requirement of the assay to determine the minimum sample volume.

Calibration

The calibrators are traceable to Mindray internal reference.

The calibration information is stored in the barcode attached in the reagent and calibrator pack. When performing the calibration, scan the information from the barcodes into the system first, and then test the calibrators of two levels. A valid calibration is required before any SARS-CoV-2 IgG test.

Recalibration is recommended every 7 days, or when a new reagent lot is used, or when the quality controls are out of specified ranges. For detailed instruction of calibration, refer to the system operation manual.

Control

Users can prepare quality controls with clinical samples or use third-party controls. Reference ranges can be established according to protocol approved by individual laboratories.

It is recommended that quality controls should be run once every 24 hours if the tests are in use, or after every calibration. The quality control frequency should be adapted to each laboratory's individual requirements.

Quality control results should be within the acceptable ranges. If a control is out of its specified range, the associated test results are invalid and the samples must be retested. Recalibration may be required. Refer to the system operation manual to check the system. If the quality control results are still out of the specified ranges, please contact Mindray Customer Service for help.

Calculation

The analyzer automatically calculates the analyte concentration of each sample, on the basis of master curve which is generated from the positive controls in the test kit and four positive reference controls. The concentrations are displayed in units/mL.

Specimen Dilution

Specimens cannot be diluted for Mindray SARS-CoV-2 IgG assay.

Interpretation of Results

Specimens with results <10.00 U/mL are considered negative for IgG antibodies to SARS-CoV-2. A negative result cannot rule out SARS-CoV-2 infection.

Specimens with results ≥10.00 U/mL are considered positive for IgG antibodies to SARS-CoV-2, suggesting previous or recent infection. Positive test results may require further confirmation. The assay results should not be used solely for confirmation or exclusion of COVID-19. Positive test results need further confirmation. The assay results should not be used solely for confirmation or exclusion of COVID-19. Positive test results need further confirmation. The assay results should not be used solely for confirmation or exclusion of COVID-19. Positive test results need further confirmation.

Limitation of Measurement

The SARS-CoV-2 IgG result of a given specimen can vary, depending on the assays from different manufacturers, which have differences in assay methods, calibration, and reagent specificity.

If the SARS-CoV-2 IgG results are inconsistent with clinical evidence, additional testing is suggested to confirm the result.

All tests with containing monoclonal mouse antibodies, anomalous results may be obtained from specimens taken from patients who have received monoclonal mouse antibodies for diagnosis or therapy in rare cases. Heterophilic antibodies in human serum can react with reagent immunoglobulins, interfering with anti-inflammatories. Pathologic examination of animals or to animal products can be prone to this interference and anomalous values may be observed. Additional information may be required for diagnosis.

Results may differ between laboratories due to the variations in population. It is recommended that each laboratory establish its own reference range.

Performance Characteristics

Precision

P/N: 046-019558-00 (1.0) English-1 SARS-CoV-2 IgG Page 1 of 2 2020-03
The CL-series SARS-CoV-2 IgG assay is designed to have a precision of ≤10% (within-device CV). Precision was determined by following National Committee for Clinical Laboratory Standards (NCCLS) Protocol EP15-A3. Two levels of quality controls were tested and run once per day, five replicates per run, for a total of 5 days, using a single lot of reagents and a single calibration. Results are shown in the table below.

### Table 1: Interference

<table>
<thead>
<tr>
<th>Substance</th>
<th>Concentration</th>
<th>Interference (%)</th>
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<tbody>
<tr>
<td>Bilirubin</td>
<td>20 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>500 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Triglyceride</td>
<td>3000 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Total protein</td>
<td>10 g/dL</td>
<td></td>
</tr>
<tr>
<td>Mucoprotein</td>
<td>200 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Total IgM</td>
<td>40 g/dL</td>
<td></td>
</tr>
<tr>
<td>Total IgG</td>
<td>0.5 g/dL</td>
<td></td>
</tr>
<tr>
<td>Rheumatoid Factor(RF)</td>
<td>1500 U/mL</td>
<td></td>
</tr>
<tr>
<td>Anti-nuclear Antibody(ANA)</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>Anti-mitochondrial Antibody(MAMA)</td>
<td>Not available</td>
<td></td>
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</tbody>
</table>

*Representative data; results in individual laboratories may vary.

### Clinical Performance

405 specimens from confirmed COVID-19 cases (Real-Time PCR positive) were tested with Mindray SARS-CoV-2 IgG assay and 333 were detected as positive, with a Positive Percent Agreement (PPA) of 82.22%. 2382 specimens not related to COVID-19 were tested with Mindray SARS-CoV-2 IgG assay and 2261 were detected as negative, with a Negative Percent Agreement (NPA) of 94.92%. The results are summarized in the table below.

### Table 2: Clinical Performance

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<tr>
<td>Mucoprotein</td>
<td>200 mg/dL</td>
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</tr>
<tr>
<td>Total IgM</td>
<td>40 g/dL</td>
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