SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay)

Reference Number
S3120E-25

Product Name
SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay)

Package Specification
25 tests/kit

Intended Use
• The SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) is intended for the qualitative detection of the SARS-CoV-2 nucleocapsid protein in human nasal, nasopharyngeal or oropharyngeal swab.
• Positive results indicate the presence of viral antigens, but clinical correlation with patient history and other diagnostic information is necessary to determine infection status. Positive results do not rule out bacterial infection or co-infection with other viruses. The agent detected may not be the definite cause of disease.
• Negative results should not be used as the sole basis for treatment or patient management decisions, including infection control decisions. Negative results should be considered in the context of a patient's recent exposures, history and presence of clinical signs and symptoms consistent with COVID-19.
• This product is intended for professional use by trained personnel.
• This kit is for in vitro diagnostic use.

Summary and Explanation of The Test
The COVID-19 outbreak was first recognized in December 2019 and has since spread to all parts of the world. It has caused tremendous public health and economy challenges worldwide. The causative agent was identified as 2019-nCoV, subsequently designated SARS-CoV-2, which belongs to the species SARS-related coronavirus (SARSr-CoV).
SARS-CoV-2 is a kind of novel coronavirus of the genus β. It has an envelope and the particles are round or oval, often pleomorphic, with a diameter of 60-140nm. Its genetic characteristics are significantly different from SARSr-CoV and MERS-related coronavirus (MERSr-CoV). Current research shows that it has more than 85% homology with bat SARS-like coronavirus (bat-SL-CoVZC45). When isolated and cultured in vitro, SARS-CoV-2 can be found in human respiratory epithelial cells in about 96 hours, while it takes about 6 days to isolate and culture in Vero E6 and Huh-7 cell lines.
The SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) adopts latex immunochromatography technology and utilizes double-antibody-sandwich method to qualitatively detect SARS-CoV-2 antigen in human nasal, nasopharyngeal or oropharyngeal swab sampled.

Test Principle
The SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) adopts latex immunochromatography technology and utilizes double-antibody-sandwich method to qualitatively detect SARS-CoV-2 antigen in human nasal, nasopharyngeal or oropharyngeal swab sampled.
If the specimen contains SARS-CoV-2 antigen, the latex marked by SARS-CoV-2 antibody can bind to the SARS-CoV-2 antigen in the specimen to form reaction complexes. The reaction complex will move forward along the nitrocellulose membrane under chromatography and bind to the SARS-CoV-2 antibody pre-coated in the test region (T-region), forming double-antibody-sandwich complexes of "(latex-SARS-CoV-2-Ab) - (SARS-CoV-2-Ag) - (SARS-CoV-2-Ab)", which finally produces a red reaction line in the T-region. Absence of this red reaction line in the T-region suggests a negative result. Regardless of whether SARS-CoV-2 antigen are contained in the specimens, there will be a red reaction line in the C-region, namely the quality control area.

Components of the Diagnostic Kit

No.	Material Name	Specification & Qty.	Main ingredients
1	SARS-CoV-2-Antigen Test Cassette (individually in a foil pouch with desiccant)	1 test/pouch × 25 pouches	• Anti-SARS-CoV-2 antibody1 • Goat anti Chicken IgY • Latex-anti-SARS-CoV-2 antibody2 • Latex-Chicken IgY
2	SARS-CoV-2 Sample Extraction Buffer	0.5 mL/tube × 25 tubes	$NaH_2PO_4{\cdot}2H_2O$, $Na_2HPO_4{\cdot}12H_2O$, Tween-20, Purified water, Proclin 300
3	Swab	25 devices/bag × 1 bag	/

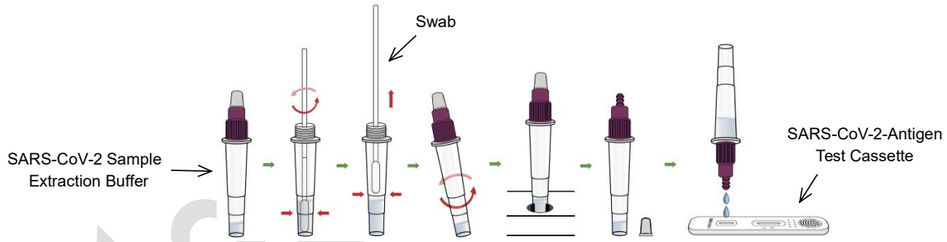
Materials Required but not provided:
• Timer
• Pipette
• Any necessary personal protective equipment
Note: Do not mix or exchange components from different kit lots.

Storage Condition and Validity
• Refrigerate or store at room temperature (2~30°C) in a dry and shady place.
• Avoid direct sunlight.
• The reagents and materials in the SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) are stable until the expiration date printed on the outer packaging. Do not use beyond the expiration date.

Warnings and Precautions
• Please read the instructions for use carefully before testing.
• The kit should be sealed and kept away from moisture. Reagents or specimens stored at low temperature should be balanced to room temperature before use.
• SARS-CoV-2-Antigen Test Cassette should be used as soon as possible after removal from aluminum foil pouch, so as to get the best performance.
• Wear appropriate personal protection equipment when running each test and handling patient specimens.
• This test is only intended for detection of nucleocapsid proteins from SARS-CoV-2, not for any other viruses or pathogen.
• Do not reuse the test kit.
• Do not use SARS-CoV-2-Antigen Test Cassettes which are damaged, or have an unclear label or expired.
• Do not eat the desiccant in the foil pouch.
• Specimens with invalid results are recommended for retest.
• Proper specimen collection, storage and transport are essential for correct results.
• Clean up spills thoroughly using an appropriate disinfectant.
• Used SARS-CoV-2-Antigen Test Cassettes and specimens should be treated as potential bio-hazardous materials.
• Handle all specimens as though they contain infectious agents.

Specimen Requirements
• The collection method of nasal swab: Carefully insert a Swab provided in the kit into one nostril. Using gentle rotation, push the swab up to 2.0 cm from the edge of the nostril. Rotate the Swab 5 times against the mucosa inside the nostril to ensure sufficient specimen collection. Using the same Swab, repeat this process in the other nostril to ensure that an adequate amount of specimen is collected from both nasal cavities.
• The collection method of nasopharyngeal swab: Gently hold the head of the person being sampled with one hand, meanwhile hold the Swab with the other hand. Insert the Swab through the nostril, and then move it slowly along the lower part of the nasal cavity. Make sure to avoid excessive force leading to traumatic bleeding after insertion. When the tip of the Swab reaches the back wall of the nasopharyngeal cavity, gently rotate it once (pause for one minute to prevent reflex cough) and slowly remove the Swab.
• The collection method of oropharyngeal swab: Insert the Swab from mouth completely into the oropharyngeal swelling, centering on the red part of the throat wall, upper jaw, and tonsils. Subsequently wipe and rotate 3 times with moderate force, avoid touching the tongue and take out the sampler.
• When being placed in SARS-CoV-2 Sample Extraction Buffer after sampling, the sampler can be stable within 30 minutes at room temperature, and stable within 1 hour at 2~8°C. Specimens are recommended to be tested as soon as possible after collection.
• The dry swab specimens should be used within 30 minutes at room temperature after collection, otherwise it should be stored in an airtight container and stored in a refrigerator at 2~8°C, but not more than 24 hours.
• Specimens to be tested shall be balanced to room temperature.

Test Procedure
Please read the instructions of use carefully before testing. Specimens to be tested, test reagents, and other test materials shall be balanced to room temperature. The test shall be conducted at room temperature.
1. Collect nasal, nasopharyngeal or oropharyngeal swab as required.
2. Remove the purple cap from SARS-CoV-2 Sample Extraction Buffer tube and insert Swab of specimen swab into it. Stir the Swab in the liquid for 10 times. Hold and squeeze the tube to mix the samples and SARS-CoV-2 Sample Extraction Buffer well.
3. Squeeze out as much liquid as possible from the Swab and remove the Swab.
4. Screw up the purple cap tight onto the tube. Shake it gently for 10 times, and be careful not to turn it upside down, to mix the liquid thoroughly.
5. Take out the SARS-CoV-2-Antigen Test Cassette from the foil bag and place it flat on the table.
6. Remove the white cap off the extraction tube and turn the tube with samples upside down. Add three drops of processed sample to the sample window, and time it.
7. Read the test results within 15~20 minutes, and the test results have no clinical significance after 20 minutes.



Note: Keep SARS-CoV-2-Antigen Test Cassette in sealed foil pouch prior to use. The cassette should be used within 120 minutes once the foil pouch is opened. If the temperature is higher than 30°C or under conditions of high humidity (＞70%RH), It should be used immediately after the foil pouch is opened.

Interpretation of Test Results
Positive: red lines appear at both test band (T-region) and control band (C-region).
Negative: red line appears at control band (C-region) only.
Invalid: no visible red line appears at control band (C-region). The test procedures may not be followed correctly, or the SARS-CoV-2-Antigen Test Cassette is deteriorated. It is recommended to retest the specimen.
Note: Specimens with low levels of antigen may give a faint sample line. Even if the test line is very faint or not uniform the test result should be interpreted as a positive result.

Limitations
1. Detection results should not be used alone for determining SARS-CoV-2 infection status, but should be combined with clinical observations, patient history, epidemiological information, and other laboratory evidence.
2. Positive test results do not rule out co-infections with other pathogens.
3. A negative result may occur if the concentration of antigen in a specimen is below the limit of detection or if the specimen is collected or transported improperly. Therefore a negative test result does not eliminate the possibility of SARS-CoV-2 infection, and should be confirmed by viral culture or a molecular assay if necessary for patient management.
4. Negative test results are not intended to rule out other pathogens infection.
5. This product is only used for the qualitative detection of the SARS-CoV-2-nucleocapsid protein in human nasal, nasopharyngeal or oropharyngeal swabs, but not for quantitative detection.
6. The performance of the kit was evaluated using the test procedures provided in this product insert only. Modifications to these procedures may alter the performance of the test.
7. Positive test results do not differentiate between SARS-CoV-2 and SARS-CoV.

Clinical Performance
Clinical performance characteristics of the SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) was evaluated with a total of 1347 specimens. The test results are shown in the table below.
These specimens were consisted of nasal, nasopharyngeal and oropharyngeal swabs from symptomatic and asymptomatic patients who were suspected of COVID-19. As with all antigen tests, performance may decrease as days since symptom onset increases. Samples were collected by qualified personnel in India and United States. Follow **Specimen Requirements** for specimens storage and testing.

For all the samples:

SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay)	PCR		
	Positive	Negative	Total
Positive	803	0	803
Negative	15	529	544
Total	818	529	1347
Sensitivity	98,17% (95%CI:92,79%-98,93%)		
Specificity	100,00% (95%CI:99,10%-100,00%)		
Overall percent agreement	98,89% (95%CI:98,33%-99,45%)		

Nasopharyngeal swabs:

SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay)	PCR		
	Positive	Negative	Total
Positive	411	0	411
Negative	8	230	238
Total	419	230	649
Sensitivity	98,09% (95%CI:81,71%-97,93%)		
Specificity	100,00% (95%CI:97,25%-100,00%)		

Overall percent agreement	98,77% (95%CI:85,48%-99,22%)

Oropharyngeal swabs:

SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay)	PCR		
	Positive	Negative	Total
Positive	286	0	286
Negative	5	192	197
Total	291	192	483
Sensitivity	98,28% (95%CI:84,11%-98,03%)		
Specificity	100,00% (95%CI:97,42%-100,00%)		
Overall percent agreement	98,96% (95%CI:86,84%-99,82%)		

Nasal swabs:

SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay)	PCR		
	Positive	Negative	Total
Positive	106	0	106
Negative	2	107	109
Total	108	107	215
Sensitivity	98,15% (95%CI:81,79%-98,42%)		
Specificity	100,00% (95%CI:97,34%-100,00%)		
Overall percent agreement	99,07% (95%CI:87,12%-99,38%)		

Notes: In clinical performance evaluation, the comparison reagent is Novel Coronavirus (2019-nCoV) Nucleic Acid Diagnostic Kit (PCR-Fluorescence Probing) manufactured by Sansure Biotech Inc, which is used for qualitative detection of the ORF1ab and N genes of novel coronavirus (2019-nCoV) in nasopharyngeal swab, oropharyngeal swab, alveolar lavage fluid, sputum, serum, whole blood, feces from suspected pneumonia cases with novel coronavirus infection, in patients with suspected clusters of novel coronavirus infection, and other patients requiring diagnosis or differential diagnosis of novel coronavirus infection. The comparative PCR reagent takes place on the nasopharyngeal swab from the throat, and the sample collection for the antigen test is carried out according to the chapter of Specimen Requirements of this manual.

Analytical Performance

1. Limit of detection (LoD): $8.0\times10^{1.0}$ $TCID_{50}$/mL

The limit of detection (LoD) of SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) was determined by detecting different concentrations of inactivated SARS-CoV-2 viruses which are used as specimen and added into the SARS-CoV-2 Sample Extraction Buffer to prepare different concentrations.

The LoD is determined by the minimum concentration of virus at a detection rate greater than 95%, i.e. at least 19 out of 20 replicates tested positive.

Stock SARS-CoV-2 Titer	$6.4\times10^{5.0}$ $TCID_{50}$/mL							
Dilution	10×	100×	1000×	2000×	4000×	8000×	16000×	32000×
Concentration in Dilution tested ($TCID_{50}$/mL)	$6.4\times10^{4.0}$	$6.4\times10^{3.0}$	$6.4\times10^{2.0}$	$3.2\times10^{2.0}$	$1.6\times10^{2.0}$	$8.0\times10^{1.0}$	$4.0\times10^{1.0}$	$2.0\times10^{1.0}$
Number positive/Total of 20 replicates	100% (20/20)	100% (20/20)	100% (20/20)	100% (20/20)	100% (20/20)	100% (20/20)	40% (8/20)	0% (0/20)
LoD	$8.0\times10^{1.0}$ $TCID_{50}$/mL							

2. Hook Effect

No high dose hook effect was observed when tested with up to a concentration of 1.0×10^{5} $TCID_{50}$/mL of inactivated SARS-CoV-2.

3. Cross-Reactivity

Cross-reactivity of the SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay) was evaluated by testing a panel of related pathogens, high prevalence disease agents, and normal or pathogenic flora that are reasonably likely to be encountered in the clinical specimens.

We test that the organisms in the table below are wet-tested in negative clinical matrix. Each organism and virus was tested in triplicate. No cross-reactivity was seen with the following microorganisms when tested at the concentration presented in the table below.

Virus/Bacteria	Test concentration	Results	Virus/Bacteria	Test concentration	Results
Human coronavirus OC43	1.3×10^{4} $TCID_{50}$/mL	Negative	*Mycoplasma pneumoniae*	4.62×10^{6} CFU/mL	Negative
Human coronavirus 229E	1.12×10^{6} $TCID_{50}$/mL	Negative	*Chlamydia pneumoniae*	2.3×10^{6} CFU/mL	Negative
Human coronavirus NL63	1.2×10^{6} $TCID_{50}$/mL	Negative	Measles Virus, Edmonston	2.6×10^{4} $TCID_{50}$/mL	Negative
Haemophilus influenzae	1.0×10^{6} cells/mL	Negative	Mumps virus	8.27×10^{6} $TCID_{50}$/mL	Negative
Influenza A(H3N2)	1.8×10^{5} $CEID_{50}$/mL	Negative	Epstein-Barr virus	3.46×10^{5} $TCID_{50}$/mL	Negative
Influenza A(H1N1, 2009)	1.26×10^{5} $TCID_{50}$/mL	Negative	*Staphylococcus aureus*	4.1×10^{6} CFU/mL	Negative
Influenza B(Y strain)	4.2×10^{7} $CEID_{50}$/mL	Negative	*Streptococcus pyogenes*	3.08×10^{6} CFU/mL	Negative
Influenza B(Victoria strain)	1.0×10^{5} $TCID_{50}$/mL	Negative	Respiratory syncytial virus	1.8×10^{5} $TCID_{50}$/mL	Negative
Parainfluenza virus 1	4.2×10^{5} $TCID_{50}$/mL	Negative	*Streptococcus pneumoniae*	1.42×10^{6} CFU/mL	Negative
Parainfluenza Virus 2	1.07×10^{5} $TCID_{50}$/mL	Negative	*Candida albicans*	2.66×10^{6} CFU/mL	Negative
Parainfluenza virus 3	2.0×10^{4} $TCID_{50}$/mL	Negative	*Metapneumovirus*	1.03×10^{5} $TCID_{50}$/mL	Negative
Parainfluenza virus 4	1.0×10^{5} $TCID_{50}$/mL	Negative	*Bordetella pertussis*	2.0×10^{6} CFU/mL	Negative
Adenovirus Type 5	4.26×10^{7} $TCID_{50}$/mL	Negative	*staphlococcus epidermidis*	1.0×10^{6} CFU/mL	Negative
Adenovirus Type 7	2.42×10^{7} $TCID_{50}$/mL	Negative	*Legionella pneumophila*	1.25×10^{6} CFU/mL	Negative
Enterovirus 70	4×10^{5} $TCID_{50}$/mL	Negative	Human Rhinovirus B70	1.0×10^{5} PFU/mL	Negative
MERS Coronavirus (Heat Inactivated)	1.0×10^{5} $TCID_{50}$/mL	Negative			

4.Endogenous/Exogenous Interference Substances Studies

The following substances, naturally present in respiratory specimens or that may be artificially introduced into the nasal cavity or nasopharynx, were evaluated with the SARS-CoV-2 Rapid Antigen Test (Immunochromatography Assay).

No Interference was seen with the following substances when tested at the concentration presented in the table below.

Substance	Concentration	Substance	Concentration
Blood	4%	Mucoprotein	0.5%
Tobramycin eye drops	5%	Fisherman's Friend	1.5mg/mL
Gold Throat Spray (Menthol)	15%	Compound Benzocaine Gel	1.5mg/mL
Mupirocin	10mg/mL	Sodium chromoglycate eye drops	15%
Ice throat candy (menthol)	1.5mg/mL	Sinex(phenylephrine hydrochloride)	15%
Tamiflu-oseltamivir	5mg/mL	Afrin(oxymetazoline)	15%
Naphthalmezoline hydrochloride Nasal drops	15%	Fluticasone Propionate nasal spray	15%

Bibliography

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Symbols

Symbols	Meanings	Symbols	Meanings
IVD	In Vitro Diagnostic Medical Device		Date of Manufacture
	Use By		Consult Instructions for Use
	Temperature Limitation		Manufacturer
LOT	Lot Number	REF	Reference Number
Σ	Number of Tests		Any Warnings and/or Precautions to Take
	Biological Risks		Do not Re-use
	Keep Away from Sunlight		Keep Dry
CE	This product fulfills the requirements of the European Directive 98/79/EC for in vitro diagnostic medical devices		Do not use if package is damaged and consult instructions for use
EC REP	Authorized representative in the European Community		

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