INNOSCREEN™

COVID-19 Antigen Rapid Test Device

Cat No.: SCOV-23 **20 Tests**

INTENDED USE

The InnoScreen™ COVID-19 Antigen Rapid Test Device is an in-vitro immunochromatographic assay for the qualitative detection of SARS-CoV-2 viral nucleoprotein antigens in nasopharyngeal swab, nasal swab and oropharyngeal swab specimens from individuals suspected of COVID-19 by their healthcare provider. This test is intended for professional use only.

INTRODUCTION

Coronaviruses are a large family of viruses. Some coronaviruses cause cold-like illnesses in people, while others cause illness in certain types of animals, such as cattle, camels, and bats. The two highly pathogenic viruses, SARS-CoV and MERS-CoV, cause severe respiratory syndrome in humans, and the other four human coronaviruses (HCoV-NL63, HCoV-229E, HCoV-OC43 and HKU1) only induce mild upper respiratory diseases in immunocompetent hosts, although some of them can cause severe infections in infants, young children and elderly individuals.

COVID-19 is the disease associated with SARS-CoV-2, which was first identified in China at the end of 2019. The virus is transmitted mainly via respiratory droplets that people sneeze, cough, or exhale. The incubation period for COVID-19 is currently estimated at between 2 and 14 days. Common symptoms of COVID-19 infection include fever, cough and respiratory symptoms such as shortness of breath and breathing difficulties. More serious cases develop severe pneumonia, acute respiratory distress syndrome, sepsis and septic shock that can lead to the death of the patient. People with existing chronic conditions seem to be more vulnerable to severe illness.

The InnoScreen™ COVID-19 antigen Rapid Test Device is a simple lateral flow immunoassay for the direct detection of SARS-CoV-2 viral nucleoprotein antigens. It provides a presumptive diagnosis of COVID-19.

PRINCIPLE

The InnoScreen™ COVID-19 Antigen Rapid Test Device is an immunochromatographic membrane assay that utilizes highly sensitive monoclonal antibodies to detect SARS-CoV-2 viral nucleoprotein antigens in respiratory specimens.

The control antibody and the SARS-CoV-2 viral nucleoprotein antigen specific monoclonal antibodies are immobilized onto a nitrocellulose membrane as two distinct lines. Nucleoprotein antigen specific SARS-CoV-2 viral antibodies are also conjugated to colloidal gold particles by a proprietary method and then immobilized onto an inert fibrous support. The resulting conjugate pad and striped nitrocellulose membrane are combined to construct the test strip. This test strip is mounted on a plastic backing then fixed into a plastic housing to assemble the test device.

Sample is treated with extraction buffer in the extraction tube to release the antigen from specimen before added to the test device. During testing, the extracted antigens bind to anti-SARS-CoV-2 antibodies conjugated colloidal gold particles to form a colored complex. As the specimen migrates along the strip by capillary action and interacts with reagents on the membrane, the complex will be captured by the anti-SARS-CoV-2 antibodies at the test region. Test results are interpreted at 15 minutes based on the presence or absence of pink-to-purple coloured Sample Lines. The presence of pink-to-purple colour Control Line indicates a valid assay.

REAGENTS AND MATERIALS PROVIDED

Contents	Qty.
Individually packed test device	20
Extraction tube	20
Extraction buffer	1
Nozzle	20
Sample collection swab	20
Package insert	1
Tube stand	1

MATERIAL REQUIRED BUT NOT PROVIDED

- Timer
- Gloves
- Transfer pipette

PRECAUTIONS

- For *in vitro* diagnostic Use Only.
- Read the Package Insert prior to use. Directions should be read and followed carefully.
- Do not use kit or components beyond the expiration date. Erroneous result may occur if test reagents or components are improperly stored.
- The device contains material of animal origin and should be handled as a potential biohazard.
- Test devices are packaged in foil pouches that exclude moisture during storage. Leave the test device in the sealed pouch until just before use. Inspect each foil pouch before opening. Do not use the test device if pouch is damaged or open.
- Do not use the Extraction buffer if it is discolored or turbid. Discoloration or turbidity may be a sign of microbial contamination.
- All patient specimens should be regarded as if they are biologically hazardous. All specimens must be collected and stored as indicated in the document (refer to SPECIMEN COLLECTION AND STORAGE).
- Failure to bring specimens and reagents to room temperature before testing may decrease assay sensitivity. Inaccurate or inappropriate specimen collection, storage, and transport may yield false negative test results.
- Avoid skin contact with buffer as it contains trace amount of sodium azide.
- If infection with SARS-CoV-2 is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, additional specimens should be collected with appropriate infection control precautions and sent to state or local health departments for testing. Samples after the extraction process are not suitable for vial culture as extraction buffer will inactivate cells and virus particles.

STORAGE AND STABILITY

- Store the InnoScreen™ COVID-19 Antigen Rapid Test Device at 2-30°C.
- **DO NOT FREEZE**.
- Kit contents are stable until the expiration dates marked on their outer packaging and containers. Once opened the device should be used immediately.

SPECIMEN COLLECTION AND STORAGE

Use freshly collected specimens for optimal test performance. Inadequate specimen collection or improper sample handling/transport may yield a false-negative result.

Nasopharyngeal swab (NP swab):

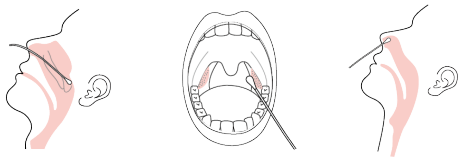
Remove swab from its pack. Tilt patient's head back 70 degrees. Gently and slowly insert the swab into one of the patient's nostrils until it reaches the posterior nasopharynx. Using gentle rotation, push swab until resistance is encountered or the distance is equivalent to that from the ear to the nostril of the patient. Slowly rotate the swab five times against the surface of the posterior nasopharynx then remove it from the nostril. Process the swab as soon as possible after collecting the specimen.

Oropharyngeal swab (OP swab):

Remove swab from its pack. Carefully insert swab into the posterior pharynx and tonsillar areas. Rub swab over both tonsillar pillars and posterior oropharynx five times. Avoid touching the tongue, teeth, and gums when collecting the sample.

Nasal swab (NS swab):

Remove swab from its pack. While gently rotating the swab, insert swab up to 2 cm into nostril (until resistance is met at the turbinate). Rotate the swab five times against the nasal wall. Using the same swab repeat the collection procedure with the second nostril. Slowly remove swab from the nostril. Process the swab as soon as possible after collecting the specimen.



a) Nasopharyngeal swab b) Oropharyngeal swab c) Nasal swab

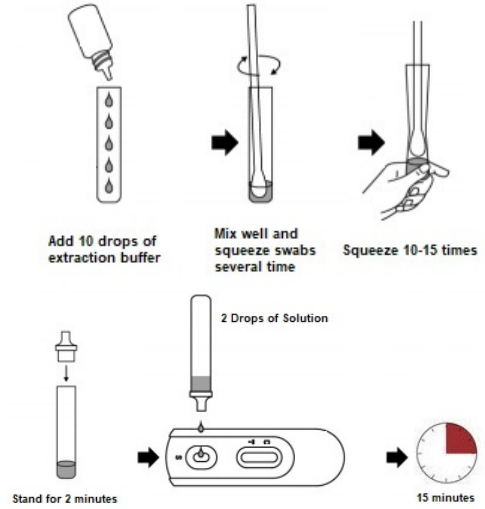
Note: Use only synthetic fiber swabs with plastic shafts. DO NOT USE calcium alginate swabs or swabs with wooden shafts, as they may contain substances that inactivate some viruses and inhibit some molecular assays. Specimens should be tested as soon as possible after collection. If swab sample is not tested immediately after collection, swab can be preserved in 0.5-1ml of saline or approved viral transport media at 2-8˚C for up to 24 hours. If needed, transport sample at 2-8˚C in a leak-proof container. If VTM (viral transport media) is used, minimal dilution of sample is required as excessive dilution will cause false negative. 0.5-1.0 ml of VTM for each sample is recommended. Only M5, Copan UTM and Hank's Balanced Salt Solution were tested and acceptable for use. Do not use specimens that are obviously contaminate with blood as it may interfere with the flow of sample with the interpretation of test results.

TEST PROCEDURE

Allow the test device, specimen, buffer, and/or controls to reach room temperature (15-30°C) prior to testing.

1. Remove the test device from the sealed pouch and use it as soon as possible. For best results, the assay should be performed within one hour.

   Note: Do not open the pouch while components come to room temperature.
2. Place the test device on a clean and level surface. Label the test with patient or control identification.
3. Insert the swab into the extraction tube. Mix well and squeeze the swab several times by compressing the walls of the tube against the swab then squeeze the tube 10-15 times. Stand for 2 minutes.
4. Roll the swab head against the inner wall of the tube as you remove it. Try to release as much liquid as possible. Dispose of the used swab in accordance with your biohazard waste disposal protocol.
5. Dispense 2 drops of solution into the sample well. Do not handle or move the test device until the test is complete and ready for reading. **Note:** Bubbles in the extraction tube can lead to inaccurate results. If you are unable to create sufficient drops, tab or shake the tube gently to release the bubble. The test device requires minimal 2 drops sample to react, insufficient sample will cause invalid result.
6. Read results at 15 minutes. **Note:** Do not interpret the results after 20 minutes.

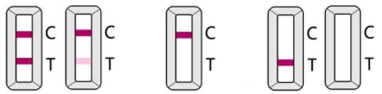


RESULT INTERPRETATION

POSITIVE: Two colored bands appear on the membrane. One band appears in the control region (C) and another band appears in the test region (T).

NEGATIVE: Only one colored band appears in the control region (C). No colored band appears in the test region (T).

INVALID: Control band fails to appear. Results from any test which has not produced a control band at the specified read time must be discarded. Please review the procedure and repeat with a new test. If the problem persists, contact your local distributor for technical support.



NOTE:

1. The color intensity in the test region (T) may vary depending on the concentration of analytes present in the specimen. Therefore, any shade of color in the test region should be considered positive. Note that this is a qualitative test only and it does not determine the concentration of analytes in the specimen.
2. Insufficient specimen volume, incorrect operation or expired device are the most likely reasons for control band failure.

QUALITY CONTROL

Internal Procedural Controls

The InnoScreen™ COVID-19 Antigen Rapid Test Device has built-in (procedural) controls. Each test device has an internal standard zone to ensure proper sample flow. The user should confirm that a red band appears at the "C" region before result interpretation.

External Positive and Negative Controls

Good laboratory practice suggests testing positive and negative external controls to ensure that the test device is working properly and that the test is correctly performed.

LIMITATIONS OF THE TEST

1. Negative results do not rule out SARS-CoV-2 infection, particularly in those who have been in contact with the virus. Follow-up testing with a

molecular diagnostic should be considered to rule out infection in these individuals.

2. The InnoScreen™ COVID-19 Antigen Rapid Test Device is for professional in vitro diagnostic use and should only be used for the qualitative detection of SARS-CoV-2 antigen. The intensity of color in a positive band should not be evaluated as "quantitative or semi-quantitative".
3. Both viable and nonviable SARS-CoV-2 viruses are detectable with the COVID-19 antigen Rapid Test Device. Test performance depends on antigen load in the specimen and may not correlate with cell culture performed on the same specimen.
4. As with all diagnostic tests, a definitive clinical diagnosis should not be based on the results of a single test but should only be made by the physician after all clinical and laboratory findings have been evaluated.
5. Failure to follow the TEST PROCEDURE and RESULT INTERPRETATION may adversely affect test performance and/or invalidate the test result.
6. A negative result may occur if the level of extracted antigen in a specimen is below the sensitivity of the test or if a poor-quality specimen is collected. Improper transport or storage of sample my also lead to false negative results.
7. Results obtained with this assay, particularly in the case of weak test lines that are difficult to interpret, should be used in conjunction with other clinical information available to the physician.
8. The use of rapid antigen tests in screening asymptomatic individuals or on patients in very early stage of infection (<3 days of onset of symptom) has limited clinical utility due to low level of antigen presented in these samples. Please refer to clinical evaluation for details.

PERFORMANCE CHARACTERISTICS

Clinical Evaluation:

A total of 1437 clinical specimens were collected in the study, including 638 nasopharyngeal swabs and 799 oropharyngeal swabs, to verify the performance of COVID-19 Antigen Rapid Test Device. 240 specimens were confirmed positive, and 1197 specimens were confirmed negative by RT-PCR. InnoScreen™ COVID-19 Antigen Rapid Test Device has an overall relative sensitivity of 83.33% (95% CI: 78.00%-87.82%) and specificity of 99.25% (95% CI: 98.58%-99.66%)

InnoScreen™ COVID-19 Antigen Rapid Test vs. RT-PCR

Sensitivity by days post-symptom onset				
Days post symptom onset	**Samples (n) RT-PCR+**	**InnoScreen™ COVID-19 Antigen +**	**Positive Results (%)**	**[95% CI]**
0-3*	46	41	89.13%	[76.43% to 96.38%]
4-8	55	46	83.64%	[71.20% to 92.23%]
9-14	81	75	92.59%	[84.57% to 97.23%]
15-20	39	25	64.10%	[47.18% to 78.80%]
>21	19	13	68.42%	[43.45% to 87.42%]
Total	240	200	83.33%	[78.00% to 87.82%]
Sensitivity by PCR Ct value				
PCR Ct value	**Samples (n) RT-PCR+**	**InnoScreen™ COVID-19 Antigen +**	**Positive Results (%)**	**[95% CI]**
≤25	154	151	98.05%	[94.41% to 99.60%]
≤30	176	170	96.59%	[92.73% to 98.74%]
≤33	191	182	95.29%	[91.24% to 97.82%]
<38	240	200	83.33%	[78.00% to 87.82%]
Specificity				
	Samples (n) RT-PCR-	**InnoScreen™ COVID-19 Antigen -**	**Negative Results (%)**	**[95% CI]**
Total	1197	1188	99.25%	[98.58% to 99.66%]

*Including asymptomatic individuals

Analytical Sensitivity

The limit of detection for InnoScreen™ COVID-19 Antigen Rapid Test Device was determined to be $2x10^{2.4}$ $TCID_{50}$/mL ($3.5x10^{2}$ PFU/ml) using inactivated SARS-CoV-2 viral culture.

Dose Hook

InnoScreen™ COVID-19 Antigen rapid test has no hook effect with high dose levels up to $1x10^{6.4}$ $TCID_{50}$/ml.

Repeatability & Reproducibility

A blind study using panels of blind coded specimens containing negative, low positive, and high positive samples on InnoScreen™ COVID-19 Antigen Rapid Test Device demonstrated that the results have no significant differences within run (10 replicates tested by one operator), between run (3 different days), between sites (3 sites), or between operators (9 operators).

Analytical Reactivity

The targeted nucleocapsid sequence used for InnoScreen™ COVID-19 Antigen Rapid Test Device is 2019-nCoV/WHU01. Research indicates that the strains of Novel SARS-CoV-2 (2019-nCoV) have high homology greater than 99% and they all contain the same conserved nucleoproteins targeted by InnoScreen™ COVID-19 Antigen rapid test device. Test of other strains on InnoScreen™ COVID-19 Antigen Rapid Test Device demonstrated there is no significant difference in reaction.

SARS-CoV-2 Variants of Concern tested			
Name (PANGO lineages)	Name (Nextstrain)	WHO Label	First Identified
B.1.1.7	20I/501Y.V1	Alpha	United Kingdom
B.1.351	20H/501.V2	Beta	South Africa
B.1.427	20C/S:452R	Epsilon	United States
B.1.429	20C/S:452R	Epsilon	United States
B.1.617.2	20A/S:478K	Delta	India
P.1	20J/501Y.V3	Gamma	Japan/Brazil

Cross Reactivity

There was no cross-reactivity with specimens meeting the disease state shown below. No inhibition was observed with any of the specimens.

HCoV-HKU1	Parainfluenza 1/2/3 virus
HCoV-OC43	Human metapneumovirus
HCoV-NL63	Rhinovirus
HCoV-229E	Coxsackie virus A16
Measles virus	Haemophilus influenzae
Streptococcus pneumoniae	Candida albicans
Epstein-Barr virus	Mycobacterium tuberculosis
Bordetella parapertussis	Norovirus
Bordetella pertussis	Mump virus
Influenza A (H1N1) pdm09	Legionella pneumophila
Influenza A (H3N2)	Mycoplasma pneumoniae
Influenza A (H5N1)	Chlamydia pneumoniae
Influenza A (H7N9)	Streptococcus pyogenes
Influenza A (H7N7)	Streptococcus agalactiae
Influenza B Victoria lineage	Group C Streptococcus
Influenza B Yamagata lineage	Staphylococcus aureus
Respiratory syncytial virus	Pooled human nasal wash with
Adenovirus	

Interfering Substances

The following substances, naturally present in respiratory specimens or that may be artificially introduced into the respiratory tract, were evaluated at the concentrations listed below. None of them were found to affect test performance of InnoScreen™ COVID-19 Antigen Rapid Test Device.

Substance	Concentration
3 OTC nasal sprays	10%
3 OTC mouthwashes	10%
3 OTC throat drops	10%
4-acetamidophenol	10 mg/ml
Acetylsalicylic acid	20 mg/ml
Albuterol	20 mg/ml
Chlorpheniramine	5 mg/ml
Dexamethasone	5 mg/ml
Dextromethorphan	10 mg/ml
Diphenhydramine	5 mg/ml
Doxylamine succinate	1 mg/ml
Flunisolide	3 mg/ml
Guaiacol glyceryl ether	20 mg/ml
Mucin	1%
Mupirocin	250 µg/ml
Oxymetazoline	10 mg/ml
Phenylephrine	10 mg/ml
Phenylpropanolamine	20 mg/ml
Relenza (zanamivir)	20 mg/ml
Rimantadine	500 ng/ml
Tamiflu (oseltamivir)	100 mg/ml
Tobramycin	40 mg/ml
Triamcinolone	14 mg/ml

LITERATURE REFERENCES

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GLOSSARY OF SYMBOLS

IVD	***In vitro* diagnostic medical device**
	Consult instructions for use
	Manufacturer
LOT	**Batch code**
	Do not re-use
	Use by date
	Caution
	Temperature limit
REF	**Catalog number**

Manufactured by:
Innovation Scientific Pty Ltd
11/87 Railway Road North, Mulgrave
NSW 2756 Australia
Tel: +61 1300 707 798 Fax: +61 1300 977 918
Email: support@innovationsci.com.au
Website: www.innovationsci.com.au