COVID-VIRO®
COVID-19 Ag Rapid Test
Ref. : TR-COV-006

Instructions for use

INTENDED USE

COVID-VIRO® is an in vitro immunochromatographic assay for the qualitative detection of nucleocapsid protein antigen from SARS-CoV-2 in nasopharyngeal swab specimens.
COVID-VIRO® is intended to aid in the rapid diagnosis of SARS-CoV-2 infections.
COVID-VIRO® also detects SARS-CoV and new variants in which the synthesis of nucleoprotein N is not affected (English and South African variants).

INTRODUCTION

SARS-CoV-2 was identified in 2019, it belongs to β-coronaviruses genus. This is the pathogen causing emerging atypical pneumonia, coronavirus disease 2019 (Covid-19).
Currently, patients infected with SARS-CoV-2 are the main source of transmission: infected people, who are asymptomatic, can also be an infectious source. Based on the current epidemiological investigation, the incubation period can range from 1 to 14 days but is usually 3 to 7 days.
A SARS-CoV-2 variant, called SARS-CoV-2 VUI 202012/01 (Variant Under Investigation, year 2020, month 12, variant 01), has been identified by viral genome sequencing in the United Kingdom. Its RNA presents multiple mutations and deletions resulting in deletions or changes of amino acids at the level of the S protein (Spike) 69-70 deletion, 144 deletion, N501Y, A570D, D614G, P681H, T716I, S982A and D1118H mutations.
The main symptoms are fever or a feeling of fever and cough. Sudden loss of smell, without nasal obstruction and complete disappearance of taste are also symptoms that have been observed in patients. In people developing more severe forms, there is difficulty breathing, which can lead to intensive care hospitalization and death.
COVID-VIRO® was designed to detect the nucleocapsid protein (N) of SARS-CoV-2, therefore mutations affecting Spike protein synthesis do not affect test performance.
COVID-VIRO® detects SARS-CoV-2 variants (SARS-CoV-2 VUI 202012/01), English and South African variants, with the same performance as it detects other known strains of the SARS-CoV-2 virus .
This antigen is generally detectable in upper respiratory tract samples during the acute phase of infection

PRINCIPLE OF THE TEST

COVID-VIRO® is a lateral flow immunochromatographic assay that uses highly sensitive monoclonal antibodies to detect nucleocapsid protein from SARS-CoV-2 in nasopharyngeal swab.
The test uses monoclonal antibodies directed against the nucleocapsid protein of SARS-CoV-2 fixed on the test line region (T) on a nitrocellulose strip. A monoclonal antibody directed against the colloidal gold labeled SARS-CoV-2 nucleocapsid protein is used as lyophilized conjugate.
During the test, SARS-CoV-2 antigens presents in the sample interact with the monoclonal anti-SARS-CoV-2 antibodies conjugated to the colored particles to form a colored antibody-antigen complex.
This complex migrates by capillary action on the membrane to the test line (T) where it will be captured by the monoclonal anti-SARS-CoV-2 antibodies fixed on the membrane.
A colored test line should appear in the results window (T) if SARS-CoV-2 antigens are present in the sample. The intensity of the colored test line will vary depending on the amount of SARS-CoV-2 antigens present in the sample. If no SARS-CoV-2 antigen is present in the sample, no color will appear on the test line (T). The control line is used as a procedural control and should always appear in the control area (C) if the test procedure is performed correctly.

MATERIAL PROVIDED

- 20 sealed pouches containing a test cassette and a desiccant
- 2 vials of buffer
- 20 nasopharyngeal sterile swabs
- 20 extraction tubes and 20 nozzles with filter
- 1 workstation
- 1 instructions for use

MATERIAL REQUIRED BUT NOT PROVIDED

- Timer

STORAGE AND STABILITY

The kit can be stored at room temperature or refrigerated (2-30°C). Do not freeze any of the test kit components. Do not use test device and reagents after expiration date. REMOVE THE CASSETTE FROM THE SEALED POUCH ONLY BEFORE DEPOSITING THE SAMPLE.

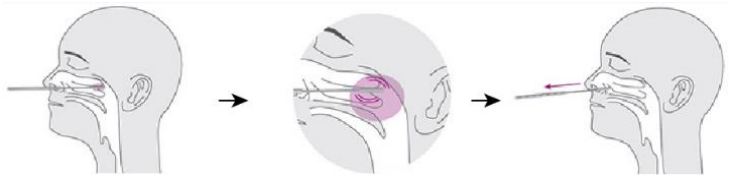
WARNINGS AND PRECAUTIONS

- For professional in vitro diagnostic use only.
- The test device should remain in the sealed pouch until use.
- Do not use expired kits.
- Swabs, tubes and test devices are for single use only. They should only be taken out of their pouch or packaging individually before performing each test (to avoid cross-contamination).
- The extraction buffer contains a solution with a preservative (0.09% sodium azide). If solution comes in contact with the skin or eyes, flush with ample volumes of water. The bottle must be closed after each test (to avoid any contamination).
- Solutions that contain sodium azide may react explosively with lead or copper plumbing. Use large quantities of water to flush discarded solutions down a sink.
- Do not interchange or mix components from different kit lots.
- When collecting nasopharyngeal sample, use swab supplied in the kit.
- To obtain accurate results, do not use visually bloody or overly viscous samples.
- Wear suitable protective clothing, gloves, and eye/face protection when handling the contents of this kit.
- Humidity and temperature can adversely affect results.
- Used testing materials should be discarded in accordance with local regulations.

SPECIMEN COLLECTION

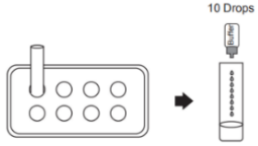
Use the nasopharyngeal swab supplied in the kit.

1. Carefully insert the swab into the patient's nostril, reaching the surface of the posterior nasopharynx.
2. Rotate the swab several times.
3. Gently remove the swab from the nasal cavity.

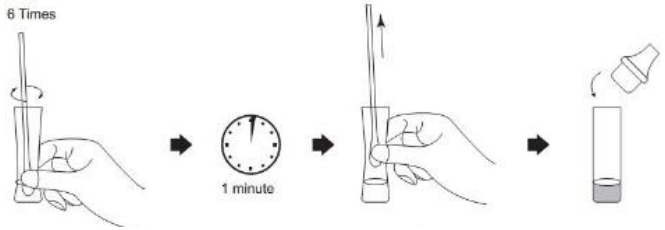


SAMPLE PREPARATION PROCEDURE

1. Insert the extraction tube into the holder. Make sure that the tube is standing firm and reaches the bottom of the workstation.
2. Add 10 drops (300µl) of buffer to the extraction tube.



3. Insert the swab into the extraction tube containing the buffer.
4. Twist the swab (at least 6 times) while pressing its head against the bottom and sides of the extraction tube.
5. Leave the swab in the extraction tube for 1 minute. If the mucus seems thick at the time of collection, allow the swab to stand for an additional 1 minute.
6. Press the swab against the sides of the extraction tube to extract the liquid from the swab.
7. Remove and discard the swab.
8. Insert a nozzle with filter into the sample extraction tube tightly.



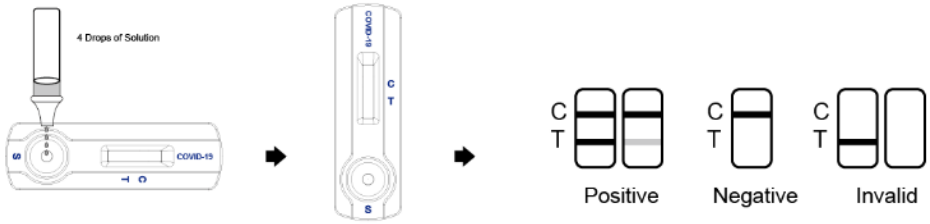
SPECIMEN TRANSPORT AND STORAGE

Nasopharyngeal swabs should be tested as soon as possible after collection.
If immediate testing is not possible, and to maintain best performance and avoid possible contamination, it is highly recommended to place the nasopharyngeal swab in a clean, unused plastic tube labeled with patient information, preserving sample integrity, and capped tightly at room temperature (15-30°C) for up to 1 hour prior to testing. Ensure the swab fits securely within the tube and the cap is tightly closed. If greater than 1 hour delay occurs, dispose of sample. A new sample must be collected for testing.

TEST PROCEDURE

Make sure sample and test components are at room temperature (15-30°C) prior to testing.

1. Remove test device from the sealed pouch just prior to testing and lay flat on work bench.
2. Reverse the sample extraction tube, and add 4 drops (100µL) of test sample by squeezing the extracted solution tube into the sample window (S).
3. Wait for the colored band(s) to appear. The result should be read in 15 minutes. Do not interpret the result after 20 minutes.



INTERPRETATION OF RESULTS

Positive : the presence of two lines, both control line (C) and test line (T) within the result window indicates a positive result.

Negative : the presence of only control line (C) within the result window indicates a negative result.

Invalid : If the control line (C) is not visible within the result window after performing the test, the result is considered invalid. Some causes of invalid results are due to not having followed the instructions correctly. It is recommended that the specimen be re-tested using a new test.

Note : the intensity of color in the test line region (T) may vary depending on the concentration of analytes present in the specimen. Therefore, any shade of color in the test line region (T) should be considered positive. Please note that this is a qualitative test, and cannot determine the concentration of analytes in the specimen. Insufficient specimen volume, incorrect operating procedure or expired tests are the most likely reasons for control band failure.

QUALITY CONTROL

An internal quality control is included in the test. A red line appearing in the control line region (C) is the internal procedural control. It confirms sufficient specimen volume and correct procedural technique. External quality controls are not supplied with this test kit.

LIMITATIONS

- The test is capable of detecting both viable and non-viable SARS-CoV-2. The performance of the test depends on antigen load and may not correlate with viral culture results performed on the same specimen. The etiology of respiratory infection caused by microorganisms other than SARS-CoV-2 will not be established with this test.
- Removing the cassette from the sealed bag well before depositing the sample may lead to a false positive result.
- THIS TEST MUST NOT BE PERFORMED FROM A SWAB PREVIOUSLY PLACED IN A VIRAL TRANSPORT MEDIA (VTM). Some VTMs contain chemicals that can interfere with the immunological reaction of the test and may result in a false positive result.
- Failure to follow the Test Procedure may adversely affect test performance and/or invalidate the test result.
- If the test result is negative and clinical symptoms persist, additional testing using other clinical methods is recommended. A negative result does not at any time rule out the presence of SARS-CoV-2 antigens in specimen, as they may be present below the minimum detection level of the test or if the sample was collected or transported improperly.
- As with all diagnostic tests, a confirmed diagnosis should only be made by a physician after all clinical and laboratory findings have been evaluated.
- Positive test results do not rule out co-infections with other pathogens and do not differentiate between SARS-CoV and SARS-CoV-2 and its variants..
- The test must be used in accordance with current regulations.

PERFORMANCE CHARACTERISTICS

Sensitivity and Specificity

COVID-VIRO® test performance was evaluated at Orléans Hospital (pre-published article on medRxiv) as part of a prospective comparative clinical study involving 226 individuals of unknown status with respect to SARS-CoV-2 infection, recruited consecutively or randomly.

Performance of COVID-VIRO® vs PCR

Reference method	Positive PCR SARS-CoV-2
Number of positive samples	113
Total number of samples	117
Sensitivity result	**96.6%**
IC95%	*93.3-99.8%*

Reference method	Negative PCR SARS-CoV-2
Number of negative samples	109
Total number of samples	109
Specificity result	**100%**

* Sensitivity of the test is **98.4%** for people with significant viral excretion (Ct ≤33), according to the criteria of the French Society of Microbiology (SFM).

Limit of detection (LOD)

The minimum detectable concentration of SARS-CoV-2 is **1,15 x 10^2 $TCID_{50}$/ml.**

Interferences

The following substances have been tested : blood (EDTA), anti-viral drugs, antibiotics/anti-bacterial drugs, nasal sprays or nose drops, nasal corticoids.
Results did not show any interference .

Precision

Intra-lot : 3 samples (negative, low positive (LOD) and high positive (4xLOD) have been tested in 10 replicates each. Results have been detected correctly.
Inter-lot : 3 samples (negative, low positive (LOD) and high positive (4xLOD) have been tested in 10 replicates with 3 different batches. Results have been detected correctly.

Cross-reactivity

Samples containing the pathogens listed below were tested.
Results did not show any cross-reaction.

Pathogen	Concentration
Respiratory syncytial virus Type A	5.5×10^7PFU/ml
Respiratory syncytial virus Type B	$2.8\times10^5$$TCID_{50}$/ml
Novel influenza A H1N1 virus (2019)	1×10^6PFU/ml
Seasonal influenza A H1N1 virus	1×10^5PFU/ml
Influenza A H3N2 virus	1×10^6PFU/ml
Influenza A H5N1 virus	1×10^6PFU/ml
Influenza B Yamagata	1×10^5PFU/ml
Influenza B Victoria	1×10^6PFU/ml
Rhinovirus	1×10^6PFU/ml
Adenovirus 3	$5\times10^{7.5}$$TCID_{50}$/ml
Adenovirus 7	$2.8\times10^6$$TCID_{50}$/ml
EV-A71	1×10^5PFU/ml
Mycobacterium tuberculosis	1×10^3bacteria/ml
Mumps virus	1×10^5PFU/ml
Human coronavirus 229E	1×10^5PFU/ml

Pathogen	Concentration
Human coronavirus OC43	1×10^5PFU/ml
Human coronavirus NL63	1×10^6PFU/ml
Human coronavirus HKU1	1×10^6PFU/ml
Parainfluenza virus 1	7.3×10^6PFU/ml
Parainfluenza virus 2	1×10^6PFU/ml
Parainfluenza virus 3	5.8×10^6PFU/ml
Parainfluenza virus 4	2.6×10^6PFU/ml
Haemophilus influenzae	5.2×10^6CFU/ml
Streptococcus pyogenes	3.6×10^6CFU/ml
Streptococcus pneumoniae	4.2×10^6CFU/ml
Candida albicans	1×10^7CFU/ml
Bordetella pertussis	1×10^4bacteria/ml
Mycoplasma pneumoniae	1.2×10^6CFU/ml
Chlamydia pneumoniae	2.3×10^6IFU/ml
Legionella pneumophila	1×10^4bacteria/ml

INDEX OF SYMBOLS

	Consult instruction for use	Σ	Tests per kit		Manufacturer
IVD	For *in vitro* diagnostic use only		Use by		Do not reuse
2°C 30°C	Store between 2 and 30°C	LOT	Lot Number	REF	Catalog number
CE	CE mark				

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