Novacheck

SARS-CoV-2 antigen rapid test

INSTRUCTIONS FOR USE

IVD

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REF: MY28

PURPOSE

The Novacheck SARS-CoV-2 Antigen Rapid Test is intended for the qualitative in vitro detection of SARS-CoV-2 antigen in nasopharyngeal swabs from asymptomatic or symptomatic individuals with onset of clinical symptoms within 7 days.

SUMMARY

SARS-CoV-2 is an enveloped β-coronavirus with a circular or elliptical particle diameter of about 60-140 nm, often pleomorphic, and distinctly different in genetic characteristics from SARS-CoV and MERS-CoV. The main clinical symptoms include fever, fatigue and other systemic symptoms accompanied by dry cough, dyspnoea, etc., which can rapidly progress to severe pneumonia, respiratory failure, acute respiratory distress syndrome, septic shock, multi-organ failure, severe acid-base metabolism disorders and even life-threatening conditions. SARS-CoV-2 is mainly transmitted by respiratory droplet infection (sneezing, coughing, etc.) and by contact (picking the nose with the hand that has come into contact with the virus, rubbing the eyes, etc.).
SARS-CoV-2 is sensitive to ultraviolet radiation and heat and can be inactivated at 56℃ for 30 minutes and by fat-soluble solvents such as ethyl ether, 75% ethanol, chlorine disinfectants, peracetic acid and chloroform.

PRINCIPLE

The Novacheck SARS-CoV-2 Antigen Rapid Test uses immunolateral chromatography technology for the qualitative detection of antigens. The colloidal gold particles labelled with anti-SARS-CoV-2 antibody 1 are fixed on the conjugation pad. The anti-SARS-CoV-2 antibody 2 is bound to the "T" test line of the nitrocellulose membrane. The goat anti-mouse IgG is bound to the "C" control line of the nitrocellulose membrane. When the concentration of SARS-CoV-2 in the sample is higher than the minimum detection limit, the antibody can conjugate with the anti-SARS-CoV-2 antibody 1 labelled with colloidal gold particles and form a complex. This complex migrates on the membrane by capillary action to the test line, where it is captured by the anti-SARS-CoV-2 antibody 2 bound to the test line, forming the "Au anti-SARS-CoV-2 antibody 1-(SARS-CoV-2) - anti-SARS-CoV-2 antibody 2 complex". These complexes are deposited to indicate the colour for determining positive antigen, the remainder of the anti-SARS-CoV-2 antibody 1 labelled with colloidal gold particles conjugates with the goat anti-mouse IgG and is deposited to indicate the colour for determining the quality of the control line "C". If the concentration of SARS-CoV-2 in the sample is below the minimum detection limit or no SARS-CoV-2 is present, the complexes will only deposit and show colour in the "C" control line.

KIT COMPONENTS

- SARS-CoV-2 antigen test cassette, packed in aluminium foil pouch
- Test tubes filled with extraction buffer
- Test swab (sterile)
- Rack for the sample tubes
- Instructions for use

MATERIALS REQUIRED BUT NOT PROVIDED

- Timer

STORAGE AND STABILITY OF REAGENTS

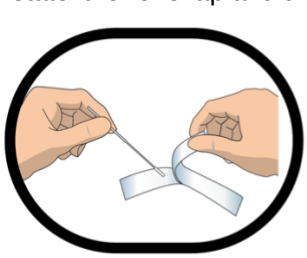
Store the kit at 2-30°C/ 36-86°F, away from direct sunlight, valid for 24 months. Do not freeze the kit. The test cassette should be used within 60 minutes after opening the foil pouch. Please refer to the product label for the date of manufacture and expiry date.

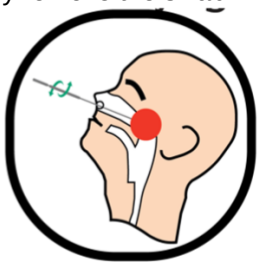
REQUIREMENTS FOR THE SAMPLE

1. **Sampling**

Collection of nasopharyngeal swabs:

Gently hold the patient's head with one hand, carefully insert the swab into the nostril and slowly travel deep along the floor of the lower nasal passage. When the tip of the swab reaches the back wall of the nasopharyngeal cavity, gently rotate it for one lap and then slowly remove the swab.





2. **Storage of the samples**

After treatment, samples may be stored at room temperature (15-30℃) for up to 24 hours, at 2-8℃ for up to 72 hours and at -20℃ for up to 36 months. The samples may be frozen and thawed three times.

Test procedure

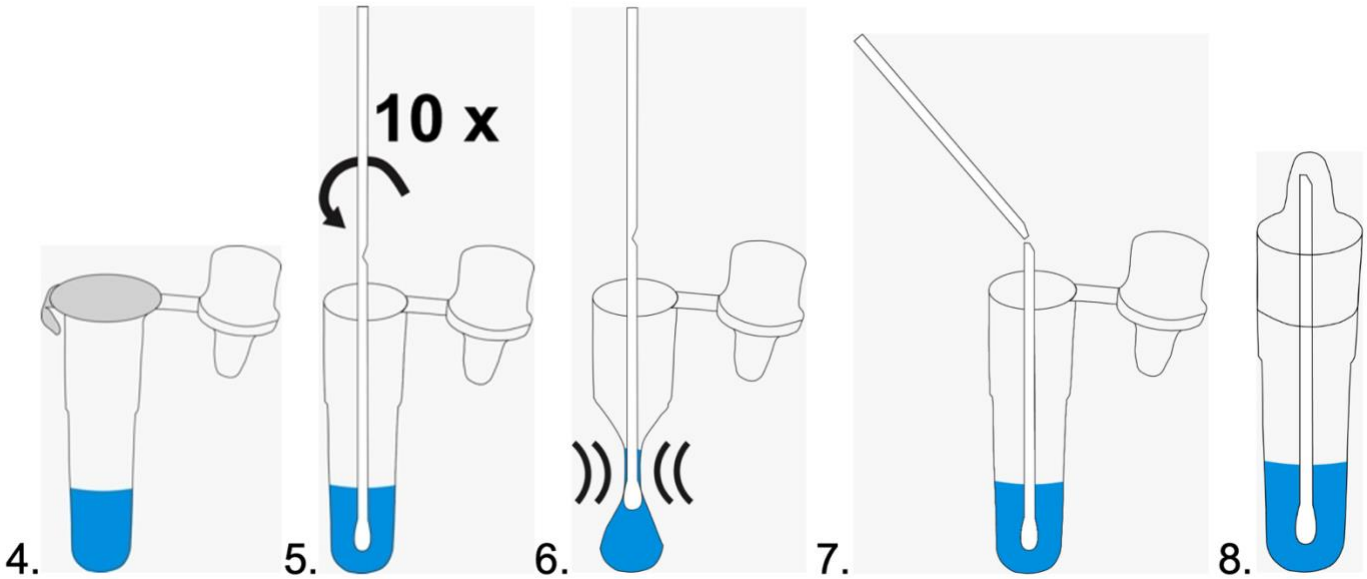
Before using the reagent, follow the package insert carefully to ensure accuracy of results.

Remark:

1. The fresh samples shall be taken as soon as possible after collection, but no later than 1 hour after collection, with an extraction solution.
2. Sample and test cassette must be at room temperature (15~30℃) during testing.

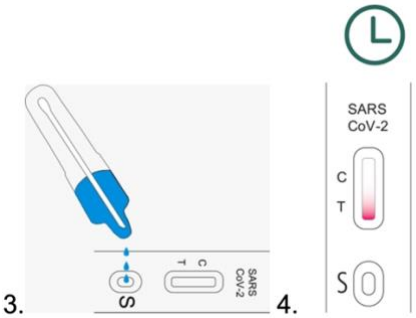
Preparation of the rehearsal

1. Remove the sample tube from the kit before testing.
2. Label the sample tube or label it with the sample number.
3. Place the labelled sample tube in the rack in the designated area of the workspace.
4. Remove the aluminium seal from the sample tube
5. Dip the swab head into the extraction solution in the sample tube and rotate the swab for about 10 seconds or 10 times close to the wall of the sampling tube to dissolve the samples as much as possible in the solution.
6. Press the tip of the swab along the inner wall of the sample tube to keep the liquid in the tube as much as possible.
7. Break off the test stick at the marked point and leave the lower part in the test tube.
8. Press the drip cap into the bottle opening.



Sample recognition

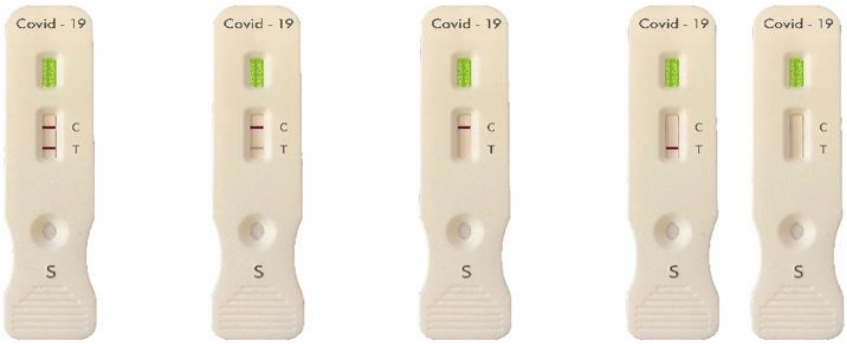
1. Before detection, the test cassettes and the sample tubes are removed from storage and brought to room temperature (15-30 °C).
2. Tear open the packaging of the aluminium foil bag, take out the test cassette and place it horizontally on the test table.
3. Turn the test tube (the test tube with the processed sample) vertically upside down and place 3 drops vertically into the sample well of the test device.
4. The test result should be evaluated within 15 to 20 minutes, the result is invalid after 20 minutes.
5. Please interpret the result by visual inspection.



DETECTION LIMIT

Limit of detection analyses determine the lowest detectable concentration of SARS-CoV-2 at which approximately 95 % of all (true positive) replicates test positive. Heat-inactivated SARS-CoV-2 virus at an initial concentration of 1.36 x 10^3 TCID50/mL (tissue culture infective dose of 50 %) was transferred to negative samples and serially diluted. Each dilution was tested in triplicate with the Novcheck® SARS-CoV-2 antigen rapid test. The detection limit of the coronavirus antigen rapid test is 1.7×10^2 $TCID_{50}$ /mL.

INTERPRETATION OF THE TEST RESULTS



positive weak positive negative invalid

Positive

Two lines appear. One coloured line appears in the control area (C) and another coloured line appears in the test area (T) regardless of the thickness of the test line.

Negative

A coloured line appears in the control area (C), no line appears in the test area (T).

Invalid

The control line is not displayed. Insufficient sample volume or incorrect procedure / handling are the most likely reasons for the control line not appearing.

Check the procedure and repeat the test with a new test kit. If the problem persists, stop using the batch immediately and contact your local dealer.

Note: The colour of the test strip may vary for different samples. However, regardless of the colour of the test strip, it should be considered a positive result within the specified detection time.

LIMITATIONS

1. The SARS-CoV-2 antigen rapid test is intended for in vitro diagnostic use only. The test should only be used for the detection of SARS-CoV-2 antigen in nasopharyngeal swabs.
2. This test kit can only be used for the qualitative detection of SARS-CoV-2 antigens and cannot determine the amount of SARS-CoV-2 antigens in samples.
3. If the test result is negative and clinical symptoms persist, it is recommended that sampling be repeated or that other test methods be used for testing. A negative result cannot exclude the possibility of exposure or infection with the SARS-CoV-2 virus at any time.
4. Test kit results are for clinician reference only and should not be used as the sole basis for clinical diagnosis. Clinical management of patients should be comprehensive in combination with symptoms/signs, medical history, other laboratory tests and response to treatment, etc.
5. Due to the limited methodology of the detection reagent, the detection limit of this reagent is generally lower than that of nucleic acid reagents. Therefore, test personnel should pay more attention to negative results and combine other test results to make a comprehensive judgement. It is recommended that nucleic acid tests or virus isolation and culture identification methods be used to verify negative results where there is doubt.

Possible causes of false negatives:

(1) Inappropriate sample collection, transport and processing, low virus titre in the sample, no fresh sample or freezing and thawing cycles of the sample can lead to false negative results.
(2) Mutation of the viral gene can lead to changes in the antigenic determinants, resulting in negative results.
(3) Research on SARS-CoV-2 is not yet complete; the virus can mutate and cause differences in the best collection time (viral titre peak) and collection site. Therefore, you can collect samples from the same patient at multiple sites or re-screen multiple times to reduce the possibility of false negative results.

CLINICAL PERFORMANCE

Diagnostic sensitivity of the prospectively collected samples

The samples were from unselected symptomatic and asymptomatic participants who were **prospectively** tested for have been screened for SARS-CoV-2 infection. "Unselected" means that no prior knowledge of SARS-CoV-2diagnosis are present (e.g. determined by PCR); inclusion should be avoided due to general possible COVID-like symptoms (or close contact with COVID-19 cases) was allowed. For each participant, the investigator took two nasopharyngeal swabs: one nasopharyngeal swab for the antigen test and another for the RT-PCR Test (**ROCHE cobas® SARS-CoV-2 qualitative RT-PCR detection assay (P/N 09448870190)).**

The study yielded a total of 110 positive samples confirmed by RT-PCR. These 110 samples were tested in parallel with the Novacheck SARS-CoV-2 antigen test and 93 of them showed positive results.

The sex, age and symptoms of the donors as well as the date of onset of symptoms were known. The date of swab collection was documented. The age of the donors ranged from 3 to 66 years, the gender distribution was 39.1% (43) women and 60.9% (67) men, indicating a balanced distribution.

Ct value	Number of samples	Number of true positive rapid antigen test samples	Number of false negative rapid antigen test samples	Sensitivity of the SARS-CoV-2 antigen test (colloidal gold) (Wilson 95% CI)
≤25	60	59	1	98.36% (91.14-99.71%)
≤30	82	81	1	98.78% (93.41-99.78%)
≤32	92	87	5	94.57% (87.90-97.66%)
≤34	101	91	10	90.10% (82.73-94.53%)
≤37	106	92	14	86.79% (79.04-91.97%)
Total*	110	93	17	84.55% (75.64-90.12%)

*incl. samples with a Ct value >37

81/82 samples with a Ct value ≤30 were detected with the Novacheck SARS-CoV-2 antigen test (diagnostic sensitivity 98.78%). When detecting samples with a high Ct value of up to 37, the sensitivity is 86.79%.

Diagnostic sensitivity of retrospectively collected samples with respect to the Omicron variant of SARS-CoV-2

Forty-one positive samples from individuals with COVID-19 symptoms within seven days of symptom onset and with the SARS-CoV-2 Omicron variant confirmed by preliminary external PCR analysis were tested with the Novacheck SARS-CoV-2 antigen test.

21 of the 41 positive samples specifically represented the **BA.2 subline** of the SARS-CoV-2 Omicron (B1.1.529) variant.

The sex, age and symptoms of the donors as well as the date of onset of symptoms were known. The date of infection was suspected based on the donor's information. The date of swab collection was documented. The age of the donors varied between 14 and 66 years, the gender distribution was 61.0% (25) female and 39.0% (16) male.

41 samples with a Ct value of up to≤ 37 were analysed for correlation between antigen and real-time RT-PCR results:

Ct value	Number of samples	Number of true positive rapid antigen test samples	Number of false negative rapid antigen test samples	Sensitivity of the SARS-CoV-2 antigen test (colloidal gold) (Wilson 95% CI)
≤ 30	7	7	0	100 % (64.57 - 100 %)
≤ 32	18	18	0	100 % (82.41 - 100 %)
≤ 34	30	30	0	100 % (88.65 - 100 %)
≤ 37	41	41	0	100 % (91.43 - 100 %)

All samples with a Ct value of up to ≤37 tested positive in the Novacheck SARS-CoV-2 antigen test (diagnostic sensitivity 100% (95% CI: 91.43 - 100%)).

Analytical results with correlation to the days since onset of symptoms of the positive samples (41 samples with a Ct value ≤ 37):

Days since onset of symptoms	Number of samples	Number of true positive rapid antigen test samples	Number of false negative rapid antigen test samples	Sensitivity of the SARS-CoV-2 antigen test (colloidal gold) (Wilson 95% CI)
≤ 1	3	3	0	100% (*n.a.*)
≤ 2	10	10	0	100% (*n.a.*)
≤ 3	19	19	0	100% (83.18 - 100%)
≤ 4	24	24	0	100% (86.20 - 100%)
≤ 5	37	37	0	100% (90.59 - 100%)
≤ 6	38	38	0	100% (90.82 - 100%)
≤ 7	41	41	0	100% (91.43 - 100%)

Diagnostic sensitivity is 100% for samples taken up to 7 days after the onset of symptoms.

Diagnostic specificity

Samples from 363 negative RT-PCR-confirmed individuals were tested with the Novacheck SARS-CoV-2 antigen test. Sex, age and date of sample collection were known. The age of the donors ranged from 4 to 84 years, and the gender distribution was 50.4% (183) females and 49.3% (179) males.

Number of samples	Number of true negative rapid antigen test samples	Number of false negative rapid antigen test samples	Specificity of the SARS-CoV-2 antigen detection kit (colloidal gold) (Wilson 95% CI)
363	357	6	98.3% (96.4-99.2%)

The diagnostic specificity of the Novacheck SARS-CoV-2 antigen test for 363 samples was **98.3 %** (357/363). The test results meet the acceptance criteria of > 98 % for diagnostic specificity as stated in the EU Common List document.

Overall accuracy

Analytical results (overall accuracy) for all samples with negative or positive PCR result (Ct<34) in this study:

		Real-time PCR		
		positive	negative	Total
SARS-CoV-2 Antigen Rapid Test	positive	91	6	97
	negative	10	357	367
	Total	101	363	464

Overall accuracy of the SARS-CoV-2 antigen rapid test: **96.55%** (448/464), Wilson 95% CI: 94.47-97.87%.
Sensitivity of SARS-CoV-2 antigen rapid test (Ct≤34): **90.10%** (91/101), Wilson 95% CI: 82.73-94.53%
Specificity of SARS-CoV-2 antigen rapid test: **98.3%** (357/363), Wilson 95% CI: 96.4- 99.2%**.**

PERFORMANCE FEATURES

- When using the company reference for the audit, the results meet the requirements of the company reference.
- Cross-reaction

Name	Concentration	Test result
Influenza B/Y amagata	1.00×10^{2} $TCID_{50}$ /mL	Negative
Influenza B/Voctoria	1.07×10^{5} $TCID_{50}$ /mL	Negative
Influenza A H1N1	1.00×10^{2} $TCID_{50}$ /mL	Negative
Influenza A H3N2	1.15×10^{2} $TCID_{50}$ /mL	Negative
Adenovirus 3	1.24×10^{5} $TCID_{50}$ /mL	Negative
Adenovirus 7	1.87×10^{6} $TCID_{50}$ /mL	Negative
People Coronavirus 229E	1.00×10^{5} $TCID_{50}$ /mL	Negative
People Coronavirus OC43	2.00×10^{6} $TCID_{50}$ /mL	Negative
People Coronavirus NL63	2.00×10^{6} $TCID_{50}$ /mL	Negative
MERS coronavirus	2.00×10^{6} $TCID_{50}$ /mL	Negative

Cytomegalovirus	1.00×10^5 $TCID_{50}$ /mL	Negative
Enterovirus 71	2.55×10^5 $TCID_{50}$ /mL	Negative
Man Parainfluenza Virus 1	1.35×10^5 $TCID_{50}$ /mL	Negative
Man Parainfluenza Virus 2	6.31×10^5 $TCID_{50}$ /mL	Negative
Man Parainfluenza Virus 3	3.25×10^5 $TCID_{50}$ /mL	Negative
Measles virus	6.31×10^5 $TCID_{50}$ /mL	Negative
Mumps virus	6.31×10^6 $TCID_{50}$ /mL	Negative
Respiratory syncytial virus	2.00×10^5 $TCID_{50}$ /mL	Negative
Rhinovirus 1A	1.26×10^5 $TCID_{50}$ /mL	Negative
Bacillus pertussis	1.30×10^6 CFU/ml	Negative
Chlamydophila pneumoniae	1.00×10^5 CFU/ml	Negative
Escherichia coli	1.00×10^5 CFU/ml	Negative
Haemophilus influenzae	1.20×10^6 CFU/ml	Negative
Mycobacterium binding	1.00×10^5 CFU/ml	Negative
Mycoplasma	1.00×10^6 CFU/ml	Negative
Neisseria meningococcus	1.00×10^5 CFU/ml	Negative
Neisseria gonorrhoeae	1.00×10^5 CFU/ml	Negative
Pseudomonas aeruginosa	3.70×10^6 CFU/ml	Negative
Staphylococcus aureus	2.20×10^6 CFU/ml	Negative
Streptococcus pneumoniae	1.00×10^6 CFU/ml	Negative
Streptococcus pyogenes	1.28×10^6 CFU/ml	Negative
Streptococcus salivarius	1.00×10^5 CFU/ml	Negative

- Disturbing substance

Troublemaker Substance name	Concentration	Negative interference result	Positive interference result
Muzin	5%	Negative	Positive
Thoroughbred	5% (V/V)	Negative	Positive

α-Interferon	500 thousand IU/ml	Negative	Positive
Zanamivir	500ng/ml	Negative	Positive
Ribavirin	20μg/ml	Negative	Positive
Oseltamivir	5μg/mL	Negative	Positive
Peramivir	0.2mg/ml	Negative	Positive
Lopinavir	8 mg/ml	Negative	Positive
Ritonavir	530μg/ml	Negative	Positive
Umifenovir	4μg/mL	Negative	Positive
Levofloxacin	30μg/ml	Negative	Positive
Azithromycin	4.5μg/ml	Negative	Positive
Ceftriaxone	0.8mg/ml	Negative	Positive
Meropenem	1.1mg/ml	Negative	Positive
Tobramycin	4ng/ml	Negative	Positive
Phenylephrine	20μg/ml	Negative	Positive
Oxymetazoline	0.1mg/ml	Negative	Positive
Beclomethasone	0.1mg/ml	Negative	Positive
Dexamethasone	2 mg/ml	Negative	Positive
Flunisolid	0.1mg/ml	Negative	Positive
Triamcinolone acetonide	10.5ng/ml	Negative	Positive
Budesonide	2.75ng/ml	Negative	Positive
Mometasone	10ng/ml	Negative	Positive
Fluticasone	55μg/ml	Negative	Positive
Histamine Hydrochloride	10ng/ml	Negative	Positive
Sodium chloride	5%	Negative	Positive

HOOK EFFECT

Within the concentration of 3.4×10^5 $TCID_{50}$ /mL for cell culture medium of SARS-CoV-2 antigen, the test results of this product showed no hook effects.

WARNINGS AND PRECAUTIONS

1. The sample should be examined in the laboratory under specific conditions. All specimens and materials should be handled according to laboratory practice for infectious diseases during examination.
2. The kit must be stored in strict compliance with the conditions specified in this leaflet. Please use it within the period of validity.
3. Do not open the sealed bag until you are ready to perform a test. The kit should be sealed and protected from moisture. If the foil pouch is damaged or damp, do not use it.
4. Sampling and detection should be done strictly according to the package insert.

Address:

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Symbols used

Do not reuse	In vitro diagnosis
Store at room temperature	Follow instructions
Description of the batch	Warning
Usable up to	Do not expose to light
Store in a dry place	Do not use if the packaging is damaged
Produced by...	Production date
Number of detections	Sterilisation with ethylene oxide
Order number	

Certificate No.: TDA-16.4/05
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