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OnsiteGene 3 Protocol Nasal Extract

yliu¹¹OnsiteGene Inc.**1** Works for me dx.doi.org/10.17504/protocols.io.bkugkwtw**OnsiteGene 1** **XPRIZE Rapid Covid Testing**

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ABSTRACT

This OnsiteGene protocol is designed for testing the nasal swab samples with a superfast nucleic acid extraction procedure and a superfast real-time PCR procedure. It uses the Star Array® Hi-Sense™ COVID-19 Molecular Testing Kit 1.0 in the one-step real-time RT-qPCR test assay to qualitatively detect RNA from SARS-CoV-2 virus in the human respiratory specimen. It combines the reverse transcription technology and real-time PCR method to provide accurate detection of the SARS-CoV-2 coronavirus. The Star Array® magnetic beads RNA extraction instrument and kit can automatically extract and purify the RNA for 32 samples in 6 minutes. It is ideal for samples that contain high amount of PCR inhibitors and can't be processed by the direct amplification. The triplex fluorescence design of the kit simultaneously detects the N1 and Orf1ab genes of the virus and the human RNase P gene as an internal control to ensure the sample quality. This protocol uses the Star Array® XDive™ Superfast Real-Time PCR instrument to perform 40-cycle PCR in 8 minutes, and can test up to 16 samples or controls in each run. The total protpcol time from sample collection to data interpretation is less than 15 minutes.

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PROTOCOL CITATION

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KEYWORDS

XDive, superfast PCR, superfast RT-qPCR, fast PCR

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MATERIALS TEXT

Instruments and Consumables

Instrument and Consumable	Supplier	Catalog #
Real-Time PCR	OnsiteGene	XDIVE-16
RNA extraction instrument	OnsiteGene	IS3000001

Mini centrifuge	Heathrow Scientific	HS120395
Vortex	Four E's Scientific	4ESS-MI0101002D
Reaction tube and cap	OnsiteGene	CM1010001
Pipette set	Microlit	RBOKit
Pipette tips	Extragene	TS-10-RS

Sample Collection and Extraction Kit

Reagent or Consumable	Supplier	Catalog #
Swab	Medcomma	MFS-03-01
1.5ml microcentrifuge tube	Biologix	88-915X
Purifier extraction kit	OnsiteGene	KT3000001
Purifier cartridge	OnsiteGene	CM3000001
Storage solution	OnsiteGene	RG0000001

PCR Reaction Reagents

Reagent	Supplier	Catalog #
Hi-Sense COVID detection kit	OnsiteGene	KT1010001
External positive control	ZeptoMetrix	NATSARS(COV2)-ERC

Primer and Probe Sequences

Target Number	Target Gene	Sequence/antibody
1_F	N1	GACCCCAAATCAGCGAAAT
1_R	N1	TCTGGTTACTGCCAGTTGAATCTG
1_P	N1	ACCCCGCATTACGTTTGGTGGACC
2_F	ORF1ab	TATGTGGAAAGTTATGGCTGTAG
2_R	ORF1ab	GATTGTGCATCAGCTGACTGAAG
2_P	ORF1ab	TTGTGATCAACTCCGGAACCCATG
3_F	Rnase P	AGATTTGGACCTGCGAGCG
3_R	Rnase P	GAGCGGCTGTCTCCACAAGT
3_P	Rnase P	TTCTGACCTGAAGGCTCTGCGCG

SAFETY WARNINGS

Most institutions will require samples potentially containing full-length SARS-CoV-2 RNA to be handled in a biosafety level 2 cabinet. Please seek guidance from your local biosafety office on specific recommendations for working with samples which could contain live SARS-CoV-2 virus.

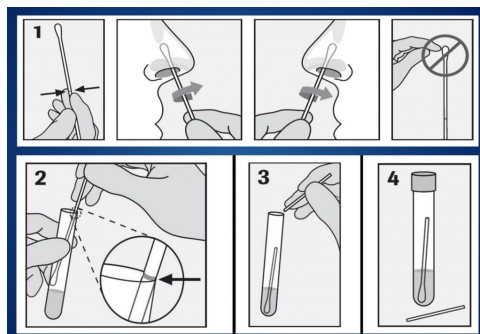
Sample Collection Procedure

1m

- 1 Anterior nasal swab should be collected with the assistance of a healthcare worker or technician.
- 2 Before collection, clean hands using alcohol-based sanitizer or soap and water (no fragrances) and wear appropriate PPE (at minimum, gloves and a mask).
 - 2.1 Back away as far as possible from the sample donor during the whole process. While preparing collection materials, direct the sample donor to begin blowing nose softly.
- 3 Ensure all collection materials are labelled with the correct identifying information.

4 Remove the lid of the collection tube containing 500 µL OnsiteGene sample storage solution. 5s

5 Take the swab out from the package. Insert swab into each nasal passage and rotate it against the inner nasal lining in a circle three times. The swab does not need to be inserted far – just enough so the tip is no longer visible. 1m



6 Place the swab into the storage solution in the tube. Remove the stick through the opening point and leave swab pad in the tube. Discard stick and secure the lid. 10s

6.1 Sterilize the tube surface with 70% ethanol or a disinfecting wipe, and place the sample in a secondary container or an appropriately labeled biohazard bag.

6.2 Dispose of gloves, and register the sample collection information (including date and time).

7 Transfer the sample at room temperature for sample processing. The virus RNA remains stable at room temperature for 3-5 days.

Real-Time PCR Procedure 14m 45s

8 Vortex each sample collection tube for 5 seconds at 3000-5000 RPM. 5s

8.1 This step can be substituted by tapping or shaking each sample collection tube to mix the sample.

9 Spin down the tube for 15 seconds using centrifuge. 15s

9.1 The purpose is to: 1) Remove liquid from the cap to avoid the contamination when cap is removed; 2) Spin down solid particles to the bottom of the tube and allow supernatant to be acquired.

- 10 Transfer 500 µL supernatant of the sample into the cartridge of magnetic beads RNA extraction instrument from OnsiteGene. 5s
- 11 Load the cartridge into the extraction instrument to extract and purify the viral RNA. The duration of the process is 6 minutes without any hand-on work. The sample elution volume is 50 µL after the extraction. The extraction instrument can process 32 samples in one run. 6m
- 12 Transfer 7.5 µL extracted RNA sample (this sample can be stored at -20°C for 14 days) from the cartridge and 7.5 µL OnsiteGene Hi-Sense™ COVID-19 detection kit reaction mix (with primers and probes) into a superfast RT-qPCR reaction tube. Secure the lid of the tube. 5s
- 13 Spin down the tube for 15 seconds using centrifuge or spinner. 15s
- 14 Load up to 16 superfast RT-qPCR reaction tubes onto the OnsiteGene XDive Superfast Real-Time PCT instrument and run the following conditions: 8m

Step	Temperature	Time
1	50°C	30 sec
2	95°C	0 sec
3	60°C	2 sec
4	Read Fluorescence intensity and overhead	(10 sec)
5	Repeat steps 2-4 for 40 cycles.	

a) XDive takes 8 minutes to complete 40 thermal cycles with fluorescence imaging.

b) Run external positive control and external negative control twice per day using 5 µL of positive control and no-template control (NTC - water). The control tests are recommended to be performed at the beginning and the end of the work/day.

- 15 15.Report results per the following interpretation criteria:

Results	IC CT	SARS-Cov-2 Targets		Interpretation
		ORF1ab CT	N1 CT	
Negative	< 35	≥ 40	≥ 40	Indicate the absence of SARS-Cov-2 RNA
Positive	any value	< 40	any value *	Indicate the presence of SARS-Cov-2 RNA
		any value *	≤ 40	

Invalid	≥ 35	≥ 40	≥ 40	Inability to conclusively determine presence or absence of SARS-Cov-2 RNA. This may be due to 1) Internal Control failure; or 2) failure to detect sufficient specimen volume. The sample needs to be retested.
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* In the case of one SARS-Cov-2 target positive (CT < 40) and one SARS-Cov-2 target negative (CT \geq 40), the result is suggestive of: 1) a sample at concentrations near or below the limit of detection of the test, 2) a mutation in one of the target regions, or 3) other factors.