Quiksal™ Oral Rinse Viral Collection Method for COVID-19 PCR Testing

SV DIAGNOSTIC LAB

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Lab is in our DNA

SV Diagnostic Laboratory (CLIA# 36D2158721, COLA# 29299) is a subsidiary of Clinical Lab Consulting. Over our 15-year tenure, we have designed, built, and started over 400 high-complexity CLIA laboratories and currently manage 130 laboratories and 500 LIMS clients. Our flagship laboratory, SV Diagnostic, is a 36k square foot, machine automated laboratory based in Dayton, Ohio with a sole focus genetic testing. We were one of the first laboratories in the United States to validate and perform EUA approved PCR testing for COVID-19 due to our validation partnership with ThermoFisher and Shimadzu.

- 70 + pathologists, PHDs and Consultants
- Member of CMS advisory panel for CLIA and accrediting bodies
- Over 100 compliance audits performed each year with 100% pass ratio
- Proprietary genetic LIMS and clinical pathway platform
- PCR Platforms: QuantStudio 12k Flex, QuantStudio 5, PathogenDx, Biomeme
- Extraction Platforms: Kingfisher Flex Extraction Automation
- Fully automated liquid handling Platforms: Tecan, Eppendorf, Hudson Robotics

The goal of this presentation is to discuss our proprietary oral rinse viral collection method used for PCR testing of COVID-19 and how we can validate your laboratory to run this device.

Quiksal™ Oral Rinse Overview

The Quiksal™ Oral Rinse Specimen Collection Device is designed to replace nasal swabs and saliva collection devices for use in COVID-19 testing. This collection process is a 2ml oral rinse that is swished or gargled for 60 seconds and returned to the container:

- Non-Invasive and can be self-administered reducing pre-analytical errors and healthcare worker exposure
- Decreased viscosity relative to saliva allows for easier and more accurate pre-analytical and analytical processes
- Post stabilization buffer acts as viral deactivation increasing the safety of transportation and pre-analytical processes *(study publication pending)*
- Reduced occurrence of non-infectious positives (more indicative of current infectivity)
- Increased sensitivity relative to mid-turbinate swabs (*study publication pending)*
- Less room for user/collector errors that jeopardize specimen integrity
- Produces 7x more specimen relative to other collection methods
- Stable post collection for COVID-19 RNA of 5 days at room temperature
- Optimized for specimen pooling
- Indicator dye ensures proper collection of specimen
- All US manufacturing and validation (Dayton, Ohio)

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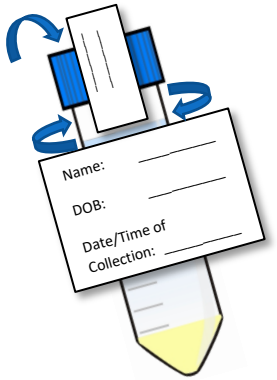
COVID - 19 Oral Rinse Instructions

Step 1

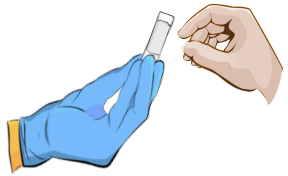
Patient should have nothing by mouth 15 minutes prior to collecting sample.

Step 2



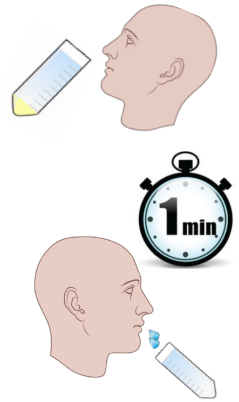
Write the patient's full name, date of birth, and date/time of collection on both labels (top and side) on tube. Please top label with patient info onto the test order form.

Step 3



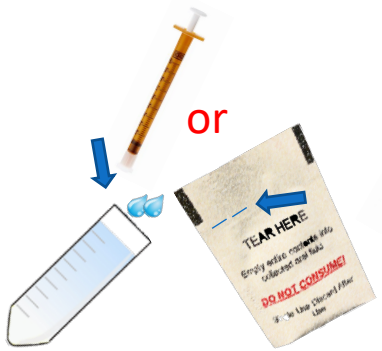
Remove the tube cap from the collection tub and hand to patient.

Step 4



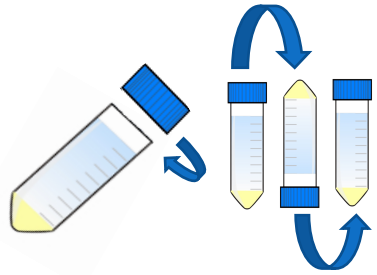
Instruct patient to dispense the oral rinse fluid from the collection tube into mouth. Return tube to collector. **DO NOT swallow contents.** Instruct the patient to swish the contents around vigorously for a full minute. After 1 minute have patient spit the entire contents into collection tube.

Step 5



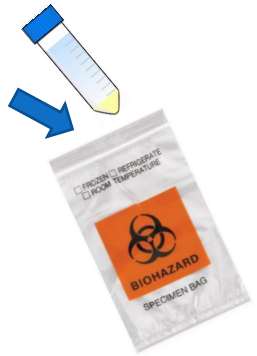
Add the stabilization solution from the syringe (**Note: remove cap from syringe first**) or tear-away pouch directly into the collection tube *after* patient has spit in tube.

Step 6



Carefully place the cap securely on the tube. Close tightly to prevent leaking. Invert tube 2-3 times to fully mix stabilization solution with oral rinse from patient.

Step 8



Place collection tube into bio-hazard zip-closure bag and seal completely. Place the folded test order form in the front pouch of the bio-hazard bag.

FAQ:

1. Patient should not take anything in the mouth 15 minutes prior to sample collection. This includes food, gum, any tobacco products, fluids and medications. If the patient has consumed anything by mouth, you must wait 15 minutes after consumption before performing the test.
2. If the patient accidently swallows the oral rinse, instruct them to spit out the contents and start over. Swallowing the oral rinse does not cause harm, it is completely food grade.
3. The stabilization solutions in step 5 may come in the form of a syringe or a tear-way package. Do **NOT** put stabilization solution in mouth.
4. Testing kits should be stored in cool and dry place at 35 - 86 F degrees.

Thank you for purchasing the COVID-19 Oral Rinse kit from Community Care. We are here to answer any of your questions, please contact us at Community Care Client Services.

CS@elementhcp.com
844-419-3470

Oral Rinse Validation

The Quiksal™ Oral Rinse Specimen Collection Device is a Specimen Collection Device intended for qualitative detection of SARS-CoV-2 RNA in saliva by rRT-PCR testing with the EUA-approved ThermoFisher Scientific TaqPath test system, including the KingFisher Flex automated nucleic acid extractor, QuantStudio 5 RT-PCR system, and the Applied Biosystems™ COVID-19 Interpretive Software according to manufacturer protocol.

Quiksal™ Oral Rinse Specimen Collection Devices were validated to collect oral specimens for real time polymerase chain (rRT-PCR) testing for SARS-CoV-2. A total of 60 (30 negative and 30 positive) specimens were run, as per FDA recommendation. Oral wash and nasopharyngeal swab specimens were collected at the same time from each patient.

Nucleic acids were isolated and purified from Quiksal™ specimens with the KingFisher Flex automated extraction system using the MagMAX™ Viral/Pathogen Nucleic Acid Isolation Kit (Cat. No. A48310).

The system was validated in the laboratory using a 200 µL specimen input with a final elution volume of 50 µL. rRT-PCR was performed testing 10 µL of eluted nucleic acid with the TaqPath™ RT-PCR COVID-19 Kit (Cat. No. A47814) primers/probes and TaqPath™ 1-Step Multiplex Master Mix (No ROX™) (Cat. No. A28523). Data were analyzed with the Applied Biosystems™ COVID-19 Interpretive Software, using pre-programmed algorithms from ThermoFisher Scientific.

VALIDATION CONCLUSIONS

Testing of paired NP and Quiksal™ samples from 60 patients exhibited 100% concordance for expected CoV-2 negative (30) and CoV-2 positive (30) samples

Comprehensive Bridging Study results attached to presentation

ThermoFisher Scientific

SV Diagnostic Laboratories uses the EUA-Approved ThermoFisher Scientific TaqPath COVID-19 Combo Kit for SARS-CoV-2 PCR testing. ThermoFisher Scientific, involved in more than 50% of worldwide COVID-19 testing, is one of the most reputable single-source suppliers for COVID-19 testing.

- The ThermoFisher TaqPath™ COVID-19 Combo Kit contains the assays and controls for a real-time reverse transcription polymerase chain reaction (RT-PCR) test intended for the qualitative detection of nucleic acid from SARS-CoV-2.
- To validate the TaqPath COVID-19 Combo Kit, assays were mapped to 185 complete SARS-CoV-2 genomes of human host in GenBank and GISAID databases as of March 5, 2020. Primer and probes sequences for SARS-CoV-2 ORF1ab, S gene, and N gene assays had 100% homology to all SARS-CoV-2 isolates analyzed, with one exception. EPI_ISL_407084 (Beta Coronavirus/Japan/AI/I-004/2020) showed a mismatch at position 7 from the 5’ end of the reverse primer (23 nt length) corresponding to 95.6% homology. The mismatch is located at the 5’end of the primer and does not affect the test performance.
- Test kits, instrumentation, and analysis software received Emergency Use Authorization from the US Food & Drug Administration March 13, 2020. The EUA number for this test system is EUA200010/A003.
- The TaqPath™ COVID-19 Combo Kit is for use only under Emergency Use Authorization (EUA). Testing is limited to laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, to perform high complexity tests.

Next Steps

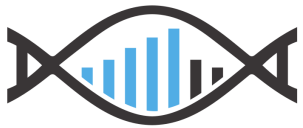
Validating the laboratory via bridging study can be accomplished in less than 72-hours with minimum work and process changes for your staff. *Quiksal is simply a variation in sample type and does not impact the SOP of your PCR testing.* There are two simple methods for validating via bridging study:

- We can supply your laboratory with previously tested samples and their associated CT values for processing and comparison
- We can supply your laboratory with Quiksal kits, and the performing laboratory can spike them with known COVID-19 controls

If you decide to use Quiksal for your viral collection needs, the process to get started is brief:

- Identify which laboratory will pilot the method
- Arrange a conference call with the location's laboratory staff to discuss usage and validation
- Validate the location via bridging study
- Order Quiksal kits for processing
- Go Live debrief conference call to ensure laboratory is ready to being processing
- Go Live

This entire process can easily be accomplished in less than 72-hours



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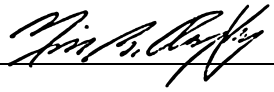
Name of Validation: Oral Wash Sample Collection Device – TaqPath COVID-19 Combo Kit New Specimen Type Bridging Study

Date of Completion: 2020-09-11

Director Name: Neil Quigley, PhD, HCLD(ABB)

Director Signature/ Date of Approval:  09 / 15 / 2020

By signing this page, I (laboratory staff) attest that I was involved in performing validation experiments for this validation.

Testing Personnel Name: Sayali Kadam, MS – Testing Personnel

Testing Personnel Signature:

INTRODUCTION

Quiksal™ Oral Rinse Specimen Collection Devices were validated to collect saliva specimens for real time polymerase chain (rRT-PCR) testing for SARS-CoV-2. A total of 60 (30 negative and 30 positive) specimens were run, as per FDA recommendation. Oral wash and nasopharyngeal swab specimens were collected at the same time from each patient.

The Quiksal™ Oral Rinse Specimen Collection Device is a Specimen Collection Device intended for qualitative detection of SARS-CoV-2 RNA in saliva by rRT-PCR testing with the ThermoFisher Scientific TaqPath COVID-19 Combo Kit test system. The device is intended for use by patients clinically suspected of COVID-19 infection or for screening of asymptomatic individuals. Use of this collection device is limited to laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, to perform high complexity tests, or by similarly qualified non-U.S. laboratories.

Results are for the qualitative detection of SARS-CoV-2 RNA. The SARS-CoV-2 RNA is generally detectable in saliva during the acute phase of infection. Positive results are indicative of the presence of SARS-CoV-2 RNA; clinical correlation with patient history and other diagnostic information is necessary to determine patient infection status. Positive results do not rule out bacterial infection or co-infection with other viruses. The agent detected may not be the definitive cause of disease. Laboratories within the United States and its territories are required to report all positive results to the appropriate public health authorities.
device is intended to be used with the ThermoFisher Scientific TaqPath COVID-19 Combo Kit EUA-approved test system, including the KingFisher Flex automated nucleic acid extractor, QuantStudio 5 RT-PCR system, and the Applied Biosystems™ COVID-19 Interpretive Software. The TaqPath COVID-19 Combo Kit was used for this validation study according to manufacturer protocol. The TaqPath COVID-19 test detects N gene, S gene, and ORFab targets.

Nucleic acids were isolated and purified from Quiksal™ specimens with the KingFisher Flex automated extraction system using the MagMAX™ Viral/Pathogen Nucleic Acid Isolation Kit (Cat. No. A48310). The system was validated in the laboratory using a 200 µL specimen input with a final elution volume of 50 µL. rRT-PCR was performed testing 10 µL of eluted nucleic acid with the TaqPath™ RT-PCR COVID-19 Kit (Cat. No. A47814) primers/probes and TaqPath™ 1-Step Multiplex Master Mix (No ROX™) (Cat. No. A28523). Data were analyzed

with the Applied Biosystems™ COVID-19 Interpretive Software, using pre-programmed algorithms from ThermoFisher Scientific.

Because analyte detection was performed in the present study by an EUA-approved methodology with only the specimen type varied, we performed only patient correlation/accuracy and stability experiments.

VALIDATION RESULTS

1. STABILITY

Two blank oral wash specimen collection devices were spiked with heat-inactivated whole SARS-CoV-2 virus (ATCC # VR-1986HKTM) and left at room temperature for 3 days (72 hours) and 5 days. Spiked samples were then extracted and run in duplicate on the TaqPath Assay according to EUA-defined procedure.

Stability – Room Temperature (15-30°C) 72 hours		
Target	**Sample 1** (Ct values)	**Sample 2** (Ct values)
MS2	28.843	28.927
N gene	27.955	28.093
ORF1ab	22.578	24.568
S gene	24.975	23.046
Final Result	**Detected**	**Detected**

Stability – Room Temperature (15-30°C) 5 days		
Target	**Sample 1** (Ct values)	**Sample 2** (Ct values)
MS2	30.044	29.710
N gene	28.070	27.850
ORF1ab	28.726	28.832
S gene	30.337	30.274
Final Result	**Detected**	**Detected**

Detected Results: Both incubation intervals yielded comparable positive results for each of two replicate samples.

2. ACCURACY

A total of 60 (30 negative and 30 positive) specimens were run, as per FDA recommendation. Oral wash and nasopharyngeal swab specimens were collected at the same time from each patient.

Expected Results: Acceptability for all specimens is expected to be at least 95% concordant, as recommended by the FDA.

Detected Results: All data were concordant with expected results, as presented in the following Tables.

Specimens with "Detected" Results				
	Specimen ID	**Target**	**NP Swab C_t**	**Quiksal™ C_t**
1	COV-0071	MS2 (IC)	33.379	29.133
		N gene	18.906	20.385

Specimens with "Not Detected" Results				
	Specimen ID	**Target**	**NP Swab C_t**	**Quiksal™ C_t**
1	COV-0073	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined

Specimens with "Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
		ORF1ab	20.228	22.358
		S gene	20.223	22.695
		Result	Detected	Detected
2	COV-0072	MS2 (IC)	35.453	27.424
		N gene	16.104	23.889
		ORF1ab	17.38	25.418
		S gene	17.433	25.537
		Result	Detected	Detected
3	COV-0026	MS2 (IC)	36.105	23.98
		N gene	10.844	23.195
		ORF1ab	9.233	20.115
		S gene	9.075	20.705
		Result	Detected	Detected
4	FC-0-0024	MS2 (IC)	28.627	28.669
		N gene	13.857	29.138
		ORF1ab	10.977	28.558
		S gene	13.75	28.954
		Result	Detected	Detected
5	FC-0-0022	MS2 (IC)	33.855	30.308
		N gene	15.919	31.905
		ORF1ab	13.586	29.555
		S gene	15.025	29.861
		Result	Detected	Detected
6	0002-OW	MS2 (IC)	27.173	30.231
		N gene	26.004	32.784
		ORF1ab	23.325	29.417
		S gene	23.425	29.635
		Result	Detected	Detected
7	0007-OW	MS2 (IC)	33.531	29.588
		N gene	15.725	25.604
		ORF1ab	13.753	23.439
		S gene	14.267	23.642
		Result	Detected	Detected
8	COV-0082	MS2 (IC)	29.668	28.371
		N gene	29.723	25.516
		ORF1ab	29.846	24.507
		S gene	30.342	25.598
		Result	Detected	Detected
9	COV-0087	MS2 (IC)	29.808342	29.405668

Specimens with "Not Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
2	COV-0025	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
3	0003-OW	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
4	COV-0057	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
5	0004-OW	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
6	COV-0093	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
7	0005-OW	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
8	0006-OW	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
9	COV-0086	MS2 (IC)	Undetermined	Undetermined

Specimens with "Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
		N gene	22.177723	25.622286
		ORF1ab	20.792553	25.062094
		S gene	21.71602	26.012178
		Result	Detected	Detected
10	COV-0083	MS2 (IC)	29.808342	29.405668
		N gene	22.177723	25.622286
		ORF1ab	20.792553	25.062094
		S gene	21.71602	26.012178
		Result	Detected	Detected
11	0001-OW	MS2 (IC)	27.760008	28.07982
		N gene	22.890291	27.823277
		ORF1ab	21.540174	24.820765
		S gene	22.529713	26.926447
		Result	Detected	Detected
12	COV-0075	MS2 (IC)	30.827122	28.051878
		N gene	17.720387	32.48126
		ORF1ab	13.055252	29.406216
		S gene	17.391912	30.961027
		Result	Detected	Detected
13	COV-0067	MS2 (IC)	34.09817	30.80646
		N gene	17.287867	21.745123
		ORF1ab	16.353928	21.02916
		S gene	17.18981	21.705313
		Result	Detected	Detected
14	COV-0066	MS2 (IC)	34.366673	33.123005
		N gene	17.644081	26.616264
		ORF1ab	17.293606	26.069921
		S gene	17.756233	26.705439
		Result	Detected	Detected
15	010-OW	MS2 (IC)	26.286	25.356
		N gene	29.824	31.832
		ORF1ab	29.252	29.956
		S gene	29.264	30.996
		Result	Detected	Detected
16	011-OW	MS2 (IC)	26.970	25.452
		N gene	21.394	Undetermined
		ORF1ab	20.562	31.786
		S gene	21.552	34.028
		Result	Detected	Detected

Specimens with "Not Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
10	COV-0085	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
11	COV-0081	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
12	COV-0084	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
13	COV-0077	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
14	COV-0078	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
15	COV-0076	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
16	COV-0074	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected

Specimens with "Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
17	012-OW	MS2 (IC)	26.6	23.914
		N gene	19.7	30.066
		ORF1ab	19.8	28.720
		S gene	19.9	29.641
		Result	Detected	Detected
18	013-OW	MS2 (IC)	28.1	26.152
		N gene	33.7	Undetermined
		ORF1ab	33.2	32.530
		S gene	34.2	34.869
		Result	Detected	Detected
19	014-OW	MS2 (IC)	26.587	25.373
		N gene	33.372	31.370
		ORF1ab	31.534	29.268
		S gene	33.240	30.435
		Result	Detected	Detected
20	015-OW	MS2 (IC)	25.751	25.598
		N gene	23.539	28.014
		ORF1ab	22.364	25.832
		S gene	23.669	27.014
		Result	Detected	Detected
21	016-OW	MS2 (IC)	26.197	26.559
		N gene	29.098	36.913
		ORF1ab	28.156	32.561
		S gene	29.056	35.087
		Result	Detected	Detected
22	017-OW	MS2 (IC)	25.902	33.378
		N gene	20.079	23.319
		ORF1ab	16.922	22.269
		S gene	18.812	22.904
		Result	Detected	Detected
23	018-OW	MS2 (IC)	25.098	27.171
		N gene	22.523	29.674
		ORF1ab	20.101	28.451
		S gene	20.965	28.935
		Result	Detected	Detected
24	019-OW	MS2 (IC)	25.425	24.807
		N gene	26.165	23.878
		ORF1ab	24.191	22.807
		S gene	25.452	23.346

Specimens with "Not Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
17	COV-0069	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
18	COV-0068	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
19	COV-0070	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
20	COV-0059	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
21	COV-0058	MS2 (IC)	Undetermined	Undetermined
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
22	025-OW	MS2 (IC)	23.897	24.880
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
23	026-OW	MS2 (IC)	27.662	27.117
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
24	027-OW	MS2 (IC)	24.959	25.510
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined

Specimens with "Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
		Result	Detected	Detected
25	020-OW	MS2 (IC)	24.934	25.326
		N gene	30.379	34.546
		ORF1ab	29.447	32.739
		S gene	30.334	34.514
		Result	Detected	Detected
26	021-OW	MS2 (IC)	24.419	25.524
		N gene	28.740	29.886
		ORF1ab	27.275	28.655
		S gene	27.690	29.712
		Result	Detected	Detected
27	COV-0090	MS2 (IC)	27.801	27.919
		N gene	26.954	32.145
		ORF1ab	25.803	32.497
		S gene	27.369	30.828
		Result	Detected	Detected
28	022-OW	MS2 (IC)	27.238	27.401
		N gene	18.148	21.494
		ORF1ab	18.102	21.034
		S gene	17.873	21.656
		Result	Detected	Detected
29	023-OW	MS2 (IC)	29.527	28.966
		N gene	20.359	31.324
		ORF1ab	17.913	31.952
		S gene	18.571	30.333
		Result	Detected	Detected
30	024-OW	MS2 (IC)	26.572	27.617
		N gene	26.014	27.892
		ORF1ab	26.183	27.803
		S gene	25.655	27.753
		Result	Detected	Detected

Specimens with "Not Detected" Results				
	Specimen ID	Target	NP Swab C_t	Quiksal™ C_t
		Result	Not Detected	Not Detected
25	028-OW	MS2 (IC)	25.200	23.852
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
26	029-OW	MS2 (IC)	24.364	26.376
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
27	030-OW	MS2 (IC)	24.580	25.623
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
28	031-OW	MS2 (IC)	24.353	25.211
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
29	032-OW	MS2 (IC)	25.221	25.661
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	Undetermined	Undetermined
		Result	Not Detected	Not Detected
30	033-OW	MS2 (IC)	25.162	25.342
		N gene	Undetermined	Undetermined
		ORF1ab	Undetermined	Undetermined
		S gene	38.675	Undetermined
		Result	Not Detected	Not Detected

VALIDATION CONCLUSIONS

The data presented in this report verify that:

(i) specimens collected with the Quiksal™ Oral Rinse Specimen Collection Device and stored at ambient temperature remain stable for rRT-PCR testing for up to 5 days, and

(ii) testing of paired NP and Quiksal™ samples from 60 patients exhibited 100% concordance for expected CoV-2 negative (30) and CoV-2 positive (30) samples.

March 13, 2020

Faith Du, Regulatory Affairs Manager,
Thermo Fisher Scientific, Inc.
5781 Van Allen Way,
Carlsbad, CA 92008 US

Dear Mrs. Du:

This letter is in response to your request that the Food and Drug Administration (FDA) issue an Emergency Use Authorization (EUA) for emergency use of the Thermo Fisher Scientific, Inc. (Thermo Fisher) TaqPath COVID-19 Combo Kit for the qualitative detection of nucleic acid from SARS-CoV-2 in nasopharyngeal swab, nasopharyngeal aspirate, and bronchoalveolar lavage (BAL) specimens from individuals suspected of COVID-19 by their healthcare provider, pursuant to Section 564 of the Federal Food, Drug, and Cosmetic Act (the Act) (21 U.S.C. §360bbb-3). The TaqPath COVID-19 Combo Kit is for use only under EUA in the United States (U.S.) in laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, to perform high complexity tests.[1]

On February 4, 2020, pursuant to Section 564(b)(1)(C) of the Act, the Secretary of the Department of Health and Human Services (HHS) determined that there is a public health emergency that has a significant potential to affect national security or the health and security of United States citizens living abroad, and that involves the virus that causes COVID-19.[2] Pursuant to Section 564 of the Act, and on the basis of such determination, the Secretary of HHS then declared that circumstances exist justifying the authorization of emergency use of in vitro diagnostics for detection and/or diagnosis of the virus that causes COVID-19 subject to the terms of any authorization issued under Section 564(a) of the Act.[3]

Having concluded that the criteria for issuance of this authorization under Section 564(c) of the Act are met, I am authorizing the emergency use of the TaqPath COVID-19 Combo Kit (as described in the scope Section of this letter (Section II)) in individuals suspected of COVID-19

[1] For ease of reference, this letter will refer to, "United States (U.S.) laboratories certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA), 42 U.S.C. §263a, to perform high complexity tests" as "authorized laboratories."
[2] On February 11, 2020, the virus tentatively named 2019-nCoV was formally designated as Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Also on February 11, 2020, the disease caused by SARS-CoV-2 was formally designated as Coronavirus Disease 2019 (COVID-19). This document uses the updated names.
[3] U.S. Department of Health and Human Services, *Determination of a Public Health Emergency and Declaration that Circumstances Exist Justifying Authorizations Pursuant to Section 564(b) of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 360bbb-3*. February 4, 2020.

by their healthcare provider for the detection of SARS-CoV-2 by authorized laboratories, subject to the terms of this authorization.

I. Criteria for Issuance of Authorization

I have concluded that the emergency use of the TaqPath COVID-19 Combo Kit for testing individuals suspected of COVID-19 by their healthcare provider meets the criteria for issuance of an authorization under Section 564(c) of the Act, because I have concluded that:

1. The SARS-CoV-2 can cause a serious or life-threatening disease or condition, including severe respiratory illness, to humans infected by this virus;

2. Based on the totality of scientific evidence available to FDA, it is reasonable to believe that the TaqPath COVID-19 Combo Kit may be effective in diagnosing COVID-19, and that the known and potential benefits of the TaqPath COVID-19 Combo Kit, when used for diagnosing COVID-19, outweigh the known and potential risks of such product; and

3. There is no adequate, approved, and available alternative to the emergency use of the TaqPath COVID-19 Combo Kit for diagnosing COVID-19.[4]

II. Scope of Authorization

I have concluded, pursuant to Section 564(d)(1) of the Act, that the scope of this authorization is limited to the use of the authorized TaqPath COVID-19 Combo Kit by authorized laboratories for the qualitative detection of SARS-CoV-2 in individuals suspected of COVID-19 by their healthcare provider.

The Authorized TaqPath COVID-19 Combo Kit

The TaqPath COVID-19 Combo Kit is a qualitative test for the detection of nucleic acid from SARS-CoV-2 in nasopharyngeal swab, nasopharyngeal aspirate, and BAL specimens from individuals suspected of COVID-19 by their healthcare provider. The SARS-CoV-2 nucleic acid is generally detectable in nasopharyngeal swab, nasopharyngeal aspirate, and BAL specimens during the acute phase of infection. Positive results are indicative of the presence of SARS-CoV-2 nucleic acid; clinical correlation with patient history and other diagnostic information is necessary to determine patient infection status. Positive results do not rule out bacterial infection or co-infection with other viruses.

To perform TaqPath COVID-19 Combo Kit testing, SARS-CoV-2 nucleic acid is first extracted, isolated and purified from nasopharyngeal swab, nasopharyngeal aspirate, or BAL specimens. The purified nucleic acid is then reverse transcribed into cDNA followed by PCR amplification and detection with the TaqPath COVID-19 Combo Kit on the Applied Biosystems 7500 Fast Dx Real-Time PCR instrument, or other authorized instruments. Data is analyzed and interpreted by the Applied Biosystems COVID-19 Interpretive Software, or other authorized software. The TaqPath COVID-19 Combo Kit includes the following primer/probe materials, or other authorized primer/probe materials and control materials, or other authorized control materials:

[4] No other criteria of issuance have been prescribed by regulation under Section 564(c)(4) of the Act.

- TaqPath RT-PCR COVID-19 Kit - containing the TaqPath COVID-19 Assay Multiplex reagent, that include the three primer/probe sets specific to different SARS-CoV-2 genomic regions (Gene Orf-1ab, N Protein, S Protein) and primers/probes for bacteriophage MS2, and the MS2 Phage Control reagent.
- TaqPath COVID-19 Control Kit – containing the TaqPath COVID-19 Control - RNA positive control that contains the SARS-CoV-2 genomic regions targeted by the kit and the TaqPath COVID-19 Control Dilution Buffer.

The TaqPath COVID-19 Combo Kit requires the following control materials, or other authorized control materials, that are processed in the same way as the patient samples and are required to be included with each batch of specimens tested with the TaqPath COVID-19 Combo Kit . All controls listed below must generate expected results in order for a test to be considered valid, as outlined in the TaqPath COVID-19 Combo Kit Instructions for Use:

- Internal Positive Control (IPC) – MS2 phage control which is required as an extraction, reverse transcription and PCR amplification positive control.
- External positive control - TaqPath COVID-19 Control contains the SARS-CoV-2 RNA genomic regions targeted by the kit. The positive control is used to monitor for failures of rRT-PCR reagents and reaction conditions.
- Negative Control - molecular-grade, nuclease-free, non-DEPC-treated water used to monitor non-specific amplification, cross-contamination during experimental setup, and nucleic acid contamination of reagents.

The TaqPath COVID-19 Combo Kit also requires the use of additional authorized materials and authorized ancillary reagents that are not included with the test and are described in the authorized TaqPath COVID-19 Combo Kit Instructions for Use.

The above described TaqPath COVID-19 Combo Kit, when labeled consistently with the labeling authorized by FDA, entitled "TaqPath COVID-19 Combo Kit Instructions for Use" (available at https://www.fda.gov/medical-devices/emergency-situations-medical-devices/emergency-use-authorizations), which may be revised by Thermo Fisher in consultation with, and with concurrence of, the Division of Microbiology Devices (DMD)/Office of Health Technology 7 Office of In Vitro Diagnostics and Radiological Health (OHT7-OIR)/Office of Product Evaluation and Quality (OPEQ)/Center for Devices and Radiological Health (CDRH), is authorized to be distributed to and used by authorized laboratories under this EUA, despite the fact that it does not meet certain requirements otherwise required by applicable federal law.

The above-described TaqPath COVID-19 Combo Kit is authorized to be accompanied by the following information pertaining to the emergency use, which is required to be made available to healthcare providers and patients:

- Fact Sheet for Healthcare Providers: TaqPath COVID-19 Combo Kit
- Fact Sheet for Patients: TaqPath COVID-19 Combo Kit

I have concluded, pursuant to Section 564(d)(2) of the Act, that it is reasonable to believe that

the known and potential benefits of the authorized TaqPath COVID-19 Combo Kit, when used for the qualitative detection of SARS-CoV-2 and used consistently with the Scope of Authorization of this letter (Section II), outweigh the known and potential risks of such a product.

I have concluded, pursuant to Section 564(d)(3) of the Act, based on the totality of scientific evidence available to FDA, that it is reasonable to believe that the authorized TaqPath COVID-19 Combo Kit may be effective in the qualitative detection of SARS-CoV-2, when used consistently with the Scope of Authorization of this letter (Section II), pursuant to Section 564(c)(2)(A) of the Act.

FDA has reviewed the scientific information available to FDA, including the information supporting the conclusions described in Section I above, and concludes that the TaqPath COVID-19 Combo Kit, when used for qualitative detection of the SARS-CoV-2 in the specified population (as described in the Scope of Authorization of this letter (Section II)), meets the criteria set forth in Section 564(c) of the Act concerning safety and potential effectiveness.

The emergency use of the authorized TaqPath COVID-19 Combo Kit under this EUA must be consistent with, and may not exceed, the terms of this letter, including the Scope of Authorization (Section II) and the Conditions of Authorization (Section IV). Subject to the terms of this EUA and under the circumstances set forth in the Secretary of HHS's determination under Section 564(b)(1)(C) described above and the Secretary of HHS's corresponding declaration under Section 564(b)(1), the TaqPath COVID-19 Combo Kit described above is authorized to detect SARS-CoV-2 in individuals suspected of COVID-19 by their healthcare provider.

This EUA will cease to be effective when the HHS declaration that circumstances exist to justify the EUA is terminated under Section 564(b)(2) of the Act or when the EUA is revoked under Section 564(g) of the Act.

III. Waiver of Certain Requirements

I am waiving the following requirements for the TaqPath COVID-19 Combo Kit during the duration of this EUA:

- Current good manufacturing practice requirements, including the quality system requirements under 21 CFR Part 820 with respect to the design, manufacture, packaging, labeling, storage, and distribution of the TaqPath COVID-19 Combo Kit

IV. Conditions of Authorization

Pursuant to Section 564(e) of the Act, I am establishing the following conditions on this authorization:

Thermo Fisher and Its Authorized Distributor(s)

A. This device must comply with the following labeling requirements under FDA regulations: the intended use statement (21 CFR 809.10(a)(2), (b)(2)); adequate directions for use (21 U.S.C. 352(f)), (21 CFR 809.10(b)(5), (7), and (8)); any appropriate limitations on the use of the device including information required under 21 CFR 809.10(a)(4); and any available information regarding performance of the device, including requirements under 21 CFR 809.10(b)(12).

B. Thermo Fisher and its authorized distributor(s) will make available the authorized TaqPath COVID-19 Combo Kit with the authorized labeling to authorized laboratories. Thermo Fisher may request changes to the authorized labeling. Such requests will be made by Thermo Fisher in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

C. Thermo Fisher and its authorized distributor(s) will provide to authorized laboratories the authorized TaqPath COVID-19 Combo Kit Fact Sheet for Healthcare Providers and the authorized TaqPath COVID-19 Combo Kit Fact Sheet for Patients.

D. Thermo Fisher and its authorized distributor(s) will make available on their website(s) the authorized TaqPath COVID-19 Combo Kit Fact Sheet for Healthcare Providers and the authorized TaqPath COVID-19 Combo Kit Fact Sheet for Patients.

E. Thermo Fisher and its authorized distributor(s) will inform authorized laboratories and relevant public health authorities of this EUA, including the terms and conditions herein, and any updates made to the TaqPath COVID-19 Combo Kit , authorized labeling and authorized Fact Sheets.

F. Through a process of inventory control, Thermo Fisher and its authorized distributor(s) will maintain records of the authorized laboratories to which they distribute the test and number of tests they distribute.

G. Thermo Fisher and its authorized distributor(s) will collect information on the performance of the test. Thermo Fisher will report to FDA any suspected occurrence of false positive and false negative results and significant deviations from the established performance characteristics of the test of which Thermo Fisher becomes aware.

H. Thermo Fisher and its authorized distributor(s) are authorized to make available additional information relating to the emergency use of the authorized TaqPath COVID-19 Combo Kit that is consistent with, and does not exceed, the terms of this letter of authorization.

I. Thermo Fisher and its authorized distributor(s) will send out a Customer Letter to authorized laboratories to inform them of acceptable material(s), other than clinical specimens, that will aid the authorized laboratories in verification of the authorized

TaqPath COVID-19 Combo Kit. Thermo Fisher will notify DMD/OHT7-OIR/OPEQ/CDRH when this condition has been completed.

Thermo Fisher

J. Thermo Fisher will notify FDA of any authorized distributor(s) of the TaqPath COVID-19 Combo Kit, including the name, address, and phone number of any authorized distributor(s).

K. Thermo Fisher will provide its authorized distributor(s) with a copy of this EUA and communicate to its authorized distributor(s) any subsequent amendments that might be made to this EUA and its authorized accompanying materials (e.g., Fact Sheets).

L. Thermo Fisher may request changes to the authorized TaqPath COVID-19 Combo Kit Fact Sheet for Healthcare Providers and the authorized TaqPath COVID-19 Combo Kit Fact Sheet for Patients. Such requests will be made by Thermo Fisher in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

M. Thermo Fisher may request changes to the Scope of Authorization (Section II in this letter) of the authorized TaqPath COVID-19 Combo Kit. Such requests will be made by Thermo Fisher in consultation with DMD/OHT7-OIR/OPEQ/CDRH, and require concurrence of, Office of Counterterrorism and Emerging Threats (OCET)/Office of the Chief Scientist (OCS)/Office of the Commissioner (OC) and DMD/OHT7-OIR/OPEQ/CDRH.

N. Thermo Fisher may request the addition of other instruments and associated software for use with the authorized TaqPath COVID-19 Combo Kit. Such requests will be made by Thermo Fisher in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

O. Thermo Fisher may request the addition of other specimen types for use with the authorized TaqPath COVID-19 Combo Kit. Such requests will be made by Thermo Fisher in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

P. Thermo Fisher may request the addition and/or substitution of primers or probes for use with the authorized TaqPath COVID-19 Combo Kit. Such requests will be made by Thermo Fisher in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

Q. Thermo Fisher may request the addition and/or substitution of other ancillary reagents and materials for use with the authorized TaqPath COVID-19 Combo Kit. Such requests will be made by Thermo Fisher in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

R. Thermo Fisher will evaluate the analytical limit of detection and assess traceability[5] of the TaqPath COVID-19 Combo Kit with any FDA-recommended reference material(s). After submission to FDA and DMD/OHT7-OIR/CDRH's review of and concurrence with the data, Thermo Fisher will update its labeling to reflect the additional testing. Such labeling updates will be made in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

S. Thermo Fisher will complete the agreed upon interference study. After submission to FDA and DMD/OHT7-OIR/CDRH's review of and concurrence with the data, Thermo Fisher will update its labeling to reflect the additional testing. Such labeling updates will be made in consultation with, and require concurrence of, DMD/OHT7-OIR/OPEQ/CDRH.

T. Thermo Fisher will track adverse events, including any occurrence of false results and report to FDA under 21 CFR Part 803.

Authorized Laboratories

U. Authorized laboratories using the TaqPath COVID-19 Combo Kit will include with result reports of the TaqPath COVID-19 Combo Kit , all authorized Fact Sheets. Under exigent circumstances, other appropriate methods for disseminating these Fact Sheets may be used, which may include mass media.

V. Authorized laboratories using the TaqPath COVID-19 Combo Kit will perform the TaqPath COVID-19 Combo Kit as outlined in the TaqPath COVID-19 Instructions for Use. Deviations from the authorized procedures, including the authorized instruments, authorized extraction methods, authorized clinical specimen types, authorized control materials, authorized other ancillary reagents and authorized materials required to perform the TaqPath COVID-19 Combo Kit are not permitted.

W. Authorized laboratories that receive the TaqPath COVID-19 Combo Kit must notify the relevant public health authorities of their intent to run the test prior to initiating testing.

X. Authorized laboratories using the TaqPath COVID-19 Combo Kit will have a process in place for reporting test results to healthcare providers and relevant public health authorities, as appropriate.

Y. Authorized laboratories will collect information on the performance of the test and report to DMD/OHT7-OIR/OPEQ/CDRH (via email: CDRH-EUA-Reporting@fda.hhs.gov) and Thermo Fisher (1-800-955-6288, Option #2; or techservices@thermofisher.com) any suspected occurrence of false positive or false negative results and significant deviations from the established performance characteristics of the test of which they become aware.

Z. All laboratory personnel using the test must be appropriately trained in RT-PCR

[5] Traceability refers to tracing analytical sensitivity/reactivity back to an FDA-recommended reference material.

techniques and use appropriate laboratory and personal protective equipment when handling this kit, and use the test in accordance with the authorized labeling.

Thermo Fisher, Its Authorized Distributor(s), and Authorized Laboratories

AA. Thermo Fisher, its authorized distributor(s) and authorized laboratories using the TaqPath COVID-19 Combo Kit will ensure that any records associated with this EUA are maintained until otherwise notified by FDA. Such records will be made available to FDA for inspection upon request.

Conditions Related to Advertising and Promotion

BB. All advertising and promotional descriptive printed matter relating to the use of the authorized TaqPath COVID-19 Combo Kit shall be consistent with the Fact Sheets and authorized labeling, as well as the terms set forth in this EUA and the applicable requirements set forth in the Act and FDA regulations.

CC. All advertising and promotional descriptive printed matter relating to the use of the authorized TaqPath COVID-19 Combo Kit shall clearly and conspicuously state that:

- This test has not been FDA cleared or approved;
- This test has been authorized by FDA under an EUA for use by authorized laboratories;
- This test has been authorized only for the detection of nucleic acid from SARS-CoV-2, not for any other viruses or pathogens; and
- This test is only authorized for the duration of the declaration that circumstances exist justifying the authorization of emergency use of in vitro diagnostic tests for detection and/or diagnosis of COVID-19 under Section 564(b)(1) of the Act, 21 U.S.C. § 360bbb-3(b)(1), unless the authorization is terminated or revoked sooner.

No advertising or promotional descriptive printed matter relating to the use of the authorized TaqPath COVID-19 Combo Kit may represent or suggest that this test is safe or effective for the detection of SARS-CoV-2.

The emergency use of the authorized TaqPath COVID-19 Combo Kit as described in this letter of authorization must comply with the conditions and all other terms of this authorization.

V. Duration of Authorization

This EUA will be effective until the declaration that circumstances exist justifying the authorization of the emergency use of in vitro diagnostic tests for detection and/or diagnosis of COVID-19 is terminated under Section 564(b)(2) of the Act or the EUA is revoked under Section 564(g) of the Act.

Sincerely,

_____

RADM Denise M. Hinton
Chief Scientist
Food and Drug Administration

Enclosures

U.S. FOOD & DRUG ADMINISTRATION

May 9, 2020

Faith Du,
Regulatory Affairs Manager,
Thermo Fisher Scientific, Inc.
5781 Van Allen Way,
Carlsbad, CA 92008 US

Re: EUA200010/A003
Trade/Device Name: TaqPath COVID-19 Combo Kit
Dated: April 22 and 29, 2020
Received: April 23, 2020

Dear Ms. Du:

This is to notify you that your request to update the Instructions for Use (IFU) of the TaqPath COVID-19 Combo Kit to; (1) add Applied Biosystems QuantStudio 7 Flex Real-Time PCR system, 384-well (RUO) and Applied Biosystems QuantStudio 5 Real-Time PCR system 384-well (ROU) instruments, (2) add Applied Biosystems COVID-19 Interpretive Software v2.2, (3) add extraction procedure for MagMAX Viral/Pathogen II Nucleic Acid Isolation Kit for manual extraction using 400µl specimen input, (4) add protocols for the new real-time PCR instruments and extraction methods and revise some of the existing procedures for clarification, (5) add additional products as an alternative to the KingFisher 96 KF microplate for automated RNA extraction, (6) update specimen storage recommendations, (7) update limitations section regarding nasal and mid-turbinate swabs, (8) include additional minor edits in the IFU for clarification, is granted. Upon review, we concur that the data and information submitted in EUA200010/A003 supports the requested updates for use with the TaqPath COVID-19 Combo Kit. By submitting this amendment for review by the Food and Drug Administration (FDA), you have complied with the Conditions of Authorization stated in the letter authorizing the emergency use of the TaqPath COVID-19 Combo Kit issued on March 13, 2020.

Sincerely yours,

_____

Uwe Scherf, M.Sc., Ph.D.
Director, Division of Microbiology Devices
OHT7: Office of In Vitro Diagnostics and Radiological Health
Office of Product Evaluation and Quality
Center for Devices and Radiological Health

U.S. Food & Drug Administration
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