

Patient demographics

Patient demographics (age, time elapsed since onset of symptoms) are available for the 257 samples used in the study. The table below shows the positive results broken down by age of the patient:

Age	LumiraDx SARS-CoV-2 Ag (n = 81)		
	Total #	Positive	Prevalence
≤ 5 years	13	0	N/A
6 to 21 years	29	6	20.7%
22 to 59 years	200	70	35.0%
≥ 60 years	15	5	33.3%

Positive results broken down by days since symptom onset:

Days since symptom onset	Cumulative RT-PCR Positive(+)	Cumulative LumiraDx Positive(+)	PPA	95% Confidence interval	
0	6	6	100.0%	61.0%	100.0%
1	12	12	100.0%	75.8%	100.0%
2	28	28	100.0%	87.9%	100.0%
3	37	37	100.0%	90.6%	100.0%
4	55	54	98.2%	90.4%	99.7%
5	61	60	98.4%	91.3%	99.7%
6	67	66	98.5%	92.0%	99.7%
7	73	72	98.6%	92.6%	99.8%
8	75	74	98.7%	92.8%	99.8%
9	75	74	98.7%	92.8%	99.8%
10	77	76	98.7%	93.0%	99.8%
11	80	79	98.8%	93.3%	99.8%
12	83	81	97.6%	91.6%	99.3%

Final data analysis is presented below:

Reference RT-PCR Assay					95% Wilson Score CI			
					LCI	UCI		
LumiraDx SARS-CoV-2 Ag Test	POS	81	6	87	PPA	97.6%	91.6%	99.3%
	NEG	2	168	170	Prevalence	32.3%	26.9%	38.2%
	TOTAL	83	174	257				

PPA - Positive Percent Agreement (Sensitivity)

NPA - Negative Percent Agreement (Specificity)

CI - Confidence Interval

LCI - Lower Confidence Interval

UCI - Upper Confidence Interval

Clinical Performance – Nasopharyngeal Swabs

The performance of the SARS-CoV-2 Ag Test was established with 255 nasopharyngeal swabs prospectively collected from individual subjects between August 2020 and September 2020 during the 2020 COVID pandemic. Subjects were presenting with symptoms of COVID-19 being screened for infection. Samples were collected from 6 sites across the United States. Swabs were collected and extracted into the LumiraDx Extraction Buffer. Samples were tested fresh within 1h of collection and tested according to the Product Insert. The performance of the LumiraDx SARS-CoV-2 Ag Test was compared to the results from nasopharyngeal samples collected into 3ml universal transport medium (UTM) and tested with an EUA authorized PCR method.

Patient demographics

Patient demographics (age, time elapsed since onset of symptoms) are available for the 255 samples used in the study. The table below shows the positive results broken down by age of the patient:

Age	LumiraDx SARS-CoV-2 Ag (n = 39)		
	Total #	Positive	Prevalence
≤ 5 years	22	0	0.0%
6 to 21 years	59	9	15.3%
22 to 59 years	150	28	18.7%
≥ 60 years	24	2	8.3%

Positive and negative results broken down by days since symptom onset:

Days since symptom onset	Cumulative PCR Positive (+)	LumiraDx Positive (+)	PPA	LCI	UCI	NPA	LCI	UCI
0	2	2	100.0%	34.2%	100.0%	100.0%	75.8%	100.0%
1	6	6	100.0%	61.0%	100.0%	100.0%	93.4%	100.0%
2	9	9	100.0%	70.1%	100.0%	100.0%	96.2%	100.0%
3	17	17	100.0%	81.6%	100.0%	98.6%	94.9%	99.6%
4	22	22	100.0%	85.1%	100.0%	98.8%	95.7%	99.7%
5	23	23	100.0%	85.7%	100.0%	98.4%	95.3%	99.4%
6	26	26	100.0%	87.1%	100.0%	98.5%	95.6%	99.5%
7	34	34	100.0%	89.8%	100.0%	98.5%	95.7%	99.5%
8	36	36	100.0%	90.4%	100.0%	98.6%	95.8%	99.5%
9	36	36	100.0%	90.4%	100.0%	98.6%	95.9%	99.5%
10	39	38	97.4%	86.8%	99.5%	98.1%	95.2%	99.3%
11	40	39	97.5%	87.1%	99.6%	97.7%	94.6%	99.0%
12	40	39	97.5%	87.1%	99.6%	97.7%	94.7%	99.0%

Final data analysis is presented below:

Reference RT-PCR Assay					95% Wilson Score CI			
					LCI	UCI		
LumiraDx SARS-CoV-2 Ag Test	POS	39	5	44	PPA	97.5%	87.1%	99.6%
	NEG	1	210	211	NPA	97.7%	94.7%	99.0%
	TOTAL	40	215	255	Prevalence	15.7%	11.7%	20.7%

Analytical performance

Limit of Detection - LOD (analytical sensitivity):

Limit of Detection (LoD) studies determined the lowest detectable concentration of SARS-CoV-2 at which 100% of all (true positive) replicates test positive. The LoD for the LumiraDx SARS-CoV-2 Ag Test was established using limiting dilutions of gamma-irradiated SARS-CoV-2 (BEI Resources NR-52287). The NR-52287 is a preparation of SARS-Related Coronavirus 2 (SARS-CoV2), isolate USA WAI1/2020, that has been inactivated by gamma-irradiation at 5 x 10⁶ RADs. The material was supplied frozen at a concentration of 2.8 x 10⁶ TCID₅₀/mL.

Limit of Detection (LoD) screening

An initial LoD screening study was performed using a 5-fold serial dilutions (six dilutions in total) of the gamma-irradiated virus made in pooled negative human nasal matrix starting at a test concentration of 2 x 10⁶ TCID₅₀/mL (as shown in table below) and processed for each study as described above. These dilutions were tested in triplicate. The lowest concentration at which all (3 out of 3 replicates) were positive was chosen for LoD Range finding. This was 32 TCID₅₀/mL.

SARS-CoV-2 tested (TCID ₅₀ /mL)	Test result
20000	3/3 positive
4000	3/3 positive
800	3/3 positive
160	3/3 positive
32	3/3 positive
6.4	0/3 positive

Limit of Detection range finding

Using the 32 TCID₅₀/mL concentration, the LoD was further refined using a 2-fold dilution series (four dilutions in total) of the gamma-irradiated SARS-CoV-2 virus made in pooled negative human nasal matrix. These dilutions were tested in triplicate. The lowest concentration at which all (3 out of 3 replicates) were positive was treated as the tentative LoD for the LumiraDx SARS-CoV-2 Ag Test. This was 32 TCID₅₀/mL.

SARS-CoV-2 tested (TCID ₅₀ /mL)	Test result
32	3/3 positive
16	0/3 positive
8	1/3 positive
4	0/3 positive

Limit of Detection (LoD) confirmation

The LoD of the LumiraDx SARS-CoV-2 Ag Test was then confirmed by testing 20 replicates with concentrations at the tentative Limit of Detection. The final LoD of the LumiraDx SARS-CoV-2 Ag Test was determined to be the lowest concentration resulting in positive detection of twenty (20) out of twenty (20) replicates. Based on this testing the LoD for nasal swab samples was confirmed as: 32 TCID₅₀/mL.

Starting Material Concentration	Estimated LOD	No. Positive/Total	% Positive
2.8 x 10 ⁶ TCID ₅₀ /mL	32 TCID ₅₀ /mL	20/20	100

Omicron Testing

The performance of a multiplex SARS-CoV-2 Ag test device, which utilizes the same anti-SARS-CoV-2 antibodies as this device, was evaluated in a comparative performance study using a dilution series of clinical specimens containing live virus, which were positive for the Omicron variant (BA.1.1.529) of SARS-CoV-2. This comparative testing was conducted by the National Institutes of Health (NIH) as a component of the Rapid Acceleration of Diagnostics (RADx) initiative. Compared to an EUA-authorized RT-PCR method, this SARS-CoV-2 Ag test detected 100% of live virus Omicron samples at a Ct-value of 23.6 (n=5). Less than 50% of Omicron dilutions at Ct-values of 24.0 and 24.8 were detected (n=5). Omicron dilutions at lower viral concentrations (Ct-values greater than 24.6 for live virus) were not detected by this similar LumiraDx SARS-CoV-2 Ag test in this study. See summary data table below.

Omicron Pool 2 - Live Dilution	Assay #1		Assay #2		LumiraDx SARS-CoV-2 Ag Test
	Ct-N2 Ave.	Percent Positive (n=5)	Percent Positive (n=5)	Percent Positive (n=5)	
Dilution 1	19.8	100	100	100	
Dilution 2	20.8	100	100	100	
Dilution 3	21.5	100	100	100	
Dilution 4	22.7	100	100	100	
Dilution 5	23.6	100	0	100	
Dilution 6	24.0	60	0	40	
Dilution 7	24.8	0	0	20	
Dilution 8	25.8	0	0	0	
Dilution 9	27.4	0	0	0	
Dilution 10	28.1	0	0	0	
Dilution 11	29.1	0	0	0	

Cross-reactivity (analytical specificity) and microbial interference studies

Cross-reactivity and interference of the LumiraDx SARS-CoV-2 Ag Test was evaluated by testing a panel of related pathogens, high prevalence disease agents and normal or pathogenic flora including various microorganisms and viruses and negative matrix that are reasonably likely to be encountered in the clinical sample and could potentially cross-react or interfere with the LumiraDx SARS-CoV-2 Ag Test. Each organism and virus were tested in the absence or presence of heat inactivated SARS-CoV-2 at 3 x LoD.

Microorganism	Source	Concentration	Cross-Reactivity (Yes/No)	Interference (Yes/No)
Human coronavirus 229E	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Human coronavirus OC43	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (19/20 positive)
Human coronavirus NL63	Zeptomatrix	9.87 x 10 ³ PFU/mL	No (3/3 negative)	No (3/3 positive)
MERS coronavirus	Zeptomatrix	7930 PFU/mL	No (2/2 negative)	No (3/3 positive)
Adenovirus (e.g. C1 Ad. 71)	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Human Metapneumovirus (hMPV)	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Parainfluenza virus Type 1	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Parainfluenza virus Type 2	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Parainfluenza virus Type 3	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Parainfluenza virus Type 4a	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Influenza A H3N2 (Wisconsin/67/05)	Zeptomatrix	8.82 x 10 ⁴ PFU/mL	No (3/3 negative)	No (3/3 positive)
Influenza A H1N1	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Influenza B (Malaysia/2506/04)	Zeptomatrix	2.92 x 10 ⁴ PFU/mL	No (3/3 negative)	No (19/20 positive)
Enterovirus	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Respiratory syncytial virus	Zeptomatrix	1 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
Rhinovirus	Zeptomatrix	4.17 x 10 ⁶ PFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Haemophilus influenzae</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Streptococcus pneumoniae</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Streptococcus pyogenes</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Candida albicans</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
Pooled human nasal wash	LumiraDx	14% v/v	No (3/3 negative)	No (3/3 positive)
<i>Bordetella pertussis</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Mycoplasma pneumoniae</i>	ATCC	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Chlamydia pneumoniae</i>	ATCC	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Legionella pneumophila</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Mycobacterium tuberculosis</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Pneumocystis jirovecii</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Pseudomonas Aeruginosa</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Staphylococcus Epidermidis</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Streptococcus Salivarius</i>	Zeptomatrix	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)
<i>Staphylococcus aureus</i>	ATCC	1 x 10 ⁶ CFU/mL	No (3/3 negative)	No (3/3 positive)

To estimate the likelihood of cross-reactivity with SARS-CoV-2 of organisms that were not available for wet testing, *in silico* analysis using the Basic Local Alignment Search Tool (BLAST) managed by the National Center for Biotechnology Information (NCBI) was used to assess the degree of protein sequence homology.

For Human Coronavirus HKU1, homology exists between the SARS-CoV-2 nucleocapsid protein and Human Coronavirus HKU1. BLAST results showed 30 sequence IDs, all nucleocapsid protein, showing homology. Sequence ID AGW27840.1 had the highest alignment score and was found to be 39.1% homologous across 76% of the sequences, this is relatively low but cross-reactivity cannot be fully ruled out.

For SARS-Coronavirus, high homology exists between the SARS-CoV-2 nucleocapsid protein and SARS-Coronavirus. BLAST results showed 68 sequence IDs, mostly nucleocapsid protein, showing homology. Sequence ID AAR87518.1, had the highest alignment score isolated from a human patient and was found to be 90.76% homologous across 100% of the sequence. This is high and cross-reactivity is likely.

For MERS-Coronavirus, high homology exists between the SARS-CoV-2 nucleocapsid protein and MERS-Coronavirus. BLAST results showed at least 114 sequence IDs, mostly nucleocapsid protein, showing homology. Sequence IDs AHY61344.1 and AWH65950.1, had the highest alignment scores isolated from a human patient and were found to be 49.4% and 50.3% homologous across 88% of the sequence. Whilst this potentially represents moderate cross-reactivity testing of the MERS virus at 7930 PFU/mL showed no reactivity (see table above).

Endogenous interference studies

A study was performed to demonstrate that potentially interfering substances that may be found in the upper respiratory tract in symptomatic subjects (including over the counter medications) do not cross-react or interfere with the detection of SARS-CoV-2 in the LumiraDx SARS-CoV-2 Ag Test. Each substance was tested in triplicate in the absence or presence of SARS-CoV-2 at 3 x LoD. Substances for testing were selected based on the respiratory samples guidance in http://www.accessdata.fda.gov/cdrh_docs/reviews/K112177.pdf. The final concentration of the substances tested are documented in the table below.

Interfering substance	Concentration	Interference (Yes/No)
Benzocaine	150 mg/dL	No (3/3 Negative, 3/3 Positive)
Blood (human)	5%	No (3/3 Negative, 3/3 Positive)
Mucin	5 mg/mL	No (3/3 Negative, 3/3 Positive)
Naso GEL (NeillMed)	5% v/v	No (3/3 Negative, 3/3 Positive)
CVS Nasal Drops (phenylephrine)	15% v/v	No (3/3 Negative, 3/3 Positive)
Afrin (Oxymetazoline)	15% v/v	No (3/3 Negative, 3/3 Positive)
CVS Nasal Spray (Cromolyn)	15% v/v	No (3/3 Negative, 3/3 Positive)
Zicam Cold Remedy	5% v/v	No (3/3 Negative, 3/3 Positive)
Homeopathic (Alkaloi)	10 % v/v	No (3/3 Negative, 3/3 Positive)
Sore Throat Phenol Spray	15% v/v	No (3/3 Negative, 3/3 Positive)
Tobramycin	3.3 mg/dL	No (3/3 Negative, 3/3 Positive)
Mupirocin	0.15 mg/dL	No (3/3 Negative, 3/3 Positive)
Fluicasonone	0.000126 mg/dL	No (5/5 Negative, 4/4 Positive)
Tamiflu (Oseltamivir phosphate)	500 mg/dL	No (3/3 Negative, 3/3 Positive)
Budesonide	0.00063 mg/dL	No (3/3 Negative, 3/3 Positive)
Biotin	0.35 mg/dL	No (3/3 Negative, 3/3 Positive)
Methanol	150 mg/dL	No (19/20 Negative, 3/3 Positive)
Acetylsalicylic Acid	3 mg/dL	No (3/3 Negative, 3/3 Positive)
Diphenhydramine	0.0774 mg/dL	No (3/3 Negative, 3/3 Positive)
Dexamethorphan	0.00156 mg/dL	No (19/20 Negative, 3/3 Positive)
Dexamethasone	1.2 mg/dL	No (3/3 Negative, 3/3 Positive)
Mucinex	5%	No (3/3 Negative, 3/3 Positive)

High dose hook effect

High Dose Hook Effect studies determine the level at which false negative results can be seen when very high levels of target are present in a tested sample. To determine if the LumiraDx SARS-CoV-2 Ag Test suffers from any high dose hook effect, increasing concentrations of gamma-irradiated SARS-CoV-2 virus (BEI Resources NR-52287) were tested up to a concentration of 1.4 x 10⁶ TCID₅₀/mL. In this study, the starting material was spiked into a volume of pooled human nasal matrix obtained from healthy donors and confirmed negative for SARS-CoV-2. At each dilution, 50 µL samples were added to swabs and the swabs processed for testing on the LumiraDx SARS-CoV-2 Ag Test as per the Product Insert using the procedure appropriate for patient nasal swab samples.

No impact on test performance or high dose hook effect was observed up to 1.4 x 10⁶ TCID₅₀/mL of gamma-irradiated SARS-CoV-2 with the LumiraDx SARS-CoV-2 Ag Test.

Test dilution	Concentration (TCID ₅₀ /mL)	Mean signal (ADC Units)
1	0	495
2	62.5	26100.6
3	250	63013.8
4	1000	83451.8
5	1.4 x 10 ⁶	86220















Point of care use

The LumiraDx SARS-CoV-2 Ag Test was used by 8 untrained users in 4 sites across the United States. Untrained users tested 132 patients and ran 148 tests.

References:

- World Health Organisation www.who.int
- Centers for Disease Control and Prevention www.cdc.gov

Symbols glossary

	Temperature limitation		Use by
	Manufacturer		Consult Instructions for Use
	In Vitro Diagnostic Medical Device		Do Not Re-use
	Catalogue Number		Prescription Use Only
	Batch code/Lot Number		Do not re-sterilize
	Indicates a medical device that has been sterilized using ethylene oxide		
	Indicates the presence of the Radio Frequency Identification (RFID) reader/tag.		
	Date of manufacture		
	Indicates that a medical device that should not be used if the package has been damaged or opened and that the user should consult the instructions for use for additional information		

LumiraDx customer services:

For product inquiries and technical support please contact LumiraDx Customer Services by email: customerservices.US@lumiradx.com, telephone 1-888-586-4721 or Lumiradx.com

For return policy

If there is a problem with the LumiraDx SARS-CoV-2 Ag Test Strips you may be asked to return them. Before returning tests please obtain a return authorization number from LumiraDx Customer Services. This return authorization number must be on the shipping carton for return. For ordinary returns following purchase, please contact LumiraDx Customer Services for terms and conditions: customerservices.US@lumiradx.com

Limited warranty