FIND Evaluation of Mologic Ltd, COVID 19 RAPID ANTIGEN TEST External Report

Version 2.0, 14 July 2022

Evaluation process – private sector engagement

FIND, the global alliance for diagnostics, seeks to ensure equitable access to reliable diagnosis around the world. It works closely with the private and public sectors and receives funding from donors and some of its industry partners. It has internal fire walls, policies and processes to protect it against any undue influence in its work or the publication of its findings.

More information on our policy and guidelines for working with private sector partners can be found here: https://www.finddx.org/policies/

For the COVID-19 response, FIND has commissioned independent evaluations of in vitro diagnostics following an Expression of Interest (EOI) process available on FIND's website by which all test submissions were scored according to their regulatory status and time to market; the manufacturing and distribution capacity of the supplier; and the supplier-reported clinical and analytical performance.

Document history

Document version	Date	Comment
1.0	23 April 2021	Initial release
1.1	08 June 2021	Updated shelf-life
1.2	15 June 2021	PCR result for one sample updated. Ag result for one sample updated.
2.0	14 July 2022	Data for Uganda added

1 Product Info:

Manufacturer name	Mologic Ltd.
Test name	COVID 19 RAPID ANTIGEN TEST
Product code(s)	11811125
Pack size(s)	25 tests per kit
Contents of kit	Lateral flow device, buffer capsule, sterile swab, swab extraction tube, instructions for use
Equipment and consumables required, but not provided	Tube stand, Stopwatch/timer
Product storage (temperature range)	2-30°C
Shelf-life (months)	18 months
Manufacturing site (country)	United Kingdom

2 Study details:

Study design:	Prospective diagnostic evaluation studies across multiple, independent sites to determine the accuracy of COVID-19 antigen RDTs, using consecutive enrolment. Interim analyses are performed at 25% and 50% enrolment, and the evaluation is stopped if tests do not meet 95% specificity. Presence of symptoms, date of symptom onset and hospitalization status is collected for all enrolled participants.
Index assays:	Novel lateral flow format tests that detect recombinant SARS-CoV-2 antigens.
Reference method:	Results of the index test are compared to the routine, diagnostic RT-PCR result, which is used for clinical management
Limit of detection:	Verification of analytical sensitivity, i.e. Limit of detection, was performed at the Liverpool School of Tropical Medicine in which standardized serial dilutions of cultured viral isolate were prepared. Proprietary swab provided in the kit was soaked in viral dilution series. Dilutions were tested in triplicate and the LOD was defined as the last dilution where all repeats were interpreted as positive.
Clinical performance:	Sensitivity was calculated as the proportion of true positive results detected by COVID 19 RAPID ANTIGEN TEST among all positives by the reference method and reported as a percentage. Specificity was calculated as the proportion of true negative specimens, identified as negative by COVID 19 RAPID ANTIGEN TEST among all negatives by the reference method, and reported as a percentage.

	The 95% confidence intervals were calculated to assess the level of uncertainty introduced by sample size, using the Wilson's score method. Invalid Ag RDT results were not repeated.
Ease of use	A System usability survey and ease of use questionnaire assessing the quality of the test, test preparation, ease of test execution, procedure time, ease of result interpretation, storage conditions and perceived settings of use was completed by operators and a final score out of 100 was calculated.

3 Evaluation details

Country of collaborator	**Germany**	**Uganda**
Location of clinical site(s) (city, town)	1. Heidelberg (HD) 2. Berlin	• Mulago National Referral Hospital • Kiruddu National Referral Hospital • Mbarara Regional Referral Hospital • Masaka Regional Referral Hospital
Health care level of site(s)	1. Heidelberg: Drive-in testing Center 2. Berlin: Ambulatory testing clinic of Charité – University Hospital	National or regional referral hospitals
Study period (date to date)	1. HD: 11- 31 March 2021 2. Berlin: 11 March – 15 April 2021	6 April – 25 May 2022
Study cohort inclusion/exclusion	Adults able to ambulate and meeting suspect definition of the Department of public health Provided informed consent	Adults with acute respiratory illness who meets WHO case definition of a COVID-19 suspected case presenting to temporary testing locations around clinical sites. Provided informed consent
Sample type, antigen test	Nasal (AN) (n=645) or NMT (n=20)	Nasopharyngeal swab
Reference PCR method	• LightMix® Modular SARS-CoV (COVID19) E-gene (Tib Molbiol) ○ N = 323 • Cobas SARS-CoV-2 (Roche Diagnostics Inc)	cobas® SARS-CoV-2 Test (Roche Diagnostics)

	○ N = 342	
Sample type, PCR test	1. HD: Nasopharyngeal swabs (oropharyngeal if NP contraindicated) 2. Berlin: Combined nasopharyngeal/oropharyngeal swabs	Nasopharyngeal swab

4 Results

4.1 Study cohort

Country	Germany	Uganda
Total N (valid PCR results)	665	455
Age [mean (min-max), N]	38.65 (18-78), 665	39.7 (18-93), 455
Gender [%F, (n/N)]	50.2%, (333/664)[1]	43.8%, (199/454)
Symptoms present [%Yes, (n/N)]	66.5%, (440/662)	100%, (455/455)
Hospitalized (n, % Yes)	Not applicable	Not applicable
Days from symptom onset [median (Q1-Q3); N]	2 (1-4); 436[1]	3, (2-4), 455
Days < 0-3 (n, %)	290, 67%	265, 58%
Days 4-7 (n, %)	121, 28%	171, 38%
Days 8+ (n, %)	25, 6%	19, 4%
Positivity [%, (n/N)]	29%, (195/665)	11%, (51/455)
PCR Ct [median (Q1-Q3); N]	20.3 (17.83 – 22.95); 195	27.5 (23.6, 28.9), 455
Ct > 33 (n, %)	5, 3%	1, 2%
Ct > 30 (n, %)	8, 4%	6, 12%
Ct > 25 (n, %)	28, 14%	36, 71%

[1] *Age unknown for n=1; Date of symptom onset unknown for n=4*

4.2 Estimation of clinical performance

Country	Germany	Uganda
Clinical Sensitivity (95% CI), N	90.6% (85.6, 94), 192[§1]	92.2% (81.5, 96.9), 51
Sensitivity days ≤7, N	93.2% (88.3, 96.2), 162	89.1% (77, 95.3), 46
Sensitivity Ct ≤ 33, N	92.5% (87.8, 95.5), 187	90% (78.6, 95.7), 50
Sensitivity Ct ≤ 25, N	96.4% (92.3, 98.3), 166	93.3% (70.2, 98.8), 15
Clinical Specificity (95% CI), N	100% (99.2, 100), 458[2]	99.8% (98.6, 100), 404
Invalid rate (%, n/N)	2.4% (16/665)	0% (0/455)

[§] 89/191 positives were tested using Roche Cobas, 103/191 using TibMolbiol.
[1] n=3 invalid for investigational RDT, excluded from the analysis
[2] n=13 invalid for investigational RDT, excluded from the analysis

4.3 Estimation of analytical performance

- Supplier-reported LOD = **2.5 x10^2 pfu/ml** ~ 3.52 x 10^2 $TCID_{50}$/ml (Isolate hCoV-19/Japan/TY7-503/2021)
- Verified LOD

Variant (lineage)	Lowest dilution detected	Verified LOD concentration	Viral Copy equivalent
UK wild type (B1)	**2.5 x10^2 pfu/ml** ~ 3.525 x 10^2 $TCID_{50}$/ml	**2.5 x10^2 pfu/ml**	**5.9 x10^5 genome copies/ml** applied to test
Alpha (B.1.1.7)	**2.5 x10^2 pfu/ml** ~ 3.525 x 10^2 $TCID_{50}$/ml	**2.5 x10^2 pfu/ml**	**5.1 x10^3 genome copies/ml** applied to test
Gamma (P1)	**1.0 x10^3 pfu/ml** ~ 1.41 x 10^3 $TCID_{50}$/ml	**1.0 x10^3 pfu/ml**	**5.6 x10^{5}genome copies/ml** applied to test
Delta (B.1617.2)	**2.5 x10^2 pfu/ml** ~ 3.525 x 10^2 $TCID_{50}$/ml	**2.5 x10^2 pfu/ml**	**9.9 x10^5 genome copies/ml** applied to test
Omicron (BA.1)	**1.0 x10^3 pfu/ml** ~ 1.41 x 10^3 $TCID_{50}$/ml	**1.0 x10^3 pfu/ml**	**1.8 x10^5 genome copies/ml** applied to test

Note: viral dilution was applied directly to the test cassette, not to the provided swab

4.3.1 Ease of use

Mologic COVID 19 RAPID ANTIGEN TEST	57 out of 100	5 operators, Germany