Zhuhai Lituo Biotechnology Co., Ltd

Clinical Evaluation Report

Product name: COVID-19 Antigen Detection Kit (Colloidal Gold)

Specimen type: secretion specimen of nasopharyngeal swabs , oropharyngeal swab, nasal swab

Version: A2

Plan Date: September 10, 2020

Test period: September 10 to November 2020

Report version: A2

Report Date: November 24, 2020

Confidentiality statement

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CONTENT

1. Intended Use

1.1 Product function

The kit is used for qualitative detection of COVID-2019 new coronavirus antigen in human nasopharyngeal swab, oropharyngeal swab, and nasal swab.

1.2 Applicable medical stages

This product can be used for diagnostic screening.

1.3 Main users of the product

The COVID-19 Antigen Detection Kit(Colloidal Gold) is used for clinical inspection and analysis, etc.; the main goal is for users and medical institutions or medical research and testing unit inspection department to screen new coronavirus cases, so as to do further analysis.

2. Research purpose

By comparing our company's new coronavirus antigen (COVID-2019) test kit (assessment reagent) with the test results from clinical case specimen and clinical diagnosis/exclusion results (PCR test method), we verify that our products are in clinical accordance with PCR detection method in terms of safety, effectiveness and accuracy.

3. Test management

Standardized operating procedures shall be established for all research procedures.

3.1 Qualification of researchers

The experiment operator should be a professional technician.

3.2 Laboratory quality control

The laboratories engaged in clinical research shall establish standard operating procedures for experimental observation indicator, which shall be completed by specialized isolation laboratories.

3.4 Data management and statistics

3.4.1 Data collection

a. Researchers must ensure that the data is true, accurate, and complete.

b. All items in the research record must be filled in. There must be no blank items or missing items (spaces without a record are underlined). The data modified by marginal notes shall be signed and dated by the researcher.

3.4.2 Data monitoring: the applicant shall appoint a supervisor, who will review each original research record form, and confirm that the clinical trial data records are timely, accurate, standardized, and complete, and the supervisor of each record shall sign.

3.4.3 Data inspection and input: The data manager of the applicant unit will check and input.

3.4.4 Statistical analysis: completed by statisticians, EXCEL software performs statistical processing on the measured data.

3.4.5 Data Archive: Archive raw data for inspection.

4. Test design

4.1 Overall test design

In this test, the total number of specimen selected for nasopharyngeal swabs, oropharyngeal swab, nasal swab shall not less than 200, respectively. The same specimen were performed a single test using the test reagent (COVID-19 Antigen detection kit) and PCR detection method to evaluate whether the Lituo COVID-19 Antigen test kit meets the requirements. If the test results cannot meet the preset standards, the sample size should be appropriately expanded for evaluation.

4.2 Experimental design and research method selection

4.2.1 Specimen source

The sample was from a suspected case of new coronary pneumonia in a clinical trial institution. The same suspected case collected a respiratory secretion from a nasopharyngeal

swabs, oropharyngeal swab, and nasal swab. The samples should have corresponding basic clinical information. The total number of samples selected for the nasopharyngeal swabs, oropharyngeal swab, and nasal swab is not less than 200, respectively. The number of positive samples for the three sample types should be not less than 100 respectively.

4.2.2 Specimen deletion criteria

All the selected samples have one item that cannot meet the information required for this verification shall be deleted.

4.2.3 Specimen removal criteria

Specimens with no results or failures are excluded.

4.2.4 Collection and storage of specimens

(1) Oropharyngeal swab specimen:

Use a special sampling swab to wipe the back wall of the pharynx and the tonsils on both sides with moderate force, avoid touching the tongue; quickly immerse the swab head in the extraction buffer tube.

(2) Nasopharynageal swab specimen:

Insert the swab into the nasal cavity with the most secretions. Rotate gently and push into the nasal cavity, then press the swab against the wall of the nose three times, remove the swab head; quickly immerse the swab head in the sample treatment solution.

(3) Nasal swab specimen:

Insert the sampling swab into the nasal cavity with the most secretions. Rotate gently, then press the swab on the nasal wall three times, take out the swab head; quickly immerse the swab head in the sample treatment solution.

(4) After collection, the specimens should be processed with the extraction buffer provided by this kit as soon as possible. And complete the test within 10 minutes.

(5) Take two specimens of the same patient, one for the experiment kit and one for PCR reagent detection.

4.2.5 Reagents to be evaluated

Product name: COVID-19 Antigen Detection Kit(Colloidal Gold)

Manufacturer: Zhuhai Lituo Biotechnology Co., Ltd.

Packing specification: 25 Tests/Kit

Main components:

Components	Quantity
Test card	25 Tests
Extraction Buffer	25 Bottles
Sampling swab	25 Tests
Instructions of Use	1 Pieces

Shelf life: 12 months Storage conditions: Store in a dry place at 4-30° C, protected from light. Batch number: 20200805

4.2.6 Statistical analysis methods of clinical research data

4.2.6.1 Data statistical analysis method

1) Evaluation indicators: negative coincidence rate, positive coincidence rate and total coincidence rate.

2) Inspection method: Kappa inspection is adopted.

4.2.6.2 Reagent clinical evaluation

The reagents to be evaluated are verified by its safety, effectiveness and equivalence of PCR method through clinical evaluation and statistical processing methods.

5. Test Implementation

5.1 Specimen selection

This testing specimen is a secretion specimen of nasopharyngeal swabs from hospital, which were tested with the reagents to be evaluated and PCR, respectively. 255 specimens were selected this time. According to the statistics of PCR test results, there were 126 positive samples for nasopharyngeal swabs, nasal swab and oropharyngeal swab, and 129 negative specimen for each.

5.2 Test Management

5.2.1 Data management and statistics:

5.2.1.1 Data collection:

a. The researcher must ensure that the data is true, accurate and complete.

b. Fill in the test record form truthfully and accurately.

5.2.1.2 Statistical analysis:

The statistical data was statistically processed by statisticians using EXCEL software.

5.2.1.3 Data archiving:

Archive the original data for inspection.

5.3 Clinical research results and analysis

5.3.1Test results and analysis of oropharyngeal swab specimens

Test result list

Reagents to be evaluated	PCR		Total	Rate
	Positive	Negative		
Positive	121	1	122	0.478
Negative	5	128	133	0.522
Total	126	129	255	
Rate	0.494	0.506		

1）κ value

$$Po = \frac{\sum Aii}{N} = \frac{121+128}{255} = 0.976$$

$$Pc = [(A+D)\times(A+C)+(C+D)\times(B+D)]/(A+B+C+D)^2 = 0.746$$

$$\kappa = \frac{Po-Pc}{1-Pc} = \frac{0.976-0.746}{1-0.746} = 0.907 > 0.61$$

κ greater than 0.61, the results are highly consistent.

2）Performance evaluation index

$$\text{Sensitivit y} = \frac{\text{Number of cases in which both Lituo and PCR tests were positive}}{\text{Number of positive cases detected by PCR}} \times 100\% = \frac{121}{126} = 96.03\%$$

$$\text{Specificit y} = \frac{\text{Number of cases in which both Lituo and PCR tests were negative}}{\text{Number of negative cases detected by PCR}} \times 100\% = \frac{128}{129} = 99.22\%$$

5.3.2Test results and analysis of nasopharyngeal swab specimens

Test result list

Reagents to be evaluated	PCR		Total	Rate
	Positive	Negative		
Positive	122	1	123	0.482
Negative	4	128	132	0.518
Total	126	129	255	
Rate	0.494	0.506		

1) κ value

$$Po = \frac{\sum Aii}{N} = \frac{122+128}{255} = 0.980$$

$$Pc = [(A+D)\times(A+C)+(C+D)\times(B+D)]/(A+B+C+D)^2 = 0.746$$

$$\kappa = \frac{Po-Pc}{1-Pc} = \frac{0.980-0.746}{1-0.746} = 0.923 > 0.61$$

κ greater than 0.61, the results are highly consistent.

2) Performance evaluation index

$$\text{Sensitivit y} = \frac{\text{Number of cases in which both Lituo and PCR tests were positive}}{\text{Number of positive cases detected by PCR}} \times 100\% = \frac{122}{126} = 96.83\%$$

$$\text{Specificit y} = \frac{\text{Number of cases in which both Lituo and PCR tests were negative}}{\text{Number of negative cases detected by PCR}} \times 100\% = \frac{128}{129} = 99.22\%$$

5.3.3 Test results and analysis of nasal swab specimens

Test result list

Reagents to be evaluated	PCR		Total	Rate
	Positive	Negative		
Positive	120	1	121	0.475
Negative	6	128	134	0.525
Total	126	129	255	

Rate	0.494	0.506

1) κ value

$$Po = \frac{\sum Aii}{N} = \frac{120+128}{255} = 0.973$$

$$Pc = [(A+D)\times(A+C)+(C+D)\times(B+D)]/(A+B+C+D)^2 = 0.746$$

$$\kappa = \frac{Po-Pc}{1-Pc} = \frac{0.973-0.746}{1-0.746} = 0.892 > 0.61$$

κ greater than 0.61, the results are highly consistent.

2) Performance evaluation index

$$\text{Sensitivit y} = \frac{\text{Number of cases in which both Lituo and PCR tests were positive}}{\text{Number of positive cases detected by PCR}} \times 100\% = \frac{120}{126} = 95.24\%$$

$$\text{Specificit y} = \frac{\text{Number of cases in which both Lituo and PCR tests were negative}}{\text{Number of negative cases detected by PCR}} \times 100\% = \frac{128}{129} = 99.22\%$$

5.3.4 Consistency analysis

Product manufacturer/Count Actual frequency	Oropharyngeal swab specimen（PCR）		Nasopharyngeal swab sample（PCR）		Nasal swab specimen （PCR）	
	Positive	Negative	Positive	Negative	Positive	Negative
Positive	121	1	122	1	120	1
Negative	5	128	4	128	6	128
Specificity	99.22%		99.22%		99.22%	
Sensitivity	96.03%		96.83%		95.24%	
Total consistency	97.65%		98.04%		97.25%	

The total consistency of the test reagent and PCR for three samples is >90%, which meets the requirements.

5.4 Discussion and conclusion

Through the above experiments, the clinical consistency analysis of the company's kits

and PCR detection kit was performed, and the results met the requirements.

In this experiment, the COVID-19 antigen detection kit (colloidal gold) and PCR detection kit are used to simultaneously test nasopharyngeal swab specimen, oropharyngeal swab specimen, and nasal swab specimen. The total number of the samples is 255 cases and the number of positive cases is not less than 100. The statistical results are within the acceptable range, and the clinical compliance is good.

Therefore, we conclude that the COVID-19 Antigen Detection Kit (colloidal gold) developed by Zhuhai Lituo Biotechnology Co., Ltd. has a good agreement rate with the PCR detection method, and the detection accuracy and clinical applicability can meet the clinical use requirements.

6. References

"National Clinical Inspection Operation Rules"

"Guiding Principles of Clinical Test Techniques for In Vitro Diagnostic Reagents"

"Clinical Laboratory Management and Technical Regulations"

7. Appendix

Attachment: Summary of clinical trial data of nasopharyngeal swab, oropharyngeal swab, nasal swab specimen.

Oropharyngeal swab specimen			Nasopharyngeal swab specimen			Nasal swab specimen		
Serial Number	Lituo Test Results	PCR Test Results	Serial Number	Lituo Test Results	PCR Test Results	Serial Number	Lituo Test Results	PCR Test Results
1	−	−	1	−	−	1	−	−
2	−	−	2	−	−	2	−	−
3	−	−	3	−	−	3	−	−
4	+	+	4	+	+	4	+	+
5	−	−	5	−	−	5	−	−
6	+	+	6	+	+	6	+	+
7	−	−	7	−	−	7	−	−
8	+	+	8	+	+	8	+	+
9	−	−	9	−	−	9	−	−
10	−	−	10	−	−	10	−	−
11	+	+	11	+	+	11	+	+
12	+	+	12	+	+	12	+	+
13	−	−	13	−	−	13	−	−
14	−	−	14	−	−	14	−	−
15	+	+	15	+	+	15	+	+
16	+	+	16	+	+	16	+	+
17	−	−	17	−	−	17	−	−
18	−	−	18	−	−	18	−	−
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21	−	−	21	−	−	21	−	−
22	−	−	22	−	−	22	−	−
23	+	+	23	+	+	23	+	+
24	+	+	24	+	+	24	+	+
25	−	−	25	−	−	25	−	−
26	+	+	26	+	+	26	+	+
27	−	−	27	−	−	27	−	−
28	+	+	28	+	+	28	+	+
29	−	−	29	−	−	29	−	−
30	−	−	30	−	−	30	−	−
31	−	+	31	+	+	31	−	+
32	−	−	32	−	−	32	−	−
33	+	+	33	+	+	33	+	+

34	−	−	34	−	−	34	−	−
35	+	+	35	+	+	35	+	+
36	+	+	36	+	+	36	+	+
37	−	−	37	−	−	37	−	−
38	+	+	38	+	+	38	+	+
39	+	+	39	+	+	39	+	+
40	−	−	40	−	−	40	−	−
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44	+	+	44	+	+	44	+	+
45	+	+	45	+	+	45	+	+
46	−	−	46	−	−	46	−	−
47	−	−	47	−	−	47	−	−
48	+	−	48	−	−	48	−	−
49	+	+	49	+	+	49	+	+
50	−	−	50	−	−	50	−	−
51	+	+	51	+	+	51	+	+
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71	−	−	71	−	−	71	−	−
72	−	−	72	−	−	72	−	−

73	+	+	73	+	+	73	+	+
74	+	+	74	+	+	74	+	+
75	+	+	75	+	+	75	+	+
76	+	+	76	+	+	76	+	+
77	−	−	77	−	−	77	−	−
78	−	−	78	−	−	78	−	−
79	−	−	79	−	−	79	−	−
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82	−	−	82	−	−	82	−	−
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85	−	−	85	−	−	85	−	−
86	+	+	86	+	+	86	+	+
87	+	+	87	+	+	87	+	+
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89	−	−	89	−	−	89	−	−
90	−	−	90	−	−	90	−	−
91	+	+	91	+	+	91	+	+
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98	+	+	98	+	+	98	+	+
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110	+	+	110	+	+	110	+	+
111	−	−	111	−	−	111	−	−

112	−	−	112	−	−	112	−	−
113	−	−	113	−	−	113	−	−
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220	−	−	220	−	−	220	−	−
221	−	−	221	−	−	221	−	−
222	+	+	222	+	+	222	+	+
223	+	+	223	+	+	223	+	+
224	−	−	224	−	−	224	−	−
225	+	+	225	+	+	225	+	+
226	+	+	226	+	+	226	+	+
227	−	−	227	−	−	227	−	−
228	+	+	228	+	+	228	+	+

229	+	+	229	+	+	229	+	+
230	−	−	230	−	−	230	−	−
231	+	+	231	+	+	231	+	+
232	+	+	232	+	+	232	+	+
233	+	+	233	+	+	233	+	+
234	−	−	234	−	−	234	−	−
235	−	−	235	−	−	235	−	−
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252	−	−	252	−	−	252	−	−
253	+	+	253	+	+	253	+	+
254	+	+	254	+	+	254	+	+
255	+	+	255	+	+	255	+	+

Note: "-" means negative diagnose is result; "+" means positive diagnosis result