Clinical Evaluation Report

Product Name: COVID-19 IgG/IgM Detection Kit (Colloidal Gold)
Specimen Type: Serum, Plasma, Whole blood
Version: V1.0
Date: Feb 20., 2020

Testing time: Feb to Mar, 2020.

Report version: V1.0

Date: Mar 15., 2020

Declaration of confidentiality

CONTENT

1. Intended Use

1.1 Product function

When the human body comes into contact with external antigen, the antibody IgM is produced first, followed by a large amount of antibody IgG. This kit is used for the qualitative detection of new coronavirus (COVID-19) IgG / IgM in human serum, plasma and whole blood. It is used for the auxiliary diagnosis of new coronavirus infection in clinical.

1.2 Applicable medical stage

This product can be used in both the diagnostic screening phase and the therapeutic or rehabilitation testing phase.

1.3 Main users of the product

The COVID-19 IgG / IgM detection kit is used for clinical laboratory analysis, etc .; the main goal is to screen and further analysis for COVID-19) cases for users and medical institutions or medical research testing units.

2. Research purpose

Comparing the test results against the same clinical samples between Lituo’s product and CFDA registered products to verify the safety, effectiveness and clinical equivalence of Lituo’s products.

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.

3.3 Data management and statistics

3.3.1 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.

3.3.2 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.

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

3.3.4 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

This test selects a total sample size of not less than 100 cases. The test use the reagent to be evaluated (COVID-19 IgG / IgM detection kit) and contrast reagent (2019-nCoV antibody detection kit) to test the same blood sample to evaluate whether Lituo's COVID-19 IgG / IgM detection kit meets the requirement. 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 sources

There should be corresponding clinical basic information of the samples. The selected sample plan is 100 cases, among which the samples should be no less than 50% of the positive cervical samples.

4.2.2 Specimen deletion criteria

All the selected samples have one piece of information that cannot meet the requirements of this verification.

4.2.3 Specimen exclusion criteria

The samples with no result or failure were eliminated.

4.2.4 Specimen collection and preservation

Serum (or plasma) or venous whole blood samples are collected by conventional methods, and EDTA, sodium heparin, and sodium citrate anticoagulants are recommended for plasma and whole blood.

After the samples are collected, they should be stored in the blood collection tube and

stored at 2-8 ℃ for no more than three days, otherwise it is recommended to store at -20 ℃.

1) Reagents to be evaluated：

Product name: COVID-19 IgG/IgM Detection Kit (Colloidal Gold)

Manufacturer: Zhuhai Lituo Biotechnology Co., Ltd.

Manufacturing Address: No. 35, Yongan Three Road, Hongqi Town, Jinwan District, Zhuhai, Guangdong, China.

Package: 25 Tests/Kit

Main composition:

Composition	Package
	25Tests/Kit
Detection card	25 pieces
Specimen Diluents (3ml/bottle)	1bottle
Instruction of Use	1 set

Shelf life: 12 months, storage condition: Store at 4-30℃in a dark, dry place, with a validity of 12 months. Batch number: 20200201.

2）Contrast reagent:

Product name: 2019-nCoV Antibody Detection Kit (Colloidal Gold Method)

Manufacturer: ： Innovita Biological Technology Co., Ltd.

Packing: 20 Tests/Batch

Shelf life: tentative 6 months Storage condition: 10-30 degree

Registration certificate # : National Machinery Note 202003400177

4.2.6 Statistical analysis methods of clinical research data

4.2.6.1 Data statistical analysis method

1) Evaluation indicators: specificity, sensitivity, negative compliance rate, positive compliance rate, and total compliance rate.

2) Test method: Kappa test is used.

4.2.6.2 Clinical evaluation of reagents

The clinical evaluation and statistical processing methods are used to verify that the kit to be evaluated is equivalent to the comparative reagent, thereby verifying the safety, effectiveness, and equivalence of the product with the comparative reagent.

5. Test Implementation

5.1 Specimen selection

The samples of this test are the remaining samples that already tested in the hospital, among which 70 specimens are positive and 50 specimens are negative.

5.2 Test Management

5.2.1 Data management and statistics：

5.2.1.1 Data collection:

1） Researchers must ensure that the data are true, accurate and complete.

2） Fill in the test record truly and accurately.

5.2.1.2 Statistical analysis:

Statisticians use EXCEL software to statistically process the measured data.

5.2.1.3 Data archiving:

Archive the raw data for review.

5.3 Clinical research results and analysis

5.3.1 Test results and analysis of serum samples

Test result list

Innovita	Lituo biotech		Total	Percentage
	Positive	Negative		
Positive	61	2	63	0.525
Negative	4	53	57	0.475
Total	65	55	120	
Percentage	0.542	0.458		

1）κappa Value

$$Po = \frac{\sum Aii}{N} = \frac{61+53}{120} = 0.95$$

$$Pe = \sum aibi = 0.542 \times 0.525 + 0.458 \times 0.475 = 0.502$$

$$\kappa = \frac{Po - Pe}{1 - Pe} = \frac{0.95 - 0.502}{1 - 0.502} = 0.900 > 0.8$$

κ value greater than 0.8 is highly consistent.

2）Performance evaluation index of serum

Sensitivity:

Number of cases tested positive by Lituo and PCR/ Number of positive cases detected by PCR * 100%=64/70=91.4%

Specificity:

Number of cases tested negative by lituo and PCR / Number of negative cases detected by PCR * 100%=49/50=98.0%

Positive conformity percentage:

Number of cases tested positive by Lituo and INNOVITA/ Number of positive cases detected

by Lituo=61/65=93.8%

Negative conformity percentage:

Number of cases tested negative by Lituo and INNOVITA/ Number of negative cases detected by Lituo=53/55=96.4%

5.3.2 Test results and analysis of plasma samples

Test result list

Innovita	Lituo biotech		Total	Percentage
	Positive	Negative		
Positive	60	3	63	0.525
Negative	4	53	57	0.4
Total	64	56	120	
Percentage	0.533	0.467		

1）κ Value

$$Po = \frac{\sum Aii}{N} = \frac{60+53}{120} = 0.942$$

$$Pe = \sum aibi = 0.533 \times 0.525 + 0.467 \times 0.475 = 0.502$$

$$\kappa = \frac{Po - Pe}{1 - Pe} = \frac{0.942 - 0.502}{1 - 0.502} = 0.884 > 0.8$$

κ value greater than 0.8 is highly consistent.

2）Performance evaluation index of plasma

Sensitivity:

Number of cases tested positive by lituo and PCR/ Number of positive cases detected by PCR * 100%=63/70=90.0%

Specificity:

Number of cases tested negative by lituo and PCR / Number of negative cases detected by PCR * 100%=49/50=98.0%

Positive conformity percentage:

Number of cases tested positive by Lituo and INNOVITA/ Number of positive cases detected by Lituo=60/64=93.8%

Negative conformity percentage:

Number of cases tested negative by Lituo and INNOVITA/ Number of negative cases detected by Lituo=53/56=94.6%

5.3.3 Performance evaluation index of whole blood

Test results list

Innovita	Lituo biotech		Total	Percentage
	Positive	Negative		
Positive	61	2	63	0.525
Negative	4	53	57	0.475
Total	65	55	120	
Percentage	0.542	0.458		

1）κ value

$$Po = \frac{\sum Aii}{N} = \frac{61+53}{120} = 0.95$$

$$Pe = \sum aibi = 0.542 \times 0.525 + 0.458 \times 0.475 = 0.502$$

$$\kappa = \frac{Po - Pe}{1 - Pe} = \frac{0.95 - 0.502}{1 - 0.502} = 0.900 > 0.8$$

κ value greater than 0.8 is highly consistent.

2）Performance evaluation index of whole blood

Sensitivity:

Number of cases tested positive by lituo and PCR/ Number of positive cases detected by PCR * 100%=64/70=91.4%

Specificity:

Number of cases tested negative by lituo and PCR / Number of negative cases detected by PCR * 100%=49/50=98.0%

Positive conformity percentage:

Number of cases tested positive by Lituo and INNOVITA/ Number of positive cases detected by Lituo=57/65=93.8%

Negative conformity percentage:

Number of cases tested negative by Lituo and INNOVITA/ Number of negative cases detected by Lituo=49/55=96.4%

5.3.4 Consistency analysis

Product manufacturer/ Actual frequency	Serum specimen		Plasma specimen		Whole blood specimen	
	Negative	Positive	Negative	Positive	Negative	Positive
Innovita	57	63	57	63	57	63
Lituo biotech	55	65	56	64	55	65

Specificity (Negative conformity rate)	96.4%	94.6%	96.4%
Sensitivity (Positive conformity rate)	93.8%	93.8%	93.8%
Accuracy (Total conformity rate)	95.0%	94.2%	95.0%

The total consistency of the three kind of specimen between Lituo biotech and Innovita is > 90%. κ greater than 0.8 is highly consistent. So Lituo Biotech is clinical equivalent to Chinese market launched products Innovita.

5.4 Discussion and conclusion

Through the above experiments, the clinical consistency analysis of Lituo's kit and the Chinese market launched products were performed, and the results met the requirements.

In this experiment, Lituo Biotech's COVID-19 IgG/IgM detection kit and Innotiva 2019-nCoV antibody detection kit were tested on blood specimen at the same time. The total number of samples was 120, and the proportion of positive samples is not less than 50%. The statistical results were within the acceptable range, and the clinical compliance was good.

Therefore, we conclude that COVID-19 IgG/IgM detection kit (colloidal gold) developed by Zhuhai Lituo Biotechnology Co., Ltd has a good conformity with the comparison kit and can meet the requirement of clinical use.

6. Reference

《National Clinical Laboratory Practice》
《Guidelines for clinical testing of in vitro diagnostic reagents》
《Clinical laboratory management and technical procedures》

7. Appendix

7.1 Summary of clinical trial data of serum specimens:

No.	Lituo Biotech Results		Innovita Results		PCR Results
	IgM	IgG	IgM	IgG	
1	–	–	–	–	–
2	–	–	–	–	–
3	–	–	–	–	–
4	–	–	–	–	–
5	+	–	+	–	+
6	+	+	+	+	+
7	–	–	–	–	–
8	–	+	–	+	+
9	–	–	–	–	–
10	–	–	–	–	–
11	–	–	–	–	–
12	–	–	–	–	–
13	+	+	+	+	+
14	+	+	+	+	+
15	+	–	+	+	+
16	–	+	–	+	+
17	–	–	–	–	–
18	+	+	+	+	+
19	+	–	+	–	+
20	–	–	–	–	–
21	+	+	+	+	+
22	–	–	–	–	–
23	–	–	–	–	+
24	–	–	–	–	–
25	–	–	–	–	–
26	–	–	–	–	–
27	–	–	–	–	–
28	–	–	–	–	–
29	–	–	–	–	–
30	+	+	+	+	+
31	+	+	+	+	+
32	+	–	–	–	+
33	+	+	+	+	+
34	–	–	–	+	+
35	+	+	+	+	+
36	+	–	+	–	+
37	–	+	–	+	+
38	–	–	–	–	–
39	–	–	–	–	–
40	–	–	–	–	–

41	–	–	–	–	–
42	–	–	–	–	–
43	–	–	–	–	+
44	+	+	+	+	+
45	+	–	+	+	+
46	+	+	+	+	+
47	+	–	–	–	+
48	–	+	–	+	+
49	+	+	+	+	+
50	+	+	+	+	+
51	+	+	+	+	+
52	+	+	+	+	+
53	+	–	+	–	+
54	+	+	+	+	+
55	+	+	+	+	+
56	–	+	–	+	+
57	–	–	–	–	–
58	–	–	–	–	–
59	–	–	–	–	–
60	–	–	–	–	+
61	–	–	–	–	–
62	–	–	–	–	–
63	+	–	+	–	+
64	–	–	–	–	–
65	–	–	–	–	–
66	–	–	–	–	–
67	+	+	+	+	+
68	+	+	+	+	+
69	+	+	+	+	+
70	+	+	+	+	+
71	+	+	+	+	+
72	–	–	–	+	+
73	–	–	–	–	–
74	–	–	–	–	–
75	–	–	–	–	–
76	+	+	+	+	+
77	–	+	–	–	+
78	–	–	–	–	–
79	–	–	–	–	+
80	–	–	–	–	–
81	–	–	–	–	–
82	+	+	+	+	+

83	+	+	+	+	+
84	–	–	–	–	–
85	–	–	–	–	–
86	+	+	+	+	+
87	–	+	-	+	+
88	+	+	+	–	+
89	–	–	–	–	–
90	–	+	-	+	+
91	–	–	–	–	–
92	+	+	+	+	+
93	–	–	–	–	–
94	+	+	+	+	+
95	+	+	+	+	+
96	–	–	–	–	–
97	–	+	–	+	+
98	+	+	+	+	+
99	+	–	+	–	+
100	+	+	+	+	+
101	+	+	+	+	+
102	+	–	+	–	+
103	+	+	+	+	+
104	–	–	–	–	–
105	–	+	–	+	+
106	+	+	+	+	+
107	+	–	+	–	+
108	–	–	–	–	–
109	+	+	+	+	+
110	+	+	+	+	+
111	–	–	–	–	–
112	+	+	+	+	+
113	–	–	–	–	–
114	–	–	–	–	–
115	+	+	+	+	+
116	–	+	–	+	+
117	–	+	–	–	–
118	–	–	–	–	–
119	+	+	+	+	+
120	+	+	+	+	+

Remarks：“-” indicates a negative diagnosis, “+” indicates a positive diagnosis.

7.2 Summary of clinical trial data of plasma specimens:

No.	Lituo Biotech Results		Innovita Restuls		PCR Results
	IgM	IgG	IgM	IgG	
1	–	–	–	–	–
2	–	–	–	–	–
3	–	–	–	–	–
4	–	–	–	–	–
5	+	–	+	–	+
6	+	+	+	+	+
7	–	–	–	–	–
8	–	+	–	+	+
9	–	–	–	–	–
10	–	–	–	–	–
11	–	–	–	–	–
12	–	–	–	–	–
13	+	+	+	+	+
14	+	+	+	+	+
15	+	–	+	+	+
16	–	+	–	+	+
17	–	–	–	–	–
18	+	+	+	+	+
19	+	–	+	–	+
20	–	–	–	–	–
21	+	+	+	+	+
22	–	–	–	–	–
23	–	–	–	–	+
24	–	–	–	–	–
25	–	–	–	–	–
26	–	–	–	–	–
27	–	–	–	–	–
28	–	–	–	–	–
29	–	–	–	–	–
30	+	+	+	+	+
31	+	+	+	+	+
32	+	–	–	–	+
33	+	+	+	+	+
34	–	–	–	+	+
35	+	+	+	+	+
36	+	–	+	–	+
37	–	+	–	+	+
38	–	–	–	–	–
39	–	–	–	–	–
40	–	–	–	–	–

41	–	–	–	–	–
42	–	–	–	–	–
43	–	–	–	–	+
44	+	+	+	+	+
45	+	–	+	+	+
46	+	+	+	+	+
47	+	–	–	–	+
48	–	+	–	+	+
49	+	+	+	+	+
50	+	+	+	+	+
51	+	+	+	+	+
52	+	+	+	+	+
53	+	–	+	–	+
54	+	+	+	+	+
55	+	+	+	+	+
56	–	+	–	+	+
57	–	–	–	–	–
58	–	–	–	–	–
59	–	–	–	–	–
60	–	–	–	–	+
61	–	–	–	–	–
62	–	–	–	–	–
63	+	–	+	–	+
64	–	–	–	–	–
65	–	–	–	–	–
66	–	–	–	–	–
67	+	+	+	+	+
68	+	+	+	+	+
69	+	+	+	+	+
70	+	+	+	+	+
71	+	+	+	+	+
72	–	–	–	+	+
73	–	–	–	–	–
74	–	–	–	–	–
75	–	–	–	–	–
76	+	+	+	+	+
77	–	+	–	–	+
78	–	–	–	–	–
79	–	–	–	–	+
80	–	–	–	–	–
81	–	–	–	–	–
82	+	+	+	+	+

83	+	+	+	+	+
84	–	–	–	–	–
85	–	–	–	–	–
86	+	+	+	+	+
87	–	+	-	+	+
88	+	+	+	–	+
89	–	–	–	–	–
90	–	+	-	+	+
91	–	–	–	–	–
92	+	+	+	+	+
93	–	–	–	–	–
94	+	+	+	+	+
95	+	+	+	+	+
96	–	–	–	–	–
97	–	–	–	+	+
98	+	+	+	+	+
99	+	–	+	–	+
100	+	+	+	+	+
101	+	+	+	+	+
102	+	–	+	–	+
103	+	+	+	+	+
104	–	–	–	–	–
105	–	+	–	+	+
106	+	+	+	+	+
107	+	–	+	–	+
108	–	–	–	–	–
109	+	+	+	+	+
110	+	+	+	+	+
111	–	–	–	–	–
112	+	+	+	+	+
113	–	–	–	–	–
114	–	–	–	–	–
115	+	+	+	+	+
116	–	+	–	+	+
117	–	+	–	–	–
118	–	–	–	–	–
119	+	+	+	+	+
120	+	+	+	+	+

Remarks：“-” indicates a negative diagnosis, “+” indicates a positive diagnosis.

7.3 Summary of clinical trial data of whole blood specimens:

No.	Lituo Biotech Results		Innovita Results		PCR Results
	IgM	IgG	IgM	IgG	
1	–	–	–	–	–
2	–	–	–	–	–
3	–	–	–	–	–
4	–	–	–	–	–
5	+	–	+	–	+
6	+	+	+	+	+
7	–	–	–	–	–
8	–	+	–	+	+
9	–	–	–	–	–
10	–	–	–	–	–
11	–	–	–	–	–
12	–	–	–	–	–
13	+	+	+	+	+
14	+	+	+	+	+
15	+	–	+	+	+
16	–	+	–	+	+
17	–	–	–	–	–
18	+	+	+	+	+
19	+	–	+	–	+
20	–	–	–	–	–
21	+	+	+	+	+
22	–	–	–	–	–
23	–	–	–	–	+
24	–	–	–	–	–
25	–	–	–	–	–
26	–	–	–	–	–
27	–	–	–	–	–
28	–	–	–	–	–
29	–	–	–	–	–
30	+	+	+	+	+
31	+	+	+	+	+
32	+	–	–	–	+
33	+	+	+	+	+
34	–	–	–	+	+
35	+	+	+	+	+
36	+	–	+	–	+
37	–	+	–	+	+
38	–	–	–	–	–

39	–	–	–	–	–
40	–	–	–	–	–
41	–	–	–	–	–
42	–	–	–	–	–
43	–	–	–	–	+
44	+	+	+	+	+
45	+	–	+	+	+
46	+	+	+	+	+
47	+	–	–	–	+
48	–	+	–	+	+
49	+	+	+	+	+
50	+	+	+	+	+
51	+	+	+	+	+
52	+	+	+	+	+
53	+	–	+	–	+
54	+	+	+	+	+
55	+	+	+	+	+
56	–	+	–	+	+
57	–	–	–	–	–
58	–	–	–	–	–
59	–	–	–	–	–
60	–	–	–	–	+
61	–	–	–	–	–
62	–	–	–	–	–
63	+	–	+	–	+
64	–	–	–	–	–
65	–	–	–	–	–
66	–	–	–	–	–
67	+	+	+	+	+
68	+	+	+	+	+
69	+	+	+	+	+
70	+	+	+	+	+
71	+	+	+	+	+
72	–	–	–	+	+
73	–	–	–	–	–
74	–	–	–	–	–
75	–	–	–	–	–
76	+	+	+	+	+
77	–	+	–	–	+
78	–	–	–	–	–
79	–	–	–	–	+
80	–	–	–	–	–

81	–	–	–	–	–
82	+	+	+	+	+
83	+	+	+	+	+
84	–	–	–	–	–
85	–	–	–	–	–
86	+	+	+	+	+
87	–	+	-	+	+
88	+	+	+	–	+
89	–	–	–	–	–
90	–	+	-	+	+
91	–	–	–	–	–
92	+	+	+	+	+
93	–	–	–	–	–
94	+	+	+	+	+
95	+	+	+	+	+
96	–	–	–	–	–
97	–	+	–	+	+
98	+	+	+	+	+
99	+	–	+	–	+
100	+	+	+	+	+
101	+	+	+	+	+
102	+	–	+	–	+
103	+	+	+	+	+
104	–	–	–	–	–
105	–	+	–	+	+
106	+	+	+	+	+
107	+	–	+	–	+
108	–	–	–	–	–
109	+	+	+	+	+
110	+	+	+	+	+
111	–	–	–	–	–
112	+	+	+	+	+
113	–	–	–	–	–
114	–	–	–	–	–
115	+	+	+	+	+
116	–	+	–	+	+
117	–	+	–	–	–
118	–	–	–	–	–
119	+	+	+	+	+
120	+	+	+	+	+

Remarks：“-” indicates a negative diagnosis, “+” indicates a positive diagnosis.