Clinical Validation Report on IVD Kits

Product Name: SARS-CoV-2 Antibody Test Kit (GICA)

Model and Specifications: 20 tests/kit, packed independently

Type of Clinical Tests: clinical validation

Date of Commence of Clinical Tests: February 14, 2020

Date of Completion of Clinical Tests: February 18, 2020

Validated by: Beijing Aipuyi Medical Inspection Center

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Date: 2021.10.17 13:20:19 EEST
Reason: MoldSign Signature
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Abstract of Research

To evaluate clinical applications of the SARS-CoV-2 (COVID-19) antibody test kit (GICA) produced by Beijing Lepu Medical Technology Co., Ltd. to in-vitro qualitative tests on the content of the SARS-CoV-2 antibody in clinical samples (serum/plasma), a clinical research has been made by Beijing Aipuyi Medical Inspection Center for this test strip. In total, 220 serum samples were selected from clinical ones as the objects of research, with the 2019-nCoV antibody test kit (colloidal-gold) produced by Innovita (Tangshan) Biotechnology Co., Ltd. as a reference product. The objects of research were classified into the positive group and the negative group by comparing test results of these products. Meanwhile, these samples were tested via a test card, to compare the test results of the product tested and those of the reference product, with statistical analysis being made. The coincidence rate of positive/negative and the total coincidence rate of both products were proven higher than 90% in comparison, indicating favorable consistency with the reference product. In the analysis results of Kappa inspection, Kappa was proven >0.8, indicating favorable and high consistency of both methods. Both systems were proven equivalent. The product tested is applicable to auxiliary clinical diagnosis.

I Foreword

As a large family of virus, coronavirus is a single plus strand RNA virus featured by envelopes. As known to us, such virus can trigger major diseases such as cold, Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). SARS-CoV-2 was identified in the cases of viral pneumonia in Wuhan, 2019 and was named officially by WHO on January 12, 2020. As a core protein of SARS-CoV-2, N protein (Nucleocapsid) is a component inside the virus, and is relatively conservative among category-β coronaviruses and is a common tool for diagnosis on coronaviruses. As a key receptor for SARS-CoV-2's entry in the cell, ACE2 is of great significance for research on the virus infection mechanism.

The R&D work concerning the SARS-CoV-2 antibody test kit (GICA) of the Company has been accomplished. To validate the applicability and accuracy of such test strip on clinical applications, clinical validation is carried out. Beijing Aipuyi Medical Inspection Center was entrusted by Beijing Lepu Medical Technology Co., Ltd. with clinical tests of the SARS-CoV-2 antibody test kit (GICA) produced by it. In total, 220 samples were involved in this clinical research.

II Purpose of Research

To validate the applicability and accuracy of the SARS-CoV-2 antibody test kit (GICA) produced by Beijing Lepu Medical Technology Co., Ltd. in clinical applications, a systematic research is required for its clinical properties.

The purpose of research of this clinical test is: calculate the consistency percentage of negative/positive and the total consistency percentage and the Kappa coefficient by making statistics of and analyzing test results through comparative experimental research for the followings for the same clinical sample: the SARS-CoV-2 antibody test kit (GICA) produced by Beijing Lepu Medical Technology Co., Ltd., the product tested, and the 2019-nCoV antibody test kit (colloidal-gold) (registration certificate No.: GXZZ 20203400177) produced by Innovita (Tangshan) Biotechnology Co., Ltd., a reference product. The equivalence between the product tested and the reference product is verified according to the results of statistical analysis, so as to validate the applicability and accuracy of the product tested in auxiliary clinical diagnosis.

The results of this clinical test are important basis for evaluating the effectiveness and safety of the product tested.

III Test Management

1. General introduction to the management structure

This clinical test was undertaken by the clinical unit of Beijing Aipuyi Medical Inspection Center. As the applicant, Beijing Aipuyi Medical Inspection Center is responsible for communications in clinical tests.

2. Quality control in the lab

1) All those engaged in research on clinical tests are proven eligible through qualification examinations and have professional background and capabilities required for clinical tests. All such personnel have been trained before such tests, acquiring comprehensive understanding for the protocol of such tests and specifics of various indexes.

2) As for quality control in the lab, the requirements for quality control specified by the laboratory departments shall be followed, to guarantee standardized test operations.

3) Pre-analysis quality control: the process of sample collection and treatment shall be checked to see whether relevant requirements are met, and whether information such as sample number is correct.

4) The progress and completions of clinical tests shall be regularly checked. Besides, the completeness and accuracy of the information concerning clinical samples shall be checked, and the test results shall be verified.

3. Statistics and data management

1) All the cases included shall be included in the summary on clinical results, and the sample number, age and gender of the subjects shall be recorded in the table. The test personnel will complete the test results of both the reference product and the product tested in the summary on clinical results.

2) The main researchers, test personnel and the sponsor shall review the data jointly upon completion of data entry, and such data shall be locked if without any doubt.

3) The summary on clinical results shall be submitted to those engaged in statistical analysis. The results of statistical analysis obtained shall be included in corresponding part of the clinical report.

4. Storage of materials

The materials related to clinical tests shall be reserved by the test unit and the applicant (one copy each), including the following materials:

The protocol/scheme of clinical tests, the report of clinical tests and the summary on clinical results.

5. Problems identified in research and countermeasures

In clinical tests, the test results of the reference sample and the tested sample are different for a small number of samples. In this case, the qualitative clinical data of such sample shall be adopted or other common test strips clinically produced of the same principle shall be used for repetitive tests.

IV Test Design

1. Overall design of tests and description of the scheme

A proper object of research shall be selected by reference to the *Technical Guidelines for Clinical Research of IVD Kit*. The SARS-CoV-2 antibody test kit (GICA) whose marketing is

approved is adopted as the reference reagent for synchronous comparison through the blind method. The consistency percentage of positive/negative and the total consistency percentage and the Kappa coefficient of the product and the reference reagent shall be analyzed.

Test scheme: 220 cases of serum are selected as the objects of research from clinical cases. The sample is classified into the positive group and the negative group as per the test results of the reference product. Meanwhile, the sample shall be tested via the qualitative test strip tested and the reference one and then the test results of the product tested and the reference product shall be compared, with statistical analysis being made. The consistency percentage of negative/positive and the total consistency percentage and the Kappa coefficient shall be calculated and the applicability and accuracy of the product tested for clinical diagnosis shall be judged based on this. The consistency in diagnosis in test results of the product and the reference product shall be judged through Kappa inspection and analysis. Moreover, the consistency in test results of the serum sample of Beijing Lepu Medical Technology Co. shall be analyzed, and the Kappa coefficient shall be calculated.

2. research methods

1) Collection, saving and transportation methods of sample

The specimen collected shall be used up immediately. Long-term storage of the specimen under room temperature is not allowed. The serum shall be separated out as soon as possible, to avoid hemolysis. The specimen subjected to hemolysis cannot be used any more. The serum/plasma specimen can be saved for three days at 2-8°C. It shall be frozen (-20°C) if long-term storage is required. Repeated freezing and thawing shall be avoided.

3) Determination of the reference methods

The 2019-nCoV antibody test kit (colloidal-gold) (registration certificate No.: GXZZ 20203400177) produced by Innovita (Tangshan) Biotechnology Co., Ltd. is one of the earliest products testing 2019-nCoV antibody whose marketing is approved in China. Such kit is the product adopting the same test (GICA) method as the SARS-CoV-2 antibody test kit (GICA) produced by Beijing Lepu Medical Technology Co., Ltd. and is widely applied clinically. It is generally believed that such kit has superior quality. The purpose and scope of clinical applications of such product are the same as the product tested. Therefore, such product is selected as one of the reference reagents for clinical research.

The sample with inconsistent determination results for the group tested and the reference group in comparative experimental research can be verified through the quantitative clinical results and clinical diagnostic results.

4) Name, specifications, source, batch number, period of validity and storage conditions of all products for clinical research

The name of the product for clinical research is the SARS-CoV-2 antibody test kit (GICA) (10 tests/kit). Such product is provided by Beijing Lepu Medical Technology Co., Ltd. and the batch number is 20CG2501X. Its period of validity is 12 months and the storage condition is 4°C~30°C.

The reference test strip is the 2019-nCoV antibody test kit (colloidal-gold) (20 tests/kit) produced by Innovita (Tangshan) Biotechnology Co., Ltd. and the period of validity is 6 months. The storage condition is 10°C~30°C.

5) Quality control methods

The progress and completions of clinical tests shall be regularly checked. Besides, the completeness and accuracy of the information concerning clinical samples shall be checked, and the test results shall be verified.

6) Methods of clinical tests

All samples of the subjects shall be subject to determination by the reference test strip and the product tested synchronously and respectively, and then the determination results of both shall be compared. The test results of the product tested recorded shall be subject to statistical analysis with those of the reference product upon completion of determination of all clinical samples, to calculate the consistency percentage of negative/positive and the total consistency percentage. Afterwards, equivalence of both shall be evaluated as per these statistical indexes.

7) Methods of statistical analysis of clinical research data

A Methods evaluating clinical performance

Whether various indexes can reach the standards of clinical evaluation shall be judged by calculating the consistency percentage of negative/positive and the total consistency percentage in the test results of the product tested and the reference product, to validate the accuracy and applicability of the product in clinical applications. The product tested shall be subject to tests through the sample of different types, with statistics on the results. Meanwhile, different types of sample of the subjects shall be subject to determination by the product tested synchronously, and then the determination results of both shall be compared. The test results recorded shall be subject to statistical analysis upon completion of determination of all clinical samples, to calculate the consistency percentage of negative/positive and the total consistency percentage. Afterwards, equivalence of both shall be evaluated as per these statistical indexes.

B Statistical methods

The products launched on the market shall be subject to comparative study and evaluation: Kappa inspection: each sample shall be tested with the product tested and the reference product respectively, and then the consistency in statistical results of these two inspection methods shall be compared through Kappa inspection.

The data shall be subject to Kappa inspection and analysis and the Kappa coefficient shall be calculated. Favorable consistency can be proven if Kappa is ≥0.8. The consistency in test results of the product tested and the reference product is evaluated as per the evaluation standards.

8) Standards of clinical evaluation

The coincidence rate shall be calculated by comparing with the reference product whose marketing is approved. The product performance shall meet the following requirements:

1) Coincidence rate of negative: the sample whose test results are negative for both the product tested and the reference product and the proportion in the sample whose test results are negative for the reference product shall be more than 90%.

2) Coincidence rate of positive: the sample whose test results are positive for both the product tested and the reference product and the proportion in the sample whose test results are positive for the reference product shall be more than 90%.

3) Total coincidence rate: the sample whose test results are the same for the product tested and the reference product and its proportion in the total number of sample shall be more than 90%.

		Reference System Positive	Negative	Total
Test System	Positive	a	b	a+b
	Negative	c	d	c+d
Total		a+c	b+d	a+b+c+d

In general, the formula calculating the coincidence rate of positive/negative is:

Coincidence rate of positive =a/(a+c)*100%

Coincidence rate of negative =d/(b+d)*100%

Total coincidence rate =(a+d)/(a+c+b+d)*100%

If the coincidence rate of positive/negative can meet clinical requirements, two methods or products are considered as equivalent; if the coincidence rate of positive/negative is greatly different, the clinical scheme shall be re-designed.

4) Kappa consistency analysis shall be adopted for statistical analysis of similar reference kits:

The results of the product tested are statistical materials and can be analyzed as per the table below:

		Reference System Positive	Negative	Total
Test System	Positive	a	b	a+b
	Negative	c	d	c+d
Total		a+c	b+d	a+b+c+d

If conducting Kappa consistency analysis for the base data above, high consistency can be judged if the Kappa coefficient is >0.8, and both systems are considered as equivalent. Consistency is considered if 0.4<Kappa coefficient <0.8, and the coincidence rate of positive/negative shall be compared, with statistical analysis being made. Two such systems are considered as inconsistent and inequivalent if the Kappa coefficient is <0.4.

9) Modification to the scheme during research

N/A

V Results and Analysis of Clinical Tests

In total, 220 test samples (125 for male and 95 for female) are included for the unit and all test samples included are tested. Statistics on test results and those of the product tested are as follows:

Table 1: Statistics on Serum IgG Test Results of the Product Tested and the Reference Product

	Positive Reference Product	Negative Reference Product	Total
Positive product tested	92	1	93
Negative product tested	0	127	127
Total	92	128	220

Item	Formula	Results	95%-L	95%-H
Coincidence rate of negative (%)	a/(a+c)*100%	100.00%	100.00%	100.00%
Coincidence rate of positive (%)	d/(b+d)*100%	99.22%	98.06%	99.88%
Total coincidence rate (%)	(a+d)/(a+b+c+d)*100%	99.55%	98.66%	100.18%
Theoretical coincidence rate Pe:	[(a+b)(a+c)+(c+d)(b+d)]/(a+b+c+d)^2	0.620		
Kappa	(PA-Pe)/(1-Pe)	0.988		

According to Table 1, among the 93 samples of the positive group, 92 are proven positive in the test results of the product tested, and 1 is proven negative. Among the 127 samples of the negative group, 127 are proven negative in the test results of the product tested and 0 is proven positive. Both the coincidence rate of positive/negative and the total coincidence rate are more than 90%, indicating favorable consistency with the reference product. According to the table, the Kappa coefficient = 0.988 (>0.8) in the results of Kappa inspection and analysis, indicating favorable and high consistency of two methods and equivalence of two such systems.

Table 2: Statistics on Serum IgM Test Results of the Product Tested and the Reference Product

	Positive Reference Product	Negative Reference Product	Total
Positive product tested	71	0	71
Negative product tested	2	147	149

Total	73	147	220

Item	Formula	Results	95%-L	95%-H
Coincidence rate of negative (%)	a/(a+c)*100%	97.22%	95.05%	97.92%
Coincidence rate of positive (%)	d/(b+d)*100%	100.00%	100.00%	100.00%
Total coincidence rate (%)	(a+d)/(a+b+c+d)*100%	99.09%	97.83%	99.76%
Theoretical coincidence rate Pe:	[(a+b)(a+c)+(c+d)(b+d)]/(a+b+c+d)^2	0.524		
Kappa	(PA-Pe)/(1-Pe)	0.981		

According to Table 2, among the 71 samples of the positive group, 71 are proven positive in the test results of the product tested, and 0 is proven negative. Among the 149 samples of the negative group, 147 are proven negative in the test results of the product tested and 2 are proven positive. Both the coincidence rate of positive/negative and the total coincidence rate are more than 90%, indicating favorable consistency with the reference product. According to the table, the Kappa coefficient = 0.981 (>0.8) in the results of Kappa inspection and analysis, indicating favorable and high consistency of two methods and equivalence of two such systems.

1. Analysis on Inconsistency in Test Results

S/N	Gender	Age	Product Tested	Reference Product	Clinical Diagnosis
46	Male	57	IgG (+) IgM (-)	IgG (+) IgM (+)	Subsequent visit of pneumonia triggered by COVID-19
62	Male	81	IgG (+) IgM (-)	IgG (+) IgM (+)	Subsequent visit of pneumonia triggered by COVID-19
114	F	70	IgG (+) IgM (-)	IgG (-) IgM (-)	Non-pneumonia triggered by COVID-19

For those subjected to subsequent visit, IgM in the blood may be degraded and IgG definite diagnosis is more effective.

VI Discussion and Conclusions

(I) Discussion

The SARS-CoV-2 antibody test card produced by Beijing Lepu Medical Technology Co., Ltd. contains the SARS-CoV-2 recombinant protein (colloidal-gold signs) enveloped on the gold-labeled pad in advance as well as the mouse-anti-human IgG antibody fixed into the test

zone G and the mouse-anti-human IgM antibody fixed into the test zone M and corresponding antibody in the quality control area (C). It can be used for rapid tests on the SARS-CoV-2 antibody in the serum/plasma specimen as well as auxiliary clinical screening of those suffering from pneumonia triggered by COVID-19. This clinical test aims at evaluating the clinical properties of such product. The test conditions are concluded as follows:

A Results of comparative analysis of the product tested and the reference product:

Test results of the serum sample of the product tested and the reference product: both the coincidence rate of negative/positive and the total coincidence rate are larger than 90%, indicating favorable consistency with the reference product. In the analysis results of Kappa inspection, Kappa was proven >0.8, indicating favorable and high consistency of both methods. Both systems were proven equivalent.

B Statistical analysis results of the product tested for different types of clinical sample

While testing the SARS-CoV-2 antibody through the product tested for different types of clinical sample, the consistency percentages of negative/positive are 100.0% and the total consistency percentage is 100.0%. The Kappa coefficient = 1.00 (>0.8) in the results of Kappa inspection and analysis, indicating favorable and complete consistency of two methods and equivalence of two such systems.

(II) Test conclusions

By analyzing the test results of the product tested and the reference product, the consistency percentage of negative/positive and the total consistency percentage are proven high. Moreover, according to the results of statistical analysis, there is no remarkable difference in test results of both, indicating favorable consistency in diagnosis and equivalence of two such systems. Meanwhile, the test results of the product tested for the serum and plasma sample of the same patient are completely identical. Therefore, such product is applicable to qualitative clinical analysis on the SARS-CoV-2 antibody in the serum and plasma sample of humans, and can be used for auxiliary diagnosis of those suffering from pneumonia triggered by COVID-19.

VI Special Notes of Clinical Research

N/A

Annex I: Instructions of the Diagnostic Kit for Clinical Tests

I Instructions for the Product Tested

SARS-CoV-2 Antibody Test (colloidal gold immunochromatography)

【Product name】

SARS-CoV-2 Antibody Test (colloidal gold immunochromatography)

【Model】

One test per bag for one person, 20 tests/kit

【Intended Use】

The product is intended for the qualitative detection of antibody content against SARS-CoV-2 in clinical samples (serum/plasma/whole blood).

【Summary】

Coronavirus, as a large virus family, is a single positive stranded RNA virus with envelope. The virus is known to cause major illnesses such as colds, Middle East Respiratory Syndrome (MERS), and Severe Acute Respiratory Syndrome (SARS). The novel virus, now known as SARS-CoV-2, was discovered in Wuhan virus pneumonia cases in 2019, and was officially named by the World Health Organization on January 12, 2020. The core protein of SARS-CoV-2 is the N protein (nucleocapsid), which is a protein component located inside the virus. It is relatively conserved among β-coronaviruses and is often used as a tool for the diagnosis of coronaviruses. ACE2, as a key receptor for SARS-CoV-2 to enter cells, is of great significance for the research of viral infection mechanism.

【Measurement Principle】

The product is based on the principle of antigen-antibody reaction and immunoassay technique. The test device contains colloidal gold labeled SARS-CoV-2 recombinant protein, mouse-anti human IgG antibody immobilized in G test area, mouse-anti human IgM antibody immobilized in M test area and the corresponding antibody in quality control area (C).

During the test, when the SARS-CoV-2 IgM antibody level in the sample is at or above the limit of detection of the test, the SARS-CoV-2 IgM antibody in the sample binds to the colloidal gold labeled SARS-CoV-2 recombinant protein which is pre-coated on a gold label pad. The conjugates migrate upward through capillary effect and would be captured by mouse-anti human IgM antibody immobilized in M test area subsequently and this produces a purple-red band appears in the M test area. When the SARS-CoV-2 IgG antibody level in the sample is at or above the limit of detection of the test, the SARS-CoV-2 IgG antibody in the sample binds to the colloidal gold labeled SARS-CoV-2 recombinant protein which is pre-coated on a gold label pad. The conjugates migrate upward through capillary effect and would be captured by mouse-anti human IgG antibody immobilized in G test area subsequently and this produces a purple-red band appears in the G test area. If it is a negative sample, there is not a purple-red band appeared in the M and G test area. Regardless of the presence or absence of the SARS-CoV-2 antibody in the sample, a purple-red band will appear in the quality control area (C). The purple-red band in the quality control area (C) is a criterion for judging whether there is enough sample and whether the chromatography process is normal. It also serves as the internal control standard for reagents.

【Components】

The product contains 20 tests, one IFU (instruction for use) and one lot number card.

For each test, it contains one testing strip, one dropper and one package of desiccant.

The testing strip is composed of one gold standard mat (colloidal gold labeled SARS-CoV-2 recombinant protein), sample mat, cellulose nitrate membrane (Mouse-anti human IgM antibody immobilized in M area, Mouse-anti human IgG antibody immobilized in G area; Goat anti-mouse antibody immobilized in C area), absorbing paper, plastic carrier board.

【Storage and Stability】

It should be stored at 4℃~ 30℃, be kept dry and away from sunlight. The shelf life is 12 months.

For per test strip, it should be used within 1 hour after unsealing.

Production Date and Expiration date are shown in the package label.

【Sample Requirements】

The test strip can be performed with serum/plasma/whole blood.

The blood should be collected by professional medical staff, and it is advised of detecting serum/plasma in priority, and under emergency conditions or special conditions, the whole blood of patients can be used for rapid testing.

After collection of samples, it should be tested immediately. It is forbidden for long time placement of the sample under room temperature. For whole blood sample, if it can not be tested in time, it can preserve for 24 hours between 2 and 8℃. Serum/plasma samples can be preserved for 3 days under temperature between 2 and 8℃, and for long time storage, they should be stored under -20℃, and it should avoided repeated freeze-thaw cycles.

Before testing, the sample must be restored to room temperature, ready for application only after homogeneity.

The sample must be returned to room temperature before testing, and should be used after mixing.

Do not use samples with severe hemolysis, severe lipids, and jaundice.

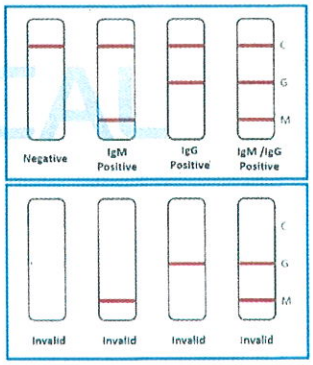
【Test Method】

Please read the instruction for use carefully before performing the test. Before testing, restore the reagents and blood sample to room temperature.

1. Remove the test strip from the packaging reagent bag and use it within 1 hour, especially in an environment with room temperature higher than 30 ° C or in high humidity.
2. Place the kit on a clean platform.
   - Serum or plasma sample: Add 10 uL of serum or plasma sample to well A, and then add two drops (about 80 uL) of sample dilution to well B, and start timing.
   - Whole blood sample: Add 20 uL of whole blood sample to sample well A, and then add two drops (about 80 uL) of sample dilution to sample well B, and start timing.
3. Wait for the fuchsia band to appear. The test results should be read within 10-20 minutes. Do not read the results after 20 minutes.

【The Explanation of the Testing Results】

- Positive (+): There appear purple stripes in both quality control area and either area M or G.
- Negative (-): There is only one purple stripe in the quality control area (C), and without purple stripe in either test area M and test area G.
- Invalid: There is no purple stripe in the quality control area (C), indicating incorrect operating procedures or the testing strip has already deteriorated. Under this conditions, it must read the instruction for use again carefully, and then use the new test strips to test again. If the problem still exists, stop using this lot number immediately and contact the local suppliers.



C: Quality Control Line M: IgM Detection line G: IgG Detection line

【Limitation of Procedure】

1. The test results of this product should be comprehensively judged by the physician in combination with other clinical information, and should not be used as the only criterion;
2. The product is used to test the SARS-CoV-2 antibody of the tested sample.

【Product Performance Index】

1 Physical Property

1.1 Appearance

The test card should be clean and integral, no burrs, no damage, no pollution; the material should be firmly attached; the label should be clear and not damaged. The sample buffer should be clear without impurities and flocs.

1.2 Liquid migration speed

The liquid migration speed should be no less than 10mm/min.

1.3 Membrane Strip Width

The membrane strip width of the testing strip should be≥2.5mm.

1.4 Sample buffer volume

The sample buffer volume should be no less than the indicated value.

2 Detection Limit

For the detection of sensitivity reference material, the positive detection rate should be no less than 90%.

3 Negative reference products compliance rate

For the detection of negative reference material, the negative detection rate should be 100%.

4 Positive reference products compliance rate

For the detection of positive reference material, the positive detection rate should be 100%.

5 Precision

For the detection of enterprise reference material P2 and P4, the results should all be positive and the color rendering should be uniform.

6 Analysis Specificity

6.1 Cross-reactivity: This test device has no cross reactivity with endemic human coronavirus OC43 antibody, influenza A virus antibody, influenza B virus antibody, respiratory syncytial virus antibody, adenovirus antibody, EB virus antibody, measles virus antibody, cytomegalovirus antibody, rotavirus antibody, norovirus antibody, mumps virus antibody, varicella-zoster virus antibody, and mycoplasma pneumoniae antibody.

6.2 Interfering substances:

The test results do not be interfered with the substance at the following concentration:

bilirubin concentration ≤250 μ mol/l; triglycerides concentration≤15 mmol/l; hemoglobin concentration ≤10 g/dL; rheumatoid factor concentration≤80RU/ml; anti-mitochondrial antibody concentration≤80 U/mL; antinuclear antibody concentration ≤80U/mL; the total IgG concentration ≤14g/L.

The test results do not be influenced by the following substance: α -interferon, zanamivir, ribavirin, oseltamivir, and paramivir, Lopinavir, ritonavir, abidol, levofloxacin, azithromycin, ceftriaxone, meropenem, tobramycin, histamine hydrochloride, phenylephrine, oxymetazoline, sodium chloride (containing Preservatives), beclomethasone, dexamethasone, flunisolide, triamcinolone, budesonide, mometasone and fluticasone.

【Precautions】

1. The test device is to be used as an aid in the diagnosis of SARS-Cov-2. Do not use expired products.
2. Do not freeze or use after the expiration date (see the packaging for the expiration date).
3. Avoid excessive temperature and humidity in the experimental environment. The reaction temperature should be 15-30 ° C and the humidity should be below 70%.
4. The package bag contains desiccant, and it should not be taking orally.
5. It is recommended to use fresh blood for the sample collection. It is not recommended to use high-fat chyle, jaundice, and high rheumatoid factor samples. Do not use hemolyzed samples.
6. When testing, please wear protective clothing, gloves and eye shields.
7. Do not use the test card with broken single packaging, unclear marks, and past the expiration date.
8. Dispose of used specimens, test cards and other waste in accordance with relevant local laws and regulations.

【Explanation of Symbols】

	DO NOT USE IF PACKAGE IS DAMAGED		CONSULT INSTRUCTIONS FOR USE
	DO NOT REUSE		EXPIRY DATE
	TEMPERATURE LIMIT		DATE OF MANUFACTURER
	MANUFACTURER		BATCH CODE
	KEEP AWAY FROM SUNLIGHT		KEEP DRY
	*IN VITRO* DIAGNOSTIC MEDICAL DEVICE		CE MARK
	AUTHORIZED REPRESENTATIVE IN THE EUROPEAN		

【References】

[1] Aiping Wu, Yousong Peng, Baoying Huang, Xiao Ding, Xianyue Wang, Genome Composition and Divergence of the Novel Coronavirus (SARS-CoV-2) Originating in China. Cell Host & Microbe 27, March 11, 2020

[2] Diagnostic and Treatment Protocol for COVID-19 (Provisional 5th Edition, Amendment Edition). 2020.2.8.

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Version number:

Annex II: Data of Clinical Tests

I Serum

Sample No.	Gender	Age	Product Tested Test Results	Reference Product Test Results
1	F	45	IgG (+) IgM (+)	IgG (+) IgM (+)
2	M	66	IgG (+) IgM (-)	IgG (+) IgM (-)
3	M	36	IgG (+) IgM (+)	IgG (+) IgM (+)
4	F	44	IgG (-) IgM (-)	IgG (-) IgM (-)
5	F	54	IgG (+) IgM (+)	IgG (+) IgM (+)
6	M	65	IgG (+) IgM (-)	IgG (+) IgM (-)
7	M	69	IgG (+) IgM (+)	IgG (+) IgM (+)
8	M	74	IgG (-) IgM (-)	IgG (-) IgM (-)
9	F	25	IgG (+) IgM (-)	IgG (+) IgM (-)
10	M	53	IgG (+) IgM (+)	IgG (+) IgM (+)
11	F	33	IgG (-) IgM (-)	IgG (-) IgM (-)
12	M	28	IgG (-) IgM (-)	IgG (-) IgM (-)
13	M	42	IgG (-) IgM (-)	IgG (-) IgM (-)
14	F	77	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
15	M	82	IgG (-) IgM (-)	IgG (-) IgM (-)
16	F	36	IgG (-) IgM (-)	IgG (-) IgM (-)
17	M	64	IgG (+) IgM (-)	IgG (+) IgM (-)
18	M	26	IgG (+) IgM (+)	IgG (+) IgM (+)
19	F	35	IgG (+) IgM (+)	IgG (+) IgM (+)
20	M	62	IgG (-) IgM (-)	IgG (-) IgM (-)
21	F	83	IgG (-) IgM (-)	IgG (-) IgM (-)
22	F	52	IgG (-) IgM (-)	IgG (-) IgM (-)
23	F	46	IgG (-) IgM (-)	IgG (-) IgM (-)
24	M	91	IgG (-) IgM (-)	IgG (-) IgM (-)
25	M	46	IgG (+) IgM (+)	IgG (+) IgM (+)
26	F	32	IgG (-) IgM (-)	IgG (-) IgM (-)
27	F	30	IgG (-) IgM (-)	IgG (-) IgM (-)
28	M	29	IgG (+) IgM (+)	IgG (+) IgM (+)
29	F	66	IgG (-) IgM (-)	IgG (-) IgM (-)
30	F	31	IgG (+) IgM (+)	IgG (+) IgM (+)

31	M	95	IgG (+) IgM (+)	IgG (+) IgM (+)
32	M	34	IgG (+) IgM (+)	IgG (+) IgM (+)
33	F	55	IgG (+) IgM (+)	IgG (+) IgM (+)
34	F	82	IgG (-) IgM (-)	IgG (-) IgM (-)
35	M	40	IgG (+) IgM (+)	IgG (+) IgM (+)
36	M	57	IgG (+) IgM (+)	IgG (+) IgM (+)
37	M	37	IgG (+) IgM (-)	IgG (+) IgM (-)
38	F	27	IgG (-) IgM (-)	IgG (-) IgM (-)
39	M	56	IgG (+) IgM (+)	IgG (+) IgM (+)
40	F	87	IgG (+) IgM (+)	IgG (+) IgM (+)
41	M	73	IgG (-) IgM (-)	IgG (-) IgM (-)
42	M	59	IgG (+) IgM (+)	IgG (+) IgM (+)
43	F	25	IgG (-) IgM (-)	IgG (-) IgM (-)
44	F	43	IgG (+) IgM (+)	IgG (+) IgM (+)
45	M	31	IgG (-) IgM (-)	IgG (-) IgM (-)
46	**M**	**57**	**IgG (+)** **IgM (-)**	**IgG (+)** **IgM (+)**
47	M	66	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
48	M	72	IgG (-) IgM (-)	IgG (-) IgM (-)
49	M	51	IgG (-) IgM (-)	IgG (-) IgM (-)
50	F	54	IgG (-) IgM (-)	IgG (-) IgM (-)
51	F	49	IgG (-) IgM (-)	IgG (-) IgM (-)
52	M	68	IgG (+) IgM (+)	IgG (+) IgM (+)
53	F	29	IgG (+) IgM (-)	IgG (+) IgM (-)
54	F	58	IgG (-) IgM (-)	IgG (-) IgM (-)
55	F	55	IgG (-) IgM (-)	IgG (-) IgM (-)
56	F	42	IgG (+) IgM (+)	IgG (+) IgM (+)
57	M	39	IgG (+) IgM (+)	IgG (+) IgM (+)
58	M	51	IgG (-) IgM (-)	IgG (-) IgM (-)
59	F	33	IgG (-) IgM (+)	IgG (-) IgM (+)
60	F	46	IgG (+) IgM (+)	IgG (+) IgM (+)
61	M	54	IgG (-) IgM (+)	IgG (-) IgM (+)
62	**M**	**81**	**IgG (+)** **IgM (-)**	**IgG (+)** **IgM (+)**
63	F	19	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
64	M	37	IgG (+) IgM (+)	IgG (+) IgM (+)
65	M	48	IgG (-) IgM (-)	IgG (-) IgM (-)
66	F	72	IgG (+) IgM (+)	IgG (+) IgM (+)
67	F	66	IgG (+) IgM (-)	IgG (+) IgM (-)
68	M	47	IgG (+) IgM (+)	IgG (+) IgM (+)
69	M	62	IgG (+) IgM (+)	IgG (+) IgM (+)
70	M	58	IgG (+) IgM (+)	IgG (+) IgM (+)
71	F	83	IgG (+) IgM (+)	IgG (+) IgM (+)
72	M	65	IgG (-) IgM (-)	IgG (-) IgM (-)
73	F	37	IgG (-) IgM (-)	IgG (-) IgM (-)
74	M	55	IgG (-) IgM (-)	IgG (-) IgM (-)
75	F	38	IgG (-) IgM (-)	IgG (-) IgM (-)
76	M	47	IgG (+) IgM (+)	IgG (+) IgM (+)
77	M	81	IgG (-) IgM (-)	IgG (-) IgM (-)
78	F	37	IgG (-) IgM (-)	IgG (-) IgM (-)
79	F	35	IgG (-) IgM (-)	IgG (-) IgM (-)

80	M	42	IgG (-) IgM (-)	IgG (-) IgM (-)
81	M	77	IgG (-) IgM (-)	IgG (-) IgM (-)
82	M	30	IgG (+) IgM (+)	IgG (+) IgM (+)
83	F	36	IgG (-) IgM (-)	IgG (-) IgM (-)
84	M	58	IgG (+) IgM (+)	IgG (+) IgM (+)
85	F	71	IgG (+) IgM (+)	IgG (+) IgM (+)
86	M	64	IgG (+) IgM (-)	IgG (+) IgM (-)
87	M	57	IgG (-) IgM (-)	IgG (-) IgM (-)
88	F	86	IgG (-) IgM (-)	IgG (-) IgM (-)
89	M	42	IgG (+) IgM (-)	IgG (+) IgM (-)
90	F	83	IgG (-) IgM (-)	IgG (-) IgM (-)
91	M	52	IgG (+) IgM (+)	IgG (+) IgM (+)
92	M	79	IgG (-) IgM (-)	IgG (-) IgM (-)
93	F	45	IgG (-) IgM (-)	IgG (-) IgM (-)
94	M	40	IgG (+) IgM (+)	IgG (+) IgM (+)
95	F	88	IgG (+) IgM (+)	IgG (+) IgM (+)
96	M	64	IgG (+)	IgG (+)

			IgM (-)	IgM (-)
97	M	17	IgG (+) IgM (-)	IgG (+) IgM (-)
98	F	62	IgG (-) IgM (-)	IgG (-) IgM (-)
99	F	42	IgG (-) IgM (-)	IgG (-) IgM (-)
100	M	53	IgG (-) IgM (-)	IgG (-) IgM (-)
101	M	62	IgG (-) IgM (-)	IgG (-) IgM (-)
102	F	38	IgG (-) IgM (-)	IgG (-) IgM (-)
103	F	78	IgG (-) IgM (-)	IgG (-) IgM (-)
104	M	56	IgG (-) IgM (-)	IgG (-) IgM (-)
105	M	36	IgG (-) IgM (-)	IgG (-) IgM (-)
106	M	48	IgG (-) IgM (-)	IgG (-) IgM (-)
107	F	70	IgG (-) IgM (-)	IgG (-) IgM (-)
108	M	84	IgG (+) IgM (+)	IgG (+) IgM (+)
109	F	64	IgG (-) IgM (-)	IgG (-) IgM (-)
110	M	58	IgG (-) IgM (-)	IgG (-) IgM (-)
111	M	55	IgG (-) IgM (-)	IgG (-) IgM (-)
112	F	51	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
113	F	33	IgG (-) IgM (-)	IgG (-) IgM (-)
114	**F**	**70**	**IgG (+)** **IgM (-)**	**IgG (-)** **IgM (-)**
115	M	45	IgG (+) IgM (+)	IgG (+) IgM (+)
116	M	49	IgG (+) IgM (+)	IgG (+) IgM (+)
117	F	36	IgG (-) IgM (-)	IgG (-) IgM (-)
118	F	34	IgG (+) IgM (-)	IgG (+) IgM (-)
119	F	43	IgG (-) IgM (-)	IgG (-) IgM (-)
120	M	74	IgG (+) IgM (+)	IgG (+) IgM (+)
121	M	38	IgG (-) IgM (-)	IgG (-) IgM (-)
122	F	48	IgG (+) IgM (+)	IgG (+) IgM (+)
123	F	36	IgG (-) IgM (-)	IgG (-) IgM (-)
124	M	54	IgG (-) IgM (-)	IgG (-) IgM (-)
125	M	71	IgG (+) IgM (+)	IgG (+) IgM (+)
126	M	55	IgG (+) IgM (-)	IgG (+) IgM (-)
127	F	19	IgG (+) IgM (+)	IgG (+) IgM (+)
128	M	65	IgG (-) IgM (-)	IgG (-) IgM (-)

129	F	40	IgG (-) IgM (-)	IgG (-) IgM (-)
130	M	71	IgG (+) IgM (+)	IgG (+) IgM (+)
131	M	33	IgG (+) IgM (+)	IgG (+) IgM (+)
132	M	38	IgG (-) IgM (-)	IgG (-) IgM (-)
133	F	54	IgG (-) IgM (-)	IgG (-) IgM (-)
134	F	35	IgG (-) IgM (-)	IgG (-) IgM (-)
135	M	86	IgG (+) IgM (+)	IgG (+) IgM (+)
136	M	48	IgG (+) IgM (-)	IgG (+) IgM (-)
137	F	39	IgG (+) IgM (+)	IgG (+) IgM (+)
138	M	56	IgG (-) IgM (-)	IgG (-) IgM (-)
139	M	89	IgG (+) IgM (-)	IgG (+) IgM (-)
140	F	44	IgG (-) IgM (-)	IgG (-) IgM (-)
141	F	77	IgG (-) IgM (-)	IgG (-) IgM (-)
142	M	76	IgG (-) IgM (-)	IgG (-) IgM (-)
143	M	62	IgG (-) IgM (-)	IgG (-) IgM (-)
144	M	49	IgG (-) IgM (-)	IgG (-) IgM (-)
145	F	84	IgG (+)	IgG (+)

			IgM (+)	IgM (+)
146	M	40	IgG (-) IgM (-)	IgG (-) IgM (-)
147	F	36	IgG (+) IgM (+)	IgG (+) IgM (+)
148	M	80	IgG (-) IgM (-)	IgG (-) IgM (-)
149	M	72	IgG (-) IgM (-)	IgG (-) IgM (-)
150	M	37	IgG (+) IgM (+)	IgG (+) IgM (+)
151	F	16	IgG (-) IgM (-)	IgG (-) IgM (-)
152	M	85	IgG (+) IgM (+)	IgG (+) IgM (+)
153	F	53	IgG (+) IgM (-)	IgG (+) IgM (-)
154	M	22	IgG (+) IgM (-)	IgG (+) IgM (-)
155	M	16	IgG (-) IgM (-)	IgG (-) IgM (-)
156	F	51	IgG (+) IgM (-)	IgG (+) IgM (-)
157	F	78	IgG (-) IgM (-)	IgG (-) IgM (-)
158	M	73	IgG (-) IgM (-)	IgG (-) IgM (-)
159	M	38	IgG (+) IgM (+)	IgG (+) IgM (+)
160	M	56	IgG (-) IgM (-)	IgG (-) IgM (-)
161	F	37	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
162	M	46	IgG (+) IgM (+)	IgG (+) IgM (+)
163	F	57	IgG (-) IgM (-)	IgG (-) IgM (-)
164	M	59	IgG (-) IgM (-)	IgG (-) IgM (-)
165	M	41	IgG (-) IgM (-)	IgG (-) IgM (-)
166	M	63	IgG (-) IgM (-)	IgG (-) IgM (-)
167	M	34	IgG (-) IgM (-)	IgG (-) IgM (-)
168	F	48	IgG (+) IgM (+)	IgG (+) IgM (+)
169	F	36	IgG (+) IgM (+)	IgG (+) IgM (+)
170	F	58	IgG (-) IgM (-)	IgG (-) IgM (-)
171	M	40	IgG (-) IgM (-)	IgG (-) IgM (-)
172	M	27	IgG (-) IgM (-)	IgG (-) IgM (-)
173	M	64	IgG (+) IgM (+)	IgG (+) IgM (+)
174	M	38	IgG (-) IgM (-)	IgG (-) IgM (-)
175	F	47	IgG (+) IgM (+)	IgG (+) IgM (+)
176	F	40	IgG (-) IgM (-)	IgG (-) IgM (-)
177	M	82	IgG (+) IgM (+)	IgG (+) IgM (+)

178	M	25	IgG (+) IgM (-)	IgG (+) IgM (-)
179	F	71	IgG (-) IgM (-)	IgG (-) IgM (-)
180	F	46	IgG (-) IgM (-)	IgG (-) IgM (-)
181	M	57	IgG (-) IgM (-)	IgG (-) IgM (-)
182	M	30	IgG (-) IgM (-)	IgG (-) IgM (-)
183	M	52	IgG (+) IgM (+)	IgG (+) IgM (+)
184	F	67	IgG (-) IgM (-)	IgG (-) IgM (-)
185	M	33	IgG (-) IgM (-)	IgG (-) IgM (-)
186	F	53	IgG (+) IgM (+)	IgG (+) IgM (+)
187	M	38	IgG (+) IgM (-)	IgG (+) IgM (-)
188	M	52	IgG (-) IgM (-)	IgG (-) IgM (-)
189	F	46	IgG (-) IgM (-)	IgG (-) IgM (-)
190	M	44	IgG (-) IgM (-)	IgG (-) IgM (-)
191	M	78	IgG (-) IgM (-)	IgG (-) IgM (-)
192	F	87	IgG (-) IgM (-)	IgG (-) IgM (-)
193	F	74	IgG (-) IgM (-)	IgG (-) IgM (-)
194	M	69	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
195	M	46	IgG (-) IgM (-)	IgG (-) IgM (-)
196	F	55	IgG (-) IgM (-)	IgG (-) IgM (-)
197	F	38	IgG (-) IgM (-)	IgG (-) IgM (-)
198	M	53	IgG (-) IgM (-)	IgG (-) IgM (-)
199	M	36	IgG (+) IgM (+)	IgG (+) IgM (+)
200	M	33	IgG (+) IgM (+)	IgG (+) IgM (+)
201	F	28	IgG (+) IgM (+)	IgG (+) IgM (+)
202	M	81	IgG (+) IgM (+)	IgG (+) IgM (+)
203	F	42	IgG (+) IgM (+)	IgG (+) IgM (+)
204	M	70	IgG (-) IgM (-)	IgG (-) IgM (-)
205	M	52	IgG (-) IgM (-)	IgG (-) IgM (-)
206	M	55	IgG (-) IgM (-)	IgG (-) IgM (-)
207	M	28	IgG (-) IgM (-)	IgG (-) IgM (-)
208	F	49	IgG (-) IgM (-)	IgG (-) IgM (-)
209	M	25	IgG (-) IgM (-)	IgG (-) IgM (-)
210	F	53	IgG (-)	IgG (-)

			IgM (-)	IgM (-)
211	F	59	IgG (+) IgM (+)	IgG (+) IgM (+)
212	F	31	IgG (+) IgM (+)	IgG (+) IgM (+)
213	F	48	IgG (-) IgM (-)	IgG (-) IgM (-)
214	M	37	IgG (+) IgM (+)	IgG (+) IgM (+)
215	M	42	IgG (-) IgM (-)	IgG (-) IgM (-)
216	M	56	IgG (+) IgM (-)	IgG (+) IgM (-)
217	M	34	IgG (-) IgM (-)	IgG (-) IgM (-)
218	F	79	IgG (-) IgM (-)	IgG (-) IgM (-)
219	F	67	IgG (-) IgM (-)	IgG (-) IgM (-)
220	M	58	IgG (+) IgM (+)	IgG (+) IgM (+)

Note: "—" – negative sample; "+"- positive sample.

III Information of the Sample with Inconsistent Test Results

The sample with inconsistent test results in the comparative test shall be re-confirmed through the results of clinical diagnosis. The records are as follows:

S/N	Gender	Age	Product Tested	Reference Product	Clinical Diagnosis
46	**M**	**57**	**IgG (+) IgM (-)**	**IgG (+) IgM (+)**	
62	**M**	**81**	**IgG (+) IgM (-)**	**IgG (+) IgM (+)**	
114	**F**	**70**	**IgG (+) IgM (-)**	**IgG (-) IgM (-)**	

Clinical Validation Report on IVD Reagents

Product name: SARS-CoV-2 Antigen Rapid Test Kit (Colloidal Gold Immunochromatography)

Model and specification: 25 tests/kit, each test strip packaged separately

Type of clinical trial: Clinical validation

Completion date: August 21, 2020

Testing agency: IPE Center for Clinical Laboratory

Abstract

To evaluate the SARS-CoV-2 Antigen Rapid Test Kit (Colloidal Gold Immunochromatography) (the "Test Kit" for short) produced by Beijing Lepu Medical Technology Co., Ltd. ("the Company" for short) for clinical application in qualitative detection of the content of SARS-CoV-2 antigen in clinical samples (nasal swab samples), IPE Center for Clinical Laboratory conducted a clinical study on the test strip therein. A total of 210 nasal swab samples were selected as the study objects, including 75 positive samples and 135 negative samples confirmed by COVID-19 diagnosis and treatment protocol. The kits used for diagnosis was 2019-nCoV PCR Kit (fluorescent PCR method) (GXZZ 20203400179) produced by Beijing Applied Biological Technologies Co., Ltd. was used as the reference kit. Based on the test result of the reference kit, the study objects were divided into 2019-nCoV antigen positive group and 2019-nCoV antigen negative group. At the same time, these samples were tested with the Test Kit, and the test results of the Test Kit and the reference kit were compared and statistically analyzed. The results showed that the negative coincidence rate, positive coincidence rate and total coincidence rate between the Test Kit and the reference kit all were greater than 90%, indicating that the Test Kit is in good consistency with the reference kit, and suitable for clinical auxiliary diagnosis.

I. Introduction

As a large virus family, 2019-nCoV is a single strand plus RNA virus with an envelope. It can cause major diseases such as colds, Middle East Respiratory Syndrome (MERS), and severe acute respiratory syndrome (SARS). SARS-CoV-2 was officially named by the World Health Organization on January 12, 2020. The core protein of SARS-CoV-2 is N protein (Nucleocapsid) inside. It is relatively conserved among β-coronaviruses and is often used for the diagnosis of coronaviruses. As the key recipient for SARS-CoV-2 to enter the cells, ACE2 is of great significance to study the viral infection mechanism.

The research and development work of the Test Kit produced by the Company has been completed. Clinical validation work has been started in order to validate the suitability and accuracy of the test strip in clinical application. Entrusted by the Company, IPE Center for Clinical Laboratory undertook the clinical trial on 210 test samples with the Test Kit produced hereby in the clinical study.

II. Purpose

The clinical performance of the Test Kit produced by the Company will be systematically studied in order to validate its suitability and accuracy in clinical application.

The purpose of this clinical trial is to conduct the comparative experimental study for the same clinical sample with the Test Kit "SARS-CoV-2 Antigen Rapid Test Kit (Colloidal Gold Immunochromatography)" produced by the Company and the reference kit "2019-nCoV PCR Kit (fluorescent PCR method)" (GXZZ 20203400179) produced by Beijing Applied Biological Technologies Co., Ltd.. Statistical analysis was carried out on the test results to calculate the negative coincidence rate, positive coincidence rate and total coincidence rate. According to the results of statistical analysis, it was validated that the Test Kit is equivalent to the reference kit, so as to validate the suitability and accuracy of the Test Kit for clinical auxiliary diagnosis.

The results of this clinical trial are an important basis for evaluating the efficacy and safety of the Test Kit.

III. Test Management

1. Introduction to management structure

The clinical trial was conducted by the clinical trialing agency IPE Center for Clinical Laboratory. As the applicant, the Company was responsible for communication and contact during the clinical trial.

2. Quality control in the laboratory

1) All researchers participating in this clinical trial passed the qualification examination and had professional background and capacity related to clinical trial. Before the clinical trial, all researchers had a full understanding of the specific contents about the clinical trial protocol and all indexes through training.

2) The quality control of the laboratory met the requirements of quality control of clinical laboratory to ensure the standardization of test procedure.

3) Quality control before the analysis: Sample collection and treatment was checked for compliance with the requirements and, sample number and other information were checked for correctness.

4) The execution and completion of clinical trial was inspected regularly. The completeness and precision of clinical sample information was checked and the test results were verified.

3. Statistics and data management

1) All selected cases were filled in the clinical outcome summary sheet, including the subjects' sample number, age, gender, and so on. The testers filled the test results of the reference kit and the Test Kit in the clinical outcome summary sheet.

2) After finishing data entry, the main researchers, testers and applicant jointly reviewed the data and locked the data when they had no doubt.

3) The clinical outcome summary sheet was then sent to analysts for statistics and analysis. The obtained statics and analysis results were incorporated into corresponding parts of the clinical report.

4. Data preservation

The testing agency and the applicant kept one copy of clinical trial data respectively, including the following contents:

Clinical Trial Agreement, Clinical Test Protocol, Ethics Committee Instructions, Clinical Test Report (testing agency's report), General Report on Clinical Trial, and Clinical Outcome Summary Sheet.

5. Problems found in the study and treatment measures

In clinical trials, when a small number of samples are tested, the results of control samples and test samples are inconsistent. In this case, the clinical quantitative data of these samples or other common clinical strips produced with the same principle are used for re-test.

IV. Test Design

1. Description of overall test design and protocol

With reference to the *Guideline of Clinical Study on In Vitro Diagnostic Reagents*, the appropriate study objects are selected and the 2019-nCoV PCR Kit (fluorescent PCR method) (GXZZ 20203400179) that was approved for marketing was used as the reference kit to conduct blinding simultaneous comparison, for analyzing the negative coincidence rate, positive coincidence rate and total coincidence rate of the Test Kit and the reference kit.

The trial protocol was to select 210 nasal swab samples as the study objects. Samples were divided into positive group and negative group according to the test results of reference kit. At the same time, the samples were tested with qualitative test strip and reference agent, the test results of the Test Kit and the reference agent were compared and statistically analyzed to

calculate the negative coincidence rate, positive coincidence rate and total coincidence rate, so as to judge the clinical suitability and accuracy of the Test Kit, and whether the test result of the Test Kit was consistent with that of the reference kit.

2. Research method

1) Sample collection, storage, transportation

After the samples were collected, they were placed in the sample treatment solution, stored at 2-8℃ and tested within 24 h. The samples should not be stored for a long time at room temperature.

2) Determination of method for comparison

Since the 2019-nCoV PCR Kit (fluorescent PCR method) produced by Beijing Applied Biological Technologies Co., Ltd. (GXZZ 20203400179) is a 2019-nCoV PCR Kit approved for marketing in China earlier, it is 2019-nCoV antigen test kit just like the Test Kit produced by the Company, both of which are new coronavirus detection products and widely used in clinical practice and generally considered to be of good quality. The purpose and scope of clinical use of this product are the same as the Test Kit. The product is therefore selected as a reference kit for clinical study.

The samples with inconsistent test results in the test group and the control group can be compared and checked by clinical quantitative results and clinical diagnosis results.

3) Names, specifications, sources, lot number, expiry dates and preservation conditions of the products for clinical study

Product name for clinical study is SARS-CoV-2 Antigen Rapid Test Kit (Colloidal Gold Immunochromatography), and the specification is 25 tests/kit. The product is provided by the Company. The lot number is 20CG2701X, and its shelf-life is 12 months. The storage condition is 4℃- 30°C.

The reference kit is 2019-nCoV PCR Kit (fluorescent PCR method) (GXZZ 20203400179) produced by Beijing Applied Biological Technologies Co., Ltd., the specification is 48 tests/kit, its shelf-life is 6 months and the storage condition is dark place with -20℃±5℃.

4) Quality control method

The execution and completion of clinical trial is inspected on a regular basis. The completeness and precision of clinical sample information is checked and the test results are verified.

5) Clinical trial method

All test samples were simultaneously tested with the control test strip and the Test Kit, and the test results of the two were compared. When all clinical samples were tested, the recorded test results of the Test Kit and the reference kit were statistically analyzed, to calculate the negative coincidence rate, positive coincidence rate and total coincidence rate and then evaluate whether they were equivalent according to these statistical indexes.

6) Statistical analysis methods for clinical study data

Calculate the negative coincidence rate, positive coincidence rate and total coincidence rate of the test results of the Test Kit and the reference kit. Determine whether each index meets the

clinical evaluation criteria to validate the accuracy and suitability of the product in clinic. Test the Test Kit with different types of samples and statistically analyze the test results. At the same time, test different types of samples of subjects simultaneously with the Test Kit, and compare the test results. When all clinical samples are tested, the recorded test results are statistically analyzed to calculate the negative coincidence rate, positive coincidence rate and total coincidence rate. And then evaluate whether they are equivalent according to these statistical indexes.

7) Clinical evaluation criteria

Compare the Test Kit with the marketed reference kit to calculate coincidence rate. Product performance shall meet the following requirements.

1) Negative coincidence rate: the proportion of samples whose test results obtained with the Test Kit and the reference kit are negative in the samples whose test results obtained with the reference kit are negative. The negative coincidence rate shall be greater than 90%.

2) Negative coincidence rate: the proportion of samples whose test results obtained with the Test Kit and the reference kit are positive in the samples whose test results obtained with the reference kit are positive. The positive coincidence rate shall be greater than 90%.

3) Total coincidence rate: the proportion of samples whose test results obtained with the Test Kit and the reference kit are the same in the total number of samples. Total coincidence rate shall be larger than 90%.

		Control system		Total
		Positive	Negative	
Test system	Positive	a	b	a+b
	Negative	c	d	c+d
Total		a+c	b+d	a+b+c+d

Generally, formulas of positive coincidence rate and negative coincidence rate are as follows:

Positive coincidence rate = a/ (a+c) * 100%

Negative coincidence rate = d/ (b+d) * 100%

Total coincidence rate = (a+d)/(a+c+b+d) * 100%

If the positive coincidence rate and negative coincidence rate meet the clinical requirements, the two methods or products are considered to be equivalent; if the difference between the positive coincidence rate and negative coincidence rate is too large, the clinical protocol shall be redesigned.

8) Modification of the protocol during the study

No modification.

V. Results and Analysis of Clinical Trial

A total of 210 samples were selected. All selected samples were tested.

Make consistency statistics on the test results of Test Kit (test product) produced by the Company and the 2019-nCoV PCR Kit, analyze their diagnostic sensitivity and specificity, and list them in the form of four-fold table.

	Test result of reference kit		Total
Test Kit	Positive	Negative	
Positive	True positive (A)	False positive (B)	A+B
Negative	False negative (C)	True positive (D)	C+D
Total	A+ C	B+D	A+B +C+D

Generally, formulas of diagnostic sensitivity and specificity are as follows:

Diagnostic sensitivity = A/ (A+C) × 100%

Diagnostic specificity = D/ (B+D) × 100%

Total coincidence rate= (A+D)/ (A+B+C+D) × 100%

Table 1: Statistics of Test Results of Test Kit and Reference Kit

	Positive result of reference kit	Negative result of reference kit	Total
Positive result of Test Kit	69	1	70
Negative result of Test Kit	6	134	140
Total	75	135	210

Item	**Formula**	**Results**	95% CI
Diagnostic sensitivity (%)	A/(A+C)*100%	92.00%	83.63%~96.28%

Diagnostic specificity (%)	D/(B+D)*100%	99.26%	95.92%~99.87%
Total coincidence rate (%)	(a+d)/(a+b+c+d)*100%	96.67%	

It can be seen from Table 1 that among the 75 samples in the positive group tested with the Test Kit, 69 cases are positive and 6 cases are negative. Among the 135 samples in the negative group tested with the Test Kit, 134 cases are negative and 1 cases are positive. The results show that the negative coincidence rate, positive coincidence rate and total coincidence rate all are greater than 90%, indicating that they are in good consistency with those of the reference kit.

VI. Discussion and Conclusion

(I) Discussion

The SARS-CoV-2 antigen rapid test strip produced by the Company contains SARS-CoV-2 N protein monoclonal antibody labeled by colloidal gold that is pre-coated on the colloidal gold labeled pad, SARS-CoV-2 N protein monoclonal antibody fixed in the test area and the corresponding antigen in the quality control area (C). The rapid test of SARS-CoV-2 antibodies in nasal swab samples is used clinically for auxiliary screening of COVID-19 patients. The purpose of the clinical trial is to evaluate the clinical performance of the product. The test conditions are presented as follows:

Comparative analysis results of the Test Kit and 2019-nCoV PCR Kit (fluorescent PCR method) (GXZZ 20203400179) produced by Beijing Applied Biological Technologies Co., Ltd.:

Test results of the Test Kit and the reference kit: The diagnostic sensitivity and specificity are greater than 90%, indicating that they are in good consistency with those of the reference kit.

(II) Test conclusion

After validation, the negative coincidence rate, positive coincidence rate and total coincidence rate between the test results of the Test Kit and 2019-nCoV PCR Kit (fluorescent PCR method) (GXZZ 20203400179) produced by Beijing Applied Biological Technologies Co., Ltd. are relatively high, and the results of the statistical analysis also show that there is no significant difference between the test results of the Test Kit and the reference kit, the two methods have good diagnosis consistency and are equivalent. At the same time, the diagnostic sensitivity and specificity of the Test Kit and the nucleic acid test results are both greater than 90%, indicating that they are in good consistency with those of the reference kit.

VI. Description of Special Circumstances on Clinical Studies

There is no special circumstance to be explained in this clinical study.

Annex I Instruction for Use of All Diagnostic Reagents Used in Clinical Trials

Instruction for Use of the Test Kit

LEPU MEDICAL

CE

SARS-CoV-2 Antigen Rapid Test Kit
(Colloidal Gold Immunochromatography)

【Product name】

SARS-CoV-2 Antigen Rapid Test Kit
(Colloidal Gold Immunochromatography)

【Model】

1 test/kit; 5 tests/kit; 10 tests/kit; 25 tests/kit; 50 tests/kit.

【Intended Use】

The product is intended for the qualitative detection of antigen against SARS-CoV-2 in clinical samples (nasal swab).

【Summary】

Coronavirus, as a large virus family, is a single positive stranded RNA virus with envelope. The virus is known to cause major illnesses such as colds, Middle East Respiratory Syndrome (MERS), and Severe Acute Respiratory Syndrome (SARS). The core protein of SARS-CoV-2 is the N protein (Nucleocapsid), which is a protein component located inside the virus. It is relatively conserved among β-coronaviruses and is often used as a tool for the diagnosis of coronaviruses. ACE2, as a key receptor for SARS-CoV-2 to enter cells, is of great significance for the research of viral infection mechanism.

【Principle】

The current test card is based on the specific antibody-antigen reaction and immunoanalysis technology. The test card contains colloidal gold labeled SARS-CoV-2 N protein monoclonal antibody which is pre-coated on the combination pad, matched SARS-CoV-2 N protein monoclonal antibody immobilized on the Test area (T) and corresponding antibody in the quality control area (C). During testing, the N protein in the sample combines with the colloidal gold labeled SARS-CoV-2 N protein monoclonal antibody which is pre-coated on the combination pad. The conjugates migrate upward under capillary effect, and subsequently captured by the N protein monoclonal antibody immobilized in the Test area (T). The higher the contents of N protein in the sample, the more the conjugates captures and the darker the color in the test area is. If there is no virus in the sample or the virus content is lower than the detection limit, then there is no color demonstrated in the test area (T). Regardless of the presence or absence of the virus in the sample, a purple stripe will appear in the quality control area (C). The purple stripe in the quality control area (C) is a criterion for the judgment of whether or not there is enough sample and whether or not the chromatography procedure is normal.

【Components】

The product consists of test cards, Instructions for use, sample treatment solution. And in each test card bag, it includes one SARS-CoV-2 antigen detection card and one package of desiccant.

Model	Test card	Instructions for use	Sample treatment solution
1 test/kit	1 test	1	1×0.5 ml
5 tests/kit	5 tests	1	1×0.5 ml
10 tests/kit	10 tests	1	2×0.5 ml
25 tests/kit	25 tests	1	5×0.5 ml
50 tests/kit	50 tests	1	5×0.5 ml

For each test card bag, it contains one test card and one package of desiccant.

The test card consists of gold standard mat (coated with colloidal gold labelled SARS-CoV-2 N protein monoclonal antibody), Sample mat, nitrocellulose membrane (Test area (T) is coated with an SARS CoV-2 N protein monoclonal antibody; the quality control area (C) is coated with goat anti-mouse antibody), absorbing paper, and hydrophobic 417 card.

【Storage and Stability】

It should be stored at 4 ~ 30℃, be kept dry and away from sunlight. The shelf life is 12 months.
For per test card, it should be used within 1 hour after unsealing.
Production Date and Expiration date are shown in the package label.

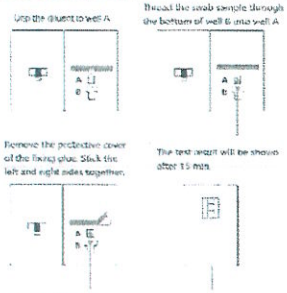
【Sample Requirements】

The product is used to test the human nasal swab sample.
Sample collection: During the collection procedures for samples, take care to make proper protection, and avoid direct contact with the sample. In case of accidental contact, disinfection treatment should be carried out in time and necessary measures should be taken.

Nasal swab sample, gently and slowly insert the swab into the nasopharynx through the nasal cavity. When resistance is encountered, the swab will arrive at the posterior nasopharynx. After a few seconds of suction, gently rotate the swab, then take out the swab to obtain the nasal swab sample.
Sample preservation, after sample collection, please complete the test within 1 hour.
The sample should come to room temperature before testing.

【Test Method】

Please read the instruction for use carefully before performing the test. Before testing, restore the reagents and sample to room temperature.
1. Remove the test card from the seal card bag and use it within 1 hour, especially in the environment with room temperature higher than 30 ℃ or in high humidity.
2. Place the test card on a clean platform. Drip 6 drops of the sample treatment solution in well A.
3. Thread the swab head through the bottom of well B into well A and rotate it two rounds clockwise and counterclockwise respectively in the sample treatment solution.
4. Remove the protective cover of the fixing glue. Stick the left and right sides together and start timing. Wait until the purple band appears. The test result should be read within 15-20 minutes.

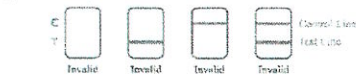


【The Explanation of the Testing Results】

• Positive (+): There appear purple stripes in both quality control area (C) and either test area (T).

• Negative (-): There is only one purple stripe in the quality control area (C), and without purple stripe in either test area (T).

• Invalid: There is no purple stripe in the quality control area (C), or there is blue stripe in the quality control area (C), indicating incorrect operating procedures or the test card has already deteriorated. Under this condition, it must read the instruction for use again carefully, and then use the new test card to test again. If the problem still exists, stop using the products with same lot number and contact the local suppliers immediately.



【Limitation of Procedure】

1. The test results of this product should be comprehensively judged by the physician in combination with other clinical information, and should not be used as the only criterion.
2. The product is used to test the SARS-CoV-2 antigen of the clinical sample.

【Product Performance Index】

1 Physical Property
1.1 Appearance

The test card should be clean and integral, no burrs, no damage, no pollution; the material should be firmly adhered; the label should be clear and not damaged. The sample dilution should be clear without impurities and flocs.
1.2 Liquid migration speed
The liquid migration speed should be no less than 10mm/min
1.3 Membrane Strip Width
The membrane strip width of the testing card should be≥2.5mm
1.4 The preparation quantity of the diluent for the samples.
The volume of the diluents for the sample is no less than the indicated value.
2 Detection Limit
For the detection of sensitivity reference material, the positive detection rate should be not less than 90%.
3 Negative reference products compliance rate
For the detection of negative reference material, the negative detection rate should be 100%.
4 Positive reference products compliance rate
For the detection of positive reference material, the positive detection rate should be 100%.
5 Repeatability
For the detection of enterprise reference material P2 and P4, the results should be positive and the color rendering should be uniform.
6 Cross reactivity
Cross-reactivity: This test device has no cross reactivity with endemicity human coronavirus OC43, influenza A virus, influenza B virus, respiratory syncytial virus, adenovirus, EB virus, measles virus, cytomegalovirus, rotavirus, Norovirus, mumps virus, varicella zoster virus, mycoplasma pneumoniae, Human metapneumovirus.

【Precautions】

1. The test is only suitable for professionals to use in vitro auxiliary diagnosis. Do not use expired products.
2. Do not freeze or use after the expiration date (see the packaging for the expiration date).
3. Avoid excessive temperature and humidity in the experimental environment. The reaction temperature should be 15-30 ° C and the humidity should be below 70%.
4. The test card bag contains desiccant, and it should not be taking orally.
5. When testing, please wear protective clothing, medical mask, gloves and goggles.
6. Do not use the test card with broken single packaging, unclear marks, and past the expiration date.
7. Dispose of used specimens, test cards and other waste in accordance with relevant local laws and regulations.

【Explanation of Symbols】

	DO NOT USE IF PACKAGE IS DAMAGED		CONSULT INSTRUCTIONS FOR USE
	DO NOT REUSE		USE-BY DATE
	TEMPERATURE LIMIT		DATE OF MANUFACTURE
	MANUFACTURER	LOT	BATCH CODE
	KEEP AWAY FROM SUNLIGHT		KEEP DRY
IVD	IN VITRO DIAGNOSTIC MEDICAL DEVICE	CE	CE MARK
REP	AUTHORIZED REPRESENTATIVE IN THE EUROPEAN COMMUNITY		

【Basic Information】

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【Approval Date and Revision Date of the Instruction】

Approved on 2nd, Sept., 2020.
Version number: CS-InCG17 REV 01

Annex II Clinical Trial Data

Sample number	Test result of Product tested	Test result of reference product
1	positive	positive
2	negative	negative
3	positive	positive
4	negative	negative
5	negative	negative
6	negative	negative
7	positive	positive
8	positive	positive
9	positive	positive
10	negative	negative
11	negative	negative
12	negative	negative
13	positive	positive
14	positive	positive
15	positive	positive
16	negative	negative
17	negative	negative
18	positive	negative
19	positive	positive
20	negative	negative
21	negative	negative
22	negative	negative
23	negative	negative
24	negative	negative
25	positive	positive
26	negative	negative
27	negative	negative
28	positive	positive
29	negative	negative
30	negative	negative
31	negative	negative
32	negative	negative
33	negative	negative
34	negative	negative
35	positive	positive
36	negative	negative
37	positive	positive
38	negative	negative
39	negative	negative
40	negative	negative
41	positive	positive
42	negative	negative
43	negative	negative
44	negative	negative
45	negative	negative
46	negative	negative

47	positive	positive
48	negative	positive
49	negative	negative
50	positive	positive
51	negative	negative
52	negative	negative
53	positive	positive
54	positive	positive
55	negative	positive
56	positive	positive
57	negative	negative
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62	positive	positive
63	negative	negative
64	positive	positive
65	negative	negative
66	negative	negative
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68	negative	negative
69	negative	negative
70	negative	negative
71	negative	negative
72	positive	positive
73	negative	negative
74	negative	negative
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76	negative	negative
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78	positive	positive
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80	positive	positive
81	negative	negative
82	negative	negative
83	positive	positive
84	negative	negative
85	negative	negative
86	negative	negative
87	negative	positive
88	positive	positive
89	negative	negative
90	negative	negative
91	positive	positive
92	negative	positive
93	negative	negative
94	positive	positive
95	positive	positive
96	negative	negative

97	positive	positive
98	negative	negative
99	negative	negative
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133	positive	positive
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140	negative	negative
141	positive	positive
142	negative	negative
143	negative	negative
144	negative	negative
145	negative	negative
146	positive	positive

147	negative	negative
148	positive	positive
149	negative	negative
150	negative	negative
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184	negative	negative
185	negative	negative
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188	negative	negative
189	negative	negative
190	negative	negative
191	negative	negative
192	positive	positive
193	negative	negative
194	negative	negative
195	positive	positive
196	negative	negative

197	positive	positive
198	negative	negative
199	positive	positive
200	negative	negative
201	negative	negative
202	negative	negative
203	negative	negative
204	positive	positive
205	positive	positive
206	negative	negative
207	negative	negative
208	negative	negative
209	positive	positive
210	negative	negative