Supplemental materials

A point-of-care selenium nanoparticle-based test for the combined

detection of anti-SARS-CoV-2 IgM and IgG in human serum and

blood

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1 Results of nucleoprotein purification and activity verification

The recombinant SARS-CoV-2 nucleoprotein, purified by affinity chromatography, was expressed in HEK293 cells. There was a clear band at approximately 50 kDa by SDS-PAGE (Fig. S1A), and the purity of the nucleoprotein was calculated to be 98.14% by HPLC (Fig. S1B). The protein-binding activity of SARS-CoV-2 nucleoprotein and the antibody was detected by ELISA. The EC50 was 0.471 ng/mL (Fig. S1C).



Figure S1 SARS-CoV-2 nucleoprotein purification SDS-PAGE results. Abbreviation: M, marker lane. 1) NP (1 μ g). 2) NP (2 μ g). 3) NP (4 μ g). SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; EC₅₀, concentration for 50% of maximal effect; HPLC, high performance liquid chromatography

2 SDS-PAGE for figure S1A

Nucleoprotein was verified by SDS-PAGE, the full image is shown in figure S1 for Figure 2A in manuscript.



Figure S2 Full image of nucleoprotein verification by SDS-PAGE. BSA, bovine serum albumin.

3 HPLC for figure S1B

Purity of nucleoprotein was tested by HPLC (TSKgel G3000SWXL, flow rate 0.5 mL/min). Result of purity was 98.14% according to relative peak area (Figure S2).



Figure S3 Chromatogram and results of nucleoprotein

4 Preparation and labeling of selenium nanoparticles

A selenium nanoparticle solution was prepared by ascorbic acid reduction with SDS and PEG as templates. The solution of selenium nanoparticles and selenium nanoparticle -conjugated nucleoprotein was clear and translucent, and a beam of light could pass through the solution, which has had a favorable Tyndall effect (Fig. S4).



Figure S4 Appearance and characterization of SeNPs. (A) Appearance of SeNPs after synthesis; (B) conjugated with protein

5 Detailed information of limit of detection for Figure 3

With the + representing the intensity of color development, we show the naked eye judgment results of three limit of detection tests by three people. The detection results are shown in figure S5 and the judgement result by naked eyes are shown in table S1.



Figure S5 Results of test and statistical for limit of detection for anti-SARS-CoV-2 IgM and IgG detection in human serum. IgG, anti-nucleoprotein IgG; IgM, anti-nucleoprotein IgM; C, control line; G, G test line; M, M test line.

		0			,					
IgG/IgM conce	entra	ation (ng/mL)	200	100	50	20	10	5	2	0
		Zhizeng Wang	++++	+++	+++	++	+	+	±	-
	1	Zhi Zheng	++++	++++	+++	++	+	+	-	-
		Hangzhan Hu	++++	+++	++	++	+	+	-	-
Naked result for		Zhizeng Wang	++++	++++	+++	+++	++	+	-	-
IgG by different	2	Zhi Zheng	++++	++++	++++	+++	++	+	-	-
persons		Hangzhan Hu	+++	+++	++	++	+	+	-	-
		Zhizeng Wang	++++	++++	+++	+	++	+	-	-
	3	Zhi Zheng	++++	+++	++	+	+	+	-	-
		Hangzhan Hu	+++	+++	++	+	+	+	-	-
		Zhizeng Wang	+++	++	+	+	-	-	-	-
	1	Zhi Zheng	+++	++	+	+	-	-	-	-
		Hangzhan Hu	+++	++	+	+	-	-	-	-
Naked result for		Zhizeng Wang	++	+++	++	+	-	-	-	-
IgM by different	2	Zhi Zheng	++	++	+	+	-	-	-	-
persons		Hangzhan Hu	+++	++	+	+	-	-	-	-
		Zhizeng Wang	+++	+++	++	+	-	-	-	-
	3	Zhi Zheng	+++	++	+	+	-	-	-	-
		Hangzhan Hu	++	++	+	+	-	-	-	-

Table S1 Judgment results for limit of detection by different persons

6 Limit of detection separate for anti-SARS-CoV-2 IgM and IgG

Anti-nucleoprotein IgM (1 mg/mL) and anti-nucleoprotein IgG (1 mg/mL) were diluted to different concentrations with negative serum and added to the kit for the LOD. Finally, the LOD of IgG and IgM in serum was determined to be 5 ng/L (Figure S6A, S6B), and 20 ng/mL (Figure S6C, S6D) by the naked eye and GraphPad Prism.



Figure S6 Sensitivity of separate detection for anti-SARS-CoV-2 IgM and IgG detection in human serum. IgG, anti-nucleoprotein IgG; IgM, anti-nucleoprotein IgM; C, control line; G, G test line; M, M test line.

7 Comparison of the effects of commercial kits

Three commercial SARS-CoV-2 antibody detection kits based on colloidal gold labeling recombinant protein were chose to compare their LOD. The A corporation kit for total antibody detection, the B corporation kit is for IgG and IgM detection, and the C corporation kit is for IgG and IgM combined monitoring. A kit cannot detect IgG and IgM with lower concentrations of 100 ng/mL and 500 ng/mL (figure S7). The LOD of B kit for IgG and IgM was 20 ng/mL and 100 ng/mL (figure S8). The LOD of C kit for IgG was 20 ng/mL, and it can not detect IgM with lower concentrations of 500 ng/mL (figure S9). The production information was shown in table S2.

ar	anti-SARS-CoV-2 antibody detection based on colloidal gold						
Number of corporation	Serial Nur	nber	Productio	n Date	Expiration	on date	
А	W195004	149	2020.04	4.24	2020.	10.24	
В	202004)8	2020.04	4.28	2020.	10.28	
С	202003)5	2020.03	3.20	2021.0	03.19	
IgG IgM (ng	100 500 /mL) C C T C nCoV nCoV	10 50 0 c T C T C T C T nCoV	5 20 0 C T nCoV		0 0 C C T nCoV		

Table S2 Product information of lateral flow kit for

Figure S7 Detection limit of A corporation kit used for anti-SARS-CoV-2 IgM and IgG detection in human serum. IgG, anti-nucleoprotein IgG; IgM, anti-nucleoprotein IgM; C, control line; T, test line.



Figure S8 Detection limit of B corporation kit used for anti-SARS-CoV-2 IgM and IgG detection in human serum. IgG, anti-nucleoprotein IgG; IgM, anti-nucleoprotein IgM; C, control line; T, test line.



Figure S9 Detection limit of C corporation kit used for anti-SARS-CoV-2 IgM and IgG detection in human serum. IgG, anti-nucleoprotein IgG; IgM, anti-nucleoprotein IgM; C, control line; G, G test line; M, M test line.

8 Basic information of contributors for figure 4

Positive serum samples of influenza, anti-nucler antibody, rheumatoid factor were collected from the Huaihe Hospital of Henan University for cross reactivity verification.

No.	No. of in figure 5	Sex	Age	Disease/Index	Notes
1	8	male	11	Influenza B positive	
2	9	male	9 mouth	Influenza A positive	
3	10	male	19	Influenza B positive	
4	11	female	14	Influenza B positive	
5	12	male	78	Influenza A positive	
6	13	female	73	Influenza B positive	
7	16	male	86	Anti-nucler antibody positive	
8	17	female	18	Anti-nucler antibody positive	
9	18	female	38	Anti-nucler antibody positive	
10	19	male	30	Rheumatoid factor (RF) positive	
11	20	female	54	RF positive	
12	23	female	63	Anti-nucler antibody+ RF positive	
13	24	male	33	Anti-nucler antibody+ RF	
14	25	female	68	Anti-nucler antibody+ RF positive	
15	26	male	90	Anti-nucler antibody+ RF positive	
16	27	female	49	Anti-nucler antibody+ RF positive	

Table S3 Clinical sample information from the Huaihe Hospital of Henan University

9 Basic information of contributors for figure 6 and table 1

A total of 353 cases were tested: 90 (positive) clinically confirmedCOVID-19 patients, 186 COVID-19 negative persons, 51 normal humans and 26 medical workers who supported Wuhan during the epidemic. The basic information of all the contributors are shown in table S4-table S7.

No.	Sex	Age	COVID-19 or not(+/-)	Judgement method	Notes
H1	female	36	-	RT-PCR	
H2	female	56	+	RT-PCR	
Н3	female	56	+	RT-PCR	
H4	male	28	-	RT-PCR	
H5	female	45	+	RT-PCR	
H6	male	38	+	RT-PCR	
H7	male	55	+	RT-PCR	
Н8	male	63	+	RT-PCR	
Н9	male	65	+	RT-PCR	
H10	female	55	+	RT-PCR	
H11	male	45	+	RT-PCR	
H12	female	42	+	RT-PCR	
H13	female	72	+	RT-PCR	False negative
H14	female	63	+	RT-PCR	
H15	male	25	+	RT-PCR	
H16	female	69	+	RT-PCR	
H17	male	42	+	RT-PCR	
H18	male	56	+	RT-PCR	
H19	male	56	+	RT-PCR	
H20	male	84	+	RT-PCR	
H21	male	36	+	RT-PCR	
H22	male	57	-	RT-PCR	
H23	male	64	+	RT-PCR	
H24	female	44	+	RT-PCR	
H25	male	49	+	RT-PCR	
H26	male	70	+	RT-PCR	
H27	female	64	+	RT-PCR	
H28	male	53	-	RT-PCR	
H29	female	24	+	RT-PCR	

Table S4 Clinical sample information from the Fire God Mountain Hospital

H30	male	87	+	RT-PCR	
H101	male	51	+	RT-PCR	
H102	female	57	+	RT-PCR	
H103	female	51	+	RT-PCR	
H104	male	77	+	RT-PCR	
H105	male	43	+	RT-PCR	
H106	male	45	+	RT-PCR	
H107	male	45	+	RT-PCR	
H108	male	40	+	RT-PCR	
H109	male	72	-	RT-PCR	
H110	female	54	+	RT-PCR	
H111	female	91	+	RT-PCR	
H112	female	65	+	RT-PCR	False negative
H113	male	62	+	RT-PCR	
H114	female	48	+	RT-PCR	
H115	male	55	+	RT-PCR	
H116	male	43	+	RT-PCR	
H117	male	65	+	RT-PCR	
H118	male	57	+	RT-PCR	
H119	female	37	+	RT-PCR	
H120	female	40	+	RT-PCR	
H121	female	42	+	RT-PCR	
H122	male	67	+	RT-PCR	
H123	male	69	+	RT-PCR	
H124	female	27	+	RT-PCR	
H125	male	64	+	RT-PCR	
H126	male	52	-	RT-PCR	IgM False positive
H127	female	84	+	RT-PCR	
H128	male	46	+	RT-PCR	
H129	male	72	+	RT-PCR	

H130	male	77	+	RT-PCR	
H131	male	54	+	RT-PCR	
H132	male	64	+	RT-PCR	
H133	male	51	+	RT-PCR	
H134	male	65	+	RT-PCR	
H135	female	68	+	RT-PCR	
H136	male	72	+	RT-PCR	
H137	male	54	+	RT-PCR	
H138	male	61	+	RT-PCR	
H139	male	45	+	RT-PCR	
H140	female	57	+	RT-PCR	
H141	female	36	+	RT-PCR	False negative
H142	male	40	+	RT-PCR	
H143	female	42	-	RT-PCR	
H144	male	43	-	RT-PCR	
H145	male	43	+	RT-PCR	
H146	female	55	+	RT-PCR	
H147	male	69	+	RT-PCR	
H149	female	57	+	RT-PCR	
H150	male	54	+	RT-PCR	
H159	male	52	-	RT-PCR	
H160	female	69	+	RT-PCR	
H161	male	69	+	RT-PCR	
H162	female	68	+	RT-PCR	
H163	female	27	+	RT-PCR	
H164	male	54	+	RT-PCR	
H165	male	54	+	RT-PCR	
H166	female	47	+	RT-PCR	
H167	female	47	+	RT-PCR	
H168	female	37	+	RT-PCR	

H169	male	72	+	RT-PCR	
H170	male	61	+	RT-PCR	
H171	male	46	+	RT-PCR	
H172	male	25	-	RT-PCR	IgM False positive
H173	male	72	+	RT-PCR	
H174	female	34	+	RT-PCR	
H175	male	63	-	RT-PCR	
H176	female	55	-	RT-PCR	
H177	male	43	-	RT-PCR	IgM False positive
H178	female	42	-	RT-PCR	
H179	female	34	-	RT-PCR	
H180	male	40	+	RT-PCR	
H181	female	57	+	RT-PCR	
H182	male	45	+	RT-PCR	
H183	female	36	-	RT-PCR	
H184	female	56	+	RT-PCR	False negative
H185	female	57	+	RT-PCR	

No.	Sex	Age	COVID-19 or not(+/-)	Judgement method	Notes
1	male	25	-	Clinical symptoms	Pulmonary disease
2	male	77	-	Clinical symptoms	Respiratory diseases
3	male	60	-	Clinical symptoms	Cardiovascular disease
4	female	81	-	Clinical symptoms	Neurological disease
5	male	68	-	Clinical symptoms	Cardiovascular disease
6	female	69	-	Clinical symptoms	Nephrosis
7	female	52	-	Clinical symptoms	Cardiovascular disease
8	female	49	-	Clinical symptoms	Neurological disease
9	male	57	-	Clinical symptoms	
10	female	65	-	Clinical symptoms	Cardiovascular disease
11	male	80	-	Clinical symptoms	Emergency disease
12	male	80	-	Clinical symptoms	Emergency disease
13	male	49	-	Clinical symptoms	Neurological disease
14	male	66	-	Clinical symptoms	Neurological disease
15	male	79	-	Clinical symptoms	Neurological disease
16	male	79	-	Clinical symptoms	Neurological disease
17	male	81	-	Clinical symptoms	Surgical disease
18	male	81	-	Clinical symptoms	Surgical disease
19	female	84	-	Clinical symptoms	Disease of the aged
20	male	78	-	Clinical symptoms	Surgical disease
21	female	76	-	Clinical symptoms	Cardiovascular disease
22	female	63	-	Clinical symptoms	Thoracic disease
23	male	75	-	Clinical symptoms	Cardiovascular disease
24	female	66	-	Clinical symptoms	Cardiovascular disease
25	male	69	-	Clinical symptoms	Surgical disease
26	male	75	-	Clinical symptoms	Neurological disease
27	female	72	-	Clinical symptoms	Disease of the aged, IgM false positive
28	male	78	-	Clinical symptoms	Surgical disease
29	male	69	-	Clinical symptoms	Respiratory disease

Table S5 Clinical sample information of non-COVID-19 patients from the First Affiliated Hospital of Henan University

30	male	59	-	Clinical symptoms	Cardiovascular disease
31	female	47	-	Clinical symptoms	Critical illness
32	female	51	-	Clinical symptoms	Orthopedic disease
33	female	54	-	Clinical symptoms	Cardiovascular disease
34	female	53	-	Clinical symptoms	Cardiovascular disease
35	female	53	-	Clinical symptoms	Cardiovascular disease
36	female	50	-	Clinical symptoms	Cardiovascular disease
37	male	53	-	Clinical symptoms	General disease
38	female	67	-	Clinical symptoms	Cardiovascular disease
39	female	56	-	Clinical symptoms	General disease
40	male	70	-	Clinical symptoms	Emergency disease
41	male	79	-	Clinical symptoms	Disease of the aged
42	female	70	-	Clinical symptoms	Cardiovascular disease
43	female	60	-	Clinical symptoms	Neurological disease
44	male	49	-	Clinical symptoms	Pulmonary disease
45	male	82	-	Clinical symptoms	General disease
46	male	37	-	Clinical symptoms	Cardiovascular disease
47	female	84	-	Clinical symptoms	Digestive disease
48	male	100	-	Clinical symptoms	Neurological disease
49	male	92	-	Clinical symptoms	Endocrine disease
50	female	66	-	Clinical symptoms	Neurological disease
51	male	72	-	Clinical symptoms	Thoracic disease
52	male	69	-	Clinical symptoms	Digestive disease
53	female	56	-	Clinical symptoms	Skin disease
54	female	35	-	Clinical symptoms	Cardiovascular disease
55	female	68	-	Clinical symptoms	Cardiovascular disease
56	female	74	-	Clinical symptoms	Cardiovascular disease
57	male	80	-	Clinical symptoms	Emergency disease
58	female	81	-	Clinical symptoms	Cardiovascular disease
59	female	82	-	Clinical symptoms	Surgical disease
60	male	70	-	Clinical symptoms	Emergency disease
61	male	59	-	Clinical symptoms	Cardiovascular disease

62	male	81	-	Clinical symptoms	Cardiovascular disease
63	female	21	-	Clinical symptoms	Digestive disease
64	female	83	-	Clinical symptoms	Cardiovascular disease
65	male	79	-	Clinical symptoms	Neurological disease
66	male	49	-	Clinical symptoms	Neurological disease
67	male	75	-	Clinical symptoms	Neurological disease
68	male	81	-	Clinical symptoms	Cardiovascular disease
69	male	69	-	Clinical symptoms	Respiratory disease
70	male	63	-	Clinical symptoms	Respiratory disease
71	male	76	-	Clinical symptoms	Nephrosis
72	male	78	-	Clinical symptoms	Surgical diseases
73	male	59	-	Clinical symptoms	Cardiovascular disease
74	male	43	-	Clinical symptoms	Cardiovascular disease
75	female	88	-	Clinical symptoms	Cardiovascular disease
76	male	50	-	Clinical symptoms	Cardiovascular disease
77	male	73	-	Clinical symptoms	General disease
78	female	53	-	Clinical symptoms	Cardiovascular disease
79	female	54	-	Clinical symptoms	Cardiovascular disease
80	female	30	-	Clinical symptoms	Cardiovascular disease
81	male	70	-	Clinical symptoms	Pulmonary disease
82	female	54	-	Clinical symptoms	Cardiovascular disease
83	female	65	-	Clinical symptoms	Cardiovascular disease
84	male	45	-	Clinical symptoms	Cardiovascular disease
85	male	85	-	Clinical symptoms	Cardiovascular disease
86	female	85	-	Clinical symptoms	Cardiovascular disease
87	male	78	-	Clinical symptoms	Nephrosis
88	male	38	-	Clinical symptoms	Surgical disease
89	female	66	-	Clinical symptoms	Neurological disease
90	male	57	-	Clinical symptoms	Cardiovascular disease
91	male	72	-	Clinical symptoms	Neurological disease
92	female	80	-	Clinical symptoms	Respiratory diseases
93	female	67	-	Clinical symptoms	Cardiovascular disease

94	female	59	-	Clinical symptoms	Surgical disease
95	male	50	-	Clinical symptoms	General disease
96	male	76	-	Clinical symptoms	Cardiovascular disease
97	male	54	-	Clinical symptoms	Infectious disease
98	male	76	-	Clinical symptoms	Cardiovascular disease
99	male	57	-	Clinical symptoms	Neurological disease
100	male	15	-	Clinical symptoms	Paediatric disease
101	female	85	-	Clinical symptoms	Digestive disease
102	male	68	-	Clinical symptoms	Surgical disease
103	male	81	-	Clinical symptoms	Cardiovascular disease
104	female	52	-	Clinical symptoms	Disease of the aged
105	male	30	-	Clinical symptoms	Emergency disease
106	female	75	-	Clinical symptoms	Digestive disease
107	female	60	-	Clinical symptoms	Surgical disease
108	female	75	-	Clinical symptoms	Digestive disease
109	female	71	-	Clinical symptoms	Disease of the aged
110	female	76	-	Clinical symptoms	Neurosurgical disease
111	male	80	-	Clinical symptoms	Emergency disease
112	male	29	-	Clinical symptoms	Cardiovascular disease
113	female	39	-	Clinical symptoms	Gynecological disease
114	male	49	-	Clinical symptoms	Neurological disease
115	male	75	-	Clinical symptoms	Neurological disease
116	female	73	-	Clinical symptoms	Cardiovascular disease
117	male	79	-	Clinical symptoms	Neurological disease
118	female	61	-	Clinical symptoms	Gynecological disease
119	female	79	-	Clinical symptoms	Cardiovascular disease
120	male	65	-	Clinical symptoms	Disease of the aged
121	male	68	-	Clinical symptoms	Surgical disease
122	female	73	-	Clinical symptoms	Cardiovascular disease
123	male	60	-	Clinical symptoms	Cardiovascular disease
124	female	65	-	Clinical symptoms	Orthopedic disease
		70			IgM false positive
125	male	70	-	Clinical symptoms	

126	male	82	-	Clinical symptoms	Disease of the aged
127	female	73	-	Clinical symptoms	Cardiovascular disease
128	male	81	-	Clinical symptoms	Cardiovascular disease
129	male	90	-	Clinical symptoms	Cardiovascular disease
130	male	49	-	Clinical symptoms	Digestive disease
131	female	54	-	Clinical symptoms	Cardiovascular disease
132	male	64	-	Clinical symptoms	Cardiovascular disease
133	male	64	-	Clinical symptoms	Cardiovascular disease
134	male	64	-	Clinical symptoms	General disease
135	male	75	-	Clinical symptoms	Rehabilitation disease
136	male	75	-	Clinical symptoms	Rehabilitation disease
137	female	23	-	Clinical symptoms	Surgical disease
138	male	37	-	Clinical symptoms	Urological disease
139	male	41	-	Clinical symptoms	Endocrine disease
140	female	3	-	Clinical symptoms	Paediatric disease
141	female	69	-	Clinical symptoms	Neurological disease
142	male	78	-	Clinical symptoms	Urological disease
143	male	71	-	Clinical symptoms	Neurological disease
144	male	49	-	Clinical symptoms	Endocrine disease
145	male	65	-	Clinical symptoms	Cardiovascular disease
146	female	86	-	Clinical symptoms	Respiratory disease
147	female	62	-	Clinical symptoms	Digestive disease
148	female	20	-	Clinical symptoms	Obstetric disease
149	female	86	-	Clinical symptoms	Respiratory disease
150	male	33	-	Clinical symptoms	Nephrosis
151	male	76	-	Clinical symptoms	General disease
152	male	80	-	Clinical symptoms	Nephrosis
153	male	65	-	Clinical symptoms	Cardiovascular disease
154	male	68	-	Clinical symptoms	Infectious disease
155	male	70	-	Clinical symptoms	Neurological disease
156	female	75	-	Clinical symptoms	Digestive disease
157	female	85	-	Clinical symptoms	Cardiovascular disease

158	male	79	-	Clinical symptoms	General disease
159	male	79	-	Clinical symptoms	General disease IgM false positive
160	male	50	-	Clinical symptoms	Neurological disease
161	male	37	-	Clinical symptoms	Rehabilitation disease
162	female	77	-	Clinical symptoms	Neurological disease
163	male	80	-	Clinical symptoms	Emergency disease
164	female	60	-	Clinical symptoms	Orthopedic disease
165	female	78	-	Clinical symptoms	Neurological disease
166	female	57	-	Clinical symptoms	Surgical disease
167	male	80	-	Clinical symptoms	Emergency disease
168	male	80	-	Clinical symptoms	Emergency disease
169	male	80	-	Clinical symptoms	Emergency disease
170	female	49	-	Clinical symptoms	Neurological disease

No.	Sex	Age	COVID-19 or not (+/-)	Judgement method	Notes
1	male	61	-	Clinical symptoms	
2	female	39	-	Clinical symptoms	
3	male	36	-	Clinical symptoms	
4	female	32	-	Clinical symptoms	
5	female	55	-	Clinical symptoms	
6	male	44	-	Clinical symptoms	
7	female	42	-	Clinical symptoms	
8	female	35	-	Clinical symptoms	
9	female	26	-	Clinical symptoms	IgM False positive
10	male	28	-	Clinical symptoms	
11	female	27	-	Clinical symptoms	
12	female	32	-	Clinical symptoms	
13	female	30	-	Clinical symptoms	
14	male	30	-	Clinical symptoms	
15	female	41	-	Clinical symptoms	
16	male	35	-	Clinical symptoms	
17	male	25	-	Clinical symptoms	
18	male	25	-	Clinical symptoms	
19	male	38	-	Clinical symptoms	
20	female	24	-	Clinical symptoms	
21	male	27	-	Clinical symptoms	
22	female	26	-	Clinical symptoms	
23	female	24	-	Clinical symptoms	
24	female	26	-	Clinical symptoms	
25	female	35	-	Clinical symptoms	
26	male	25	-	Clinical symptoms	
27	male	32	-	Clinical symptoms	
28	male	26	-	Clinical symptoms	

Table S6 Clinical sample information of 51 normal persons from the Joint National Laboratory forAntibody Drug Engineering of Henan University

29	female	27	-	Clinical symptoms	
30	female	25	-	Clinical symptoms	
31	female	25	-	Clinical symptoms	
32	female	25	-	Clinical symptoms	
33	male	25	-	Clinical symptoms	
34	female	29	-	Clinical symptoms	
35	female	27	-	Clinical symptoms	
36	male	26	-	Clinical symptoms	
37	female	25	-	Clinical symptoms	
38	female	24	-	Clinical symptoms	
39	female	27	-	Clinical symptoms	
40	female	29	-	Clinical symptoms	
41	female	28	-	Clinical symptoms	
42	female	26	-	Clinical symptoms	
43	female	24	-	Clinical symptoms	
44	female	26	-	Clinical symptoms	
45	female	31	-	Clinical symptoms	
46	male	26	-	Clinical symptoms	
47	male	25	-	Clinical symptoms	
48	male	24	-	Clinical symptoms	
49	male	31	-	Clinical symptoms	
50	male	34	-	Clinical symptoms	
51	male	34	-	Clinical symptoms	

			0 1		
No.	Sex	Age	COVID-19 or not (+/-)	Judgement method	Notes
1	male	39	-	RT-PCR	
2	male	37	-	RT-PCR	
3	female	30	-	RT-PCR	
4	female	37	-	RT-PCR	
5	female	29	-	RT-PCR	
6	female	28	-	RT-PCR	
7	male	51	-	RT-PCR	
8	male	32	-	RT-PCR	
9	female	29	-	RT-PCR	
10	female	32	-	RT-PCR	
11	female	31	-	RT-PCR	
12	female	26	-	RT-PCR	
13	female	30	-	RT-PCR	
14	female	34	-	RT-PCR	
15	male	34	-	RT-PCR	
16	female	44	-	RT-PCR	
17	male	29	-	RT-PCR	
18	female	28	-	RT-PCR	
19	male	47	-	RT-PCR	
20	male	36	-	RT-PCR	
21	male	39	-	RT-PCR	
22	female	34	-	RT-PCR	
23	female	36	-	RT-PCR	
24	male	49	-	RT-PCR	
25	female	31	-	RT-PCR	
26	female	34	-	RT-PCR	

Table S7 Clinical samples 26 non-COVID-19 persons from medical workers who supported Wuhan during the epidemic

10 Results for Table 1 in manuscript

The detection results of samples from the Fire God Mountain Hospital are shown in figure S10-S12 and table S6. A total of 106 specimens, of which 90 were positive for COVID-19 and 16 were negative by RT-PCR. There were 87 single positive results, 77 IgG positive results, 75 IgM positive samples, 63 double positive results of IgG and IgM, 3 false positives for IgM (number H126, H172 and H177) and 5 false negative (number H13, H112, H141, H173 and H184).

Sample number	HI COVID-19 IgG/IgM	H2 COVID-19 IgG/IgM	H3 COVID-19 IgG/IgM	H4 COVID-19 IgG/IgM	H5 COVID-19 IgG/IgM	H6 COVID-19 IgG/IgM	147 COVID-19 IgG/IgM	H8 COVID-19 IgG/IgM	H9 COVID-19 IgG/IgM	HIO COVID-19 IgG/igM
	C G M	C G M	C G M	C L G M	C G M	C G M	C G M	C I G M	C G M	C G G M
		0				0	0	0	6	6
	HII COVID-19 IgG/IgM	HI2 COVID-19 IgG/IgM	HI3 COVID-19 IgG/IgM	H(F COVID-19 IgG/IgM	HIS COVID-19 IgG/IgM	HI6 COVID-19 IgG/IgM	HI7 COVID-19 IgG/IgM	(118 COVID-19 IgG/IgM	HIP COVID-19 IgG/IgM	U20 COVID-19 IgG/IgM
	C G M	C G M	C C G M	C I G M	C L G L M	C — G M	C - G M	C G M	C G G M	C - G M
	0	0	0	0	0	0	0	0	0	0
	Kovid-19	Xore COVID-19 IgG/IgM	HZZ COVID-19 IgG/IgM	COVID-19 IgG/IgM	H25 COVID-19 IgG/IgM	M26 COVID-19 IgG/IgM	HM COVID-19 IgG/IgM	H 28 COVID-19 IgG/IgM	M29 COVID-19 IgG/IgM	130 COVID-19 IgG/IgM
	C G M	C C G M	C G M	C - G M	C G M	C G M	C G M	C G M	C G G M	C G G M
	3		0	9	0	0	0	0	0	0
	H/131 COVID-19 IgG/IgM	/-//52 COVID-19 IgG/IgM	HI03 COVID-19 IgG/IgM	1-1 104 COVID-19 IgG/IgM	14/0j- COVID-19 IgG/IgM	/1/06 COVID-19 IgG/IgM	COVID-19 IgG/IgM	HINS COVID-19 IgG/IgM	I-/103 COVID-19 IgG/IgM	HIID COVID-19 IgG/IgM
	C – G M	C G	C G	C G M	C I G M	C G M	C G M	C G M	C G M	C G M
	0				0			0	0	0)
	HIII COVID-19 IgG/IgM	H//2 COVID-19 IgG/IgM	HII3 COVID-19 IgG/IgM	Frink COVID-19 IgG/IgM	HAF COVID-19 IgG/IgM	H116 COVID-19 IgG/IgM	HIIN COVID-19 IgG/IgM	F148 COVID-19 IgG/IgM	HI19 COVID-19 IgG/IgM	H/26 COVID-19 IgG/IgM
	C – G M	C – G M	C I G M	C I G M	C – G – M	C – G M	C – G M	C U U U U U U U U U U U U U U U U U U U	C T G M	C – G M
	0	0				0	0		0	0
	HIZ COVID-19 IgG/IgM	HINZ COVID-19 IgG/IgM	HI23 COVID-19 IgG/IgM	H/24 COVID-19 IgG/IgM	H/lef COVID-19 IgG/IgM	HI2 COVID-19 IgG/IgM	Hrz7 COVID-19 IgG/IgM	HIN8 COVID-19 IgG/IgM	Frrag COVID-19 IgG/IgM	MAD COVID-19 IgG/IgM
	C G M	C G M	C G M	C - G M	C G M	C G M	C G M	C G M	C G M	C G M
		9	0	0	0	0	0	0	0	0

Figure S10 Detection result of some samples from the Fire God Mountain Hospital

Sample number	Hibi COVID-19 IgG/IgM	11132 COVID-19 IgG/IgM	H133 COVID-19 IgG/IgM	WI74 COVID-19 IgG/IgM	1-1135 COVID-19 IgG/IgM	H 36 COVID-19 IgG/IgM	HI37 COVID-19 IgG/IgM	H138 COVID-19 IgG/IgM	1/13 COVID-19 IgG/IgM	UI40 COVID-19 IgG/IgM
	C G M	C G M	C L G M	COM	CGM	CGM	C G M	C G M	CGM	C G M
	0	0	0	0	0	0	0	0	0	0
	HILL COVID-19 IgG/IgM	COVID-19 IgG/IgM	UI43 COVID-19 IgG/IgM	MU44 COVID-19 IgG/IgM	H 145 COVID-19 IgG/IgM	VI46 COVID-19 IgG/IgM	UIU COVID-19 IgG/IgM	WI49 COVID-19 IgG/IgM	MI50 COVID-19 IgG/IgM	
	C G M				C C C C	G M	G H		C G M	
	0		0					0	0	
	COVID-19 IgG/IgM	Hise COVID-19 IgG/IgM	HI61 COVID-19 IgG/IgM	H162 COVID-15 IgG/IgM	H163 COVID-15 IgG/IgM	HI64 COVID-19 IgG/IgM	HI65 COVID-19 IgG/IgM	V/166 COVID-19 IgG/IgM	HIG7 COVID-19 IgG/IgM	HIB9 COVID-19 IgG/IgM
	C G M	C G M	C G M	C G G M	C = G M	C G M	C G M	C G M	C G M	C G M
				0	0			0		
	H169 COVID-19 IgG/IgM	H 170 COVID-19 IgG/IgM	14171 COVID-1 IgG/IgM		72 H	173 F ID-19 COV	//74 + /ID-19 CON 6/IgM IgC	/175- 1 /1D-19 CC 5/1gM Ig	-/176 DVID-19 C G/IgM	H177 OVID-19 IgG/IgM
	C G M	C G M	C G M	C G M	C G M	C . G M	C G M	C G M		
				0			0			
	HI78 COVID-19	H(79 COVID-19 IaG/IaM	COVID-1			8 2 41 D-19 COV	83 (4 /1D-19 CO	VID-19 C	4185 OVID-19	
	C G M	C G G M	C G M	CGM	CGM	C G M	C G M	C G M		
	0	0	0				0		O •	

Figure S11 Detection result of some samples from the Fire God Mountain Hospital



Figure S12 Auxiliary judgment result of samples H1-H30 from the Fire God Mountain Hospital

No.	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
lgG	-	+++	-	-	++	+++	++	+++	+++	++
lgM	-	+	++	-	+	-	+	-	++	+
No.	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20
lgG	+++	++	-	+++	+++	+++	+++	-	++	++
lgM	++	++	-	+	+	++	+	-	+++	-
No.	H21	H22	H23	H24	H25	H26	H27	H28	H29	H30
lgG	++	-	+++	+++	+++	+++	+++	-	+	+++
lgM	+	-	++	-	++	+	++	-	-	+
No.	H101	H102	H103	H104	H105	H106	H107	H108	H109	H110
lgG	++	+++	++	+++	-	++	+	++	-	+++
lgM	++	++	+	++	+++	-	+	++	-	++
No.	H111	H112	H113	H114	H115	H116	H117	H118	H119	H120
lgG	++	-	+++	+++	+++	++	+++	+++	+++	+
lgM	+	-	+++	+++	+	++	++	++	++	+
No.	H121	H122	H123	H124	H125	H126	H127	H128	H129	H130
lgG	+++	+++	+++	-	+++	-	+++	+++	++	+++
lgM	+++	+	++	+	+++	+	+++	++	-	++
No.	H131	H132	H133	H134	H135	H136	H137	H138	H139	H140
lgG	+++	+++	++	++	+++	+++	+	+++	+++	+++
lgM	+++	++	++	++	++	+++	++	+++	++	++
No.	H141	H142	H143	H144	H145	H146	H147	H149	H150	H159
lgG	-	+	-	-	+++	-	+++	+	+++	-
lgM	-	+++	-	-	+++	+	+++	+	+++	-
No.	H160	H161	H162	H163	H164	H165	H166	H167	H168	H169
lgG	+++	+++	+++	+	+++	+	+++	+++	-	+++
lgM	+++	++	+	+	++	-	+++	+++	+	-
No.	H170	H171	H172	H173	H174	H175	H176	H177	H178	H179
lgG	+++	++	-	-	++	-	-	-	-	-
lgM	++	-	++	-	+++	-	+	++	-	-
No.	H180	H181	H182	H183	H184	H185				
lgG	+++	+	+++	-	-	++				
lgM	+++	++	+	-	-	-				

Table S8 Judgement result of Fire God Mountain Hospital

The detection results of samples from the First Affiliated Hospital of Henan University are shown in figure S13-S18 and table S9. There are 3 false IgM positive samples (number 27, 124, 159) of all the 170 negative samples by clinical symptoms.



Figure S13 Detection result of some non-COVID infector from the Fire God Mountain Hospital



Figure S14 Detection result of some non-COVID infector from the Fire God Mountain Hospital



Figure S15 Detection result of some non-COVID infector from the Fire God Mountain Hospital



Figure S16 Detection result of some non-COVID infector from the Fire God Mountain Hospital



Figure S17 Auxiliary judgment result of negative COVID-19 samples 1-90



Figure S18 Auxiliary judgment result of negative COVID-19 samples 91-170

No.	1	2	3	4	5	6	7	8	9	10
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	11	12	13	14	15	16	17	18	19	20
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	21	22	23	24	25	26	27	28	29	30
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	+	-	-	-
No.	31	32	33	34	35	36	37	38	39	40
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	41	42	43	44	45	46	47	48	49	50
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	51	52	53	54	55	56	57	58	59	60
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	61	62	63	64	65	66	67	68	69	70
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	71	72	73	74	75	76	77	78	79	80
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	81	82	83	84	85	86	87	88	89	90
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	91	92	93	94	95	96	97	98	99	100
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	101	102	103	104	105	106	107	108	109	110
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	111	112	113	114	115	116	117	118	119	120
lgG										
lgM										

Table S9 Judgement result of non-COVID-19 samples

						-				
No.	121	122	123	124	125	126	127	128	129	130
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	+	-	-	-	-	-	-
No.	131	132	133	134	135	136	137	138	139	140
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	141	142	143	144	145	146	147	148	149	150
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	151	152	153	154	155	156	157	158	159	160
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	+	-
No.	161	162	163	164	165	166	167	168	169	170
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-

The detection results of 51 normal person samples from the Joint National Laboratory for Antibody Drug Engineering of Henan University are shown in figure S19 and table S10. There is one false IgM positive sample (number 9) of all the 51 normal persons. The testing process and results are photographed in the clean bench, so the photographing effect is not good, but it does not affect the interpretation of the results. Sample No. 23 was not tested and result collected at the same time with other samples. We combined the results.

COVID-19 IgG/IgM C G M	COVID-19 IgG/IgM C G M	COVID-19 IgG/IgM C G M	COVID-19 IgG/IgM C G M	COVID-19 IgG/IgM C G M	6 COVID-19 IgG/IgM G M	C C C M	8 covid-19 lgG/gM	YID-19 GrigM C G M	о ир-19 Злам
0	0	6	6	0			6	0	•
		19 COVID-1 19 GOVID-1 19 GARM	Ig COVID-1 IgG/IgM C G M	COVID-1 IgG/IgM C G M	rig Ig COVID-1 IgG/IgM C G M	IP COVID-15 IgG/IgM C G M	/2 COVID-19 IgG/IgM C G M	lq COVID-19 IgG/igM C G M	COVID-19 IgGAgM C G M
C G M		COVID-19 IgG/IgM C G M	CVID-19 IgGrIgM C G M	COVID-19 IgG/IgM C G M	2-6 COVID-19 IgG/IgM C G M	2-7 COVID-19 IgG/IgM C G M	2.ÿ COVID-19 IgGIgM C G M	COVID-19 IgG/IgM C G M	SOVID-19 IgG/IgM C G M
	-19 covno- igangk C F M	10 COVID- IgGight C G F M		COVID-1 IgGAgM C C M	G G	e covib-te igGigm C C C C C C C C C C C C C C C C C C C	37 COVID-19 IgG/igM C G M	COVID-19 Igg/igM C G M	COVID-19 IgG/IgM C C M M
COVID-11 IgG31gM C G M	covid-19 lgGigM C G M	COVID-19 IgGigM C F G M		COVID-19 IgG/IgM E G M	416 ovib-19 GG/gM F C G M	47 VID-19 GrigM = C = M	D-19 GM 19G/IgM C G M	C G M	COVID-19 IgGAgM C G M

Figure S19 Detection results of normal person samples

No.	1	2	3	4	5	6	7	8	9	10
lgG	-	-	-	-	-	-	-	-	-	-
IgM	-	-	-	-	-	-	-	-	+	-
No.	11	12	13	14	15	16	17	18	19	20
lgG	-	-	-	-	-	-	-	-	-	-
IgM	-	-	-	-	-	-	-	-	-	-
No.	21	22	23	24	25	26	27	28	29	30
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	31	32	33	34	35	36	37	38	39	40
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	41	42	43	44	45	46	47	48	49	50
lgG	-	-	-	-	-	-	-	-	-	-
IgM	-	-	-	-	-	-	-	-	-	-
No.	51									
lgG	-									
IgM	-									

Table S10 Judgement result of 51 normal person samples

The detection results of blood samples from 26 medical workers are shown in figure S20 and table S11. The detection were completed with finger blood by themselves in quarantine hotel. Blood and dilution was added excessively and leading to unclean detection background, but it does not affect the interpretation of the results.



Figure S20 Detection results of 26 blood samples from 26 medical workers

No.	1	2	3	4	5	6	7	8	9	10
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	11	12	13	14	15	16	17	18	19	20
lgG	-	-	-	-	-	-	-	-	-	-
lgM	-	-	-	-	-	-	-	-	-	-
No.	21	22	23	24	25	26				
lgG	-	-	-	-	-	-				
lgM	-	-	-	-	-	-				

Table S11 Judgement result of 26 blood samples from 26 medical workers

11 Preparation methods of conjugate pad and reaction pad

The preparation of conjugate pad and sample pad in the lateral flow kit is very important, including the raw materials used. In addition to what is shown in the manuscript, we also the method of kit and add it to the supplemental materials.

Preparation of conjugate pad: The labeled proteins was resuspended in working solution (10 mM PBS pH 7.4 containing 0.05% Tween 20, 1% BSA, 5% sucrose, and 5% trehalose), and sprayed with rate of 8μL/min by dispense platform (Shanghai Jiening Biotechnology Co., Ltd., XYZ3010) at room temperature, and dry for 12 hours at 37°C.

Preparation of reaction pad: The anti-human IgG (Fapon Biotech Inc. 20200221), anti-human IgM (Fapon Biotech Inc. 20180221-2) and anti-His antibody (Luoyang Baiaitong Experimental materials center, C010106) was diluted to 4 mg/mL, 4 mg/mL and 1mg/mL by PBS (10mM, pH7.4), respectively, and spraying onto G test line, M test line and control line of nitrocellulose membrane at room temperature, and dry for 6 hours at 37°C.