

Additional file 1

Development and clinical evaluation of an up-converting phosphor technology-based point-of-care (UPT-POCT) assay for diagnosis of COVID-19 and rapid prediction of protective effect

Pingping Zhang^{1, 2#}, Baisheng Li^{3#}, Yao Wang^{4#}, Wei Min^{2#}, Xiaohui Wang^{5#}, Yugui Zhou^{1, 2#}, Zhencui Li³, Yong Zhao¹, Huan Zhang³, Min Jiang⁵, Huanying Zheng³, Chao Yang⁵, Wei Zhang³, LeZuo⁵, Qi Gao², Zhengrong Yang⁵, Yanzhao Li², Tiejian Feng⁵, Changqing Lin^{2*}, Qinghua Hu^{5*}, Tie Song^{3*}, Ruifu Yang^{1, 4*}

Author Affiliations:

¹State Key Laboratory of Pathogen and Biosecurity, Beijing Institute of Microbiology and Epidemiology, Beijing 100071, P. R. China

²Beijing Key Laboratory of POCT for Bioemergency and Clinic (No. BZ0329), Beijing 100071, P. R. China

³Guangdong Provincial Center for Disease Control and Prevention, Guangzhou 511430, P. R. China

⁴Department of Clinical Laboratory, Peking Union Medical College Hospital, Peking Union Medical College, Chinese Academy of Medical Sciences, Beijing, 100032, People's Republic of China

⁵Shenzhen Center for Disease Control and Prevention, Shenzhen, P. R. China

#: These authors contributed equally to this work.

***Address for Correspondence**

Ruifu Yang, Beijing Institute of Microbiology and Epidemiology, No. 20, Dongdajie Street, Fengtai District, Beijing 100071, P. R. China. Email: ruifuyang@gmail.com

Tie Song, Guangdong Provincial Center for Disease Control and Prevention, Guangzhou 511430, P. R.

China. Email: sjkzx_songtie@gd.gov.cn

Qinghua Hu, Shenzhen Center for Disease Control and Prevention, Shenzhen, P. R. China. Email:

huqinghua@szcdc.net

Changqing Lin, Beijing Key Laboratory of POCT for Bioemergency and Clinic (No. BZ0329), Beijing

100071, P. R. China. Email: changqing.lin@hotgen.com.cn

Supplementary Tables

Table S1 Detection results for the serum sample from one convalescent COVID-19 patient.

Sample size	Dilution fold	T/C ratio of UPT		OD value of ELISA	
		MEAN	SD	MEAN	SD
3	Negative control	0.175	0.015	1.00E-03	0.004
3	3200	0.211	0.006	0.009	0.007
3	1600	0.263	0.02146	0.033	0.00436
6	800	0.343	0.0097	0.084	0.01137
3	400	0.512	0.04277	0.164	0.007
3	200	0.761	0.05735	0.411	0.04291
3	100	1.45	0.09949	0.781	0.16901
3	50	3.09	0.34314	1.956	0.30453
3	25	4.291	0.07657	2.622	0.08271
3	12.5	8.154	0.264	2.794	0.01931
2	6.25	12.881	0.544	2.8835	0.05303

Table S2 Detection results for 39 serum samples taken from 27 COVID-19 patients during the acute phase of illness

Sample No.	Dilution Fold	T/C ratio of UPT		OD value of ELISA		Calculated T/C ratio*
		MEAN	SD	MEAN	SD	
1	100	1.417	0.089	0.685	0.136	1.274
2	25	0.769	0.092	0.297	0.048	0.673
3	100	0.738	0.091	0.577	0.062	1.107
4	400	1.245	0.01	0.661	0.061	1.237
5	100	1.253	0.109	0.8	0.071	1.452
6	100	0.672	0.028	0.89	0.105	1.592
7	100	2.279	0.259	2.167	0.202	3.57
8	400	2.582	0.017	0.419	0.042	0.862
9	100	0.83	0.14	0.743	0.061	1.364
10	100	0.902	0.128	0.585	0.098	1.119
11	100	0.376	0.03	0.178	0.007	0.489
12	400	0.978	0.027	0.747	0.047	1.37
13	100	2.546	0.098	2.132	0.051	3.515
14	400	1.483	0.082	1.452	0.088	2.462
15	400	1.04	0.046	0.433	0.006	0.884
16	100	1.473	0.047	0.73	0.078	1.344
17	100	3.51	0.179	1.286	0.328	2.205
18	100	0.73	0.048	0.34	0.018	0.74
19	100	2.859	0.102	1.13	0.059	1.963

20	100	1.147	0.112	1.109	0.052	1.931
21	100	1.455	0.071	1.417	0.122	2.408
22	100	3.487	0.112	0.714	0.064	1.319
23	100	2.062	0.157	0.682	0.07	1.269
24	100	1.847	0.065	1.176	0.25	2.035
25	100	1.024	0.087	0.59	0.077	1.127
26	100	3.374	0.264	2.046	0.211	3.382
27	100	1.71	0.124	1.401	0.206	2.383
28	100	0.956	0.092	0.49	0.017	0.972
29	100	2.341	0.33	1.617	0.104	2.718
30	100	0.279	0.021	0.079	0.002	0.335
31	100	0.648	0.033	0.667	0.02	1.246
32	100	3.376	0.259	2.119	0.105	3.495
33	100	1.895	0.212	1.785	0.044	2.978
34	400	1.221	0.003	1.052	0.129	1.843
35	100	0.363	0.027	0.266	0.018	0.625
36	100	1.732	0.112	0.893	0.033	1.596
37	400	1.449	0.073	0.883	0.013	1.581
38	100	0.702	0.074	1.53	0.086	2.583
39	100	1.066	0.06	1.798	0.036	2.998

* Calculated T/C ratio (y) = 1.549x + 0.213, where “x” is the OD value from an ELISA. This equation was obtained from the results of the convalescent serum samples.

Table S3 Correlation between the T/C ratios and NAb titers for 528 serum samples from 312 COVID-19 patients

Sample size	Neutralizing titer	MEAN of T/C	SD of T/C
16 (+1*)	1:4	0.859	0.669
46	1:8	1.166	0.846
54	1:16	1.901	1.073
140	1:32	2.735	1.860
75	1:64	4.062	2.450
103	1:128	5.019	2.941
40	1:256	5.917	3.335
33	1:512	7.230	2.936
14	1:1024	8.345	4.539
6	>1:1024	13.753	3.894
Total: 528			

Note: One serum sample with neutralizing titer of 1:4 and T/C ratio of 38.54 was excluded for calculation of average of T/C, but included in Spearman rank correlation analysis.

Table S4 Correlation between the T/C ratios and RP rates

Neutralizing titer	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512	1:1024
NRP cases	9	20	32	42	31	41	22	8	8
RP cases	6	12	12	35	10	16	5	3	0
Total	15	32	44	77	41	57	27	11	8
RP rate	40%	38%	27%	45%	24%	28%	19%	27%	0%
Mean of T/C ratio	0.738	1.246	1.960	3.287	4.380	5.546	6.204	6.339	9.689
SD of T/C ratio	0.509	0.914	1.143	2.102	2.677	3.033	3.710	1.414	5.730

SD: Standard deviation

Table S5 Correlation between the T/C ratios and accumulated RP (ARP) rates

Neutralizing titer	Accumulated NRP cases (a)	ARP cases (b)	Cases included (a+b)	ARP rate (b/a+b)	Cases in proportion ((a+b) /312)	MEAN of T/C ratio	SD of T/C ratio
≥1:4	213	99	312	32%	100%	0.738	0.509
≥1:8	204	93	297	31%	95%	1.246	0.914
≥1:16	184	81	265	31%	85%	1.960	1.143
≥1:32	152	69	221	31%	71%	3.287	2.102
≥1:64	110	34	144	24%	46%	4.380	2.677
≥1:128	79	24	103	23%	33%	5.546	3.033
≥1:256	38	8	46	17%	15%	6.204	3.710
≥1:512	16	3	19	16%	6%	6.339	1.414
≥1:1024	8	0	8	0%	3%	9.689	5.730

SD: Standard deviation

Table S6 Correlation between the T/C ratios and protection rates against RP

Neutralizing	Total – Accumulated	Protection rate	MEAN of	SD of T/C
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titer	RP		T/C ratio	ratio
≥1:4	213	0.68	0.738	0.509
≥1:8	219	0.7	1.246	0.914
≥1:16	231	0.74	1.96	1.143
≥1:32	243	0.78	3.287	2.102
≥1:64	278	0.89	4.38	2.677
≥1:128	288	0.92	5.546	3.033
≥1:256	304	0.97	6.204	3.71
≥1:512	309	0.99	6.339	1.414
≥1:1024	312	1.00	9.689	5.73

SD: Standard deviation

Protection rate: (Total – Accumulated RP)/Total

Table S7 Detection results for the serum samples from COVID-19-vaccinated people

Sample size	Neutralizing titer	UPT-POCT assay	
		MEAN of T/C ratio	SD
2	1:32	1.327	0.047
13	1:48	2.275	1.438
5	1:64	2.354	0.608
8	1:96	4.345	1.525
7	1:192	8.177	3.492
Total: 35			