Electronic Supplementary Material (ESI) for Analytical Methods.

Early Diagnosis of Myocardial Infarction in clinic through CK-MB Detection Using Magnetic Separation Integrated with Chemiluminescence

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Table S1. The analytical performance of the related methods and our method.

Methods	Quantitative range	Advantage	Disadvantage
Immunoinhibitory assay	0-1000 U/L	Low cost	Many interference factors
Electrochemiluminescence	0.100-500 ng/mL	Sensitive	Complicated, expensive
Colloidal gold test strip	----	Simple, low cost	Qualitative
Our method	0-500 ng/mL	Sensitive, simple	----

Table S2. The results of detection of CK-MB -depleted serum by our method.

Replicates	**CK-MB (ng/mL)**	**Replicates**	**CK-MB (ng/mL)**	**Replicates**	**CK-MB (ng/mL)**
1	0.013	21	0.064	41	0.081
2	0.027	22	0.065	42	0.082
3	0.031	23	0.066	43	0.083
4	0.032	24	0.066	44	0.085
5	0.033	25	0.067	45	0.086
6	0.044	26	0.067	46	0.086
7	0.045	27	0.067	47	0.090
8	0.047	28	0.069	48	0.091
9	0.049	29	0.069	49	0.092
10	0.055	30	0.070	50	0.095
11	0.055	31	0.073	51	0.095
12	0.055	32	0.074	52	0.096
13	0.056	33	0.075	53	0.096
14	0.057	34	0.075	54	0.096
15	0.058	35	0.076	55	0.097
16	0.059	36	0.077	56	0.097
17	0.059	37	0.077	*57*	0.097
18	0.063	38	0.078	*58*	0.099
19	0.063	39	0.080	59	0.103
20	0.064	40	0.081	60	0.105

Table S3. The results of detection of CK-MB -depleted serum by our method using other batch of reaction reagent.

Replicates	**CK-MB (ng/mL)**	**Replicates**	**CK-MB (ng/mL)**	**Replicates**	**CK-MB (ng/mL)**
1	0.002	21	0.047	41	0.067
2	0.017	22	0.047	42	0.068
3	0.020	23	0.048	43	0.071

Replicates	CK-MB (ng/mL)	Replicates	CK-MB (ng/mL)	Replicates	CK-MB (ng/mL)
4	0.022	24	0.050	44	0.072
5	0.023	25	0.053	45	0.072
6	0.025	26	0.054	46	0.074
7	0.026	27	0.055	47	0.075
8	0.029	28	0.055	48	0.079
9	0.029	29	0.057	49	0.079
10	0.032	30	0.058	50	0.082
11	0.034	31	0.058	51	0.083
12	0.035	32	0.059	52	0.085
13	0.035	33	0.061	53	0.087
14	0.036	34	0.061	54	0.088
15	0.037	35	0.062	55	0.089
16	0.037	36	0.064	56	0.092
17	0.040	37	0.064	*57*	0.097
18	0.042	38	0.065	*58*	0.103
19	0.045	39	0.066	59	0.107
20	0.045	40	0.067	60	0.111

Table S4. The results of detection of the five low samples by our method.

	Orig. Sample [ng/ml]	0.250	0.280	0.300	0.350	0.380
	Rep	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Run1	rep 1	0.126	0.267	0.237	0.247	0.443
	rep 2	0.373	0.395	0.197	0.145	0.473
	rep 3	0.339	0.123	0.285	0.456	0.167
	rep 4	0.297	0.181	0.171	0.271	0.334
Run2	rep 1	0.093	0.438	0.186	0.470	0.302
	rep 2	0.217	0.290	0.258	0.250	0.479
	rep 3	0.117	0.140	0.209	0.406	0.441
	rep 4	0.101	0.188	0.325	0.250	0.173
Run3	rep 1	0.325	0.268	0.497	0.203	0.354
	rep 2	0.282	0.368	0.265	0.441	0.259
	rep 3	0.279	0.235	0.335	0.427	0.472
	rep 4	0.097	0.159	0.427	0.378	0.440
SD				0.116		
Mean				0.290		

Table S5. The results of detection of the five low samples by our method using other batch of reaction reagent.

Orig. Sample [ng/ml]	0.250	0.280	0.300	0.350	0.380

	Rep	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Run1	rep 1	0.139	0.231	0.185	0.398	0.361
	rep 2	0.129	0.303	0.455	0.259	0.255
	rep 3	0.173	0.256	0.507	0.257	0.458
	rep 4	0.385	0.205	0.344	0.244	0.339
Run2	rep 1	0.345	0.106	0.237	0.271	0.461
	rep 2	0.193	0.239	0.392	0.282	0.234
	rep 3	0.095	0.342	0.497	0.497	0.242
	rep 4	0.372	0.079	0.142	0.226	0.515
Run3	rep 1	0.168	0.249	0.229	0.278	0.457
	rep 2	0.133	0.218	0.253	0.393	0.290
	rep 3	0.160	0.121	0.340	0.476	0.304
	rep 4	0.223	0.376	0.288	0.498	0.448
SD				0.119		
Mean				0.293		

Table S6. The results of detection of 4 ng/mL, 70 ng/mL, and 200 ng/mL CK-MB with the presence of different concentration of bilirubin using our method.

	[Conc] mg/mL	0	0.1	0.2	0.3	0.4
Low Sample	Rep 1	3.801	3.762	3.833	4.094	4.220
	Rep 2	3.903	3.765	4.065	3.691	4.009
	Rep 3	3.974	4.055	3.818	4.085	4.076
	Average	3.893	3.861	3.905	3.956	4.102
	% Recovery		96.53%	97.63%	98.90%	102.55%
Medium Sample	Rep 1	70.38	66.16	68.72	63.10	69.41
	Rep 2	70.00	69.43	70.45	66.38	71.83
	Rep 3	67.60	70.92	71.42	73.52	75.92
	Average	69.33	68.84	70.20	67.67	72.39
	% Recovery		98.34%	100.29%	96.67%	103.41%
High Sample	Rep 1	193.1	196.2	196.7	204.2	210.2
	Rep 2	196.3	193.1	198.2	197.8	186.7
	Rep 3	202.4	197.5	204.9	199.8	216.8
	Average	197.3	195.6	199.9	200.6	204.6
	% Recovery		97.80%	99.95%	100.30%	102.30%

Table S7. The results of detection of 4 ng/mL, 70 ng/mL, and 200 ng/mL CK-MB with the presence of different concentration of hemoglobin using our method.

	[Conc] mg/dL	0	500	1000	1500	2000
Low Sample	Rep 1	3.692	3.785	3.801	3.909	4.086
	Rep 2	3.796	3.680	3.689	3.847	4.025
	Rep 3	3.766	3.754	3.853	3.791	3.779
	Average	3.751	3.740	3.781	3.849	3.963
	% Recovery		93.50%	94.53%	96.23%	99.08%

Medium Sample	Rep 1	66.44	66.95	66.39	67.41	68.30
	Rep 2	66.91	66.70	69.13	66.51	70.16
	Rep 3	64.61	64.99	66.83	68.28	68.74
	Average	65.99	66.21	67.45	67.40	69.06
	% Recovery		94.59%	96.36%	96.29%	98.66%
High Sample	Rep 1	192.5	186.8	181.9	196.3	202.4
	Rep 2	194.7	188.8	189.6	191.4	195.3
	Rep 3	188.9	188.8	195.5	179.0	200.2
	Average	192.0	188.1	189.0	188.9	199.3
	% Recovery		94.05%	94.50%	94.45%	99.65%

Table S8. The results of detection of 4 ng/mL, 70 ng/mL, and 200 ng/mL CK-MB with the presence of different concentration of triglycerides using our method.

Low Sample	[Conc] mg/dL	0	500	1000	1500	2000
	Rep 1	3.991	4.019	4.044	3.887	3.850
	Rep 2	4.067	4.058	4.125	3.854	3.885
	Rep 3	4.072	3.964	3.828	4.094	4.003
	Average	4.043	4.014	3.999	3.945	3.913
	% Recovery		100.35%	99.98%	98.63%	97.83%
Medium Sample	Rep 1	71.79	68.75	71.04	69.53	69.98
	Rep 2	69.09	68.86	73.77	59.50	70.04
	Rep 3	69.83	67.65	64.68	70.33	74.69
	Average	70.24	68.42	69.83	66.46	71.57
	% Recovery		97.74%	99.76%	94.94%	102.24%
High Sample	Rep 1	201.8	198.4	200.8	219.7	193.8
	Rep 2	204.0	201.3	201.3	187.7	190.9
	Rep 3	193.9	198.1	198.1	196.4	198.1
	Average	199.9	199.3	200.1	201.3	194.3
	% Recovery		99.65%	100.05%	100.65%	97.15%

Table S9. The comparison results obtained by immunofluorescence method and our method.

Sample Number	Immunofluorescence method (ng/mL)	Our method (ng/mL)	Recovery %
1	34.36	34.01	98.98
2	215.45	224.67	104.2
3	254.01	251.88	99.16
4	47.25	46.14	97.65
5	2.21	2.25	101.8
6	15.62	15.65	100.1
7	1.99	2	100.5
8	4.31	4.41	102.3

9	1.31	1.28	97.71
10	57.71	57.9	100.3
11	3.33	3.46	103.9
12	1.62	1.6	98.77
13	22.18	22.62	102.0
14	81.75	78.57	96.11
15	4.77	4.73	99.16
16	1.59	1.56	98.11
17	18.1	18.95	104.7
18	37.61	36.12	96.04
19	6.29	6.55	104.1
20	5.12	4.94	96.48
21	69.5	69.05	99.35
22	103.05	107.5	104.3
23	2.19	2.2	100.5
24	2.84	2.9	102.1
25	258.97	257.09	99.27
26	2.68	2.78	103.7
27	108.71	110.3	101.5
28	89.94	89.41	99.41
29	30.87	30.72	99.51
30	7.23	7.26	100.4
31	77.9	78.54	100.8
32	237.96	237.66	99.87
33	146.01	147.95	101.3
34	148.16	149.89	101.2
35	198	205.13	103.6
36	7.43	7.49	100.8
37	181.85	184.27	101.3
38	172.99	168.92	97.65
39	3.29	3.24	98.48
40	6.21	5.93	95.49
41	76.54	79.26	103.6
42	24.6	24.73	100.5
43	153.6	153.55	99.97
44	68.59	71.93	104.9
45	11.26	11.79	104.7
46	197.64	193.12	97.71
47	114.09	109.24	95.75
48	11.63	11.5	98.88
49	16.83	17.59	104.5
50	235.2	234.71	99.79

51	45.39	43.19	95.15
52	95.14	92.34	97.06
53	229.27	218.03	95.10
54	114.74	108.51	94.57
55	19.68	19.63	99.75
56	5.54	5.31	95.85
57	176.58	177.51	100.5
58	263.03	256.59	97.55
59	46.48	45.88	98.71
60	60.93	64.97	106.6
61	275.97	283.77	102.8
62	160.04	151.53	94.68
63	242.2	229.84	94.90
64	61.35	60.89	99.25
65	145.79	148.13	101.6
66	205.15	194.19	94.66
67	85.29	89.3	104.7
68	45.01	43.72	97.13
69	175.58	169.3	96.42
70	51.01	47.34	92.81
71	123.08	124.64	101.3
72	51.71	51.16	98.94
73	73.89	69.39	93.91
74	43.01	44.81	104.2
75	194.94	203.41	104.3
76	103.93	101.2	97.37
77	22.9	22.75	99.34
78	35.32	33.95	96.12
79	108.82	110.07	101.1
80	17.87	18.04	101.0
81	3.49	3.42	97.99
82	1.65	1.57	95.15
83	22.78	22.67	99.52
84	77.39	78.45	101.37
85	4.84	4.58	94.63
86	1.62	1.55	95.68
87	18.19	19.12	105.11
88	38.77	37.09	95.67
89	6.5	6.37	98.00
90	4.9	4.96	101.2
91	71.34	69.16	96.94
92	110.4	107.4	97.28

93	2.31	2.09	90.48
94	2.99	2.88	96.32
95	251.57	249.13	99.03
96	2.71	2.84	104.8
97	110.56	109.81	99.32
98	90.47	92.72	102.5
99	31.07	30.27	97.43
100	7.22	7.25	100.4
101	65.51	64.7	98.76
102	4.78	4.77	99.79
103	99.09	101.24	102.2
104	3.82	3.99	104.5
105	189.94	185.95	97.90
106	33.19	34.53	104.0
107	4.86	4.94	101.6
108	67.8	71.26	105.1
109	104.12	104.7	100.6
110	2.19	2.12	96.80
111	3.05	2.87	94.10
112	245.38	253.29	103.2
113	2.83	2.71	95.76
114	44.47	45.69	102.7
115	95.91	100.2	104.5
116	21.99	20.85	94.82
117	34.9	33.13	94.93
118	111.44	110.76	99.39
119	17.99	18.1	100.6
120	3.52	3.44	97.73

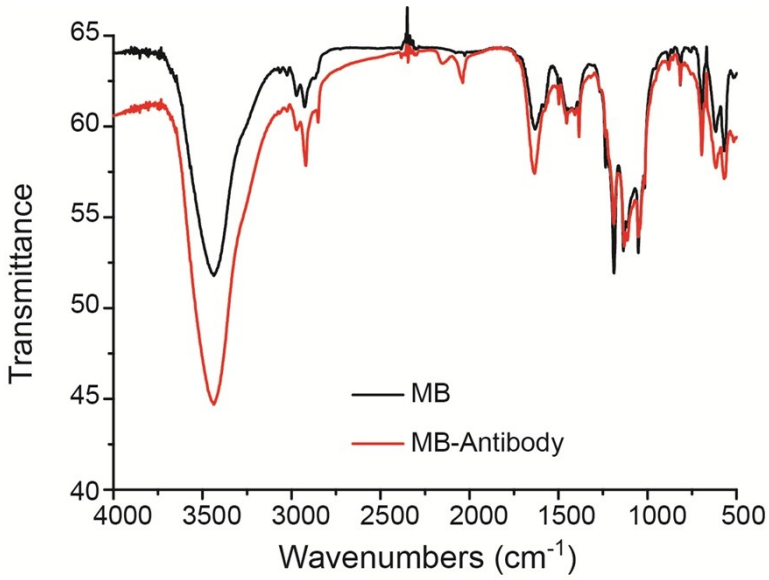

Figure S1. Infrared spectroscopy of MB and antibody labelled MB.

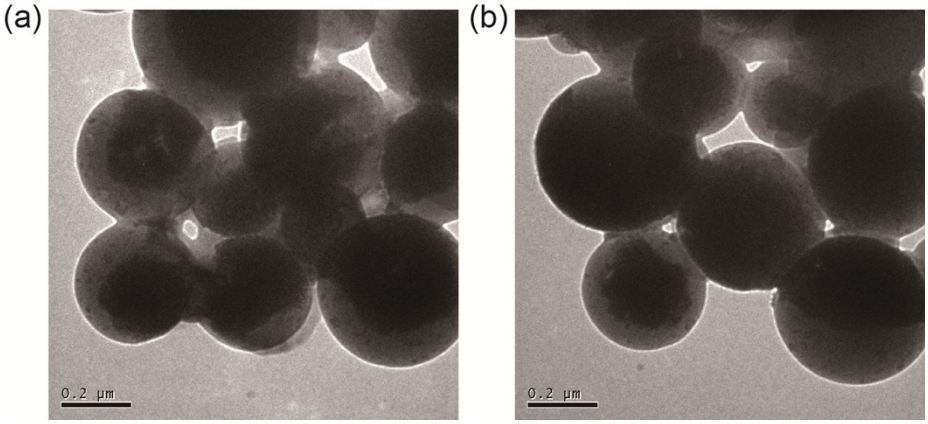

Figure S2. TEM image of MB (a) and antibody labelled MB (b).