

Three-Dimensional Paper-Based Model for Cardiac Ischemia

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Supplemental Information:

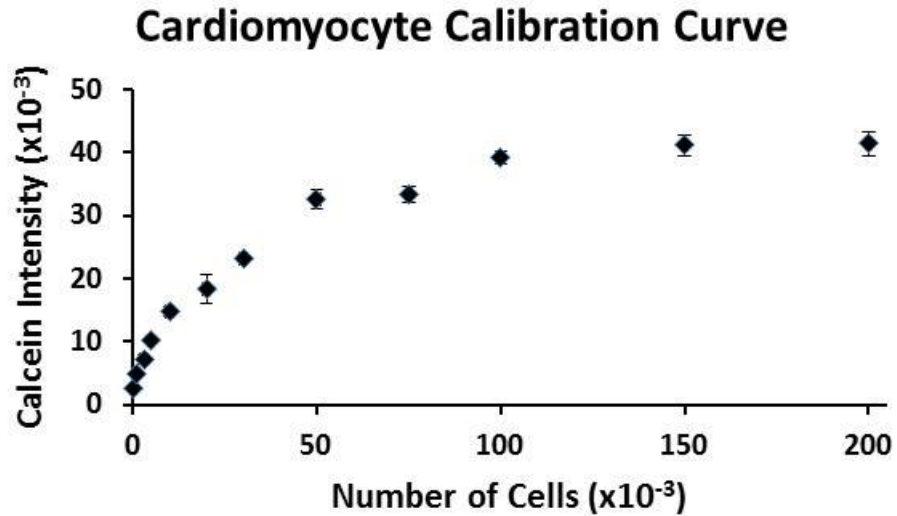


Figure S1. Calibration Curve. Plot relating the number of cardiomyocytes seeded into a sheet of the paper scaffold (Whatman 114 chromatography paper) and the fluorescence intensities measured after calcein staining. The cardiomyocytes were seeded and cultured for six hours in M199 culture media prior to calcein staining and imaging on a Typhoon 9000 FLA fluorescence scanner (GE Healthcare).

Lists of the detailed statistical information (generated from SigmaPlot) for each of the figures presented in the manuscript.

Figure 1D:

One Way Analysis of Variance

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Group Name	N	Missing	Mean	Std Dev	SEM
Row 1	20	0	90362.644	18979.871	4244.028
Row 2	20	0	25405.186	2531.418	566.042
Row 3	20	0	39785.375	5240.035	1171.708
Row 4	20	0	30487.635	3585.032	801.638
Row 5	20	0	30621.785	4392.250	982.137
Row 6	20	0	34289.710	5603.747	1253.036
Row 7	20	0	65377.922	10449.918	2336.673
Row 8	20	0	20777.583	3278.578	733.112
Row 9	20	0	12390.386	776.579	173.648
Row 10	20	0	8364.595	824.436	184.350
Row 11	20	0	7294.987	543.596	121.552
Row 12	20	0	9815.978	621.668	139.009
Row 13	20	0	58588.779	8658.197	1936.032
Row 14	20	0	14159.462	2149.056	480.544
Row 15	20	0	6660.413	607.547	135.852
Row 16	20	0	5176.421	763.707	170.770
Row 17	20	0	4483.815	422.868	94.556
Row 18	20	0	4744.340	753.981	168.595

Source of Variation	DF	SS	MS	F	P
Between Groups	17	201073314084.667	11827842004.980	322.165	<0.001
Residual	342	12556053874.318	36713607.820		
Total	359	213629367958.985			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = <0.001).

Power of performed test with alpha = 0.050: 1.000

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):

Overall significance level = 0.05

Comparisons for factor:

Comparison	Diff of Means	t	Unadjusted P	Critical Level	Significant?
Row 1 vs. Row 17	85878.829	44.820	<0.001	0.000	Yes
Row 1 vs. Row 18	85618.304	44.684	<0.001	0.000	Yes
Row 1 vs. Row 16	85186.223	44.459	<0.001	0.000	Yes
Row 1 vs. Row 15	83702.231	43.684	<0.001	0.000	Yes
Row 1 vs. Row 11	83067.657	43.353	<0.001	0.000	Yes
Row 1 vs. Row 10	81998.049	42.795	<0.001	0.000	Yes
Row 1 vs. Row 12	80546.666	42.037	<0.001	0.000	Yes
Row 1 vs. Row 9	77972.258	40.694	<0.001	0.000	Yes
Row 1 vs. Row 14	76203.182	39.770	<0.001	0.000	Yes

Row 1 vs. Row 8	69585.061	36.316	<0.001	0.000	Yes
Row 1 vs. Row 2	64957.459	33.901	<0.001	0.000	Yes
Row 7 vs. Row 17	60894.107	31.781	<0.001	0.000	Yes
Row 7 vs. Row 18	60633.582	31.645	<0.001	0.000	Yes
Row 7 vs. Row 16	60201.501	31.419	<0.001	0.000	Yes
Row 1 vs. Row 4	59875.009	31.249	<0.001	0.000	Yes
Row 1 vs. Row 5	59740.859	31.179	<0.001	0.000	Yes
Row 7 vs. Row 15	58717.509	30.645	<0.001	0.000	Yes
Row 7 vs. Row 11	58082.935	30.313	<0.001	0.000	Yes
Row 7 vs. Row 10	57013.327	29.755	<0.001	0.000	Yes
Row 1 vs. Row 6	56072.934	29.264	<0.001	0.000	Yes
Row 7 vs. Row 12	55561.944	28.998	<0.001	0.000	Yes
Row 13 vs. Row 17	54104.963	28.237	<0.001	0.000	Yes
Row 13 vs. Row 18	53844.439	28.101	<0.001	0.000	Yes
Row 13 vs. Row 16	53412.357	27.876	<0.001	0.000	Yes
Row 7 vs. Row 9	52987.536	27.654	<0.001	0.000	Yes
Row 13 vs. Row 15	51928.365	27.101	<0.001	0.000	Yes
Row 13 vs. Row 11	51293.791	26.770	<0.001	0.000	Yes
Row 7 vs. Row 14	51218.460	26.731	<0.001	0.000	Yes
Row 1 vs. Row 3	50577.270	26.396	<0.001	0.000	Yes
Row 13 vs. Row 10	50224.183	26.212	<0.001	0.000	Yes
Row 13 vs. Row 12	48772.800	25.454	<0.001	0.000	Yes
Row 13 vs. Row 9	46198.393	24.111	<0.001	0.000	Yes
Row 7 vs. Row 8	44600.339	23.277	<0.001	0.000	Yes
Row 13 vs. Row 14	44429.316	23.188	<0.001	0.000	Yes
Row 7 vs. Row 2	39972.737	20.862	<0.001	0.000	Yes
Row 13 vs. Row 8	37811.196	19.734	<0.001	0.000	Yes
Row 3 vs. Row 17	35301.559	18.424	<0.001	0.000	Yes
Row 3 vs. Row 18	35041.035	18.288	<0.001	0.000	Yes
Row 7 vs. Row 4	34890.287	18.209	<0.001	0.000	Yes
Row 7 vs. Row 5	34756.137	18.139	<0.001	0.000	Yes
Row 3 vs. Row 16	34608.953	18.062	<0.001	0.000	Yes
Row 13 vs. Row 2	33183.593	17.318	<0.001	0.000	Yes
Row 3 vs. Row 15	33124.961	17.288	<0.001	0.000	Yes
Row 3 vs. Row 11	32490.387	16.957	<0.001	0.000	Yes
Row 1 vs. Row 13	31773.866	16.583	<0.001	0.000	Yes
Row 3 vs. Row 10	31420.779	16.398	<0.001	0.000	Yes
Row 7 vs. Row 6	31088.212	16.225	<0.001	0.000	Yes
Row 3 vs. Row 12	29969.396	15.641	<0.001	0.000	Yes
Row 6 vs. Row 17	29805.895	15.556	<0.001	0.000	Yes
Row 6 vs. Row 18	29545.371	15.420	<0.001	0.000	Yes
Row 6 vs. Row 16	29113.289	15.194	<0.001	0.000	Yes
Row 13 vs. Row 4	28101.144	14.666	<0.001	0.001	Yes
Row 13 vs. Row 5	27966.993	14.596	<0.001	0.001	Yes
Row 6 vs. Row 15	27629.297	14.420	<0.001	0.001	Yes
Row 3 vs. Row 9	27394.989	14.297	<0.001	0.001	Yes
Row 6 vs. Row 11	26994.723	14.089	<0.001	0.001	Yes
Row 5 vs. Row 17	26137.970	13.641	<0.001	0.001	Yes
Row 4 vs. Row 17	26003.819	13.571	<0.001	0.001	Yes
Row 6 vs. Row 10	25925.115	13.530	<0.001	0.001	Yes
Row 5 vs. Row 18	25877.445	13.505	<0.001	0.001	Yes
Row 4 vs. Row 18	25743.295	13.435	<0.001	0.001	Yes
Row 3 vs. Row 14	25625.912	13.374	<0.001	0.001	Yes
Row 7 vs. Row 3	25592.548	13.357	<0.001	0.001	Yes
Row 5 vs. Row 16	25445.364	13.280	<0.001	0.001	Yes
Row 4 vs. Row 16	25311.214	13.210	<0.001	0.001	Yes

Row 1 vs. Row 7	24984.722	13.040	<0.001	0.001	Yes
Row 6 vs. Row 12	24473.732	12.773	<0.001	0.001	Yes
Row 13 vs. Row 6	24299.068	12.682	<0.001	0.001	Yes
Row 5 vs. Row 15	23961.372	12.505	<0.001	0.001	Yes
Row 4 vs. Row 15	23827.222	12.435	<0.001	0.001	Yes
Row 5 vs. Row 11	23326.798	12.174	<0.001	0.001	Yes
Row 4 vs. Row 11	23192.648	12.104	<0.001	0.001	Yes
Row 5 vs. Row 10	22257.190	11.616	<0.001	0.001	Yes
Row 4 vs. Row 10	22123.040	11.546	<0.001	0.001	Yes
Row 6 vs. Row 9	21899.325	11.429	<0.001	0.001	Yes
Row 2 vs. Row 17	20921.370	10.919	<0.001	0.001	Yes
Row 5 vs. Row 12	20805.807	10.859	<0.001	0.001	Yes
Row 4 vs. Row 12	20671.657	10.789	<0.001	0.001	Yes
Row 2 vs. Row 18	20660.846	10.783	<0.001	0.001	Yes
Row 2 vs. Row 16	20228.764	10.557	<0.001	0.001	Yes
Row 6 vs. Row 14	20130.248	10.506	<0.001	0.001	Yes
Row 3 vs. Row 8	19007.792	9.920	<0.001	0.001	Yes
Row 13 vs. Row 3	18803.404	9.813	<0.001	0.001	Yes
Row 2 vs. Row 15	18744.772	9.783	<0.001	0.001	Yes
Row 5 vs. Row 9	18231.399	9.515	<0.001	0.001	Yes
Row 2 vs. Row 11	18110.198	9.452	<0.001	0.001	Yes
Row 4 vs. Row 9	18097.249	9.445	<0.001	0.001	Yes
Row 2 vs. Row 10	17040.590	8.893	<0.001	0.001	Yes
Row 5 vs. Row 14	16462.323	8.592	<0.001	0.001	Yes
Row 4 vs. Row 14	16328.173	8.522	<0.001	0.001	Yes
Row 8 vs. Row 17	16293.768	8.504	<0.001	0.001	Yes
Row 8 vs. Row 18	16033.243	8.368	<0.001	0.001	Yes
Row 8 vs. Row 16	15601.162	8.142	<0.001	0.001	Yes
Row 2 vs. Row 12	15589.207	8.136	<0.001	0.001	Yes
Row 3 vs. Row 2	14380.189	7.505	<0.001	0.001	Yes
Row 8 vs. Row 15	14117.170	7.368	<0.001	0.001	Yes
Row 6 vs. Row 8	13512.127	7.052	<0.001	0.001	Yes
Row 8 vs. Row 11	13482.596	7.037	<0.001	0.001	Yes
Row 2 vs. Row 9	13014.800	6.792	<0.001	0.001	Yes
Row 8 vs. Row 10	12412.988	6.478	<0.001	0.001	Yes
Row 2 vs. Row 14	11245.723	5.869	<0.001	0.001	Yes
Row 8 vs. Row 12	10961.605	5.721	<0.001	0.001	Yes
Row 5 vs. Row 8	9844.202	5.138	<0.001	0.001	Yes
Row 4 vs. Row 8	9710.052	5.068	<0.001	0.001	Yes
Row 14 vs. Row 17	9675.647	5.050	<0.001	0.001	Yes
Row 14 vs. Row 18	9415.122	4.914	<0.001	0.001	Yes
Row 3 vs. Row 4	9297.740	4.852	<0.001	0.001	Yes
Row 3 vs. Row 5	9163.589	4.782	<0.001	0.001	Yes
Row 14 vs. Row 16	8983.041	4.688	<0.001	0.001	Yes
Row 6 vs. Row 2	8884.525	4.637	<0.001	0.001	Yes
Row 8 vs. Row 9	8387.197	4.377	<0.001	0.001	Yes
Row 9 vs. Row 17	7906.570	4.126	<0.001	0.001	Yes
Row 9 vs. Row 18	7646.046	3.990	<0.001	0.001	Yes
Row 14 vs. Row 15	7499.049	3.914	<0.001	0.001	Yes
Row 9 vs. Row 16	7213.965	3.765	<0.001	0.001	Yes
Row 14 vs. Row 11	6864.475	3.583	<0.001	0.001	Yes
Row 7 vs. Row 13	6789.144	3.543	<0.001	0.001	Yes
Row 8 vs. Row 14	6618.121	3.454	<0.001	0.001	Yes
Row 14 vs. Row 10	5794.867	3.024	0.003	0.001	No
Row 9 vs. Row 15	5729.972	2.990	0.003	0.002	No
Row 3 vs. Row 6	5495.664	2.868	0.004	0.002	No

Row 12 vs. Row 17	5332.163	2.783	0.006	0.002	No
Row 5 vs. Row 2	5216.600	2.723	0.007	0.002	No
Row 9 vs. Row 11	5095.399	2.659	0.008	0.002	No
Row 4 vs. Row 2	5082.449	2.653	0.008	0.002	No
Row 12 vs. Row 18	5071.638	2.647	0.008	0.002	No
Row 12 vs. Row 16	4639.557	2.421	0.016	0.002	No
Row 2 vs. Row 8	4627.603	2.415	0.016	0.002	No
Row 14 vs. Row 12	4343.484	2.267	0.024	0.002	No
Row 9 vs. Row 10	4025.791	2.101	0.036	0.002	No
Row 10 vs. Row 17	3880.780	2.025	0.044	0.002	No
Row 6 vs. Row 4	3802.075	1.984	0.048	0.002	No
Row 6 vs. Row 5	3667.925	1.914	0.056	0.002	No
Row 10 vs. Row 18	3620.255	1.889	0.060	0.003	No
Row 10 vs. Row 16	3188.174	1.664	0.097	0.003	No
Row 12 vs. Row 15	3155.565	1.647	0.100	0.003	No
Row 11 vs. Row 17	2811.172	1.467	0.143	0.003	No
Row 9 vs. Row 12	2574.407	1.344	0.180	0.003	No
Row 11 vs. Row 18	2550.647	1.331	0.184	0.003	No
Row 12 vs. Row 11	2520.991	1.316	0.189	0.004	No
Row 15 vs. Row 17	2176.598	1.136	0.257	0.004	No
Row 11 vs. Row 16	2118.566	1.106	0.270	0.004	No
Row 15 vs. Row 18	1916.073	1.000	0.318	0.005	No
Row 14 vs. Row 9	1769.076	0.923	0.357	0.005	No
Row 10 vs. Row 15	1704.182	0.889	0.374	0.006	No
Row 15 vs. Row 16	1483.992	0.774	0.439	0.006	No
Row 12 vs. Row 10	1451.383	0.757	0.449	0.007	No
Row 10 vs. Row 11	1069.608	0.558	0.577	0.009	No
Row 16 vs. Row 17	692.606	0.361	0.718	0.010	No
Row 11 vs. Row 15	634.574	0.331	0.741	0.013	No
Row 16 vs. Row 18	432.081	0.226	0.822	0.017	No
Row 18 vs. Row 17	260.524	0.136	0.892	0.025	No
Row 5 vs. Row 4	134.150	0.0700	0.944	0.050	No

Figure 2C:

One Way Analysis of Variance

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Group Name	N	Missing	Mean	Std Dev	SEM
Row 1	12	0	0.129	0.0538	0.0155
Row 2	11	0	0.313	0.164	0.0496
Row 3	9	0	0.577	0.124	0.0414
Row 4	10	0	0.748	0.0527	0.0167
Row 5	10	0	0.792	0.0600	0.0190
Row 6	11	0	0.761	0.0423	0.0128

Source of Variation	DF	SS	MS	F	P
Between Groups	5	4.210	0.842	95.890	<0.001
Residual	57	0.501	0.00878		
Total	62	4.711			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = <0.001).

Power of performed test with alpha = 0.050: 1.000

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):
Overall significance level = 0.05

Comparisons for factor:

Comparison	Diff of Means	t	Unadjusted P	Critical Level	Significant?
Row 5 vs. Row 1	0.663	16.520	<0.001	0.003	Yes
Row 6 vs. Row 1	0.632	16.151	<0.001	0.004	Yes
Row 4 vs. Row 1	0.619	15.423	<0.001	0.004	Yes
Row 5 vs. Row 2	0.479	11.706	<0.001	0.004	Yes
Row 6 vs. Row 2	0.448	11.217	<0.001	0.005	Yes
Row 3 vs. Row 1	0.448	10.830	<0.001	0.005	Yes
Row 4 vs. Row 2	0.435	10.631	<0.001	0.006	Yes
Row 3 vs. Row 2	0.264	6.267	<0.001	0.006	Yes
Row 5 vs. Row 3	0.215	5.001	<0.001	0.007	Yes
Row 2 vs. Row 1	0.184	4.693	<0.001	0.009	Yes
Row 6 vs. Row 3	0.184	4.374	<0.001	0.010	Yes
Row 4 vs. Row 3	0.171	3.979	<0.001	0.013	Yes
Row 5 vs. Row 4	0.0440	1.050	0.298	0.017	No
Row 5 vs. Row 6	0.0311	0.759	0.451	0.025	No
Row 6 vs. Row 4	0.0129	0.315	0.754	0.050	No

Figure 3B:

One Way Analysis of Variance

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Group Name	N	Missing	Mean	Std Dev	SEM
Row 1	10	0	71943.241	26265.950	8306.023
Row 2	10	0	18513.370	4714.648	1490.903
Row 3	10	0	17013.402	6772.563	2141.672

Source of Variation	DF	SS	MS	F	P
Between Groups	2	19580960764.150	9790480382.075	38.749	<0.001
Residual	27	6821961032.570	252665223.429		
Total	29	26402921796.720			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference ($P = <0.001$).

Power of performed test with alpha = 0.050: 1.000

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):

Overall significance level = 0.05

Comparisons for factor:

Comparison	Diff of Means	t	Unadjusted P	Critical Level	Significant?
Row 1 vs. Row 3	54929.839	7.727	<0.001	0.017	Yes
Row 1 vs. Row 2	53429.871	7.516	<0.001	0.025	Yes
Row 2 vs. Row 3	1499.969	0.211	0.834	0.050	No

Figure 3C:

One Way Analysis of Variance

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Group Name	N	Missing	Mean	Std Dev	SEM
Row 1	10	0	73.600	255.793	80.889
Row 2	10	0	1502.900	254.824	80.582
Row 3	10	0	237.100	286.816	90.699
Row 4	10	0	2870.500	329.419	104.171
Row 5	10	0	1097.000	487.791	154.253
Row 6	10	0	3763.400	624.872	197.602

Source of Variation	DF	SS	MS	F	P
Between Groups	5	107437872.150	21487574.430	135.775	<0.001
Residual	54	8545967.100	158258.650		
Total	59	115983839.250			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = <0.001).

Power of performed test with alpha = 0.050: 1.000

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):
Overall significance level = 0.05

Comparisons for factor:

Comparison	Diff of Means	t	Unadjusted P	Critical Level	Significant?
Row 6 vs. Row 1	3689.800	20.740	<0.001	0.003	Yes
Row 6 vs. Row 3	3526.300	19.821	<0.001	0.004	Yes
Row 4 vs. Row 1	2796.900	15.721	<0.001	0.004	Yes
Row 6 vs. Row 5	2666.400	14.987	<0.001	0.004	Yes
Row 4 vs. Row 3	2633.400	14.802	<0.001	0.005	Yes
Row 6 vs. Row 2	2260.500	12.706	<0.001	0.005	Yes
Row 4 vs. Row 5	1773.500	9.969	<0.001	0.006	Yes
Row 2 vs. Row 1	1429.300	8.034	<0.001	0.006	Yes
Row 4 vs. Row 2	1367.600	7.687	<0.001	0.007	Yes
Row 2 vs. Row 3	1265.800	7.115	<0.001	0.009	Yes
Row 5 vs. Row 1	1023.400	5.752	<0.001	0.010	Yes
Row 6 vs. Row 4	892.900	5.019	<0.001	0.013	Yes
Row 5 vs. Row 3	859.900	4.833	<0.001	0.017	Yes
Row 2 vs. Row 5	405.900	2.281	0.026	0.025	No
Row 3 vs. Row 1	163.500	0.919	0.362	0.050	No

Figure 4B:

One Way Analysis of Variance

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Group Name	N	Missing	Mean	Std Dev	SEM
Row 1	20	0	3276.261	264.952	59.245
Row 2	20	0	2927.986	157.526	35.224
Row 3	20	0	2116.471	177.693	39.733

Source of Variation	DF	SS	MS	F	P
Between Groups	2	14166437.804	7083218.902	167.864	<0.001
Residual	57	2405188.242	42196.285		
Total	59	16571626.047			

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference ($P = <0.001$).

Power of performed test with $\alpha = 0.050$: 1.000

All Pairwise Multiple Comparison Procedures (Holm-Sidak method):

Overall significance level = 0.05

Comparisons for factor:

Comparison	Diff of Means	t	Unadjusted P	Critical Level	Significant?
Row 1 vs. Row 3	1159.790	17.854	<0.001	0.017	Yes
Row 2 vs. Row 3	811.516	12.493	<0.001	0.025	Yes
Row 1 vs. Row 2	348.274	5.361	<0.001	0.050	Yes